ENVIRONMENTAL ASSESSMENT

Construction of US 641 from South of the Clarks River Bridge to North of Puryear, Tennessee

Calloway County, Kentucky and Henry County, Tennessee

KYTC Item Number: 1-314.20
TDOT PIN: 101886.05

Submitted Pursuant to the National Environmental Policy Act 42 U.S.C. 4332(2)(c)
by
the U.S. Department of Transportation, Federal Highway Administration,
the Kentucky Transportation Cabinet and the Tennessee Department of Transportation

Federal Highway Administration

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July 2019

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Approved For Public Availability

Acting Division Administrator
Federal Highway Administration KY Division

7/17/19
Date

Director of Division of Environmental Analysis
Kentucky Transportation Cabinet

7/16/2019
Date

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7/16/2019
Date

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1.0 PROJECT DESCRIPTION

In the 1970s, the Kentucky Transportation Cabinet (KYTC) began its initiative to provide the citizens of the Purchase Area with a safer, more efficient connection to the Interstate Highway System. Construction began on a four-lane improvement on US 641 between Murray and the Purchase Parkway (now I-69) in the 1980s and the US 641 improvement was opened to traffic before 1990 (see Figure 1). Following the upgrade of US 641 north of Murray, the KYTC introduced a new state route with the design and construction of Kentucky 80. KY 80 was planned to connect the Purchase Parkway with I-24 east of Cadiz. The sections traveling through Graves and Calloway Counties were under construction in the early 2000s, with all but one section being completed by the early 2010s. Two major investments from the KYTC on this new corridor were the replacement of the Eggners Ferry Bridge carrying KY 80/US 68 over Kentucky Lake at Aurora, Kentucky, which was completed and opened to traffic in 2016, and the Lake Barkley Bridge carrying KY 80/US 68 over Lake Barkley at Canton, Kentucky, which opened to traffic in early 2018. The western terminus for KY 80 is currently at KY 303 south of Mayfield, with a final section scheduled for construction in 2019 that will connect to the Purchase Parkway/I-69.

Along with the attention to KY 80 in the early 2000s, US 641 has also been a focus of the KYTC and the Tennessee Department of Transportation (TDOT) for improving north-south connectivity in the region. A project to extend the five-lane section of US 641 from Glendale Road in Murray, which transitions to a four-lane divided section before reaching the bridge over the Middle Fork of the Clarks River Bridge (KYTC Item No. 1-314.10), is scheduled to go to construction in summer 2019. Concurrently, TDOT has been working for many years to provide an improved connection from the state line south to I-40. TDOT is currently planning improvements from the state line south into Paris in Henry County, as well as additional work in Benton County, TN. The improvements from the state line to Paris have been divided into two sections with one to be constructed by the end of 2019, and another to go into design in 2020. When complete, these projects will provide regional connectivity between I-69, I-24, and I-40 through the rural western portions of both states.

A Value Engineering (VE) Study was completed for the two Kentucky projects (1-314.10 and 1-314.20) in 2012. The study evaluated available preliminary project plans and provided cost-saving recommendations for consideration as the projects further advanced. Recommendations included considering an alternative along the existing corridor, evaluating an alternative east of the existing alignment, options for addressing the crossing of the TransCanada gas line, and tying in at State Line Road, all of which were incorporated into the design as KYTC Item Number 1-314.20 was further refined. Recommendations from the study will continue to be considered during detailed design. A copy of the VE Study can be found in Appendix A.

In December 2018, the US 641 project (KYTC Item Number 1-314.20) was awarded a Better Utilizing Investments to Leverage Development (BUILD) Grant from the US Department of Transportation for $23 million (see Appendix B). This grant will be used to partially support the construction of 5.7 miles of the project from south of Murray to State Line Road in Hazel, KY, at the Tennessee state line. Funding from the grant will not be used for construction into Tennessee. A Bi-State Agreement for construction of the remainder of the project is being developed. Under the agreement, KYTC will develop right-of-way and construction plans for the project in its entirety. TDOT will reimburse KYTC for the development of

Tennessee right-of-way and construction plans and commits to let its portion of the project to construction within ten years of the right-of-way certification date.

Figure 1: Vicinity Map

1.1 Project Setting

1.1.1 Calloway County, Kentucky and Henry County, Tennessee

Calloway and Henry Counties are located in southwestern Kentucky and northwestern Tennessee, respectively, with the proposed project extending across the state line (see Figure 2). Adjacent Kentucky counties are: Graves, Marshall, and Trigg Counties. Adjacent Tennessee counties are: Weakley, Carroll, Benton, and Stewart Counties.

Calloway County, KY, and Henry County, TN, are relatively flat lying, with numerous lakes, ponds, sloughs, and swamps. Both counties are situated within the Mississippi Embayment physiographic region of Kentucky and the Inner Coastal Plain physiographic region in Tennessee.

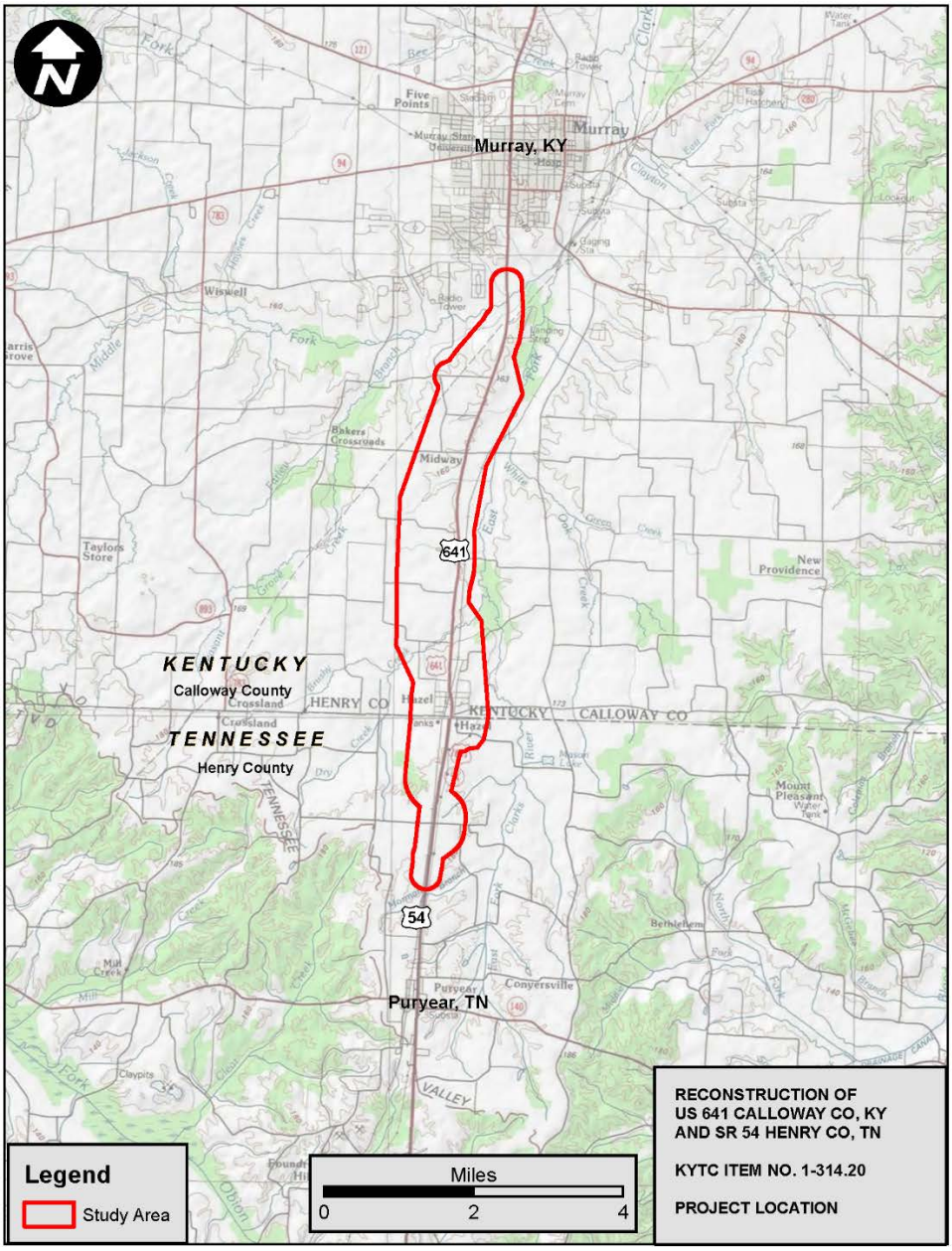


Figure 2: Project Location

1.1.2 Project Corridor

The US 641 Project in rural western Kentucky and Tennessee will improve an existing two-lane highway (see Figure 3) by either widening along the existing corridor or constructing a new alignment parallel to the existing corridor. The proposed alternatives would construct 6.7 to 8.6 miles of improved roadway, depending on the project beginning point that is selected in Tennessee. Whether the improvement occurs on existing alignment or in a parallel corridor, existing US 641 will continue to operate as it does today by providing local access to existing businesses and residential areas. The project would serve the many agricultural and manufacturing operations in Calloway County and northwestern Tennessee by providing an improved facility meeting current design standards that will improve safety and traffic operations.

Figure 3: US 641, Looking South

1.2 Purpose and Need

1.2.1 Project Purpose

US 641 is listed on the National Truck Network as a preferred corridor through Calloway County and western Tennessee to connect with the interstate systems. The purpose of this project is to provide a facility for safe and efficient movement of traffic and freight in the region, particularly between I-24, I-40, and I-69. Between Murray, Kentucky and Henry County, Tennessee, this goal can be accomplished by eliminating the existing geometric deficiencies, reducing the number and severity of crashes, and providing opportunities for farm equipment to safely use the roadway. The project corridor is a primary north-south connection between these interstates and its geometric deficiencies inhibit safe mobility in the area. Narrow driving lanes with narrow shoulders that quickly drop into ditches (see Figure 4) are persistent throughout the corridor, making driving conditions less than desirable, especially during inclement weather events. Frequent access points and sightlines are also problematic, with many areas having insufficient sight distance for pulling onto or off of US 641. The dominant agricultural economy of the area results in large farming equipment frequently using the roadway to access fields, especially during planting and harvesting seasons. These vehicles, coupled with limited safe passing opportunities, slow traffic and present a hazard to travelers in the corridor.

Figure 4: Narrow Shoulders and Steep Drop-offs into Excised Ditches

The purpose of the project is to:

- Provide safe and efficient linkage along US 641 between Murray, Kentucky and Henry County, Tennessee; and
- Improve passenger vehicle and freight connectivity with the interstate system.

1.2.2 Project Need

Three primary needs have been identified for the US 641 corridor:

- Correct geometric deficiencies: The existing roadway includes geometric deficiencies, including narrow lanes and shoulder widths, and substandard horizontal and vertical curves that do not meet current design standards, all of which contribute to a high crash rate, particularly in the Kentucky portion of the project.
- Improve safety: The number of crashes on the Kentucky section is statistically significant, and the fatality rate is three times the statewide average.
- Improve regional connectivity: Connectivity in the region is negatively affected by the substandard design and inability for travelers to navigate around heavy farm machinery that frequently use the roadway.

1.2.2.1 Roadway Geometric Deficiencies

Figure 5: Steep Drop-offs at Culverts

Figure 6: Narrow Lanes and Poor Geometry Create Unsafe Conditions

The corridor is characterized by two 10-foot driving lanes, one- to three-foot shoulders, and steep drop-offs into roadside ditches (see Figure 5). Trucks, as well as passenger vehicles, are routinely observed crossing the centerline due to the narrowness of the lanes and poor geometric conditions (see Figure 6). The roadway lacks a clear zone throughout most of its length and horizontal curvature lacking superelevation creates difficult conditions for drivers, especially during wet weather. Fatal and incapacitating head-on, sideswipe, and run-off road crashes are concentrated in horizontal curves, suggesting that geometry may be contributing to this problem. Narrow bridges along the corridor also

inhibit efficient traffic flow, especially for large trucks. Driveways, rural intersections, and numerous other access points along the corridor create safety concerns. Lack of safe passing opportunities, limited sight distances, and frequent use by slow-moving agricultural vehicles all contribute to a less than desirable driving condition for both commercial vehicles and commuters.

The road is posted as 55 mph at the project's southern terminus near Howard Road, approximately 1.2 miles south of the Crossland Road/Brannon Lane intersection. As the roadway crosses State Line Road in Hazel, the speed limit is reduced to 35 mph, which is consistent through the town. Based upon comments received at the public meeting, area residents complain that this restriction is not always observed, resulting in safety concerns at intersections and possible conflicts with pedestrians and vehicles parking adjacent to local businesses. Safety issues in Hazel are exacerbated by an at-grade crossing of a railroad on the north end of town. The posted speed limit increases to 45 mph just north of the EW Miller intersection and increases again to 55 mph approximately 0.2 miles further to the north at Lavender Street. The roadway remains posted at 55 mph for nearly four miles to near Strawberry Lane, where it is reduced to 45 mph. It remains posted at this speed beyond the bridge over the Middle Fork Clarks River, the northern limit of the project.

North of Lavender Street where the road is posted for 55 mph, there are four substandard vertical curves with sight distances sufficient only for a 50 mph design speed. Near the northern end of the project, just south of Brandon Lane, is a horizontal curve with a 30 mph design speed. Superelevation is insufficient for the posted 45 mph speed limit (see Table 1 and Figure 7).

Table 1: Geometric Deficiency Locations

MP (K or T)*	Horiz. Radius	Superelev.	Sight Distance	Design Speed	Posted Speed
22.263 (T)			401	45	55
1.222 (K)			484	50	55
1.705 (K)			482	50	55
1.922 (K)			488	50	55
2.183 (K)			474	50	55
5.316 (K)	3,050	1.38%		30	45

*Mile points in either Kentucky or Tennessee

Figure 7: Geometric Deficiencies

1.2.2.2 Safety

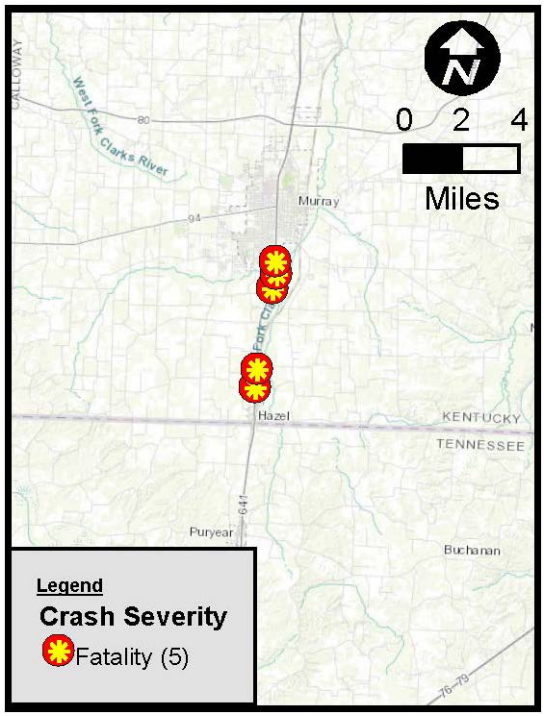


Figure 8: Fatality Crashes 2013-2017

Figure 8 identifies locations where crashes resulting in fatalities occurred in the corridor from January 2013 through December 2017. The crashes are categorized by manner of collision and severity of incident in Figure 10. As shown, collisions resulting in fatalities or incapacitating injuries belong to one of seven categories: Angle, Backing, Head-On, Opposing Left Turn, Rear End, Sideswipe – opposing direction, Sideswipe – same direction, and Single Vehicle. Single Vehicle and Rear End, followed by Angle and Head-on crashes, were the most prominent crash types. This project is expected to reduce the majority of the single vehicle and head-on collisions with the addition of lanes, medians, adequate clear zone, and improved roadway geometry.[1] See Figure 9.

Many of the crash problems in the corridor appear to be related to a variety of geometric issues, including curvature, narrow lanes (10 feet), narrow shoulders (typically a few feet or less), and superelevation issues. Crashes are frequently occurring during inclement weather conditions. Congestion and the operational Level of Service for the section do not appear to be contributing to crash incidents in the corridor. The project will directly address safety issues by providing an improved highway that meets current design criteria.[2] Overall, for the 2025-2044 period, the project is predicted to reduce the number of crashes by more than 60%.[3]

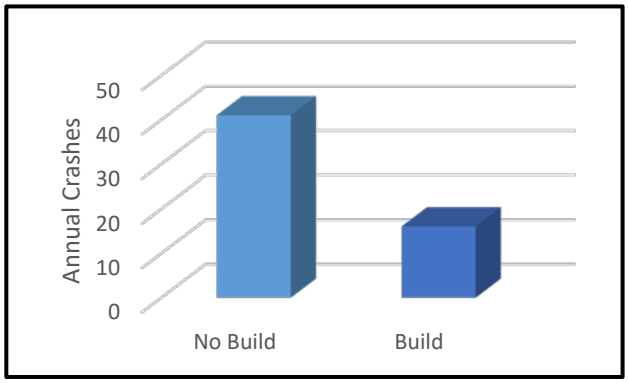


Figure 9: Projected Annual Crashes

Crash rates for the Kentucky section were analyzed to determine a critical crash rate factor (CCRF). The analysis compares crashes for the roadway with crashes that occur on similar facilities statewide and assesses whether the number of crashes is statistically significant, indicated by a CCRF greater than 1.0. Crash rates and fatality rates are also compared with statewide averages as part of the analysis. Crashes occurring between January 2013 and December 2017 were analyzed. During this period, there were 218 crashes, five of which resulted in eight fatalities. The fatality rate for the Kentucky section of this project

[1] See Appendix B; US 641 Calloway County FY 2018 BUILD Grant Appendix C for crash data and analysis, July 2018
[2] AASHTO Green Book – A Policy on Geometric Design of Highways and Streets, 7th Edition
[3] See Appendix B; US 641 Calloway County FY 2018 BUILD Grant, July 2018

is more than three times the statewide average for similar roadways. The Kentucky section of the project has a CCRF of 1.01, indicating that the number of crashes is statistically significant (see Appendix C).

The Fatality Rate for the Kentucky section is more than three times the statewide average for similar roadways.

Crashes in Tennessee (2013-2017) between Howard Road and the state line were also evaluated (see Appendix C). During the analysis period, there were 14 crashes, none of which were fatalities and one of which resulted in a serious injury. The Severe Crash Rate is used by TDOT to identify locations where severe crashes (incapacitating injury or fatality) exceed the statewide averages for similar roadways. A severe Crash Rate above 1.0 satisfies the criteria for implementing a safety project. The Severe Crash Rate for the section of the project is 0.49. Unlike the section between Hazel and Murray, this result indicates that the section in Tennessee between Howard Road and Hazel is not experiencing a statistically significant number of crashes.

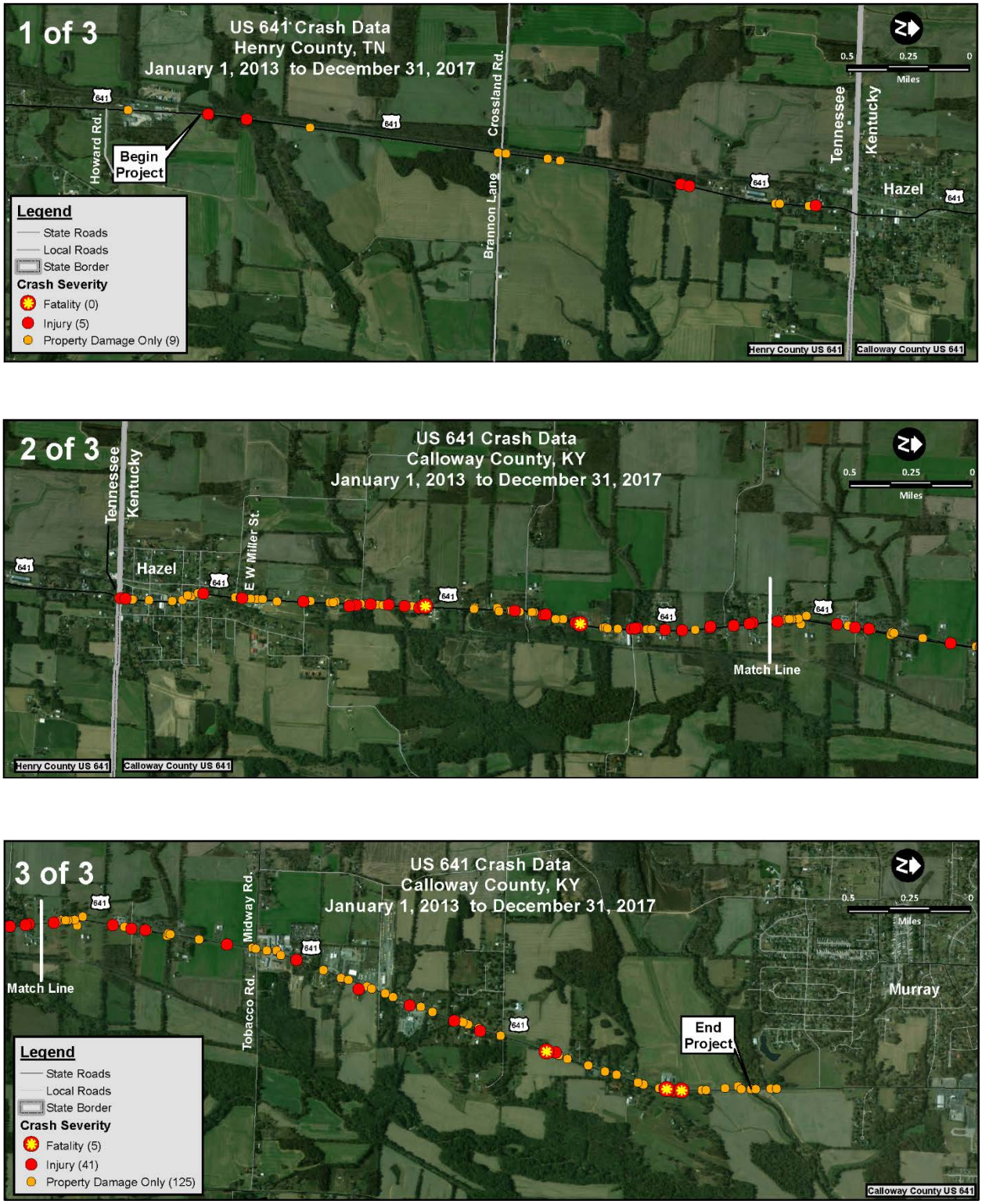


Figure 10: Crash Data January 2013 through December 2017

1.2.2.3 Regional Connectivity

The current highway does not adequately serve the regional need for efficient connection to the interstate systems lying to the north and south. Many drivers, including trucking companies, use this route to travel north-south through the region, and this highway impacts the safety and efficiency of that travel. By improving the geometrics of the roadway, delays due to crashes will be reduced and a more predictable travel through the corridor will be recognized, thus improving the regional connectivity to the interstate systems. In addition, an improved roadway will better serve the agricultural and manufacturing businesses in the broader western Kentucky and Tennessee region.

Agriculture is an essential part of the Calloway County and western Kentucky economies. Agricultural producers and trucking companies utilize the state and national highway system daily to access fields and facilities, and as a connection to the Interstate Highway System. The US 641 corridor is no different. During the spring planting and fall harvest season, this section of US 641 provides access to many of the agricultural fields along the corridor. As a result, slow-moving agricultural equipment hinders movement of traffic and freight, adversely affects travel times through the corridor, and negatively influences regional connectivity.

Along with the agricultural operations, many trucking companies utilize US 641 as a vital connection to ship goods to points south by connecting Calloway County to Paris, Tennessee, as well as I-40 between Memphis, Tennessee, and Nashville, Tennessee. Manufacturing and distribution is also a major economic component within the area with Pella Windows and Doors, Paschall Trucking Lines, Briggs and Stratton, and several other industrial facilities providing a large percentage of the local and regional employment. Many of these facilities rely upon the US 641 corridor for north-south connectivity into Tennessee and beyond. In addition, Murray State University (the sixth-largest public university in Kentucky) and the Murray-Calloway County Hospital (largest facility in Calloway County) both depend on US 641 as a primary access roadway for their facilities. These existing transportation needs are all affected by the substandard facility and poor operational characteristics of the corridor.

1.3 Logical Termini

The project will improve US 641 either along the existing corridor or on new alignment. The project has a logical terminus to the south, near Howard Road, the northern terminus of TDOT project PIN 101886.02, which will improve the facility from near Howard Road south to near Smith Road, north of Paris. Work on the preliminary design for that project is scheduled to begin in summer 2020.

The project has a logical terminus to the north, ending at the Middle Fork of the Clarks River Bridge. From there northward, KYTC has programmed the widening of US 641 to a four-lane section, transitioning to a five-lane urban section near Murray (KYTC Item No. 1-314.10). The project is scheduled to go to construction in summer 2019.

1.4 Traffic

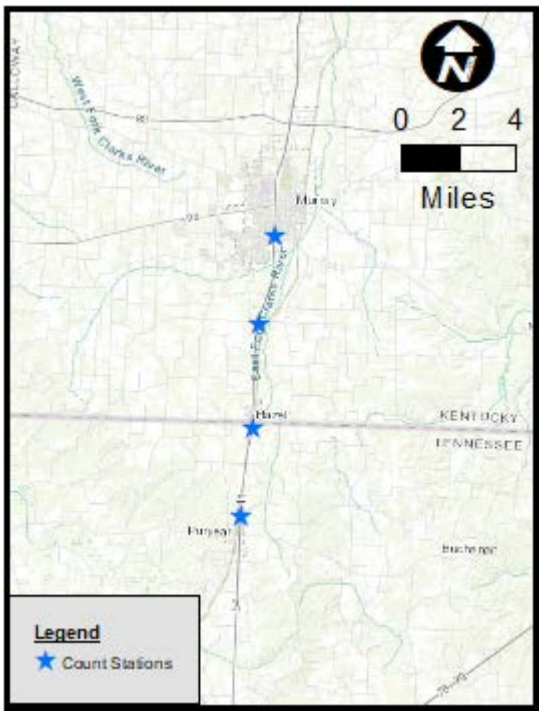
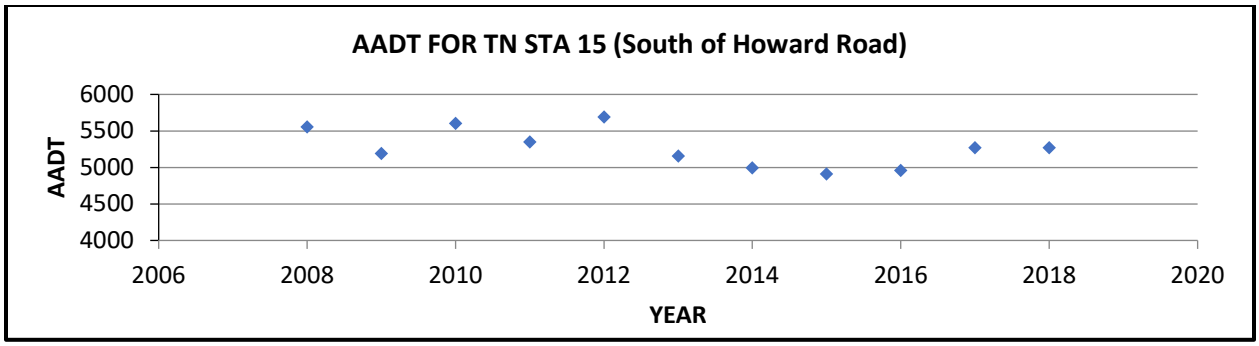


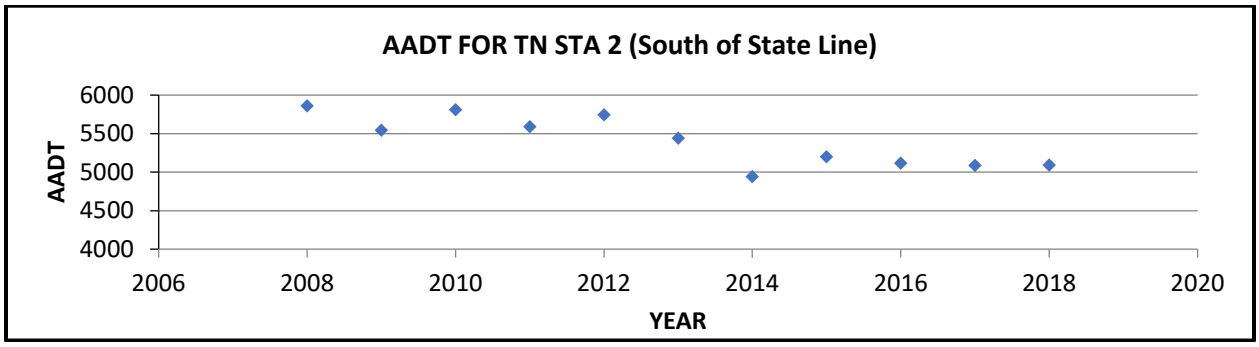
Figure 11: Traffic Count Stations

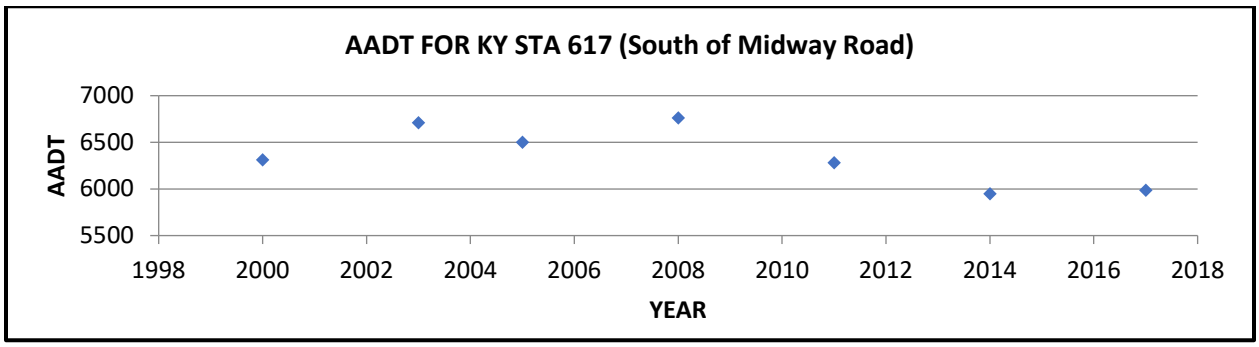
Traffic on US 641 has changed relatively little in the past ten years. Moving from south to north, there are two traffic count stations in Tennessee between Puryear and the state line: STA 15 just south of Howard Road (MP 21.85) and STA 2 just south of the state line (MP 24.93). There are also two traffic count stations in Kentucky located between Hazel and Murray: STA 617 south of Midway Road (MP 3.56) and STA B33 at Glendale Road MP 6.67. These locations have been historically used to collect traffic information in the area (see Figure 11). Since 2000, traffic has been trending downward. The most recent average daily traffic (ADT) counts for Station 617 (2017) and B33 (2016) are 5,984 and 7,320 ADT, respectively (see Figure 12). Trucks comprise approximately nine percent of the traffic.

The 2017 traffic counts in Tennessee have been provided for two sections between Hazel and Howard Road. The more northerly section, between MP 23.47 (Crossland Road/Brannon Lane) and MP 24.93 (State Line Road), reports an ADT of 5,090 vehicles. South of Brannon Lane to Howard Road (MP 21.85), traffic is slightly higher, with a reported ADT of 5,270 vehicles. A weighted average through these two sections results in 5,184 vehicles. These figures are somewhat lower but reasonably consistent with traffic counts in Kentucky.

With traffic growth having been relatively flat for the past 10-15 years, traffic projections have not been developed for the project. Projections, if made, would be expected to reflect little or no growth, given the data collected in the last 10-15 years; therefore, for the purpose of design and assessment of the project, existing traffic and future traffic have been assumed to be similar. For the purpose of analysis, based upon the traffic count data available, traffic has been assumed to be 7,300 ADT between Murray and Midway Road; 5,900 ADT between Midway Road and State Line Road; and 5,200 between State Line Road and Howard Road.







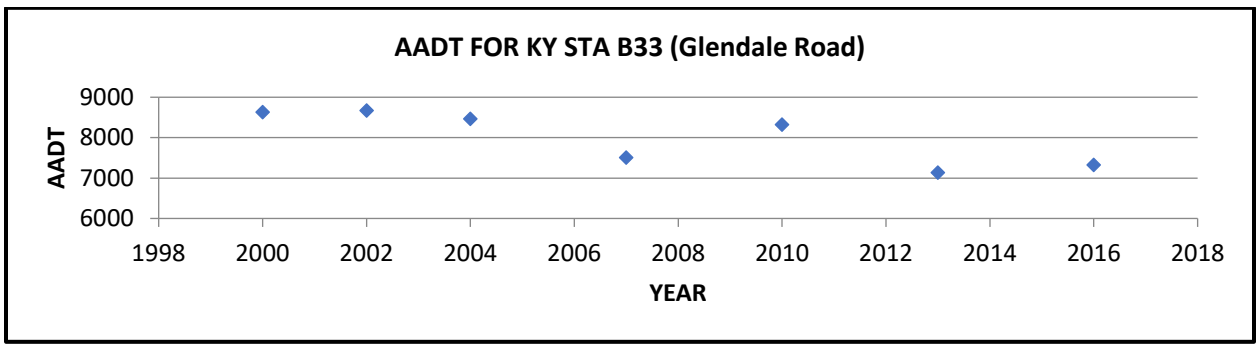


Figure 12: Count Station Traffic Data

1.5 Consistency with Local Plans

KYTC has included the Kentucky portion of the project in its *FY 2016-2022 Six-Year Highway Plan*, enacted in June 2016. The Calloway County section is listed under Item No. 1-314.20. TDOT has also assigned a Project Identification number (PIN) to the project (PIN 101886.05) for preliminary engineering and environmental review.

Of the 15 economic districts in Kentucky, Calloway County belongs to the Purchase Area Development District (PADD). The PADD assists eight local county governments: Ballard, Calloway, Carlisle, Fulton, Graves, Hickman, Marshall, and McCracken Counties. The *PADD Comprehensive Economic Development Strategy 2018 Update* notes that the development and improvement of transportation infrastructure is crucial to the growth of the region and ranks among the highest in priorities of local officials and leaders. US 641 in Calloway County is the highest-priority highway improvement identified in the strategic plan.

The PADD and local government officials have voiced strong support for the proposed US 641 project. This support was identified through personal communication, individual meetings, and public meetings during the development of the *Alternatives Study, Calloway County, Kentucky, US 641 Reconstruction from the Tennessee State Line to KY 1550 in Murray, Kentucky, Item No. 1-314* (2002). This support was further reinforced by local officials at meetings of the US 641 Steering Committee during development of this project and at the local officials briefing conducted in advance of the public meeting held March 12, 2019.

In Tennessee, Henry County is part of the Northwest Tennessee Development District (NTDD). The NTTD is an association of 47 municipalities and nine counties (Benton, Carroll, Crockett, Dyer, Gibson, Henry, Lake, Obion, and Weakley Counties) organized to advocate and promote economic and community development in the region. The *2017 NTDD Comprehensive Economic Development Strategy* identifies that upgrading existing roads and/or the construction of new roads are important infrastructure improvements closely linked to economic vitality. The Study Area is not included in any local or county plans.

The project is consistent with Tennessee's *25-Year Long-Range Transportation Policy Plan*. The plan reflects TDOT's vision for addressing transportation needs statewide and provides the foundation for prioritizing long-term transportation investments across the state.

The *Tennessee Statewide Multimodal Freight Plan* was developed to establish "a guiding principle for the efficient movement of people and freight"[4] and has three specific purposes: 1) Define strategic goals for the Tennessee freight system; 2) Establish a strategy to achieve freight-related goals that align with TDOT's guiding principles; and 3) Fulfill the requirements of the FAST Act. The plan includes a list of prioritized projects that "improve the state of good repair of the transportation infrastructure, one of the three primary objectives identified by TDOT and stakeholders." The US 641 improvement is identified as Project Number WP-22 on page 10-17 of the report.

[4] Tennessee Statewide Multimodal Freight Plan, 2018

2.0 PROPOSED ALTERNATIVE CONCEPTS

2.1 Alternatives Considered

In addition to the No-Build Alternative, which provides a baseline for the comparison of build alternative impacts and performance, five build alternatives (Alternatives 1, 2, 3, 4, and 5), with several variations, were analyzed during project development. The alternatives follow or parallel the existing corridor northward to the crossing of the Middle Fork of the Clarks River approximately 5.7 miles north of the Kentucky/Tennessee state line and south of Murray, KY. A separate state-funded project improves the corridor to four and five lanes north of the river crossing.

When considering an alternative along the existing alignment, a four-lane section would be consistent with the roadway that will soon exist north of the river. However, the impacts to property, community, and development that would result from construction of such a wide typical section in the existing corridor would be extraordinarily high. Therefore, along the existing alignment in both Kentucky and Tennessee, a three-lane alternative is being considered, rather than a four- or five-lane section, in order to minimize impacts to development along the corridor, including historic properties, and to reduce the number of relocations required for construction. All other alternatives in Kentucky would create a new four-lane divided roadway parallel to the existing US 641 corridor. In Tennessee, alternatives located on new highway alignment will consist of a five-lane roadway (four travel lanes and continuous turn lane). It is anticipated that the construction in Tennessee will be phased by initially constructing three lanes, with future widening to the full five-lane section. All of the alternatives have been designed to satisfy a minimum 55 mph design speed. Actual posted speeds through Hazel along Alternative 3 would be expected to be no greater than 35 mph.

All of the alternatives will cross a TransCanada high pressure gas line near the northern end of the project. The Genesee and Wyoming Railroad closely parallels the roadway throughout much of the Study Area and must be crossed by all of the alternatives. The railroad lies east of the existing roadway in the northern Study Area and crosses US 641 at-grade just north of Hazel, moving west of the roadway in the southernmost part of the Study Area.

Alternatives west of the existing roadway have been developed to avoid a radio tower located south of Midway Road. East of the existing corridor, alternative development is challenged by an expansive floodplain of the East Fork of the Clarks River. Wetlands and historic properties are also scattered throughout the Study Area and influenced alternative development. The alternatives being considered can be seen in Figure 13 and Figure 14. The alternatives considered but eliminated are shown in Figure 15 - Figure 24.

2.1.1 No-Build Alternative

The No-Build Alternative would leave the existing road as it currently is, with maintenance activities such as routine paving, striping, and drainage, performed when necessary. In comparison to the proposed build alternatives, short-term costs to maintain current roadway operations would be less expensive due to the lack of expenditures needed for right-of-way acquisition and residential displacements, utility relocations, or project construction. In addition, the No-Build Alternative would impose no direct construction

impacts. However, implementation of the No-Build Alternative would leave the area with a deficient and poorly linked transportation corridor. The No-Build Alternative would neither correct the geometric deficiencies in the existing roadway that contribute to the high fatality rates nor provide improved passenger and freight access to the interstate system as outlined in the purpose and need (see Section 1.2). The No-Build Alternative would not fulfill the purpose and need of the proposed project and was therefore dismissed from further consideration.

2.1.2 Alternative 3

Beginning 0.9 miles north of Howard Road (MP 22.77), **Alternative 3** (7.81 miles) constructs a three-lane rural roadway with shoulders along the existing corridor. As the alternative enters Hazel, it transitions to a two-lane curb and gutter section with parking on each side. As the alternative exits Hazel, it transitions back to its three-lane rural typical section and follows the existing alignment northward, shifting east and west as necessary to minimize impacts to adjacent properties, particularly historic resources. It crosses the TransCanada high pressure gas line near its northern terminus south of the bridge over the Middle Fork of the Clarks River.

2.1.3 Alternative 4

Alternative 4 (8.23 miles) departs eastward from the existing roadway on new alignment approximately 0.9 miles north of Howard Road (MP 22.77), then turns westward to overpass the Genesee and Wyoming Railroad and US 641. After crossing the road and railroad, Alternative 4 remains entirely on the western side of existing US 641, lying as many as 0.8 miles west of the existing roadway. Moving northward, it passes west of Hazel, providing connections to the town with intersections at State Line Road to the south and EW Miller Road to the north. The alternative then turns northwestward, becoming the most westerly alternative, before turning northeastward, passing east of a radio tower near Midway Road, crossing the TransCanada high pressure gas line and continuing to its terminus south of the bridge over the Middle Fork of the Clarks River. There is a variation of this alternative in the northern third of the project, identified as **Alternative 4A** (8.22 miles), which remains to the west of the radio tower before crossing the gas line. **Alternative 4A has been identified as the preferred alternative in Kentucky.**

Alternatives 4F, 4H, and 4I each depart from the existing roadway at different points that lie between 0.4 and 1.3 miles north of Howard Road. All of the alternatives re-converge with the alignment of Alternatives 4 and 4A prior to reaching State Line Road at the Kentucky-Tennessee border. Any of these three alternatives (4F, 4H, or 4I) can be combined with the alignment of Alternatives 4 and 4A in Kentucky to create a complete alternative. Alternatives 4 and 4A only differ in length by 0.01 miles. For simplicity, the lengths of Alternatives 4F, 4H, and 4I in the descriptions provided below are calculated as if combined with the portion of Alternative 4A that lies in Kentucky.

Alternative 4F (7.75 miles) begins approximately 1.3 miles north of Howard Road (MP 23.14) and proceeds northeasterly, crossing Brannon Lane at-grade before turning to the northwest and climbing in elevation to pass over the existing roadway and the Genesee and Wyoming Railroad. After crossing the railroad, it turns to the north and travels concurrent with Alternatives 4 and 4A beginning approximately 2,300 feet south of State Line Road.

Alternative 4H (8.03 miles) is configured very similarly to Alternatives 4 and 4A but its point of departure from the existing alignment is further to the south (MP 22.66), lying approximately 0.8 miles north of Howard Road. From there, it departs from the existing roadway, turning northeasterly then northwesterly, climbing in elevation to pass over existing US 641 and the Genesee and Wyoming Railroad. After crossing the railroad and intersecting at-grade with Crossland Road/Brannon Lane, the alignment turns northward and converges with Alternatives 4 and 4A approximately 5,300 feet north of Crossland Road/Brannon Lane.

Alternative 4I (8.64 miles) has the same general geometry as Alternative 4H but departs from the existing roadway approximately 0.4 miles north of Howard Road (MP 22.24). From there, it turns northeasterly then northwesterly, climbing in elevation to pass over the existing road and the Genesee and Wyoming Railroad. After crossing the railroad, it turns to the north, intersecting at-grade with Crossland Road/Brannon Lane, then continues northerly to its convergence with Alternative 4/4A approximately 5,300 feet north of Crossland Road/Brannon Lane. **Alternative 4I has been identified as the preferred alternative in Tennessee.**

Alternatives 4/4A to US 641 Connector

Construction of the improvement in Kentucky will begin in the Fall of 2020 in accordance with requirements of the BUILD grant awarded to the project. Construction of Alternative 4I in Tennessee will begin within ten years of the right-of-way certification date. During the interim period, a connection is required between the proposed and the existing road that can be safely used by all traffic traveling the corridor. All southbound through traffic would be directed to this connector. Once the Tennessee section of the project is constructed, through traffic will remain on the proposed road (Alternatives 4/4A).

The most southern connections in Kentucky between Alternatives 4/4A and the existing road would occur near Hazel, where intersections would be constructed with EW Miller Road and State Line Road. Both EW Miller Road and State Line Road were considered as locations for the proposed connector. Both roads are narrow (16- to 18-foot pavement), have little to no shoulder, and would require some improvement for safe and efficient traffic flow between Alternatives 4/4A and the existing corridor. State Line Road crosses the Genesee and Wyoming Railroad approximately 335 feet west of existing US 641. The anticipated requirements for considering a grade-separated crossing and potential challenges of securing approval for widening the roadway at the railroad crossing resulted in the dismissal of State Line Road as a connector option.

Three options have been considered for connecting US 641 with the new roadway north of Hazel; two along EW Miller Road (C1 and C2) and a third on new alignment parallel and slightly north of EW Miller Road (C3). For all of the options, traffic traveling southbound on the new roadway (Alternatives 4/4A) would be directed onto the new connector. The new road (Alternatives 4/4A) between the new connector and State Line Road would be signed for local traffic only. The location of these possible connectors are shown in Figures 13 – 15.

With Option C1, EW Miller Road between Alternatives 4/4A and Fifth Street would consist of two 12-foot driving lanes with 6-foot shoulders and would be signed for 35 mph. To minimize right-of-way and utility impacts, it would transition to a curb and gutter section with 12-foot lanes between Fifth Street and US

641. T-intersections with left and right turn lanes would be provided on EW Miller Road at each end of the connector. Signalization is not proposed for either intersection.

Figure 13: Connector Option C1

Option C2 would provide free-flowing traffic from the new roadway (Alternatives 4/4A) onto improved EW Miller Road. Like with Option C1, between Alternatives 4/4A and Fifth Street, two 12-foot lanes with six-foot shoulders would be constructed and would be signed for 35 mph. Between Fifth Street and US 641, a curb and gutter section with 12-foot lanes would be constructed. There would be no stop conditions for traffic travelling on US 641 or EW Miller Road with this option. When the Tennessee section of the project is completed, the western connection between EW Miller Road and Alternatives 4/4A would be modified to a T-intersection, much like what is described as Option C1. The eastern end of the connection could remain as a free-flowing movement or could also be changed to a T-intersection.

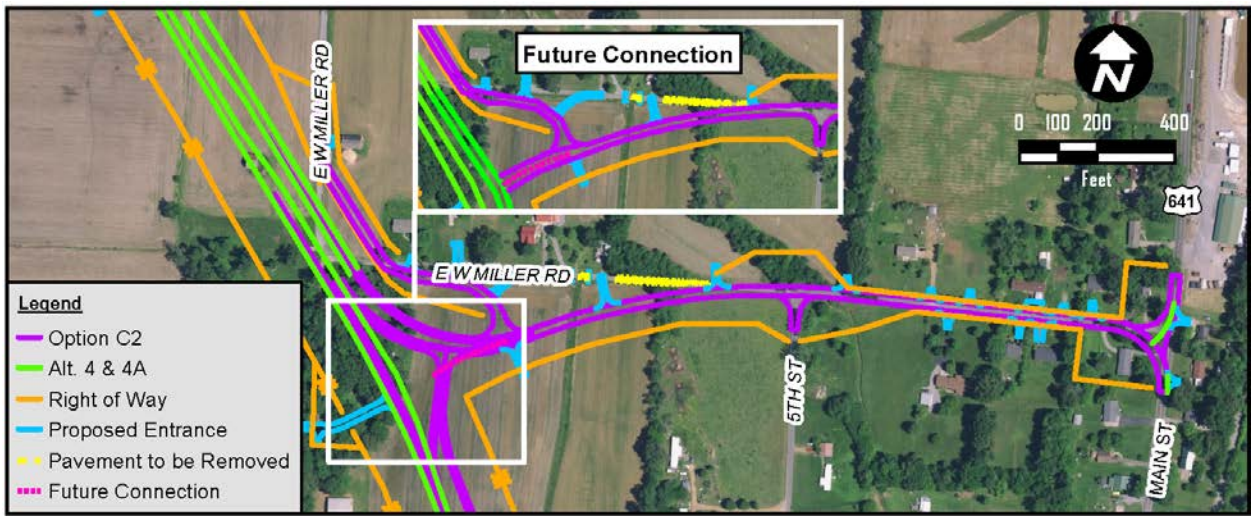


Figure 14: Connector Option C2

Option C3 would construct a new connector road approximately 300-500 feet north of EW Miller Road. The road would consist of two 12-foot lanes with six-foot shoulders. Fifth Street would be extended northward beyond EW Miller Road to intersect with the connector. The connector would be signed for 45

mph between Alternatives 4/4A and Fifth Street, and would be reduced to 35 mph between Fifth Street and US 641. Like Option C2, this option would also create a free-flow connection without any stops. EW Miller Road south of Option C3 would dead-end near Alternatives 4/4A. Vehicles on EW Miller Road would access Alternatives 4/4A via Fifth Street and Option C3. EW Miller Road north of the connector would be realigned to intersect with Option C3. There would be no change to the intersection of EW Miller Road and US 641.

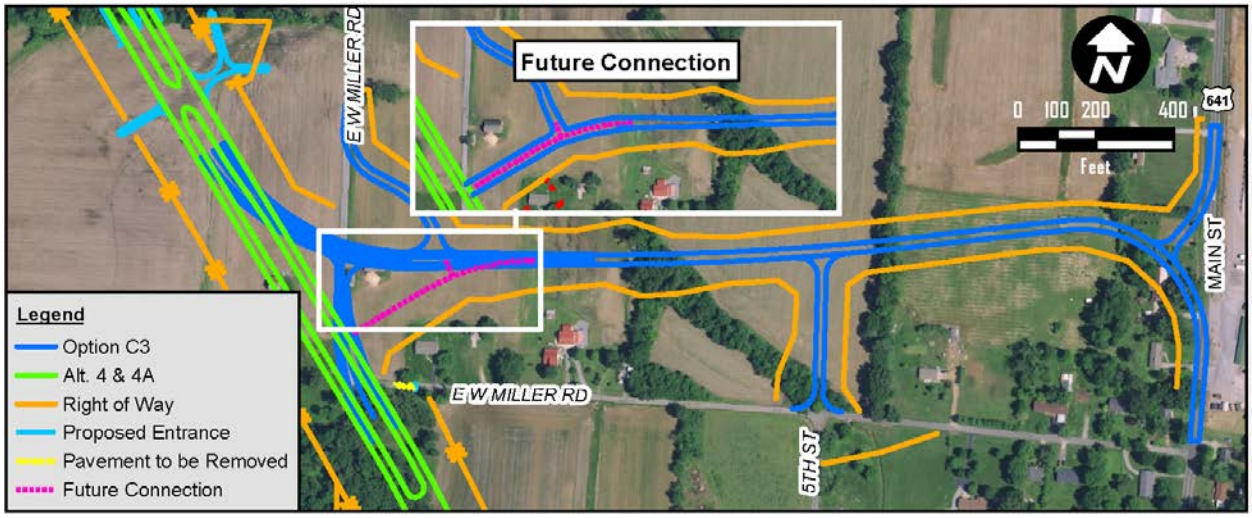


Figure 15: Connector Option C3

2.1.4 Alternative 5

Alternative 5 (6.76 miles) departs northeasterly from the existing corridor approximately 2.0 miles north of Howard Road (MP 23.84) then turns northward, remaining to the east of US 641 throughout its entire length. It is constrained further to the east by the East Fork of the Clarks River. It connects with the local Hazel roadways at Mason Lake Road and State Line Road then proceeds northward, crossing the Genesee and Wyoming Railroad approximately three miles north of Hazel. From there, it continues northward, crossing the TransCanada high pressure gas line just prior to returning to the existing alignment south of the existing bridge over the Middle Fork of the Clarks River.

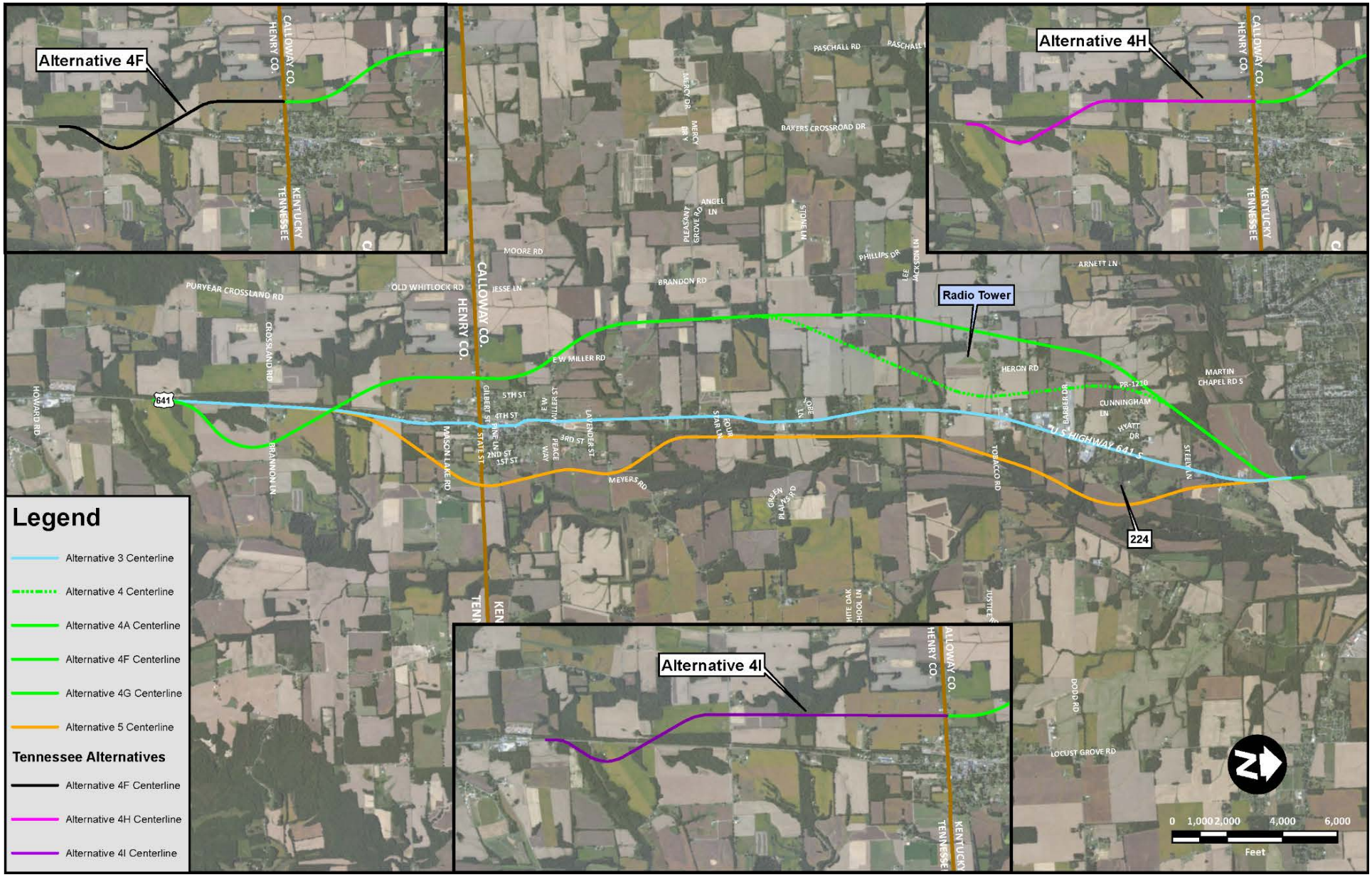


Figure 16: Alternatives Considered in this Environmental Assessment

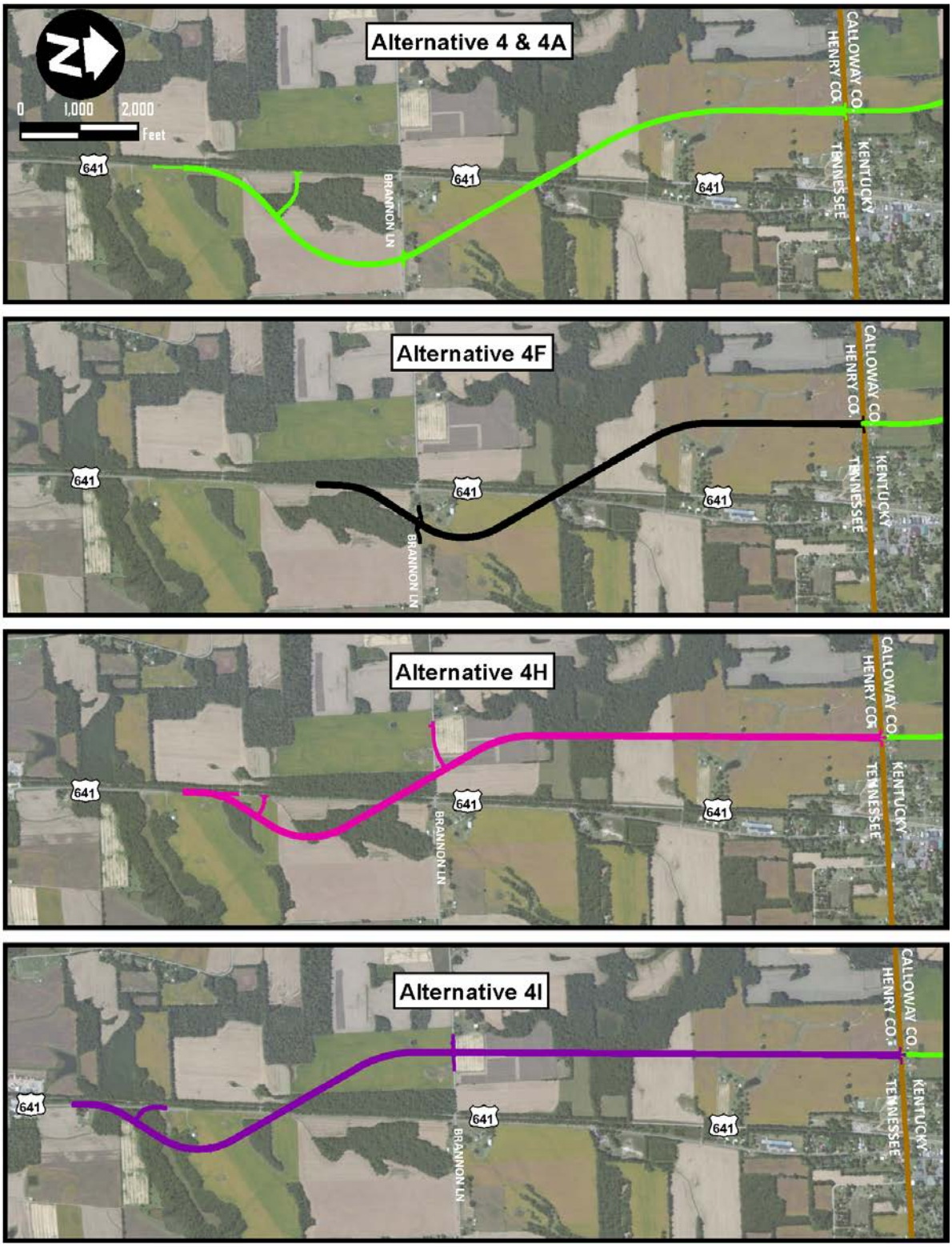


Figure 17: Details of Tennessee Alternatives Considered in this Environmental Assessment

2.2 Alternatives Considered but Eliminated

Alternative 1 (8.11 miles) departed from the existing roadway approximately 0.9 miles north of Howard Road (MP 22.77) and traveled eastward at an increasing grade before turning westward and overpassing the Genesee and Wyoming Railroad and existing US 641. It continued northward, crossing the state line at State Line Road and skirting the western limits of Hazel, KY. In addition to the State Line Road intersection south of Hazel, an intersection with EW Miller Road would have provided access north of the town. As it moved to the north, the alternative remained on the western side of the existing corridor, turning northwesterly to avoid a radio tower, then crossing a TransCanada high pressure gas line before rejoining existing US 641 south of the bridge over the Middle Fork of the Clarks River. The alignment was found to adversely affect two farms (FS 199 and FS 201) determined to be eligible for the National Register of Historic Places (NRHP) and required a Section 4(f) use of the properties. With the successful development of avoidance alternatives, this alternative was eliminated.

Alternative 2 (8.08 miles) was very similar to Alternative 1, departing eastward from the existing roadway approximately 0.9 miles north of Howard Road (MP 22.77) then turning westward to overpass the Genesee and Wyoming Railroad and US 641 before turning northward, crossing State Line Road/State Street and passing just west of Hazel. Like Alternative 1, access to Hazel was provided at the State Street intersection to the south and at the intersection with EW Miller Road to the north. As it traversed further northward, Alternative 2 lay slightly closer to the existing alignment than Alternative 1 before rejoining the Alternative 1 corridor east of the radio tower, crossing a TransCanada high pressure gas line and making its way to its terminus south of the bridge over the Middle Fork of the Clarks River. The alignment was found to adversely affect two farms (FS 199 and FS 201) determined to be eligible for the NRHP and required a Section 4(f) use of the properties. With the successful development of avoidance alternatives, this alternative was eliminated.

Alternative 3 with a five-lane typical section that would have reconstructed US 641 along the existing alignment was preliminarily considered but dismissed due to the high degree of impacts that would have been recognized by residences and businesses along the corridor.

In addition to the various configuration for Alternative 4 in Tennessee that have been carried forward (4F, 4H, and 4I), several additional alternatives for reconnecting with US 641 on the southern end of the project were also considered but dismissed. South of the railroad crossing, **Alternative 4B** (7.75 miles) reduced (compared with Alternatives 4 and 4A) the radii of the horizontal curves that would return traffic to the existing alignment while maintaining a free-flow condition, thus resulting in a shorter project (see Figure 19). Alternative 4B was developed assuming a 55 mph design speed. At the direction of TDOT, all alternatives in Tennessee were subsequently designed using a 60 mph design speed. Minor changes in the Alternative B design parameters resulted in the development of Alternative 4F and the elimination of Alternative 4B. **Alternative 4C** (7.31 miles) introduced an even shorter horizontal curve to tie down as quickly as possible with the existing alignment, creating a "T" intersection with existing US 641 (see Figure 20). With the desire to maintain a free-flow condition, this alternative was eliminated. **Alternative 4D**, which terminated at an intersection with Crossland Road west of US 641 and the railroad, was summarily dismissed (see Figure 21). With this alternative, traffic travelling on Crossland Road between the new route and the existing corridor would undesirably have crossed the railroad at-grade. With **Alternative 4E**

(7.75 miles), a trumpet interchange was considered to connect the new alternative with the existing roadway (see Figure 22). This alternative was dismissed due to the high costs involved.

Alternative 4G (7.01 miles) would have elevated the Genesee and Wyoming Railroad on its existing location and passed the new road beneath the railway (see Figure 23). This alternative would have required reconstruction of approximately 4,800 feet of the railroad and temporary tracks that would have been constructed to the west, which could have been used while the railroad was being reconstructed. Elevating the railroad, rather than passing the roadway over the railroad, would have allowed the convergence point with the existing alignment to occur approximately 1,750 feet north of Crossland Road/Brannon Lane (MP 23.80), thus shortening the alternative by more than 0.6 miles when compared with Alternative 4F. After departing from the existing alignment, the alternative turned immediately to the west, passing beneath the newly elevated railroad, and was common with the horizontal alignment of Alternatives 4 and 4A throughout the remainder of its length. This alternative was eliminated due to the potential complexities of acquiring railroad right of way; uncertainties regarding the extent of track reconstruction that would have been necessary; and concerns with impacts to US 641 that could have occurred while working in such proximity.

Alternative 4J (8.04 miles) was very similar to Alternative 4G but returned to the existing corridor slightly further to the south (see Figure 24). Like Alternative 4G, It would have elevated the Genesee and Wyoming Railroad on its existing location and passed the new road beneath the railway, requiring reconstruction of approximately 4,800 feet of the railroad and temporary tracks to the west, which could have been used while the railroad was being reconstructed. Elevating the railroad, rather than passing the roadway over the railroad, allowed the convergence point with the existing alignment to occur approximately 3,600 feet south of Crossland Road/Brannon Lane, thus shortening the alternative by 0.6 miles when compared with Alternative 4I. After departing from the existing alignment at MP 22.78, the alternative turned immediately to the west, passing beneath the newly elevated railroad, and was common with the horizontal alignment of Alternative 4I throughout the remainder of its length. This alternative was eliminated due to the complexities of modifying the railroad and acquiring right of way; uncertainties regarding the extent of track reconstruction that would have been necessary; and concerns with impacts to US 641 that could have occurred while working in such proximity.

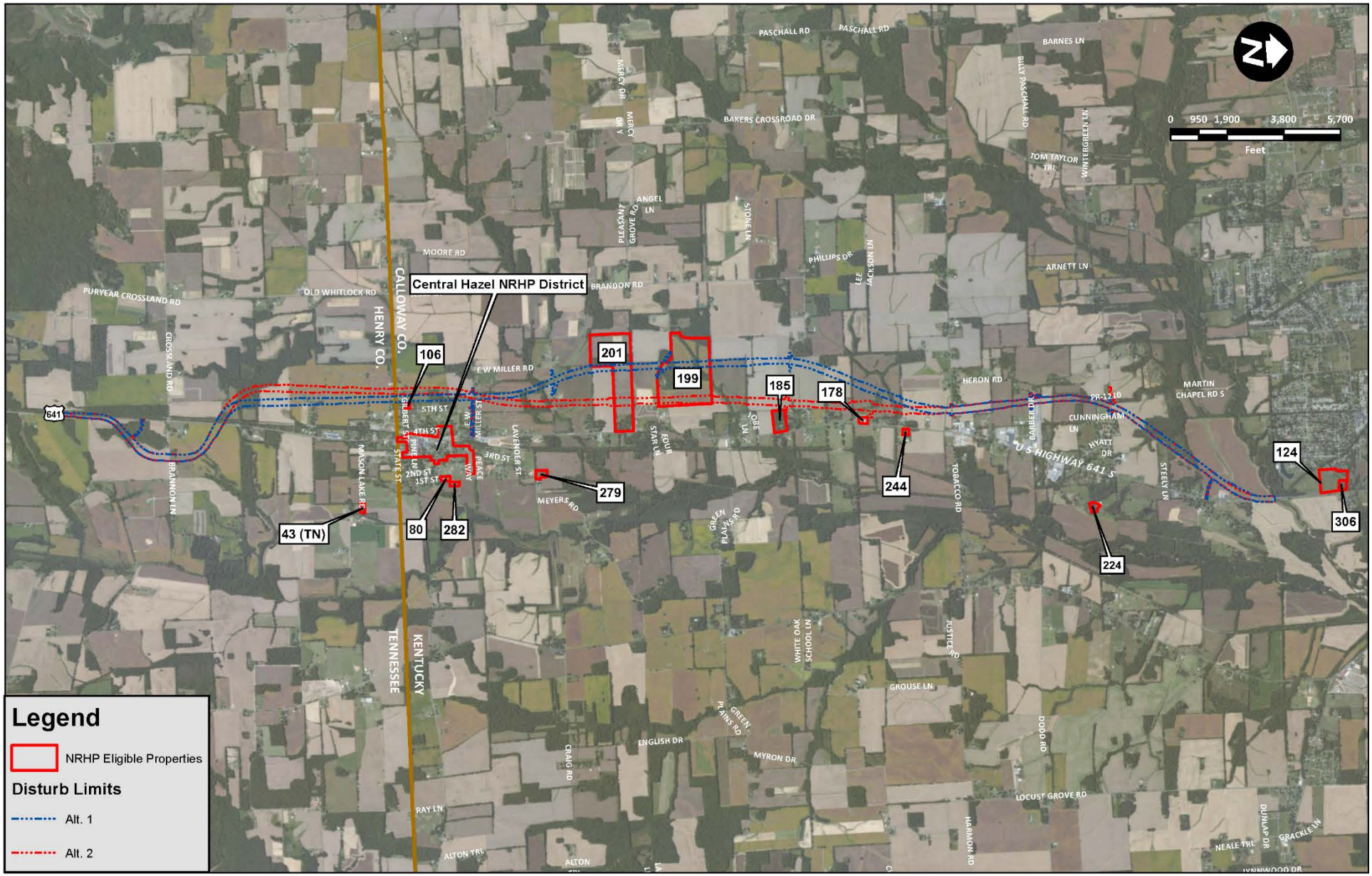


Figure 18: Alternatives Considered but Eliminated - Alternatives 1 and 2

Figure 19: Alternatives Considered but Eliminated – Alternative 4B

Figure 20: Alternatives Considered but Eliminated – Alternative 4C

Figure 21: Alternatives Considered but Eliminated – Alternative 4D

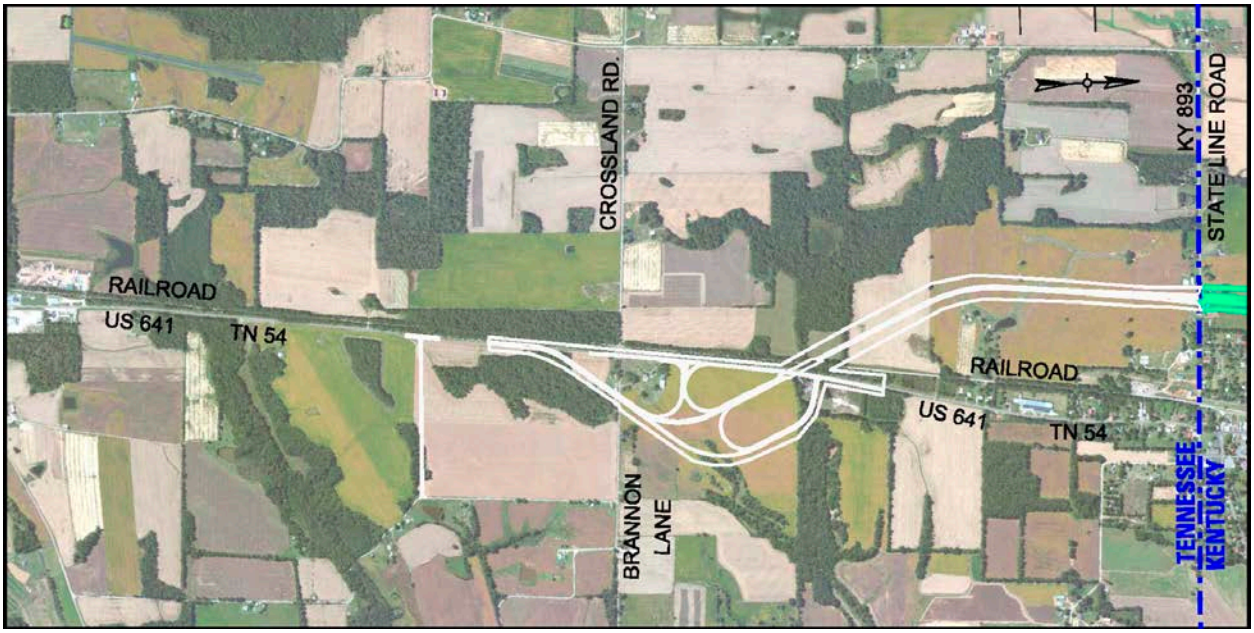


Figure 22: Alternatives Considered but Eliminated – Alternative 4E

Figure 23: Alternatives Considered but Eliminated – Alternative 4G

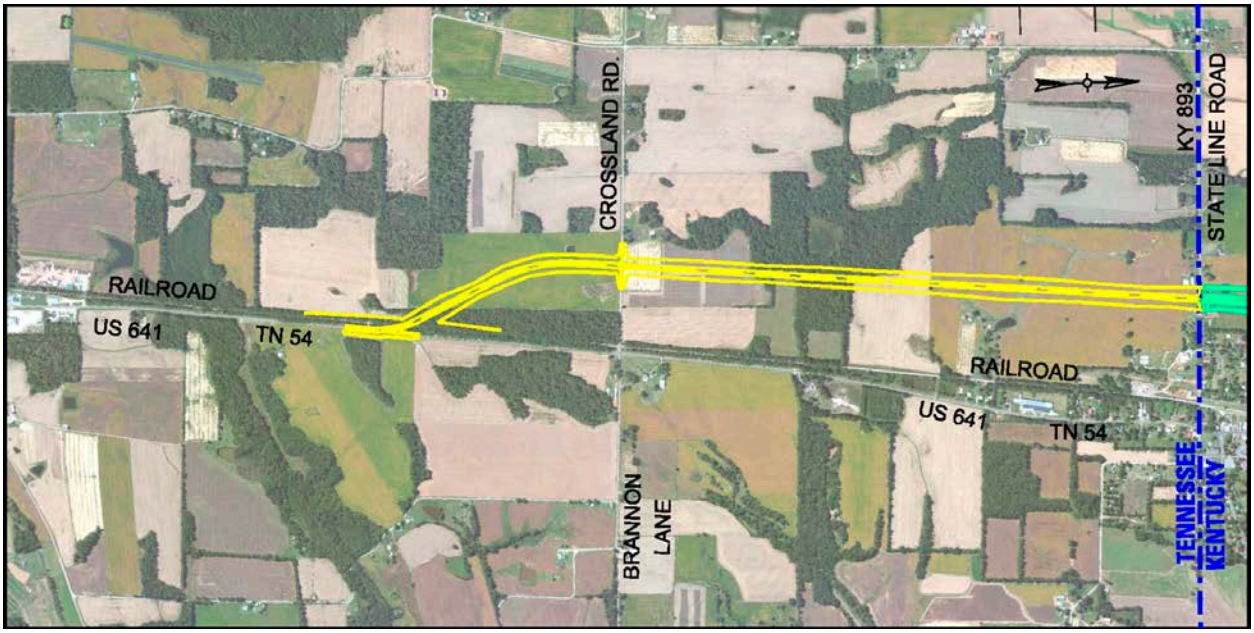


Figure 24: Alternatives Considered but Eliminated – Alternative 4J

2.3 Typical Section

Two typical sections were considered along the existing corridor for construction of Alternative 3. Throughout most of its length, the road would consist of two 12-foot travel lanes with 8-foot paved shoulders and a 14-foot center turning lane. Through Hazel, the typical section was reduced to two travel lanes with parking on each side to minimize impacts to the community and historic properties (see Figure 25).

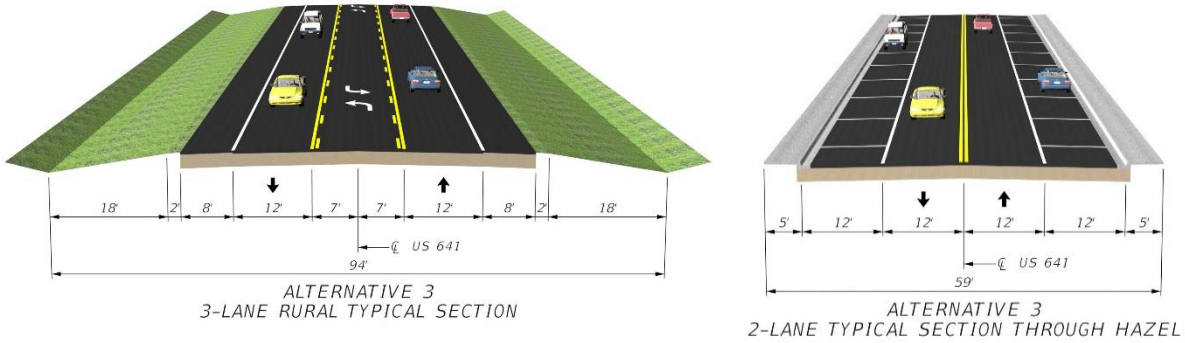


Figure 25: Alternative 3 Typical Sections

All other alternatives in Kentucky are located on new alignment and would consist of four 12-foot lanes, paved shoulders that are ten feet wide on the outside and four feet wide on the inside, and a 48-foot depressed median (see Figure 26). For Alternatives 4 and 4A, a connector is proposed north of Hazel. Three options are considered that have varying typical sections. Options 1 and 2 would provide a connection by improving EW Miller Road to include two 12-foot lanes and 6-foot shoulders between Alternatives 4/4A and Fifth Street. At Fifth Street it would transition to two 12-foot lanes with curb and gutter, which it would maintain to its terminus at existing US 641. For Option 1, left and right turn lanes will be provided at the US 641 intersection. Option 3 is on new alignment and would include two 12-foot lanes with six-foot shoulders along its entire length.

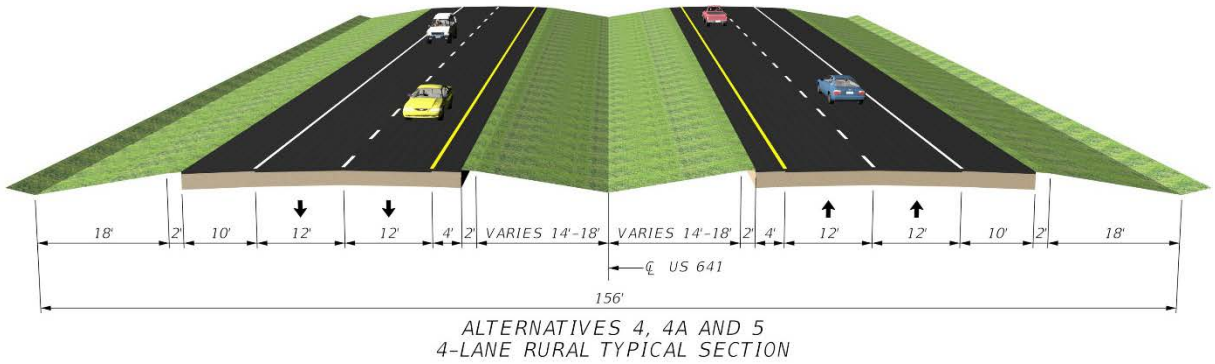


Figure 26: Kentucky Off-Corridor Typical Section

For all off-corridor alternatives in Tennessee, the typical section transitions to a five-lane rural typical section consisting of 12-foot driving lanes, a 14-foot turning lane, and shoulders measuring eight feet on the outside and four feet on the inside. It is anticipated that construction will be phased to initially build a three-lane section with intent for future widening to the ultimate five-lane configuration (see Figure 27). This initial phase would include two 12-foot driving lanes with 8-foot shoulders and a 14-foot continuous turning lane.

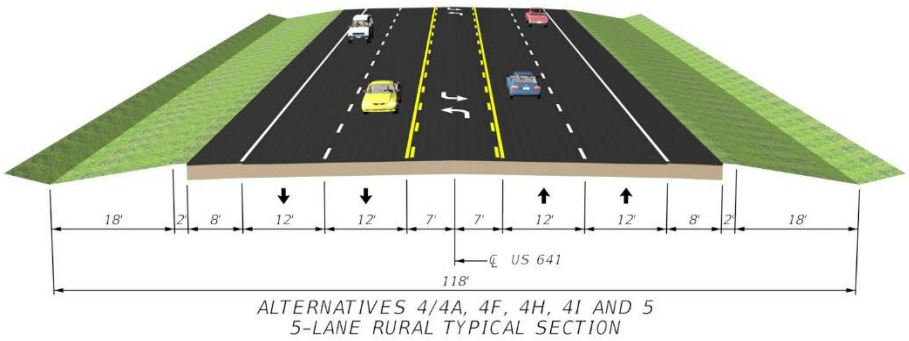


Figure 27: Tennessee Off-Corridor Typical Section

3.0 ENVIRONMENTAL CONSEQUENCES

3.1 Air Quality

The Environmental Protection Agency (EPA), under direction of the Clean Air Act as amended in 1990, sets limits on known National Ambient Air Quality Standards (NAAQS) for criteria pollutants. An air quality analysis for the project was conducted in accordance with Section 600 of the *KYTC Division of Environmental Analysis Guidance Manual* and Section 5.3.5 (Air Quality) of the *Tennessee Environmental Procedures Manual*. The purpose of this analysis is to address potential air quality effects including transportation conformity, Carbon Monoxide Hot-Spot Analysis, Mobile Source Air Toxics (MSATs), construction air quality, and indirect and cumulative effects (see Section 3.14 for a detailed discussion on indirect and cumulative effects).

3.1.1 Conformity

EPA establishes National Ambient Air Quality Standards (NAAQS) that define the allowable concentrations for various priority pollutants including the six criteria pollutants: ozone, carbon monoxide, nitrogen dioxide, sulfur dioxide, Particulate Matter less than 10 microns in diameter (PM_{10}), and Particulate Matter less than 2.5 microns in diameter ($PM_{2.5}$). Areas of the country where air pollution levels persistently exceed the NAAQS may be designated “nonattainment.”

Neither Calloway nor Henry County has violations of the NAAQS nor do they have a nonattainment status for any of the criteria air pollutants. The entirety of the project, including that portion lying in Tennessee, is included in the Kentucky Statewide Transportation Improvement Program (STIP) (Administrative Modification #2018.090, see Appendix D). The area is in attainment for all transportation-related criteria pollutants; therefore, conformity requirements do not apply.

3.1.1.1 Carbon Monoxide (CO) Hot-Spot Analysis

Carbon monoxide is a colorless, odorless gas that interferes with the delivery of oxygen to a person’s organs and tissues. The health effects of CO exposure depend on the duration and intensity of exposure as well as a person’s health. CO concentrations are usually higher during the winter months because vehicles emit higher CO emissions in cold weather due to the characteristics of internal combustion engines.

The NAAQS for CO include a one-hour standard of 35 parts per million (ppm) and an eight-hour standard of 9 ppm. The need for a CO hot-spot analysis was considered in accordance with the Guideline for Modeling Carbon Monoxide from Roadway Intersections published by EPA (hereafter referred to as the EPA Guideline) and the EPA Conformity Rule, to ensure that the project would not cause new violations or contribute to existing violations of the NAAQS. Since there are no signalized or stop conditions and traffic is expected to remain constant along the proposed corridor, a CO Hot-Spot analysis is not required.

3.1.2 Mobile Source Air Toxics

In addition to the criteria pollutants, the EPA regulates Mobile Source Air Toxics (MSATs). The Clean Air Act Amendments of 1990 listed 188 Hazardous Air Pollutants and addressed the need to control toxic emissions from transportation. In 2001, EPA issued its first MSAT rule, which identified 21 MSAT compounds as being hazardous air pollutants that required regulation. A subset of these MSAT compounds was identified as having the greatest influence on health. More recently, EPA issued a second MSAT Rule in February 2007, which provided additional recommendations of compounds having the greatest impact on health. The current subset of seven MSAT compounds include: benzene, 1,3-butadiene, formaldehyde, acrolein, diesel particulate matter, naphthalene, and polycyclic organic matter. Unlike the criteria pollutants, MSATs do not have NAAQS, making evaluation of their impacts less standard.

On February 3, 2006, the FHWA released *Interim Guidance on Air Toxic Analysis in NEPA Documents*. This guidance was superseded on September 30, 2009; December 6, 2012; and most recently on October 18, 2016 by FHWA's *Updated Interim Guidance on Mobile Source Air Toxic Analysis in NEPA Documents*, herein referred to as the Updated Interim Guidance (see Appendix D). The purpose of FHWA's Updated Interim Guidance is to advise on when and how to analyze MSATs in the NEPA process for highways. This guidance is interim because MSAT science is still evolving. As the science progresses, FHWA will revise and update the guidance.

The qualitative analysis presented below provides a basis for identifying and comparing the potential differences among MSAT emissions, if any, from the various alternatives. The assessment is derived in part from a study conducted by the FHWA entitled *A Methodology for Evaluating Mobile Source Air Toxic Emissions Among Transportation Project Alternatives*.

FHWA's guidance groups projects into the following categories:

- Exempt Projects and Projects with No Meaningful Potential MSAT Effects
- Projects with Low Potential MSAT Effects
- Projects with Higher Potential MSAT Effects

The guidance provides examples of Projects with Low Potential MSAT Effects, including projects for which the design year traffic projections are less than 140,000 to 150,000 AADT. For projects with Low Potential MSAT Effects, any increase in emissions due to increased VMT would be offset somewhat by lower MSAT emission rates due to increased speeds; according to the U.S. EPA's MOVES2014 model, emissions of all the priority MSAT decrease as speed increases.

The resulting VMTs for the No-Build and the preferred alternative (Alternatives 4A and 4I) are shown in Table 2. As shown, the projected VMT for the No-Build Alternative is 50,680 miles and the projected VMT for the preferred alternative is 53,004 miles, an increase of approximately four percent. Even though there is an increase in VMTs, the emission reductions predicted by the U.S. EPA's MOVES2014 model as a result of increased speed would offset these increases for the preferred alternative.

Table 2: Build Year VMT Projections on Affected Roadway Network

Alternative	Build Year Daily VMT (Miles)
No-Build	50,680
Preferred Alternative	53,004
Change	2,324 (4%)

3.1.3 Construction Air Quality

Road construction activities have the potential to generate fugitive dust. Fugitive dust consists of particulate matter that becomes airborne directly or indirectly as a result of human activity. Road construction can generate fugitive dust from earth-moving equipment (e.g., bulldozers, graders) and trucks loading and unloading or transporting earthen materials. Wind can cause fugitive dust in areas cleared of vegetation during construction.

The contractor would be required to perform all construction activities in accordance with the KYTC's and TDOT's *Standard Specifications for Road and Bridge Construction* (updated June 15, 2012, and January 1, 2015, respectively) for the prevention of air pollution as the result of burning (if allowed), drilling, blasting, production of materials, hauling, or any other necessary construction operations. Best Management Practices (BMPs) would be implemented to control fugitive dust as required by the Kentucky Division for Air Quality and TDEC's Division of Air Pollution Control.

3.1.4 Air Quality Mitigation

No air quality impacts resulting from emissions are anticipated as a result of any of the project alternatives; therefore, no mitigation is necessary.

3.2 Noise

The highway traffic noise analysis for this project was conducted in accordance with the KYTC *Noise Analysis and Abatement Policy* (KYTC Noise Policy) effective July 1, 2015; TDOT's *Policy on Highway Traffic Noise Abatement* (TDOT Noise Policy); and the Federal Highway Administration's (FHWA) 23 CFR Part 772 – *Procedures for Abatement of Highway Traffic Noise and Construction Noise*. Separate reports were developed and coordinated with the respective states to address potential impacts within each jurisdiction. Copies of the reports are provided in Appendix E.

3.2.1 Noise Impact Criteria

Noise levels are measured to establish existing conditions and to develop a model that can predict noise levels that will be recognized with changes in traffic and possible construction of a project. The FHWA has established Noise Abatement Criteria (NAC) for various types of land use (see Table 3). Existing and predicted noise conditions are compared with the NAC to determine whether a traffic noise impact occurs. An impact is considered to occur if the measured or predicted noise level approaches or exceeds the NAC. "Approaches" is defined as being one decibel below the NAC.

Table 3: Noise Abatement Criteria (Hourly A-weighted Sound Level, decibels [dBA])

Activity Category	$L_{Aeq}(h)$	Evaluation Location	Activity Description
A	57	Exterior	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose.
B[1]	67	Exterior	Residential.
C[1]	67	Exterior	Active sport areas, amphitheaters, auditoriums, campgrounds, cemeteries, day care centers, hospitals, libraries, medical facilities, parks, picnic areas, places of worship, playgrounds, public meeting rooms, public or nonprofit institutional structure, radio stations, recording studios, recreation areas, Section 4(f) sites, schools, television studios, trails, and trail crossings.
D	52	Interior	Auditoriums, day care centers, hospitals, libraries, medical facilities, places of worship, public meeting rooms, public or nonprofit institutional structure, radio studios, recording studios, schools, and television studios.
E[1]	72	Exterior	Hotels, motels, offices, restaurants/bars, and other developed lands, properties or activities not included in A-D, or F.
F	---	---	Agriculture, airports, bus yards, emergency services, industrial, logging, maintenance facilities, manufacturing, mining, rail yards, retail facilities, shipyards, utilities (water resources, water treatment, electrical), and warehousing.
G	---	---	Undeveloped lands that are not permitted.

[1] Includes undeveloped lands permitted for this activity category. Source: 23 CFR 772, July 2010

An impact may also be considered to occur if there is a substantial noise level increase. In Kentucky, a substantial increase is considered to exist when, with the Build alternative, the noise level at a receptor exceeds the No-Build condition by 10 dBA or more. In Tennessee, a substantial noise increase is defined in policy based upon the existing noise level (see Table 4).

Table 4: Substantial Noise Level Increase for Tennessee

Existing Noise Level (dBA) (1)	Noise Level Increase (dB) (2)
42 or less	15 or more
43	14 or more
44	13 or more
45	12 or more
46	11 or more
47 or more	10 or more

(1) Worst hour noise level from the combination of natural and mechanical sources and human activity.
(2) Predicted design year noise level minus existing noise level.

Noise receptors were identified along the proposed alternative corridors. Noise readings and traffic data were collected at strategic locations in the Study Area during both the AM and PM peak and used in the FHWA's Traffic Noise Model version 2.5 (FHWA TNM 2.5). Using traffic information, Alternatives 3, 4, 4A, 4F, 4H, 4I, and 5 were analyzed to determine whether traffic noise impacts will result from construction of the project.

Traffic counts in the Study Area have not increased in recent years, and significant traffic growth is not anticipated with or without implementation of the project. For the purpose of analyzing future noise conditions, it is assumed that all existing traffic will be relocated onto the new roadway after construction. This presumption is considered to be conservative for the alternatives lying off the existing corridor (Alternatives 4A and 5), since some residual traffic will inevitably remain on existing US 641.

3.2.2 Kentucky Analysis

The noise receptors analyzed in Kentucky are shown in Figure 28. There were 18 noise receptors located along existing US 641 that were identified as currently exceeding the NAC. Most of these receptors were located very near the existing roadway. The highest predicted noise reading (69.6 dBA L_{eq}) was experienced at Site F7, a residence located at 614 US 641. For the No-Build condition, noise levels would be expected to remain constant with those that presently exist.

With the construction of Alternative 3, 14 of the 18 residences that had noise levels predicted to exceed the NAC, would be relocated by widening of the corridor. Of the remaining four sites, noise levels were predicted to be reduced due to shifting the alignment and traffic slightly away from the residences. The highest predicted noise level with construction of this alternative is at 3480 US 641 in the northern part of the project, Site 32 (65.4 dBA L_{eq}). Only one noise-sensitive commercial property was identified, an office/call center (Site 1). The building would be relocated for construction of Alternative 3. Two churches are located on the existing road but neither have exterior areas of frequent human use. Alternative 3 would not create any traffic noise impacts; as such, noise abatement is not proposed for this alternative.

Alternative 4A would divert through traffic away from the existing corridor, where the highest concentration of receptors are present. Eight residential properties would be relocated for construction of the alternative and have not been considered in this analysis. There are no businesses in the corridor. There are two small clusters of receptors that are proximate to the alternative, one at the intersection with Midway Road and a second on the west side of Hazel. In the Midway area, noise levels at Site F4 are predicted to increase 4.3 dBA L_{eq} with construction of Alternative 4A. The highest predicted noise level in the Midway area is 59.6 dBA L_{eq}. Alternative 4, which diverges from Alternative 4A and takes a more easterly course in the northern section of the project, was considered to be so similar in its effects to Alternative 4A that this short variant section was not independently analyzed. Results from the analysis of Alternative 4A indicate that a traffic noise impact is not experienced unless a receptor lies within 50-100 feet of the proposed roadway. No noise receptors along Alternative 4 are located this proximate to the proposed alternative. West of Hazel, noise levels at the receptors are predicted to range from 47.7 dBA L_{eq} to 54 dBA L_{eq}. Alternative 4A would not create any traffic noise impacts; as such, noise abatement is not proposed for this alternative.

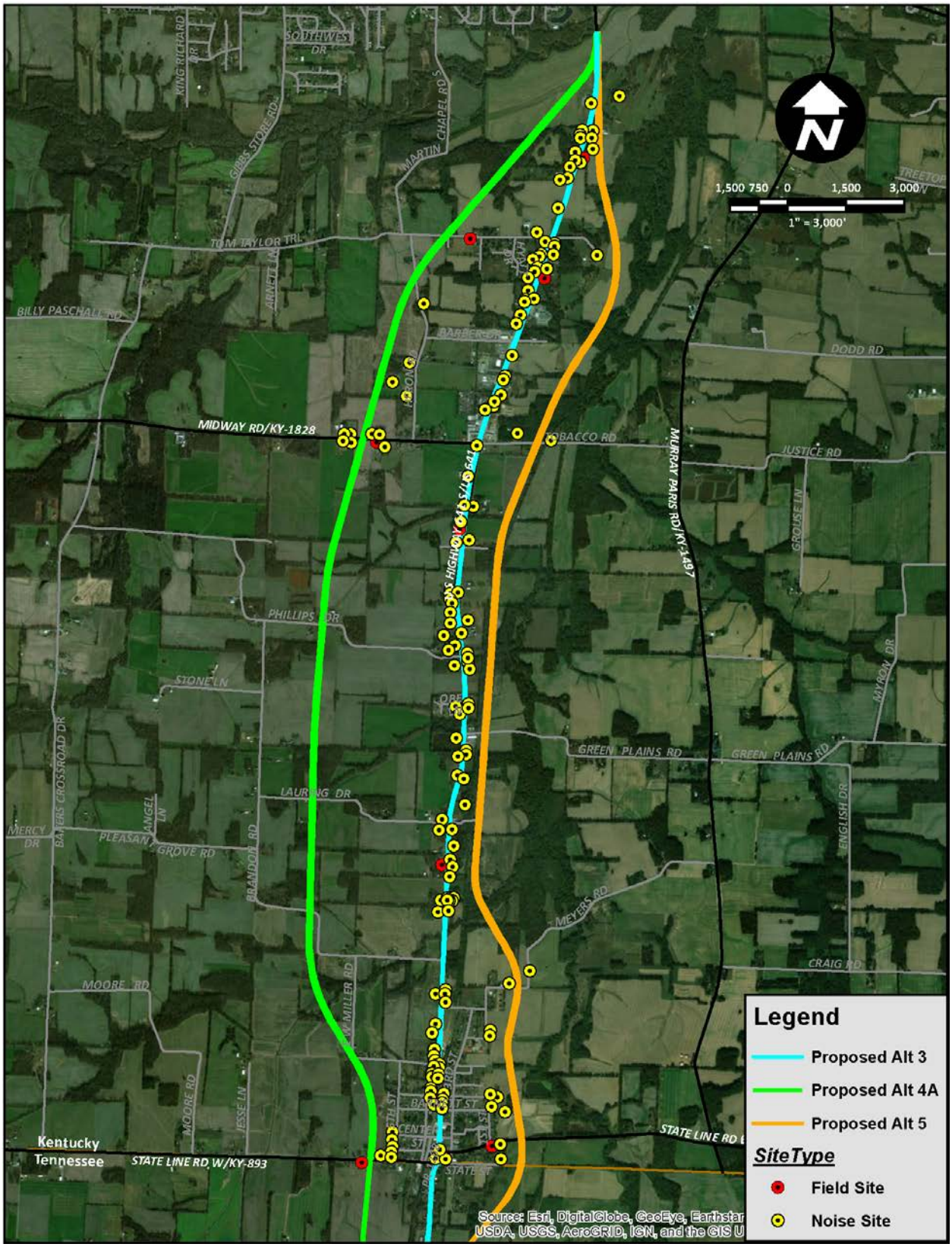


Figure 28: Kentucky Noise Receptors

Three connector options between existing US 641 and Alternatives 4/4A were also evaluated (see Appendix E, Addendum to Kentucky Noise Report). Options C1 and C2 were determined to have a substantial noise increase at one location; no other noise impacts were identified for any of the three options. KYTC Noise Policy does not consider noise abatement to be acoustically feasible unless it provides a minimum 5 dBA reduction for a at least three impacted receptors. Since only one residence would experience a noise impact, noise abatement is not proposed for any of these options. A more detailed discussion of the impacts of the three US 641 to Alternatives 4/4A connector options is provided in Section 3.11.

Alternative 5 lies east of the existing corridor and passes more closely to the rear of properties on US 641 than its western counterparts, Alternatives 4 and 4A. Receptors are more evenly dispersed along the length of this alternative than with Alternative 4 and 4A. Nine properties would be relocated for construction of the alternative and have not been considered in this analysis. The maximum noise level for receptors lying east of Hazel is 59.1 dBA L_{eq}. As the alternative proceeds northward, most potentially affected receptors lie to the west, near the existing alignment. With the conservative assumption that all traffic would move from the existing to the new corridor, noise levels at all receptors north of Hazel are expected to decrease as a result of the increased distance between the receptors and traffic. Alternative 5 would not create any traffic noise impacts; as such, noise abatement is not proposed for this alternative.

3.2.3 Tennessee Analysis

The noise receptors analyzed in Tennessee are shown in Figure 29. There were seven noise receptors located along existing US 641 that were identified as currently exceeding the NAC. Most of these receptors were located very near the existing roadway. The highest predicted noise reading (69.6 dBA L_{eq}) was experienced at Site 8, a residence located at 351 State Line Road on Alternative 3. For the No-Build condition, noise levels would be expected to remain constant with those that presently exist.

With the construction of Alternative 3, five receptors are predicted to have a noise impact. Of the seven residences along the existing alignment that are currently experiencing noise levels exceeding the NAC, one would be relocated by widening of the corridor. Four of the residences would experience noise level reductions due to shifting of the roadway away from the residences. With the roadway shift, noise levels at two of the residences would no longer exceed the NAC. Noise levels were predicted to increase to 69.8 dBA L_{eq} at Site 12 (+2.7) and 68.0 dBA L_{eq} at Site 15 (+1.9). One additional site (Site 14) that did not exceed the NAC in the Existing condition, is predicted to experience a noise impact (68.2 dBA L_{eq}). The highest predicted noise level (69.8 dBA L_{eq}) with construction of this alternative is at 13625 Highway 641 North (Site 12). Several commercial businesses are located on the existing corridor south of Hazel but do not experience any noise impacts. The five sites that would experience a traffic noise impact are located within an approximate 700-foot section of the road, which provides front access to the properties. Three of the properties are located on the west side of the road and the remaining two are located to the east. When considering noise abatement, barriers must be both feasible and reasonable in accordance with TDOT's *Noise Policy* to be included in the project plans. Noise barriers for the impacted properties on Alternative

3 are not feasible as US 641 is not access controlled. Barriers would limit driveway access to properties and would not be effective if constructed. Noise abatement is not proposed for this alternative.

Alternatives 4/4A and 4F vary only slightly at the southernmost end of the project. These alternatives would divert through traffic away from the existing corridor, where the highest concentration of receptors are present. Two residential properties would be relocated for construction of these alternatives and have not been considered in this analysis. There are no businesses in the corridors. There are two small clusters of receptors that are proximate to the alternatives at State Line Road west of Hazel. The highest predicted noise level with construction of these alternatives is at 351 State Line Road, Site F8 (59.7 dBA L_{eq}). Noise levels at Site F8 are predicted to increase 4.8 dBA L_{eq} with construction of these alternatives. Potential receptors on Brannon Lane, west of Alternative 4/4A, would be located more than 400 feet from the alternative, too distant to experience a noise impact. Alternatives 4/4A and 4F would not create any traffic noise impacts; as such, noise abatement is not proposed for this alternative .

Alternative 4H is similar to Alternatives 4F but ties in with existing US 641 slightly further to the south. One property would be relocated for construction of the alternative and has not been considered in this analysis. The highest predicted noise level with construction of this alternative is at 351 State Line Road, Site F8 (59.5 dBA L_{eq}), which would experience an increase of 4.6 dBA L_{eq}. Site 23, located at 300 Crossland Road, would experience the greatest increase in noise level (+4.9 dBA L_{eq}). Alternative 4H would not create any traffic noise impacts; as such, noise abatement is not proposed for this alternative.

Alternative 4I (preferred alternative) is similar to Alternatives 4F and 4H but it ties in with existing US 641 slightly further to the south. Two properties would be relocated for construction of the alternative and have not been considered in this analysis. The highest predicted noise level with construction of this alternative is at 11160 US 641 North, Site 21 (64.0 dBA L_{eq}). Noise levels at 300 Crossland Road (Site 23) are predicted to increase 11.9 dBA L_{eq} with construction of Alternative 4I. Since this increase exceeds 10 dBA L_{eq}, it is considered a traffic noise impact. Though noise abatement would be considered to address this impact, noise barriers would not be reasonable since the required area per benefitted residence will exceed the allowable area per benefited residence established by TDOT policy, therefore, noise abatement is not proposed for this alternative.

Alternative 5, located east of existing US 641, would not require the relocation of any properties or businesses for construction of the alternative. The highest predicted noise level (51.4 dBA L_{eq}) with construction of this alternative is at 1285 Mason Lake Road (Site 26). Noise levels at 102 State Street (Site 24) are predicted to increase 14.9 dBA L_{eq} with construction of Alternative 5. Though noise abatement would be considered to address this impact, noise barriers would not be reasonable since the required area per benefitted residence will exceed the allowable area per benefited residence established by TDOT policy, therefore, noise abatement is not proposed for this alternative.

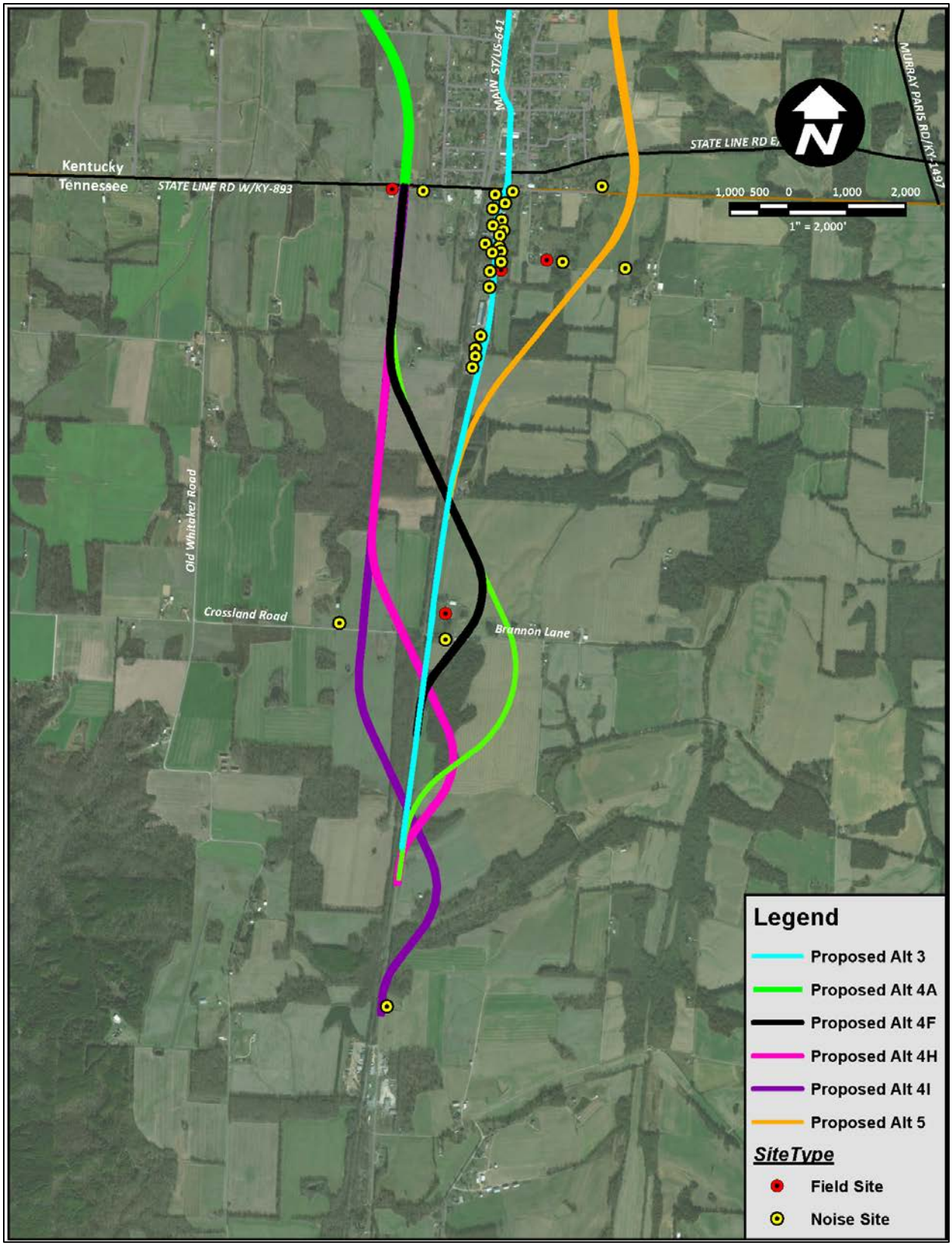


Figure 29: Tennessee Noise Receptors

3.2.4 Traffic Noise Impact Conclusion

Noise levels for all but five study sites are below the NAC; two sites experience an increase of 10 dBA or more. With Alternatives 4A, 4F, 4H, 4I, and 5, due to alternatives shifting traffic away from the existing roadway, and areas of dense residential use, the receptors along the existing corridor of US 641 will see a reduction in traffic noise. There is only one noise impacted receptor associated with the Alternative 4I, the preferred alternative. Two of these options for connecting Alternatives 4/4A and US 641 would result in a substantial noise increase at one residence. Based on the above considerations, noise abatement measures are not proposed for this project.

3.2.4 Information for Local Officials

Undeveloped land exists along both the existing alignment and the off-corridor alternatives. Information from the noise studies developed for the project will be provided to the local city and county officials for their consideration when making planning decisions regarding new development along the corridor. Predicted noise levels relative to the distance from the roadway are provided in the studies and shown in Table 5. Generally, noise-sensitive receptors should not be constructed within fifty feet of the roadway.

Table 5: Noise Levels for Undeveloped Lands

Distance from Alternative 4A/4I	L_{eq}(1h) (dBA)[(2)]
50’ Offset	66.6
100’ Offset	61.9
200’ Offset	56.9
300’ Offset	53.3
400’ Offset	51.1
500’ Offset	49.4

3.2.5 Construction Noise

Noise and vibration impacts would originate from heavy equipment movement, possible blasting, and construction activities such as pile driving and vibratory compaction of embankments. These impacts will be intermittent, of relatively short duration, and will be largely dependent on the distance to nearby receptors. Construction noise will generally be much less of a nuisance for the off-corridor alignments due to the reduced density of receptors. These effects do not constitute a noise impact as defined by FHWA regulation or the noise policies of the KYTC and TDOT.

The project construction will be governed by the specifications of the respective state agencies. Both the *KYTC Standard Specifications for Road and Bridge Construction* and the TDOT *Standard Specifications for Road and Bridge Construction* include requirements for proper maintenance of construction equipment to minimize the nuisance that can be caused by construction noise.

3.3 Ecological Resources

Aquatic and terrestrial features within the Study Area were identified and characterized based on in-house research and a field assessment of the Study Area. Research involved reviewing the following sources: USGS topographic quadrangle maps, aerial photography, floodplain maps, watershed maps, geologic

maps, karst areas map, physiographic maps, National Wetlands Inventory (NWI) maps, United States Department of Agriculture (USDA) Soil Survey maps, floral community maps, and mining maps. State and federal agencies were contacted regarding the presence of potential threatened and endangered species, their critical habitat, or other significant natural resources that may occur within the Study Area.

An *Ecological Assessment Report* was prepared for the KYTC in 2018/2019 and an *Environmental Boundaries Report* was prepared for TDOT in 2019 to document ecological conditions in the Study Area and the potential impacts that could occur with construction of the project. The two reports follow the guidance and requirements of the respective states for analysis of ecological impacts. These documents are provided in Appendix F.

3.3.1 Agency Coordination

Outreach to state and federal agencies was initiated to seek assistance and input identifying threatened and endangered species and other sensitive resources in the Study Area that should be considered during early project development. This section summarizes information gathered through correspondence with the U.S. Fish and Wildlife Service - Kentucky Field Office (USFWS-KFO) and USFWS Tennessee Field Office (USFWS-TFO), Kentucky Department of Fish and Wildlife Resources (KDFWR), Office of the Kentucky Nature Preserves (OKNP), Kentucky Division of Water (KDOW), Tennessee Department of Environment and Conservation (TDEC) Division of Water Resources (DWR), TDEC Division of Natural Areas (DNA), Tennessee Wildlife Resources Agency (TWRA), and Natural Resources Conservation Service (NRCS) via web-based services (KY and TN).

The proposed Study Area is not within or adjacent to a national park or a state/federal forest; therefore, consultation with the National Park Service (NPS), Kentucky Division of Forestry, and U.S. Forest Service (USFS) was not initiated. Since the Study Area is not within a known karst area, consultation with the Kentucky Speleological Society (KSS) was not initiated (https://kgs.uky.edu/kgsmap/kgsgeoserver/viewer.asp).

U.S. Fish and Wildlife Service (Kentucky and Tennessee Field Offices)

A Request for Information using the USFWS Information for Planning and Consultation (IPaC) online system was submitted to the USFWS-KFO and USFWS-TFO offices on August 17, 2018. Response letters were issued by the USFWS on the same day. Species identified by the agencies are listed in Table 6.

Table 6: Federally-listed Species as Reported by Kentucky and Tennessee USFWS IPaC Reports

Common Name	Scientific Name	Also Reported By
Mammals		
Indiana bat	*Myotis sodalis*	KDFWR
Northern long-eared bat	*Myotis septentrionalis*	KDFWR
Gray bat	*Myotis grisescens*	KDFWR and OKNP
Plants		
Price's potato bean	*Apios priceana*	None

The Kentucky USFWS Consultation Code is 04EK1000-2018-SLI-2019. In Kentucky, the USFWS noted the federally-endangered Indiana bat (*Myotis sodalis*) and gray bat (*Myotis grisescens*), and the federally-

threatened northern long-eared bat (*Myotis septentrionalis*) and Price's potato-bean (*Apios priceana*) as having the potential to occur within the project vicinity. The Tennessee consultation code is 04EK1000-2018-SLI-2019. Tennessee reported the Indiana bat, northern long-eared bat, and gray bat as having the potential to occur within the project vicinity (see Figure 30).

The project is in "potential" Indiana bat and northern long-eared bat habitat as defined by the USFWS-KFO. Figure 30 shows the location of known threatened or endangered species habitat, specifically areas known to provide habitat for endangered or threatened bats and Price's potato bean. These known locations do not overlap with the Study Area. Neither USFWS office reported the presence of critical habitat for any listed species in the Study Area.

Kentucky Department of Fish and Wildlife Resources (KDFWR)

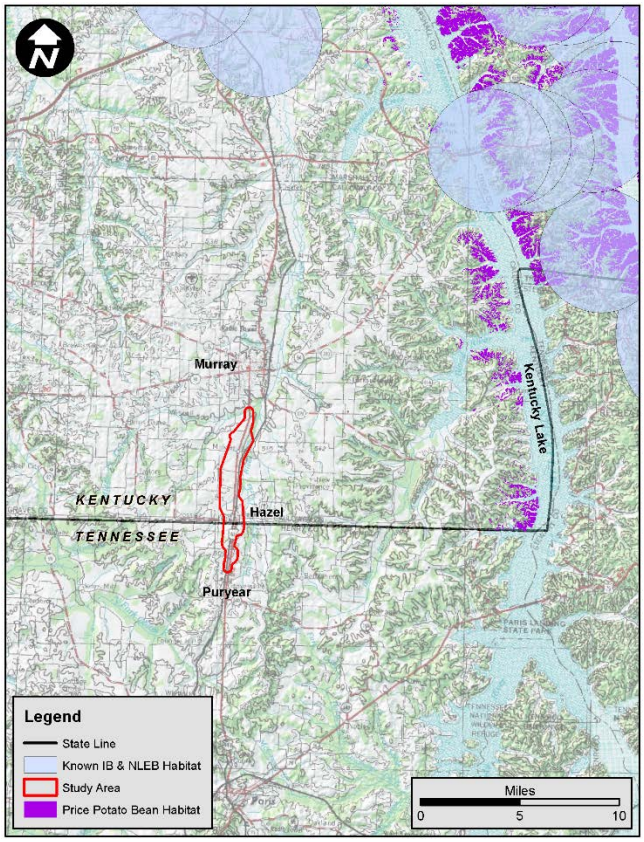


Figure 30: Known Endangered/Threatened Species Habitat

A Request for Information letter was emailed to the KDFWR on July 23, 2018. A response letter was issued by the KDFWR on July 30, 2018. The KDFWR indicated that the federally-listed northern long-eared bat, Indiana bat, gray bat, piping plover (*Charadrius melodus*), and interior least tern (*Sternula antillarum athalassos*) are known to occur within ten miles of the project corridor. The state-listed northern crayfish frog (*Rana areolate circulosa*), pocketbook (*Lampsilis ovata*), purple Lilliput (*Toxolasma lividum*), and barn owl (*Tyto alba*) are known to occur within one mile of the project corridor.

The KDFWR provided a list of BMPs to minimize impacts to streams, such as culverts designed to allow for passage of aquatic organisms, use of natural stream channel design, construction during low-flow periods, replanting disturbed areas, and returning streams to stable condition after construction. They recommend strict erosion control measures be developed and implemented prior to construction to minimize siltation into streams, which may include silt fences, straw bales, brush barriers, sediment basins, and diversion ditches.

Office of the Kentucky Nature Preserves (OKNP)

An electronic data request was submitted to the OKNP on July 23, 2018, requesting information regarding documented occurrences of protected plant or animal species, or exemplary natural communities, within or in the vicinity of the Study Area. The OKNP replied on July 30, 2018, and identified three state-listed

species within one mile of the Study Area: prickly bog sedge (*Carex atlantica ssp. capillacea*), northern crawfish frog, and chain pickerel (*Esox niger*), as well as one federally-listed species of management concern (SOMC), Bewick's wren (*Thryomanes bewickii*).

Tennessee Wildlife Resources Agency (TWRA)

The TWRA responded to a request for information via an email dated February 28, 2018. Their response included the following: "In searching our databases for state listed species under our authority, we did not find documented occurrences of Tennessee state listed species within the project corridor in Tennessee. We do not anticipate adverse impacts to state listed species under our authority due to the proposed project; provided that best management practices to address erosion and sediment are implemented and maintained during construction activities."

Tennessee Department of Environment and Conservation (TDEC), Division of Natural Areas (DNA)

The TDEC DNA provided information regarding the potential presence of the state-listed endangered species, the cutleaf water-milfoil (*Myriophyllm pinnatum*). Their response included: "We have reviewed the state's natural heritage database and the state endangered Cutleaf Water-milfoil (*Myriophyllum pinnatum*) was last observed in 1975 growing in a small pond between the railroad track and highway 641 about 0.3 miles north of Crossland Road, an area unaffected by any of the proposed alternatives. The habitat for this species is normally acidic wetland and ponds. The Cutleaf Water-milfoil observation is historic and could be extirpated from the area. There are no other natural areas, or critical habitats near the project site."

Tennessee Department of Environment and Conservation (TDEC), Division of Water Resources (DWR)

TDEC reported this project does not pose a significant impact on programs regulated by the Division of Water Resources (DWR). They reported the presence of wetlands and indicated that hydrologic determinations for all streams, wet weather conveyances, or other aquatic resources will be required. A General NPDES Permit for Discharge of Stormwater Associated with Construction Activities will be required since the project is disturbing more than one acre of land.

No federally-listed species were identified as occurring in the Study Area but one state-listed endangered species, the cutleaf water milfoil, has been identified as living within the boggy depressions in the vicinity. The project does not impact any public water supplies, navigable waters, any river that is part of the Nationwide Rivers Inventory, or any wild scenic river.

3.3.2 Federally Listed Endangered and Threatened Species

Through consultation with the Kentucky and Tennessee USFWS offices using the IPaC system and communication with the KDFWR and TDEC, federally-listed threatened and endangered species were identified for consideration during project development. The USFWS identified Indiana bat, gray bat, northern long-eared bat, and Price's potato-bean as potentially located in the area. In addition to the Indiana bat, gray bat, and northern long-eared bat, KDFWR also identified piping plover and interior least tern as occurring within ten miles of the project.

3.3.2.1 Habitat Description and Assessment

The requisite habitat characteristics for each of the threatened or endangered species identified by the resource agencies were considered during office research and field reconnaissance and were used to support conclusions regarding the potential presence of each species.

Indiana Bat (*Myotis sodalis*): Potential habitat in the Study Area for this federally-endangered species is primarily summer and foraging habitat. Suitable summer habitat consists of live or dead trees and snags that exhibit any of the following characteristics: exfoliating bark, crevices, cavities, or cracks (USFWS KFO 2016). Trees suitable for summer roosting have a diameter at breast height (dbh) of five inches or greater and suitable maternity trees are characterized by a dbh of nine inches or greater. The upland woods and forested wetlands in the Study Area include trees with the habitat characteristics suitable for Indiana bat; therefore, these areas represent **potential foraging habitat and summer/maternity roosting habitat for the species**. Winter hibernacula habitat consists of limestone caves, rock shelters, and abandoned mine portals, none of which were found in the Study Area.

Gray Bat (*Myotis grisescens*): Potential habitat in the Study Area for this federally-endangered species includes bridges, which may be used as summer roosting locations. The upland woods and forested wetlands may be used as potential foraging habitat for this species. Summer foraging habitat may also include forested areas along banks of streams and lakes near cave entrances (NatureServe, 2018). Generally, gray bats use limestone caves, rock shelters, and abandoned mine portals year-round. They have been known to also use the underside of highway bridges during summer months. The pre-cast concrete bridges on US 641 were inspected for the presence of gray bats. No individual bats or signs of bat usage (i.e., guano, staining) were found. **Gray bats are assumed to be utilizing riparian stream corridors within the Study Area.** Winter hibernacula habitat consists of limestone caves, rock shelters, and abandoned mine portals, none of which were found in the Study Area.

Northern Long-eared Bat (*Myotis septentrionalis*): Potential habitat in the Study Area for this federally-threatened species is primarily summer and foraging habitat. Suitable summer roosting trees consists of live or dead trees and snags with a dbh of three inches or greater that exhibit any of the following characteristics: exfoliating bark, crevices, cavities, or cracks (USFWS KFO 2016). Northern long-eared bats have also been documented roosting during the summer in man-made structures such as barns, which are present throughout the Study Area. The upland woods and forested wetlands include trees with the habitat characteristics suitable for northern long-eared bat; **therefore, these areas represent potential foraging habitat and summer roosting habitat for the species.** Winter hibernacula habitat consists of limestone caves, rockshelters, and abandoned mine portals, which were not found in the Study Area.

Piping Plover (*Charadrius melodus*): According to Sibley (1961), the piping plover is not a common resident in Kentucky. Breeding occurs north of the state in the Great Lakes and Great Plains areas of the country and the bird then migrates to the coast for winter; therefore, these small shore birds may be found along the sandy beaches and shorelines in western Kentucky as they migrate from breeding grounds to wintering habitats. Based upon the literature, there is **no habitat** for this species within the Study Area.

KDFWR noted the species as present within ten miles of the project. The preferred habitat described by the literature can be found along the shores of Kentucky Lake, less than ten miles from the project.

Bewick's Wren (*Thryomanes bewickii*): OKNP correspondence reported the presence of Bewick's wren within one mile of the project. According to Sibley (1961), Bewick's wren is a summer resident in western Kentucky. This bird is mainly found in the western and southwestern U.S. Bewick's wrens use brushy areas, thickets, and scrub habitats in open country, and open and riparian woodland (NatureServe 2018). Egg laying occurs from April into June and produces two to three broods per year (NatureServe 2018). **Even though habitat for this species is present in the Study Area, this species has not been reported in Calloway County to the OKNP since 1972 and was not observed during field investigations.**

Interior Least Tern (*Sternula antillarum athalassos*): The interior least tern is found around large- to medium-sized rivers with wide channels dotted with barren to sparsely vegetated sandbars, but they can also be found along sand and gravel pits, lake and reservoir shorelines, and occasionally, gravel rooftops (NatureServe 2018). There is **no habitat** for the species in the Study Area. **The East and Middle Forks Clarks River systems are too narrow and would not provide the habitat preferred by the species.** The KDFWR noted the species as present within ten miles of the project. The preferred habitat described by the literature can be found along the shores of Kentucky Lake, less than ten miles from the project.

Pocketbook (*Lampsilis ovata*): The KDFWR reported the presence of pocketbooks within one mile of the project. The pocketbook has a very general habitat preference, adapting well to impoundments as well as free-flowing, shallow rivers. Although usually found in moderate to strong currents, it can survive in standing water. The most suitable substrate consists of a mixture of gravel and coarse sand mixed with some silt or mud (NatureServe 2018). Even though the pocketbook was listed as occurring within one mile of the project, Haag and Cicerello and the Kentucky's Comprehensive Wildlife Conservation Strategy (2013) do not list it as occurring in Calloway County. The East and Middle Forks Clarks River could provide habitat for this species. East Fork Clarks River will not be directly impacted by this project and the presence of pocketbooks around the Middle Fork bridge is unlikely. No unionid relic shells were found during field investigations and the natural substrate around the bridge has been replaced with rip rap for stability. **Within the area of potential project impacts, there is no habitat for the species.**

Price's Potato Bean (*Apios priceana*): The preferred habitat of Price's potato bean consists of open, rocky, wooded slopes and floodplain edges of mixed hardwoods with well-drained loam soils and old alluvium or over calcareous boulders (Kral 1983). An example of the appropriate habitat would be an area with bluffs or ravine slopes that meet a creek or river bottom with no deep shade. **This particular type of habitat was not found in the Study Area but abundantly exists around Kentucky Lake**.

Cave / Rockshelter Surveys

The thick layers of loess material throughout the Study Area are not conducive to the formation of caves, rockshelters, or other natural winter habitat/hibernacula for bat species. The Study Area falls within a non-karst area of the state as indicated on the Karst Potential Interactive Map available from the Kentucky Geologic Map Information Service. Based on coordination with the resource agencies, no known Indiana

bat, northern long-eared bat, or gray bat hibernacula are located within five miles of the project. Field studies did not reveal any features that could be used as winter habitat/hibernacula for bat species.

3.3.2.2 Habitat Assessment Conclusions

Table 7 presents federally-listed species identified through outreach to various state and federal resource agencies and the species' potential for occurring within the Study Area. Habitat is present within the Study Area for the Indiana, gray, and northern long-eared bats. There is no suitable habitat for Price's potato bean, interior least tern, or piping plover within the Study Area.

Table 7: Potential Impacts to Federally-listed Threatened and Endangered Species

Scientific Name	Common Name	Federal Status	KY[5] Status	TN[6] Status	Species Present	Habitat Present
Mammals						
Myotis sodalis	Indiana bat	E	E	E	Undetermined	Yes
Myotic grisescens	Gray bat	E	T	E	Undetermined	Yes
Myotis septentrionalis	Northern long-eared bat	T-4(d)	E	Rare, not state listed	Undetermined	Yes
Plants						
Apios priceana	Price's Potato-bean	T	E	E	No	No
Birds						
Charadrius melodus	Piping plover	E	NS	NS	No	No
Sternula antillarum athalassos	Interior least tern	E	E	E	No	No

* E = Endangered; T = Threatened; 4(d) = 4(d) rule for threatened species; NS = No State Status

A Biological Assessment will be prepared in the summer of 2019 to address these species prior to the conclusion of the environmental review process for the project. If the status of Bewick's wren, an SOMC, changes to threatened or endangered before construction, then this species will also need to be addressed in the Biological Assessment. Impacts to federally-listed species and any required minimization or mitigation measures will be addressed through consultation with the USFWS-KFO and USFWS-TFO. Mitigation for take associated with potential direct, indirect, and cumulative effects to the Indiana and northern long-eared bats resulting from summer habitat loss may be addressed through a contribution to the Imperiled Bat Conservation Fund, following guidance provided in the *Revised Conservation Strategy for Forest-Dwelling Bats in the Commonwealth of Kentucky* (June 2016). Gray bats, if present, should only experience a temporary impact during construction along streams. KYTC and TDOT *Standard Specifications for Road and Bridge Construction* will require site-specific erosion control measures and BMPs that will minimize adverse impacts to local streams and their macroinvertebrate community.

[5] http://app.fw.ky.gov/speciesinfo/countyList.asp?strGroup=1

[6] http://environment-online.state.tn.us:8080/pls/enf_reports/f?p=9014:3:0

3.3.3 Surface Waters

There are no special use waters for either state in the Study Area. The only waters assessed by state agencies are Middle Fork Clarks River (Kentucky) and Dry Creek (Tennessee). Kentucky lists Middle Fork Clarks River as fully supporting for fish whereas Dry Creek in Tennessee is listed as a 303(d) stream.[7] Neither stream is being impacted directly by this project but there is one tributary to Dry Creek potentially being impacted by Alternatives 4, 4A, 4F, 4H, and 4I.

The majority of this project is located within the East Fork Clarks River watershed, with only a small segment of the northern end of the project draining to the Middle Fork Clarks River (see Figure 31). Alternatives 3, 4, 4A, and 5 all have floodplain impacts at their crossing of Brushy Creek and at the northern terminus near the Middle Fork Clarks River. Alternative 3 also impacts the floodplain of an unnamed tributary to the East Fork Clarks River. Alternative 4I would also impact the floodplain of Mormon Creek at the southern end of the project. Alternative 5 would have the greatest impact to floodplains (see Figure 32 and Table 8).

Table 8: Floodplain Impacts (acres)

	Alternative									
	3	**4**	**4A**	**4/4F**	**4A/4F**	**4/4H**	**4A/4H**	**4/4I**	**4A/4I**	**5**
Impacted Floodplain (acres)	4.7	14.1	14.1	14.1	14.1	14.1	14.1	16.0	16.0	30.0

Though these alternatives have some impact on floodplains, none of the impacts would be considered significant. A No Rise Certification, a Conditional Letter of Map Revision (CLOMR), or a Letter of Map Revision (LOMR) will be prepared for the project, as appropriate, consistent with the Memorandum of Understanding (MOU) between FHWA and the Federal Emergency Management Agency (FEMA). The design of the roadway will be consistent with both the MOU and the floodplain management criteria identified in the National Flood Insurance Regulations (NFIR) found in Title 44 of the Code of Federal Regulations (CFR). Furthermore, the design will be consistent with the floodplain management guidelines for implementing *EO 11988* and federal regulations found in 23 CFR 650A.

For the purpose of assessing water quality in the area, three perennial streams (Middle Fork Clarks River, Tributary to East Fork Clarks River, and Brushy Creek) were chosen as representative of streams in the area. In-situ water quality data for water temperature, dissolved oxygen concentration, and pH readings were within expected seasonal ranges of the warm water aquatic habitat standard for all the sample sites. The results of the analytical water quality testing were typical of streams found in a landscape dominated by agriculture, with higher levels of nitrogen and phosphate compounds. Overall, the water quality in the Study Area is consistent with what would be expected, given the surrounding land uses. The complete results of the water quality analyses can be found in the *Ecological Assessment Report* found in Appendix F.

In the Study Area, a total of 64 stream channel crossing locations and 38 potential wetland impact locations were documented. Of the 64 stream channels, 11 were perennial, 21 were intermittent, 24 were

[7] https://tdeconline.tn.gov/dwrwqa/

ephemeral, and 8 were wet weather conveyances. “Wet weather conveyance” is a term defined in the Tennessee Water Quality Control Act of 1977 as “man-made or natural watercourses, including natural watercourses that have been modified by channelization, that flow only in direct response to precipitation runoff in their immediate locality, whose channels are above the groundwater table, and in which hydrological and biological analyses indicate that, under normal weather conditions, due to naturally occurring ephemeral or low flow there is not sufficient water to support fish, or multiple populations of lotic aquatic organisms whose life cycle includes an aquatic phase of at least two months.”

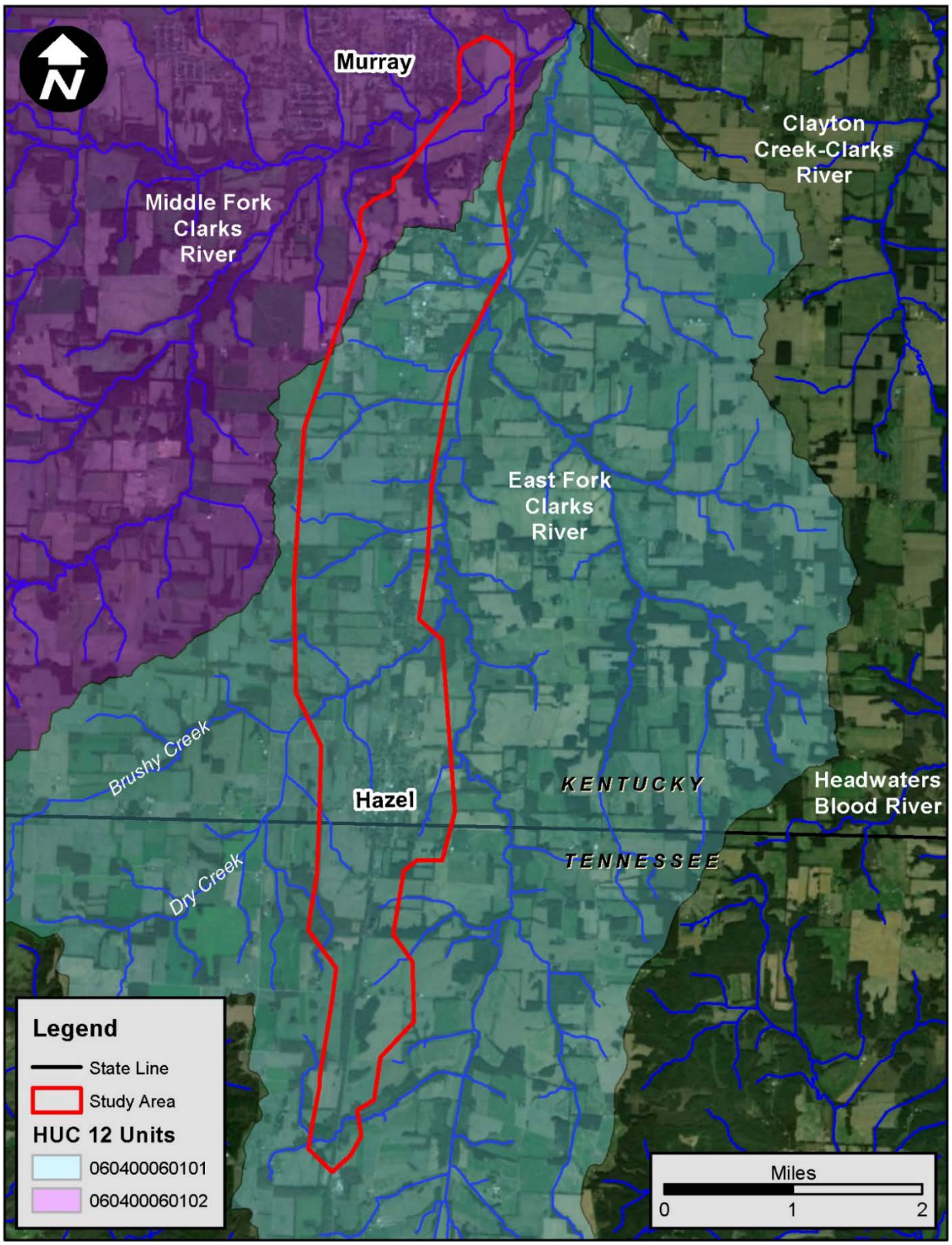


Figure 31: Hydrologic Unit Map

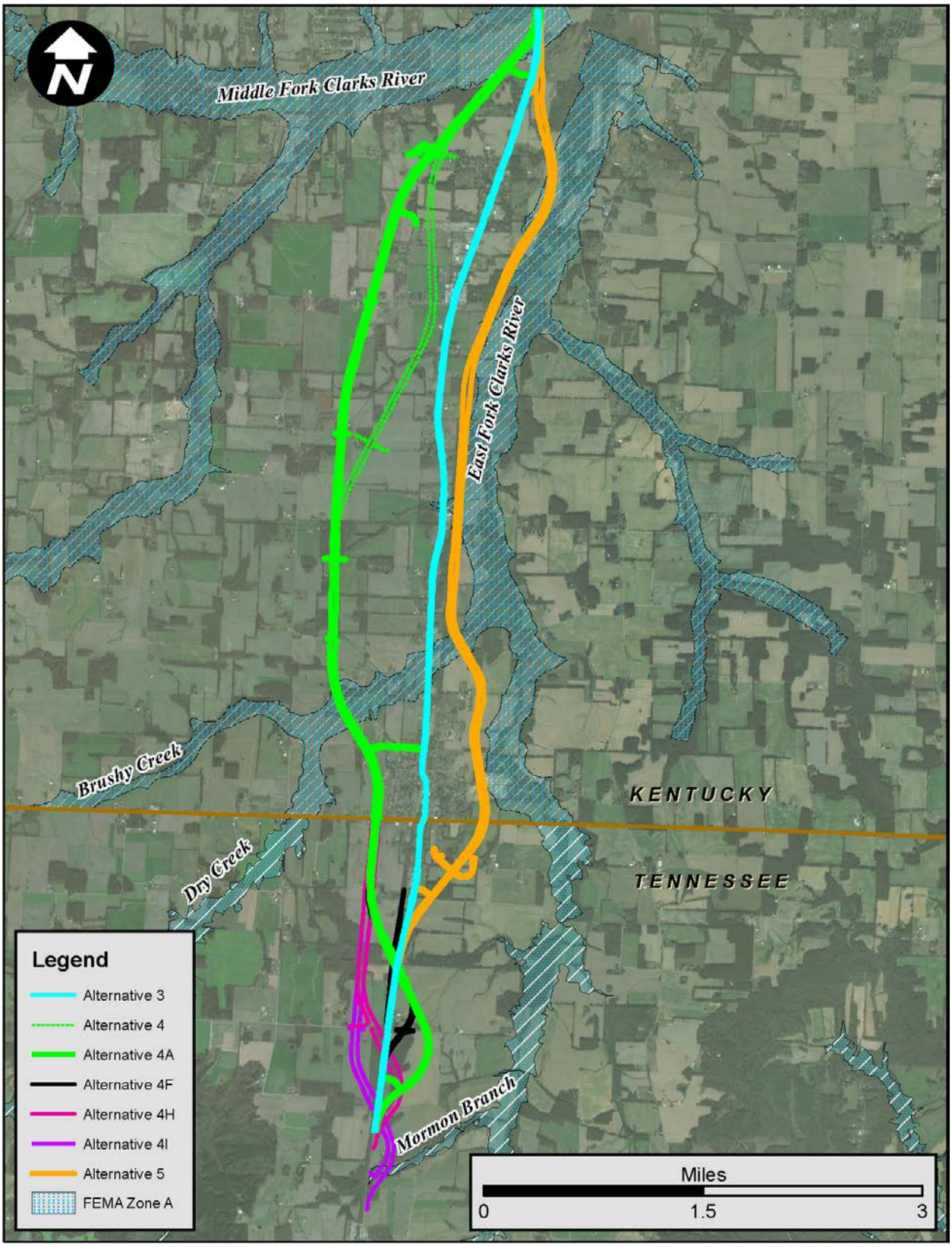


Figure 32: Floodplain Map

Table 9 lists the number of streams and ponds affected by each alternative. Table 10 lists the number of wetlands affected by each alternative. Of the 38 wetlands investigated, there were 20 palustrine forested (PFO), 14 palustrine emergent (PEM), and one palustrine scrub/shrub (PSS). Three forested wetlands shown on NWI mapping were found to be non-wetland (WTL05, WTL06, and WTL15). Refer to Figure 33 - Figure 36 for the locations of streams and wetlands identified within the Study Area and where these features would be impacted by the alternatives. A summary of the ecological impacts of each alternative are presented in Table 11.

Table 9: Number of Streams and Ponds Affected

	Alternative									
Water Resource	**3**	**4**	**4A**	**4/4F**	**4A/4F**	**4/4H**	**4A/4H**	**4/4I**	**4A/4I**	**5**
Perennial	3	3	2	3	2	3	2	4	3	4
Intermittent	4	6	6	6	6	7	7	8	8	10
Ephemeral Streams	5	3	3	3	3	3	3	3	3	3
Wet Weather Conveyance (TN only)	4	1	1	1	1	1	1	2	2	0
Ponds (Jurisdictional and Non-jurisdictional)	0	0	0	1	1	1	1	1	1	5

Table 10: Number of Wetlands Affected

	Alternative									
Water Resource	**3**	**4**	**4A**	**4/4F**	**4A/4F**	**4/4H**	**4A/4H**	**4/4I**	**4A/4I**	**5**
Palustrine Emergent	0	1	1	1	1	1	1	1	1	2
Palustrine Forested	2	5	5	6	6	7	7	6	6	6
Palustrine Scrub/Shrub	0	0	0	0	0	0	0	0	0	1

Table 11: Estimated Ecological Impacts for Each Alternative within the Study Area

	Alternative									
Feature	**3**	**4**	**4A**	**4/4F**	**4A/4F**	**4/4H**	**4A/4H**	**4/4I**	**4A/4I**	**5**
Perennial (lf)	477	768	492	1,009	731	864	492	1,559	1,283	837
Intermittent (lf)	480	1,364	1,364	1,364	1,364	1,640	1,640	1,809	1,809	2,426
Ephemeral (lf)	404	1,039	1,039	1,039	1,039	1,039	1,039	1,039	1,039	258
Wet Weather Conveyance (lf) (TN)	658	112	112	186	186	388	388	388	388	82
Ponds (no.)	0	0	0	1	1	1	1	1	1	5
Wetlands (ac)	1.48	3.36	3.36	5.49	5.49	13.91	13.91	5.29	5.29	7.97
Forested Land (ac)	9	29	30	33	34	50	50	50	50	41

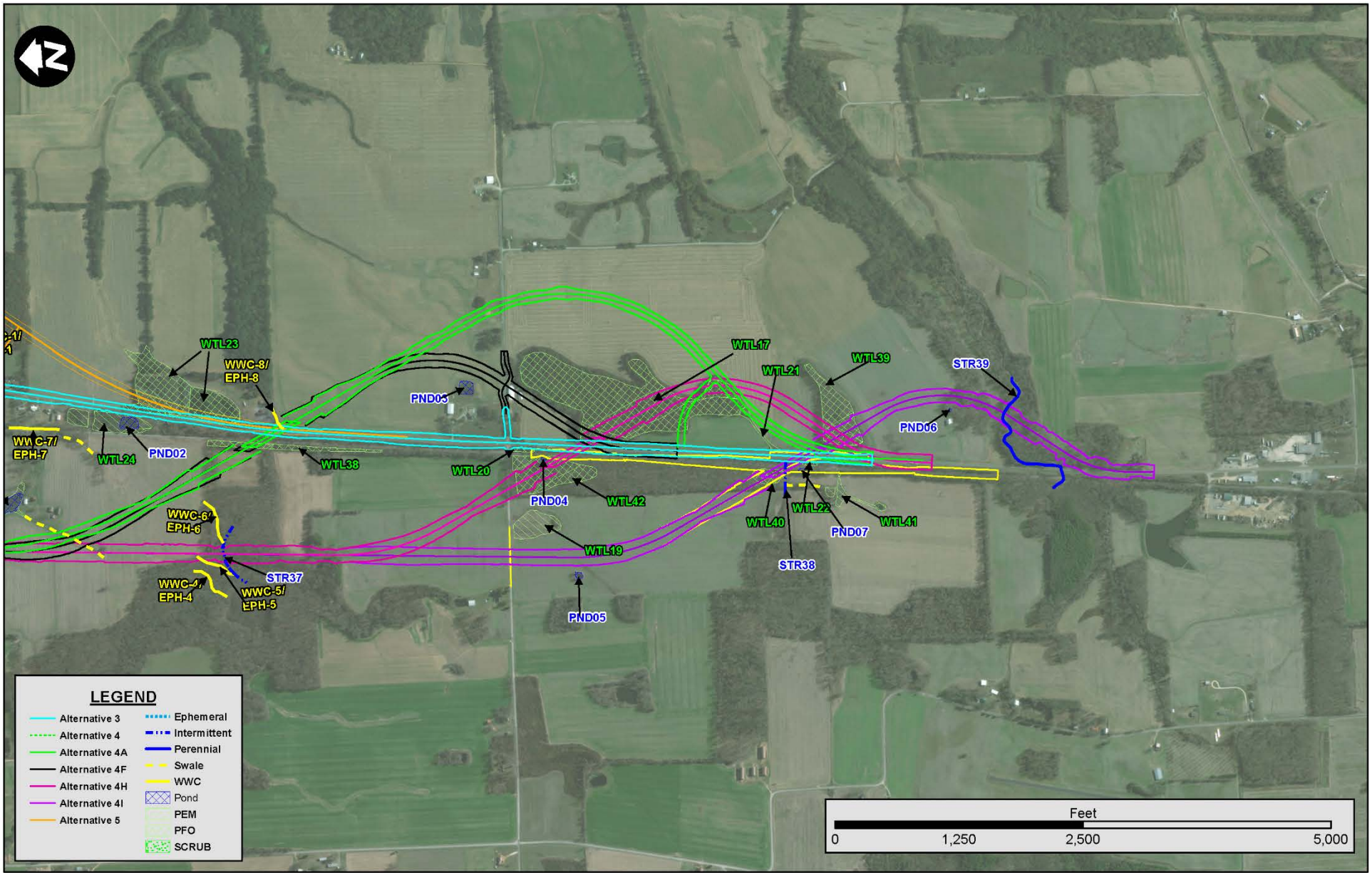


Figure 33: Surface Water Impacts (1 of 4)

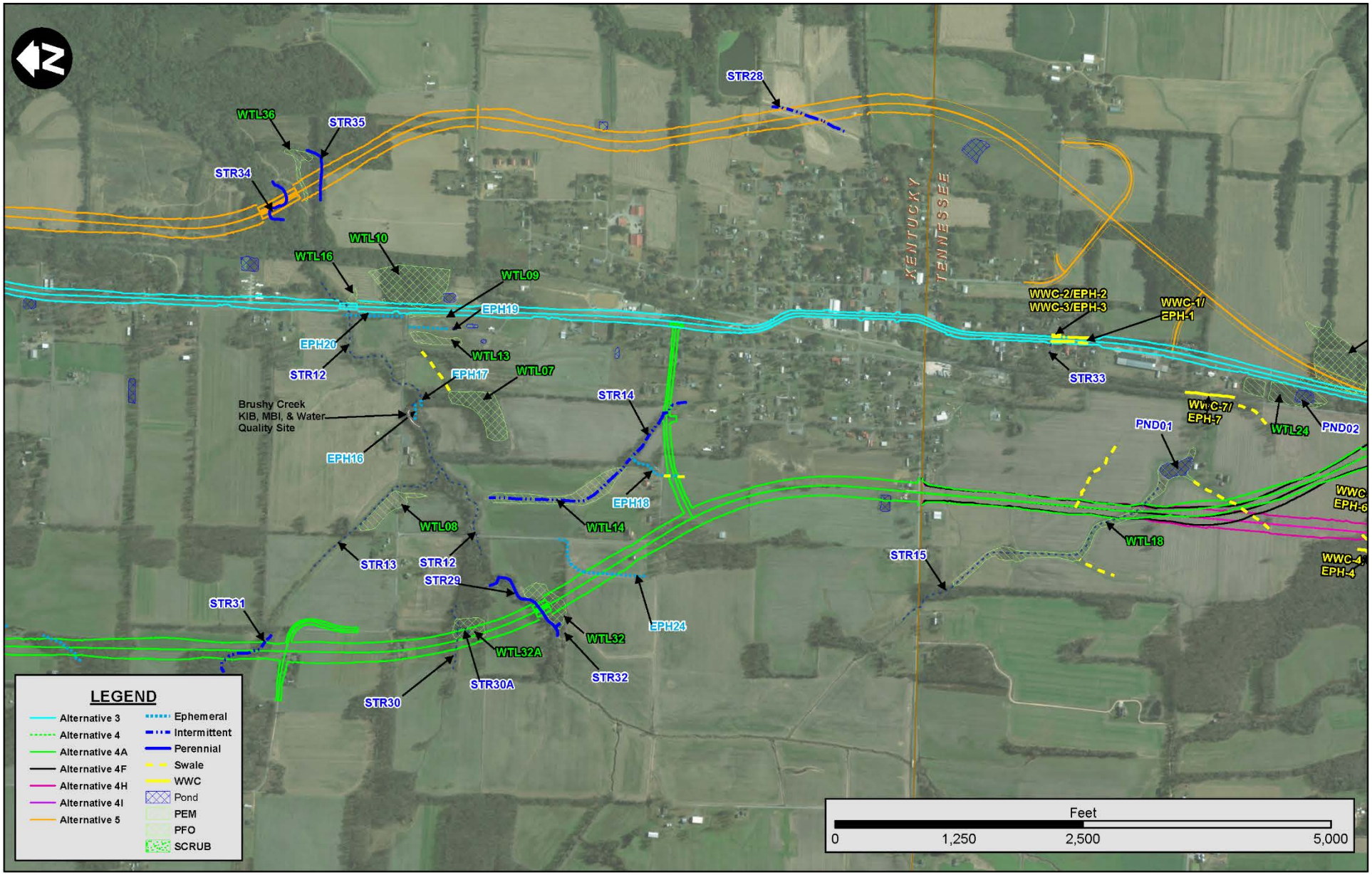


Figure 34: Surface Water Impacts (2 of 4)

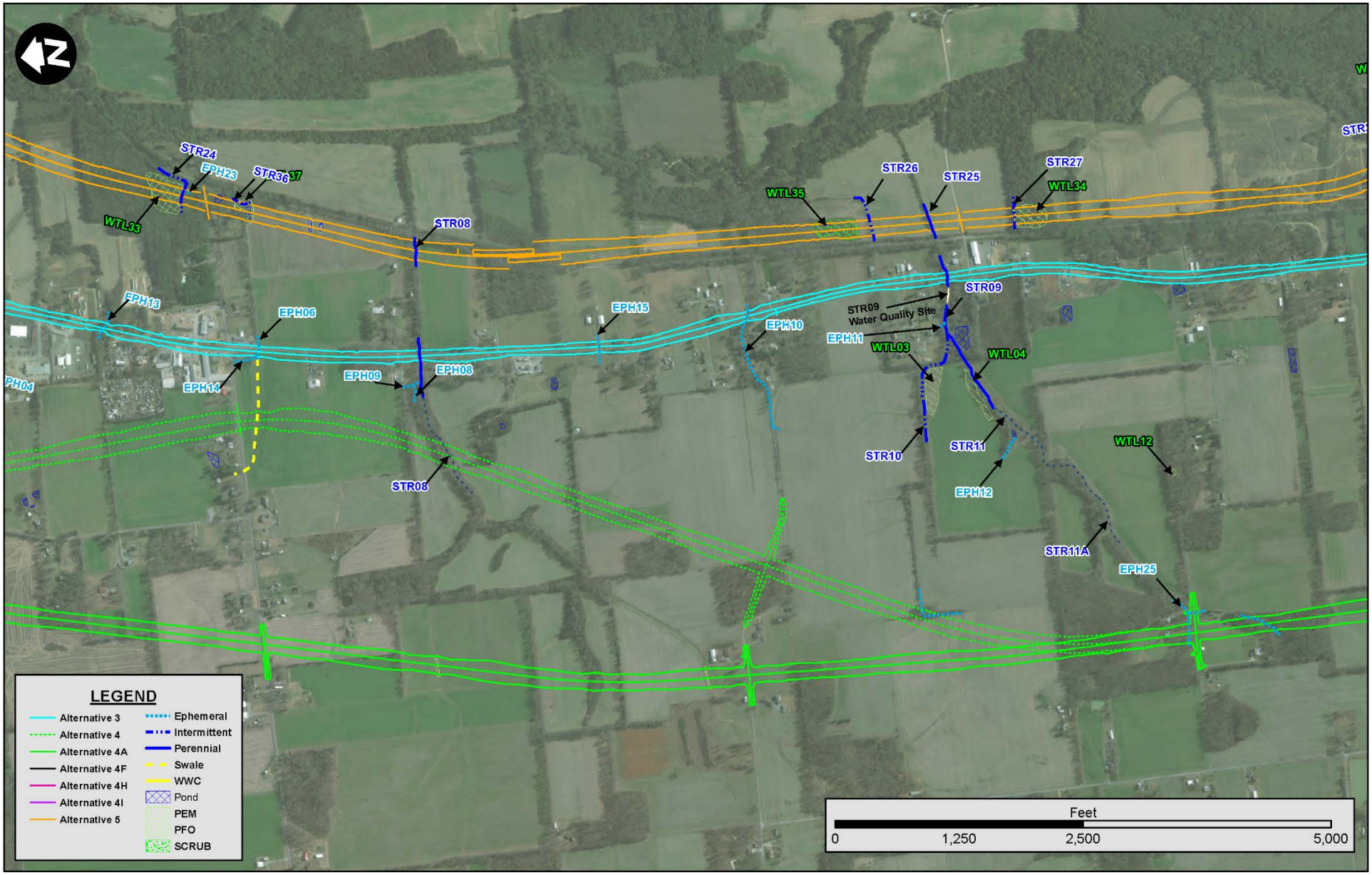


Figure 35: Surface Water Impacts (3 of 4)

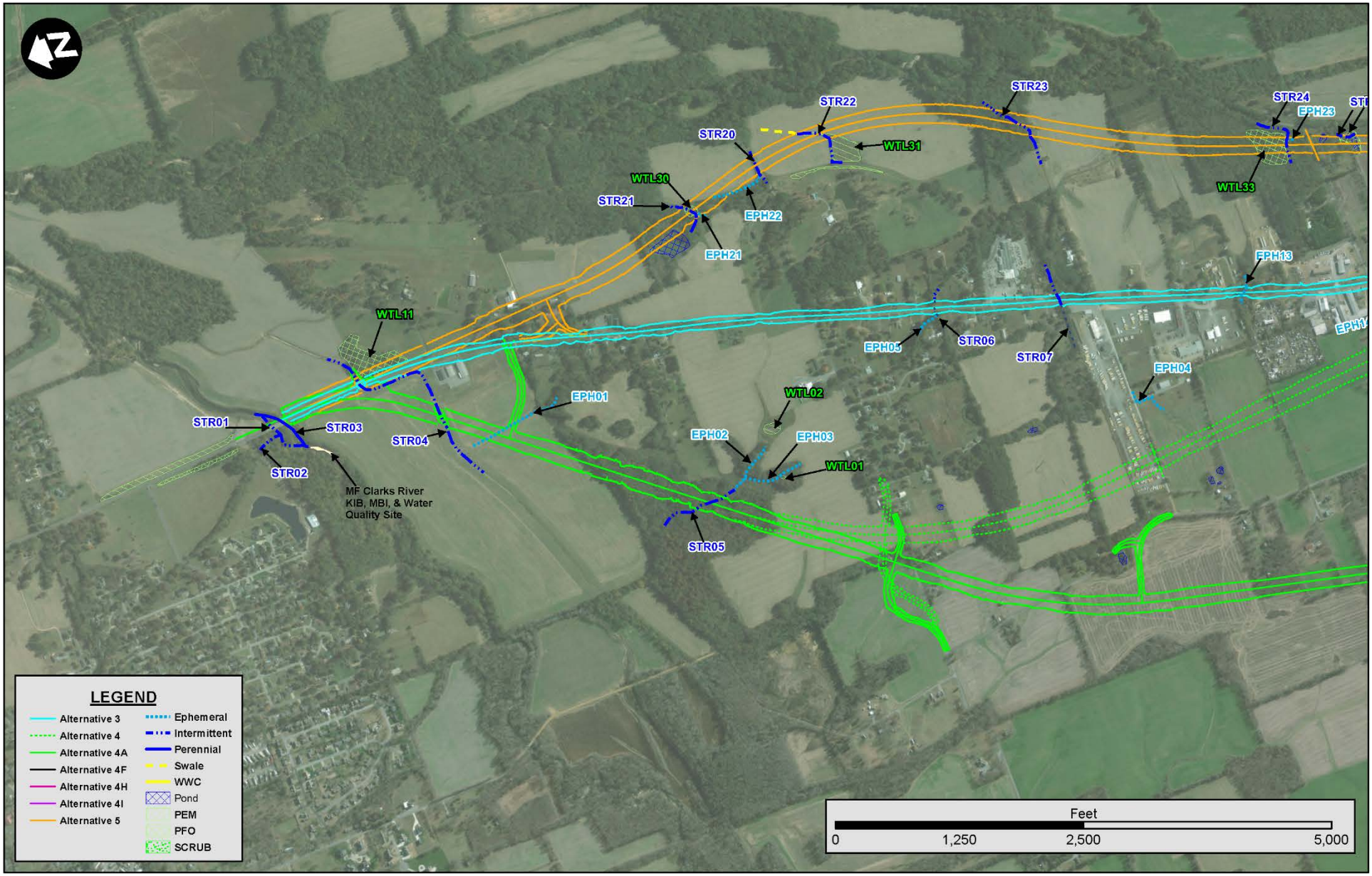


Figure 36: Surface Water Impacts (4 of 4)

3.3.4 Summary

The off-alignment alternatives (Alternatives 4, 4A, 4F, 4H, 4I, and 5) are dominated by agricultural land use, while the alignment along existing US 641 (Alternative 3) consists primarily of transportation right of way, business, and residential land uses. Waters affected by the various alternatives include perennial stream crossings, intermittent stream crossings, ephemeral stream crossings, wet weather conveyances, and wetlands. Coordination with the USACE, KDOW, and TDEC DWR will be necessary to ensure compliance with the Clean Water Act for placement of fill within waters of the United States (WOUS). Mitigation for unavoidable wetland impacts will be determined through the permitting process under Section 404, as administered by USACE, and Section 401 of the Clean Water Act, as administered by KDOW and TDEC DWR. Permits will likely require mitigation for stream and wetland impacts. Mitigation requirements will not likely be satisfied on-site but will more likely take the form of payment to the KDFWR Wetland and Stream Mitigation Fund or the use of commercial bank credits.

Alternative 3 has the fewest ecological impacts. This finding is predictable since the alternative is along the existing corridor, using existing rights of way to a large degree, and has a more limited footprint, consisting of a three-lane typical section compared with other alternatives having a four-lane divided or five-lane typical section. Of the off-corridor alternatives, the ecological impacts of Alternatives 4, 4A, and 4F are relatively similar, with Alternative 4A having slightly elevated perennial stream impacts and Alternative 4F having slightly higher forested impacts. Alternatives 4H and 4I are the longest of the alternatives so some higher levels of impact might be expected solely on the basis of their additional length. Alternative 4H crosses a large wetland, resulting in the highest number of wetland impacts among the alternatives (13.91 acres). Alternative 4I affects the greatest length of streams as well as forested land, which provides habitat for endangered and threatened bats.

Habitat for federally-listed species within the alternatives is limited to suitable summer roosting/ maternity habitat for the Indiana and northern long-eared bats and foraging or roosting habitat (bridges) for gray bats. Documentation of a No Habitat/No Effect determination, to be made by the KYTC, will be included in the project record for all other federally-listed species that were identified as potentially occurring in the area. Coordination with USFWS-KFO and USFWS-TFO will be necessary to ensure compliance with the Endangered Species Act for removal of habitat potentially used by federally-listed bat species. Mitigation for take associated with potential direct, indirect, and cumulative effects to the Indiana and northern long-eared bats resulting from this habitat loss may be addressed through a contribution to the Imperiled Bat Conservation Fund, following guidance provided in the *Revised Conservation Strategy for Forest-Dwelling Bats in the Commonwealth of Kentucky* (June 2016). Gray bats, if present, should only experience a temporary impact during construction along streams. KYTC and TDOT *Standard Specifications for Road and Bridge Construction* will require site-specific erosion control measures and BMPs that will minimize adverse impacts to local streams and their macroinvertebrate communities.

There is no habitat for Price's potato bean, interior least tern, or piping plover in the Study Area. If the status of Bewick's wren, an SOMC, changes to threatened or endangered before construction, then this

species will need to be addressed along with other federally-listed species in a Biological Assessment, which will be prepared in the summer of 2019, prior to the conclusion of the environmental review process.

For a discussion of additional ecological effects associated with the construction of a US 641 to Alternatives 4/4A connector, see Section 3.11.

3.4 Section 106: Cultural Historical and Archaeological Resources

Section 106 of the National Historic Preservation Act of 1966, as amended, and 36 CFR Part 800 (Protection of Historic Properties, Revised 11 January 2001) require that federal agencies or federally-funded projects consider the direct and indirect effects of an undertaking on historic properties listed or eligible for listing in the National Register of Historic Places (NRHP) prior to the issuance of a federal permit or license or the expenditure of any funds for construction. As a federal undertaking, the lead federal agency, the FHWA, is required to consult with the State Historic Preservation Officer (SHPO), American Indian tribes, local officials, and others with a demonstrated interest in historic preservation, regarding the effects of the project on historic properties. In accordance with the procedures contained in 36 CFR Part 800, cultural resource assessments, including background research and field surveys, were performed for the proposed project to locate historic sites and structures that may be affected by the proposed project. Archaeological records were reviewed to identify the location of known archaeological sites and assess the potential for encountering additional sites when conducting a more thorough Phase I evaluation of the preferred alternative. Results of the architectural assessments were presented in *Cultural-Historic Survey of US 641 in Calloway County, Kentucky, South of Murray Kentucky to the Tennessee State Line* (April 17, 2019) and *Historic and Architectural Assessment Pursuant to 36 CFR 800 – Cultural Historic Survey of Improvements to US 641 from the Tennessee State Line to Near Puryear in Henry County, Tennessee* (April 24, 2019). Potential impacts to archaeological resources in the project vicinity were assessed in *Archaeological Resources Overview US 641 Reconstruction, Calloway County, Kentucky (Item No. 1-314.2) and Henry County, Tennessee* (October 22, 2018). The cultural historic reports are included in Appendix G and the archaeology report is on file with the KYTC.

3.4.1 Cultural Historic Resources

Properties located within 1,000 feet of proposed alternatives were evaluated to determine potential eligibility for listing in the NRHP and, if eligible, an assessment of effects was completed. The assessment resulted in the survey of more than 350 properties and identification of 14 properties considered eligible for NRHP listing. The location of the properties can be seen in Figure 37. A summary of the properties determined to be eligible for NRHP listing and the determination of effects are shown in Table 12. Concurrence with the identification of NRHP eligible properties and effects was provided by the KY SHPO and TN SHPO in letters dated April 17, 2019, and May 17, 2019, respectively (see Appendix G).

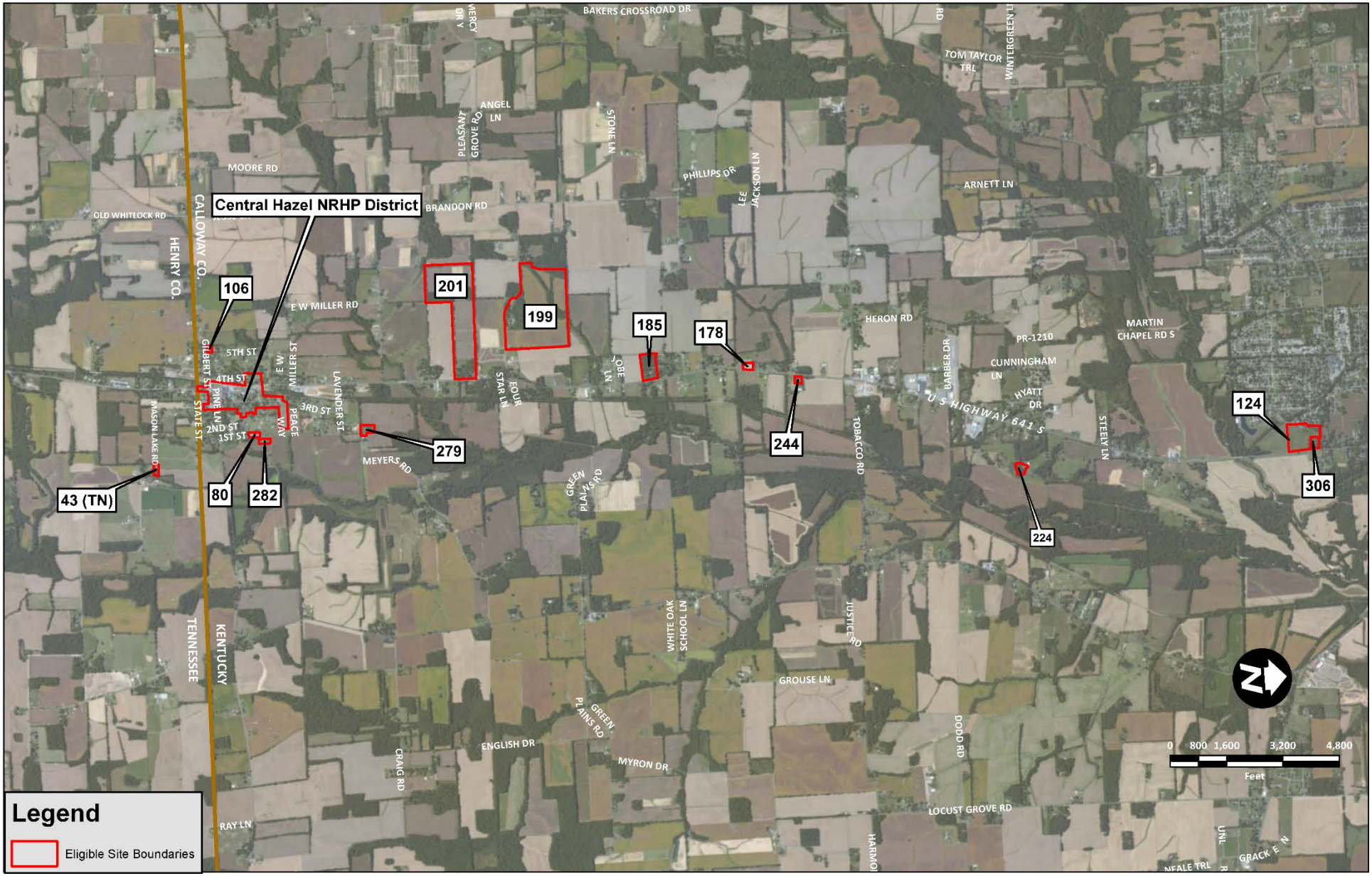


Figure 37: National Register Eligible Boundaries

Table 12: NRHP Eligible Sites and Summary of Effects

Site Name (Field Site #)	Alternative								
	1	2	3	4	4A	4F*	4H*	4I*	5
Central Hazel NRHP District									
Hazel School Lunch Room Building (FS 80)									
Old Wilson House (FS 106)									
Clara Humphrey House (FS 124)									
Hubert Coles Truck Stop and Diner (FS 178)									
Dan and Lutricia Poyner House (FS 185)									
Roach Farm (FS 199)									
Edwards Farm (FS 201)									
Hill Dairy Barn and Farm Pond (FS 224)									
Buren and Nina Poyner House (FS 244)									
Charlotte House (FS 279)									
Dr. Jake and Josephine Mayer House (FS 282)									
Simmons House (FS 306)									
Chestnut Grove AME Church (FS 43 TN)									

= No Effect = No Adverse Effect = Adverse Effect

* Impacts when Tennessee Alternative combined with Alternative 4A in Kentucky

Figure 38: Main Street (US 641) Looking North at Center Street Intersection

The survey defined boundaries for the Central Hazel Historic District. The district is eligible for the NRHP under Criterion A on the regional level for its importance as an intact example of a late nineteenth- and early-twentieth-century railroad town associated with market-oriented production in south-central Calloway County (see Figure 38). The Central Hazel Historic District includes 66 properties, 51 of which are contributing elements to the district (see Figure 39). The typical section for Alternative 3 was narrowed from three lanes with shoulders to three lanes with curb and gutter to minimize impacts to contributing elements in the northern portion of the district. The centerline was also shifted slightly to the east to minimize impacts to contributing elements west of the roadway. Through the central part of the district, a two-lane section with parking on each side mirrors the existing condition. Widening back to a three-lane section occurs south of the district boundaries. Alternative 3 would have No Adverse Effect to the district.

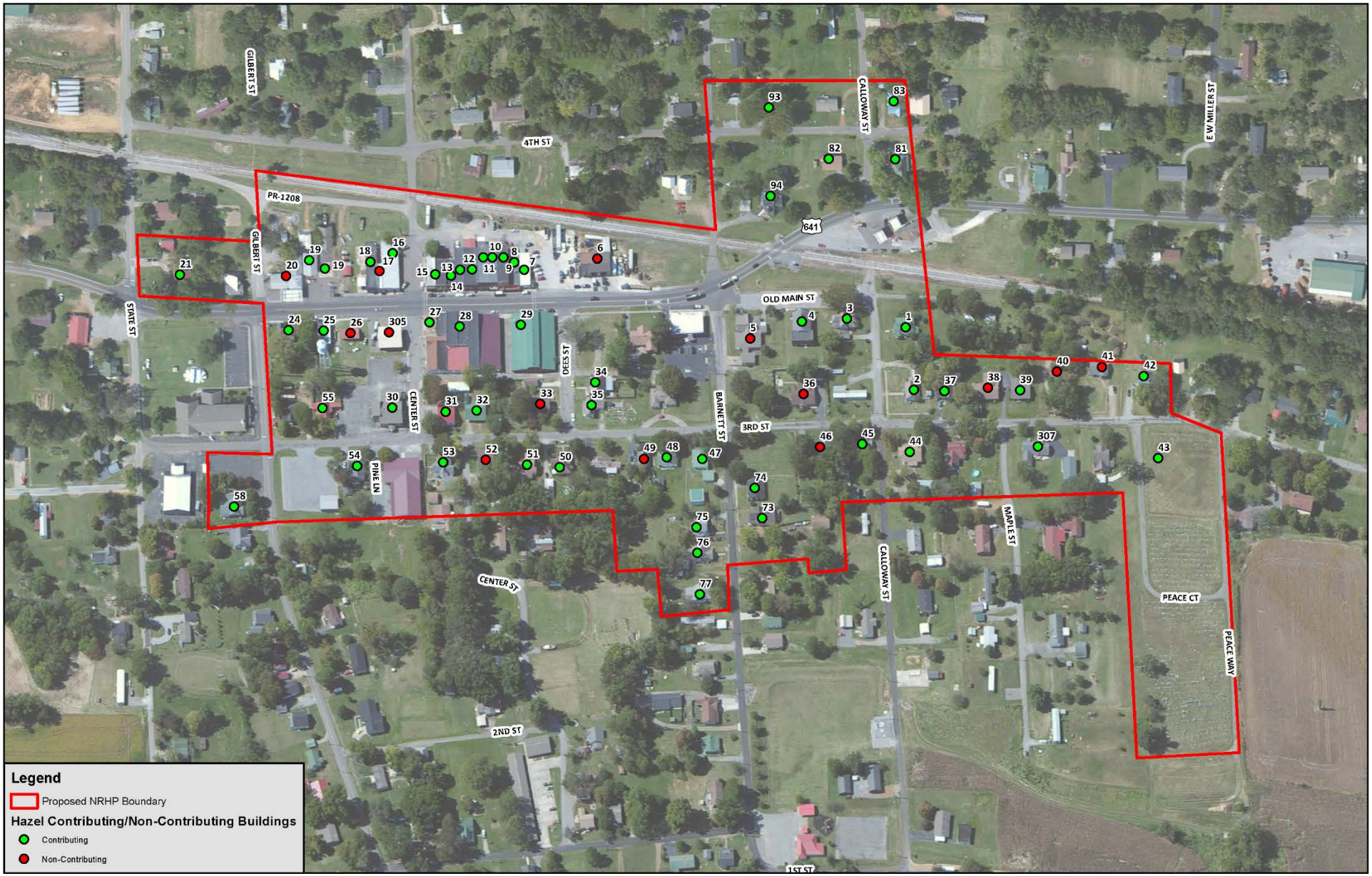


Figure 39: Central Hazel Historic District

While relocating the traffic outside of the town of Hazel has the benefit of alleviating truck congestion through the narrow downtown corridor, it also diverts traffic that might otherwise have stopped if passing through the town. Some businesses within the town are destination locations. As a result, the historic district would experience indirect effects under 36CFR 800.5(a)(2)(iv), that result in a "change of the character of the property's use or physical features within the property's setting that contribute to its historic significance." As the Main Street contributes to the district's character and setting, this is an Adverse Effect. It is also possible that the project may cause "neglect of a property which causes its deterioration…." A bypass diverting traffic may indirectly cause commerce to shift to the new road, and thus contribute to deterioration of the integrity of the Central Hazel NRHP district. Off-corridor Alternatives 4, 4A, and 5 have all been determined to have an Adverse Effect on the historic district. The letter of concurrence from the KY SHPO indicated that the adverse effects may be mitigated to No Adverse Effect by incorporating measures to minimize the effect. The letter specifically mentioned developing the NRHP nomination form to actually list the district in the NRHP and providing signage on the off-corridor alignments that raise traveler awareness of the nearby historic town. Should the preferred alternative 4A be selected for implementation, additional consultation with the KY SHPO will be necessary to formalize incorporating mitigation measures within the project to minimize the adverse effect.

Additional eligible properties were scattered across the landscape throughout the corridor, 12 in Kentucky and one in Tennessee. FS 199 (Roach Farm) and FS 201 (Edwards Farm) are large agricultural tracts, both located to the west of the existing corridor and north of Hazel. Unavoidable adverse impacts to these properties, as well as to FS 106 west of Hazel, resulted in the dismissal of Alternatives 1 and 2. Several of the historic properties (FS 244, FS 178, FS 185, and FS 201) front existing US 641. At these locations, Alternative 3 was shifted east or west as necessary to avoid impacting the eligible properties.

In Tennessee, southeast of Hazel, lies the Chestnut Grove African Methodist Episcopal (AME) Church (FS 43 – TN). The church congregation was founded in 1878 by African American members of the Quinn's Chapel church in Paris, Tennessee, and the present building was constructed in 1959, replacing an earlier structure constructed sometime after 1920. The property served as sacred space for the African American community in southern Calloway and northern Henry County for generations. The Chestnut Grove AME church congregation worshipped on this site from circa 1926 to 1998. The site is eligible under NRHP Criterion A for its association with the African American community in Hazel, Kentucky, and northern Henry County, Tennessee. The historic boundary includes an acre surrounding the structure. Alternative 5 does not directly impact the historic property but the proposed approach connecting with Mason Lake Road lies just 55 feet from the historic property boundary. Right of way for the mainline of Alternative 5 would lie less than 300 feet from the building. The project would introduce visual, atmospheric, or audible elements that diminish the integrity of the property's historic features. Situating the highway within proximity of this property would effectively reduce the integrity of setting and feeling, and thus negatively impact its historic character, causing an Adverse Effect.

3.4.2 Archaeological Resources

An archaeological overview was conducted for the Study Area to review available literature and evaluate the potential for encountering archaeological properties that may be eligible for listing in the NRHP. The records check determined that portions of the project alternatives within Tennessee have been previously investigated for cultural resources, but the exact area of this previous testing is difficult to determine due to inaccurate mapping within the previous survey. The majority of the Study Area within Kentucky has not been previously surveyed for cultural resources.

The literature review indicated multiple archaeological sites located in the 2.0 km (1.24 mi) Study Area. Three archaeological sites are located within 2.0 km (1.24 mi) of the Kentucky portion of the Study Area, none of which are directly impacted by or adjacent to the proposed alternatives. A total of four sites and eight field sites have been previously identified in the Study Area for the Tennessee portion of the project. Two are within the footprint of Alternatives 1 and 2, which have been dismissed due to other historic property impacts, and three are adjacent to Alternative 3. All of these sites were recommended as Not Eligible for listing in the NRHP.

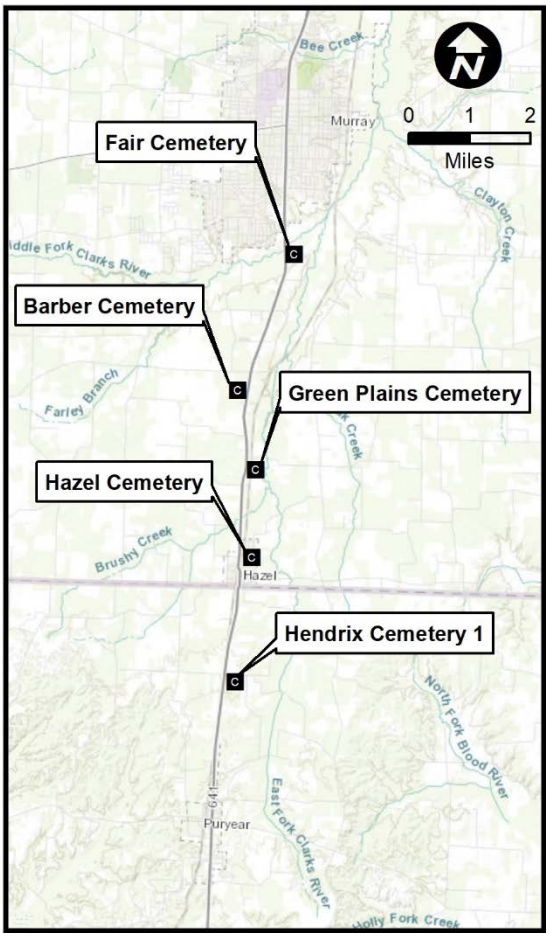


Figure 40: Cemetery Locations

As part of the ongoing environmental review and prior to a final decision regarding location of the project, a Phase I survey of the preferred alternative will be completed to determine whether archaeological resources exist within the footprint of the project. Where practicable, these sites will be avoided. Should Phase I investigations identify sites that cannot be avoided, Phase II testing will be conducted to further assess those sites and determine eligibility for listing in the NRHP. Consultation will be conducted pursuant to 36 CFR 800.6 to resolve adverse effects to any NRHP-eligible archaeological sites that cannot be avoided and that do not warrant preservation in place.

In addition to the known archaeological sites, seven cemeteries in Kentucky and eight cemeteries in Tennessee have been identified within the 2.0 km (1.24 mi) Study Area; five of these cemeteries are located adjacent to proposed alternatives (see Figure 40). Alternative 3 would impact the Green Plains Cemetery, located west of US 641, approximately 0.2 miles north of the US 641/Lauring Drive intersection. Alternatives 4 and 4A (not the Preferred alternative in Tennessee) would impact the Hendrix Cemetery, located near the southern end of the project approximately one-quarter of a mile east of the US 641/Brannon Lane intersection. Cemeteries affected by the selected alternative would be assessed to determine eligibility

under NRHP Criteria A, B, C, and D, and archaeological relocation of some or all parts of the impacted areas could be required.

Other cemeteries identified in proximity to the proposed alternatives but which would not be directly affected include the Fair Cemetery, east of the north end of the project; Barber Cemetery, west of the existing alignment and south of Midway; and the Hazel Cemetery, located northeast of Hazel. For cemeteries located near but not known to be directly affected by proposed alternatives, archaeological investigators recommended that the boundaries of the cemeteries should be delineated and a 100-foot exclusion buffer should be established around the defined limits. If cemeteries cannot be avoided, grave relocations will be completed in conformance with the respective state's laws, policies, and procedures, archaeological recovery as described above notwithstanding. For the KYTC, procedures authorized under the Authority of 600 KAR 3:020 and 901 KAR 5:090, as outlined in the *KYTC Right of Way Manual*, Chapter 1200, will be followed. The KYTC District Office grave relocation agent will attempt to contact all next of kin to make them aware of the potential disinterment of the remains. The Cabinet will contract with a funeral director licensed by the Commonwealth of Kentucky to disinter and reinter the remains, at a nearby cemetery, under the supervision of the District Office grave relocation agent. Though TDOT does not have a formal written policy detailing these procedures, notification of next of kin, and contracting the disinterment/reinternment with a licensed funeral director, is consistent with its standard practice.

3.5 Section 4(f) and Section 6(f)

3.5.1 Section 4(f)

Section 4(f) of the U.S. Department of Transportation Act of 1966 (1966 USDOT Act) provides protection for publicly owned parks, recreation areas, and wildlife or waterfowl refuges; historic properties that are listed in or eligible for inclusion in the NRHP; and archaeological sites listed in or eligible for the NRHP and of such importance to warrant "preservation in place." Approval of a project impacting a resource protected under Section 4(f) may only occur if:

i) There is no feasible or prudent alternative to the use of the property; and

ii) The action includes all possible planning to minimize harm to the property resulting from such use; or

iii) The agency determines that the use of the property, including any measure(s) to minimize harm (such as any avoidance, minimization, mitigation, or enhancement measures) committed to by the applicant, will have a *de minimis* impact on the property.

Section 4(f) protection is afforded to properties where some use of the property is required. Most commonly, this use involves permanent incorporation of some or all of the property into a transportation facility. Temporary occupancy required for construction of the project may also be considered a use if it is considered to be adverse. Constructive use of the property may occur when there is no actual physical use of the property but proximity impacts result in substantial impairment to the property's activities, features, or attributes that qualify the property for protection under Section 4(f).

There are no publicly owned parks, recreation areas, or wildlife or waterfowl refuges impacted by the project. Though there is an adverse effect to the Chestnut Grove AME Church from Alternative 5, there is no use of the property and, therefore, it is not subject to Section 4(f) evaluation. The impacts to the church that would occur as a result of the proposed highway are not so severe that the protected activities, features, or attributes that qualify the property for protection under Section 4(f) are substantially impaired; therefore, there is no constructive use of the church property. Some minor strip taking would occur within the Central Hazel Historic District's northern limits for construction of Alternative 3. All properties affected are noncontributing to the district and the impacts were determined not to be adverse in consultation with the SHPO. Since no contributing elements of the district are affected, there is no Section 4(f) use.

The district would also experience an adverse effect resulting from the off-corridor alignments bypassing the town. None of these alternatives would encroach upon the boundaries of the district; therefore, there is no Section 4(f) use. Furthermore, the impacts to the district resulting from the proposed highway, located nearly one-quarter mile away, are not so severe that the protected activities, features, or attributes that qualify the property for protection under Section 4(f) are substantially impaired; therefore, there is no constructive use of the historic district. Since there is no Section 4(f) use of the district by these alternatives, a Section 4(f) evaluation is not required.

Roach Farm (FS 199) *De Minimis* Determination

The Roach Farm was determined to be eligible for listing in the NRHP through consultation with the SHPO. The mainline of all project alternatives avoids impacts to the historic property; however, Alternatives 4 and 4A, which are coincidental at this location, require a use of approximately 0.1 acres for the construction of the approach on Lauring Drive (see Figure 42). The effect of this minor strip taking was evaluated during consultation with the KY SHPO and there was concurrence that this impact would have No Adverse Effect to the historic property. The letter from KY SHPO (April 17, 2019, Appendix G) included the statement "We understand that for Alternate 4 or 4A there will be a small strip taking for the Roach Farm CW 336 (FS 199) and that it falls within the Section 4(f) *de minimis* finding, therefore we concur with your recommendation that this property have a no adverse effect."

In a *Memorandum of Understanding Among the Federal Highway Administration, the Kentucky State Historic Preservation Office and the Kentucky Transportation Cabinet* (February, 2018), it was programmatically stipulated that "the FHWA is hereby notifying the SHPO of FHWA's intent to determine Section 4(f) *de minimis* use(s) (when applicable) for those projects in which the SHPO has previously concurred with a finding that the project will have No Adverse Effects or that there are No Historic Properties Affected and that this agreement satisfies the notification requirements specified in 23 CFR 774."

FHWA concludes that all criteria for making a *de minimis* Section 4(f) finding have been satisfied and that such finding is appropriate for the Roach Farm.

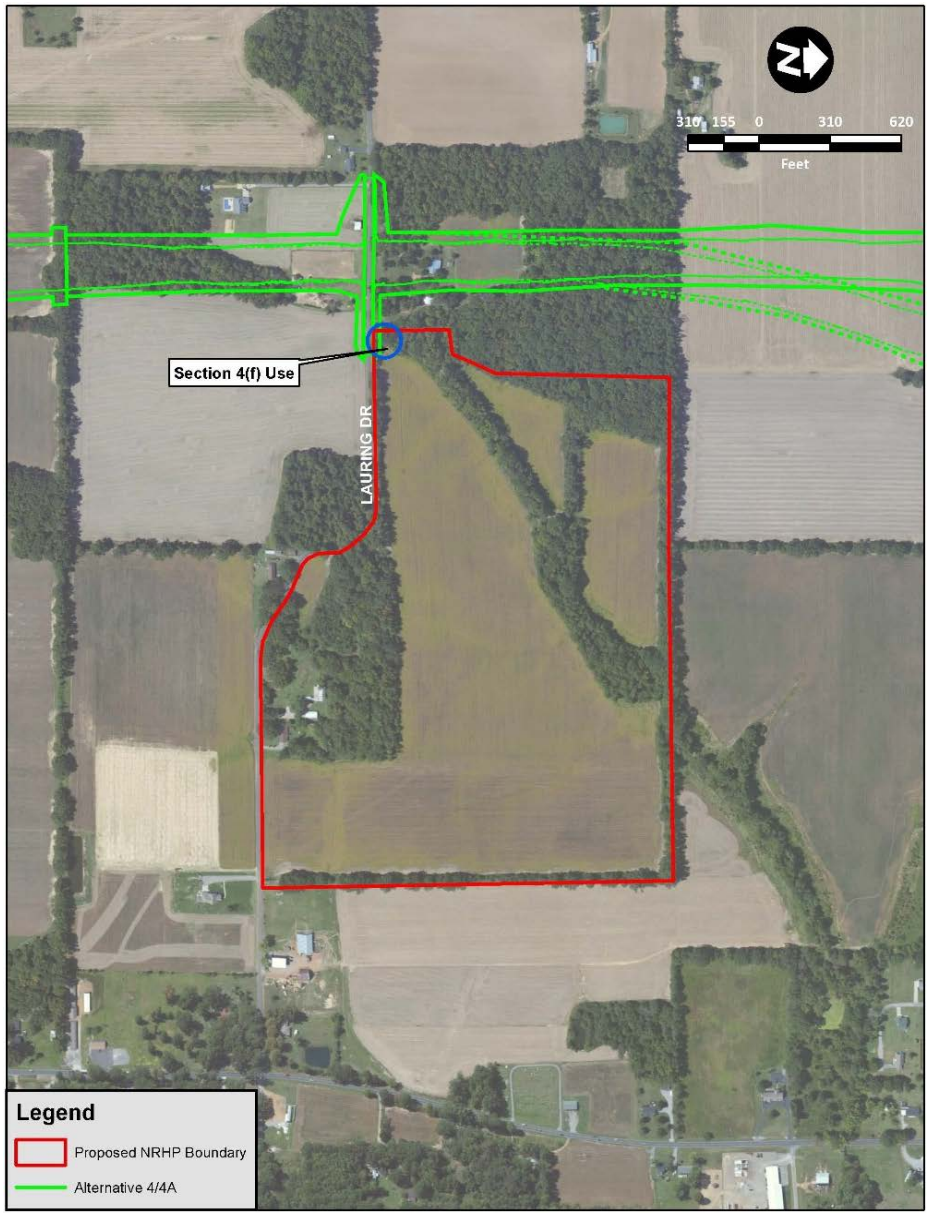


Figure 41: Roach Farm

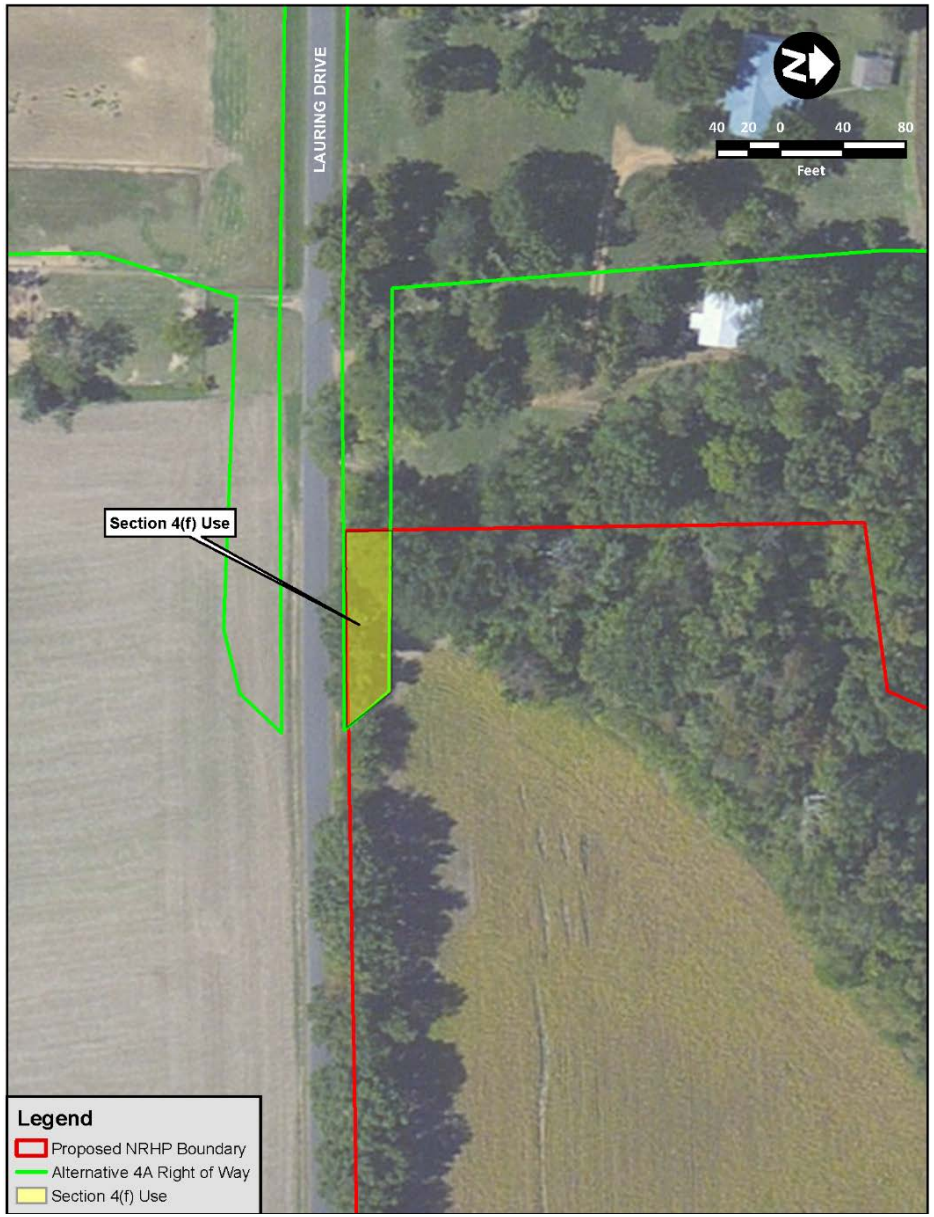


Figure 42: Roach Farm Section 4(f) Use

3.5.2 Section 6(f)

Federal Land and Water Conservation Act (LWCF) funds are often used to purchase or improve lands that are used for parks, conservation, recreation, or similar purposes. Those purchases and improvements are protected under Section 6(f) of the act and any impacts require an in-kind replacement and approval from the Secretary of the Interior. Field reconnaissance did not identify any recreational properties in proximity to the alternatives where LWCF funds might have been used. A database review (May 13, 2019) of all LWCF grants issued for Calloway County and Henry Counties (https://www.lwcfcoalition.com), and consultation with TDEC Recreational Education Services did not reveal any properties purchased or improved with LWCF funds that would be impacted by any alternatives associated with this project. LWCF grants have been used at several locations in Calloway and Henry Counties but none that are proximate to any of the proposed alternatives. The closest use occurred at Hazel City Park, which is located approximately 0.2 miles east of US 641 between Barnett and Calloway Streets in Hazel. A complete list of the properties in the area where LWCF grants have been used can be found in Appendix H.

3.6 Land Use

Land uses in both Calloway and Henry Counties are predominantly agricultural and rural residential. Existing and historical land uses in the Study Area were determined by analyzing historic aerial photographs. This analysis showed that the Study Area has remained relatively static, with the proportions of forest (60%), agricultural/field (30%), and light residential development (10%) remaining roughly the same over the past 20 years.

The Study Area is a patchwork of agricultural fields and light residential development. There is little industrial usage throughout the Study Area. There is one subdivision/mobile home park near the northern terminus of the project just south of Murray, but the rest of the corridor is single family residences. Agricultural fields in the Study Area are a mixture of row crops and hayfields.

The 2016 County Business Patterns dataset from the US Census Bureau was referenced for information regarding business types and employment in the area. In 2016, 823 business establishments were located in Calloway County. Retail trade accounted for the largest percentage (19%) of business, followed by health care and social assistance (11%), construction (11%), and other services (except public administration; 11%). The following industries each comprised less than 10% of the business establishments: agriculture, forestry, fishing, and hunting; mining, quarrying, and oil and gas extraction; utilities; manufacturing; wholesale trade; transportation and warehousing; information; finance and insurance; real estate and rental and leasing; professional, scientific, and technical services; administrative and support and waste management and remediation services; educational services; arts, entertainment, and recreation; and accommodation and food services. As of 2016, there were 2,753 persons working in the transportation and warehousing sector (19% of the workforce); 2,531 persons employed in the manufacturing sector (17%); and 2,308 persons employed in health care and social assistance (16%).

For Henry County, the 2016 Census listed 695 business establishments. The three most numerous business types were retail trade (20%); other services (except public administration; 13%); and health care

and social assistance (12%). The following sectors each account for fewer than 10% of all establishments in the county: mining, quarrying, and oil and gas extraction; construction; manufacturing; wholesale trade; transportation and warehousing; information; finance and insurance; real estate and rental and leasing; professional, scientific, and technical services; administrative and support and waste management and remediation services; educational services; arts, entertainment, and recreation; and accommodation and food services. There are a total of 8,664 employees listed for all sectors. The three sectors employing the most people are retail trade (20%); manufacturing (17%); and health care and social assistance (16%).

3.7 Community Impacts

With the exception of a church that would be relocated for Alternative 3, no impacts to community resources, public facilities, institutions, or major employers are anticipated as a result of the proposed project. This section provides detail regarding the impacts to the community that may occur as a result of the project. The *Social and Economic Impact Analysis* for this project is located in Appendix I.

3.7.1 Socioeconomic and Demographic Characteristics

3.7.1.1 Industry

Major manufacturing companies in Calloway County include Pella Corporation (817 employees) and Briggs & Stratton Corporation (604 employees). The largest non-manufacturing companies are Murray State University (2,637 employees), Murray-Calloway County Hospital (1,000 employees), Paschall Truck Lines (1,502 employees), Kenlake Foods (340 employees), Calloway County Schools (500 employees), and Saputo Dairy Foods USA (315 employees). The three largest industries are trade, transportation, and utilities; manufacturing; and leisure and hospitality.[8]

The largest manufacturing companies in Henry County are Dana Corporation (600 employees), Republic Builders (300 employees), and Tecumseh (200 employees). The largest non-manufacturing companies are Henry County Medical Center (787 employees), Henry County Schools (550 employees), and Wal-Mart (295 employees) (Henry County Alliance 2019).[9]

From 2013 through 2017, the downward trend in the unemployment rate in both Calloway and Henry counties mirrored that of Kentucky and Tennessee as a whole (see Table 13).

[8] Kentucky Cabinet for Economic Development: www.thinkkentucky.com

[9] Paris-Henry County Industrial Committee: http://parishenrycoedc.com/labor-market/labor-statistics-2/

Table 13: County and State Unemployment Rates 2013-2017[10]

Year	Calloway County	Henry County	Kentucky	Tennessee
2013	9.7%	13.2%	9.8%	10.1%
2014	10.6%	12.7%	9.3%	9.5%
2015	9.1%	9.7%	8.4%	8.4%
2016	6.9%	7.9%	7.6%	7.5%
2017	5.7%	6.7%	6.8%	6.6%

3.7.1.2 Population

According to 2000 and 2010 U.S. Census information, Calloway County had a population of 37,191 in 2010, while Henry County had a population of 32,330. From April 1, 2010, to July 1, 2018, Calloway County experienced a 5% increase in population, while the population of Henry County grew by less than 1% during the same time period.[11] This population increase in both counties occurred at a slower rate than from 2000 to 2010. For Calloway County, the population growth is likely partially due to the presence of Murray State University, a public university, located in Murray. The Study Area, which is represented by Census Tracts 105, 106, and 107 in Calloway County and 9691 in Henry County, had a population of 15,940 in 2010 (Table 14). Population for the state and projections for the labor market are shown in Table 15.

Table 14: Population History of Census Tract Block Groups, Counties, and States[12]

Area	2000	2010
Calloway County	34,177	37,191
Census Tract 105	3,311	3,132
Census Tract 106	6,260	6,735
Census Tract 107	3,306	3,277
Henry County	31,115	32,330
Census Tract 9691	2,867	2,796
Kentucky	4,041,769	4,339,357
Tennessee	5,689,267	6,346,105

Table 15: Population Projections for Counties and States[13]

Area	2020	2025	2030	2035	2040
Calloway County	39,328	40,487	41,687	42,604	43,503
Henry County	32,538	32,616	32,513	32,286	32,009
Tennessee	6,883,347	7,148,217	7,390,535	7,621,801	7,853,224
Kentucky	4,533,464	4,634,415	4,726,382	4,808,682	4,886,381

[10] 2013 through 2017 American Community Surveys https://factfinder.census.gov/
[11] U.S. Census Bureau: State and County QuickFacts. http://quickfacts.census.gov
[12] 2000 and 2010 U.S. Census Data. www.factfinder2.census.gov
[13] Population Projections 2020-2040. http://ksdc.louisville.edu; http://ksdc.louisville.edu/data-downloads/projections/

3.7.1.3 Ethnic Characteristics

According to the 2017 American Community Survey, 89.7% of individuals in Calloway County and 87.5% of individuals in Henry County are White. The portion of the population identifying itself as Black represents 3.7% and 9.0% of the population in the two counties, respectively. Other racial and ethnic backgrounds account for smaller percentages. Ethnic characteristics in the four Census Tracts vary slightly, but at least 86.4% of their residents are White. Census Tract 105, which includes part of the City of Murray, has a higher percentage of Black residents (6.6%) than Calloway County (3.7%); Census Tract 9691 in Tennessee has fewer Black residents (1.5%) compared to Henry County as a whole (9.0%). Persons of Hispanic origin comprise 2.6% of the population in Calloway County and 2.3% of the population in Henry County (see Table 16). Hispanic is not considered a race category in the American Community Survey; a person can be White, Black, or another race and be of Hispanic origin.

Table 16: Populations by Race & Hispanic Origin

Geography	Count	White	Black	American Indian and Alaska Native	Asian	Native Hawaiian and Other Pacific Islander	Some Other Race	Two or more Races	Hispanic or Latino
Calloway County	Total	34,657	1,422	106	707	21	12	687	1,004
	%	89.7	3.7	0.3	1.8	0.1	<0.1	1.8	2.6
Census Tract 105	Total	3,337	243	0	0	0	0	38	65
	%	90.6	6.6	0.0	0.0	0.0	0.0	1.0	1.8
Census Tract 106	Total	6,590	284	36	385	0	0	44	284
	%	86.4	3.7	0.5	5.1	0.0	0.0	0.6	3.7
Census Tract 107	Total	2,818	57	0	28	0	0	72	98
	%	91.7	1.9	0.0	0.9	0.0	0.0	2.3	3.2
Census Tract 105 – Block Group 4	Total	1,185	67	0	0	0	0	0	26
	%	92.7	5.2	0.0	0.0	0.0	0.0	0.0	2.0
Census Tract 106 – Block Group 6	Total	2,686	87	0	150	0	0	44	0
	%	90.5	2.9	0.0	5.1	0.0	0.0	1.5	0.0
Census Tract 107 – Block Group 3	Total	1,009	46	0	28	0	0	6	92
	%	85.4	3.9	0.0	2.4	0.0	0.0	0.5	7.8
Henry County	Total	28,234	2,889	64	33	0	0	289	754
	%	87.5	9.0	0.2	0.1	0.0	0.0	0.9	2.3
Census Tract 9691	Total	2,615	42	6	3	0	0	48	73
	%	93.8	1.5	0.2	0.1	0.0	0.0	1.7	2.6
Census Tract 9691 - Block Group 1	Total	883	0	0	0	0	0	35	61
	%	90.2	0.0	0.0	0.0	0.0	0.0	3.6	6.2
	Total	857	17	6	3	0	0	6	12

Geography	Count	White	Black	American Indian and Alaska Native	Asian	Native Hawaiian and Other Pacific Islander	Some Other Race	Two or more Races	Hispanic or Latino
Census Tract 9691 – Block Group 2	%	95.1	1.9	0.7	0.3	0.0	0.0	0.7	1.3
Census Tract 9691 – Block Group 3	Total	875	25	0	0	0	0	7	0
	%	96.5	2.8	0.0	0.0	0.0	0.0	0.8	0

3.7.1.4 Per Capita Personal and Household Income

The median per capita and household incomes in Calloway and Henry Counties[14] are lower than those in Kentucky and Tennessee, respectively. Census Tract 105, which has a larger population of young people (15-24 years) than the other two census tracts, also has a lower per capita and household income. In contrast, median household income in Census Tracts 106 and 107 is higher than in the county and state. Per capita and household income in Census Track 9691 is higher than Henry County, but lower than Tennessee (see Table 17).

Table 17: Census Tract, County, and State Per Capita and Median Household Income

Income	Calloway County	Census Tract 105	Census Tract 106	Census Tract 107	Henry County	Census Tract 9691	Kentucky	Tennessee
Per Capita	$21,490	$18,579	$32,695	$22,250	$22,239	$27,605	$23,462	$24,409
Median Household	$39,677	$33,265	$59,828	$46,099	$36,950	$41,437	$43,036	$44,298

The 2017 American Community Survey data show that the percentage of individuals in poverty in the past 12 months in Census Tracts 105, 106, and 107 is lower than the average for Calloway County (see Table 18). Potentially affected block groups in Calloway County also have lower poverty rates than the county as a whole, except for Census Tract 106 – Block Group 6 (22.5%; 0.1% higher than the county average). In Henry County, Census Tract 9691 has a higher poverty rate (21.7%) than the county as a whole (19.7%). Census Tract 9691 – Block Group 1 has a lower poverty rate than Henry County as a whole (8.6% compared to 19.7%) while Census Tract 9691 – Block Group 2 (27.5%) and Census Tract 9691 – Block Group 3 (30.3%) are 7.8% and 10.6% higher than the county average, respectively. Both county poverty rates are higher than those of their respective states, and two of the four Census Tract poverty rates are higher than that of their state. See Table 18 and Figure 43.

[14] 2013 American Community Survey 5-Year Estimates

Table 18: Percentage of Individuals Living in Poverty

Area	%
Kentucky	18.3%
Calloway County	22.4%
Census Tract 105	19.0%
Census Tract 106	16.3%
Census Tract 107	7.5%
Census Tract 105 – Block Group 4	6.9%
Census Tract 106 – Block Group 6	22.5%
Census Tract 107 – Block Group 3	8.9%
Tennessee	16.7%
Henry County	19.7%
Census Tract 9691	21.7%
Census Tract 9691 – Block Group 1	8.6%
Census Tract 9691 – Block Group 2	27.5%
Census Tract 9691 – Block Group 3	30.3%

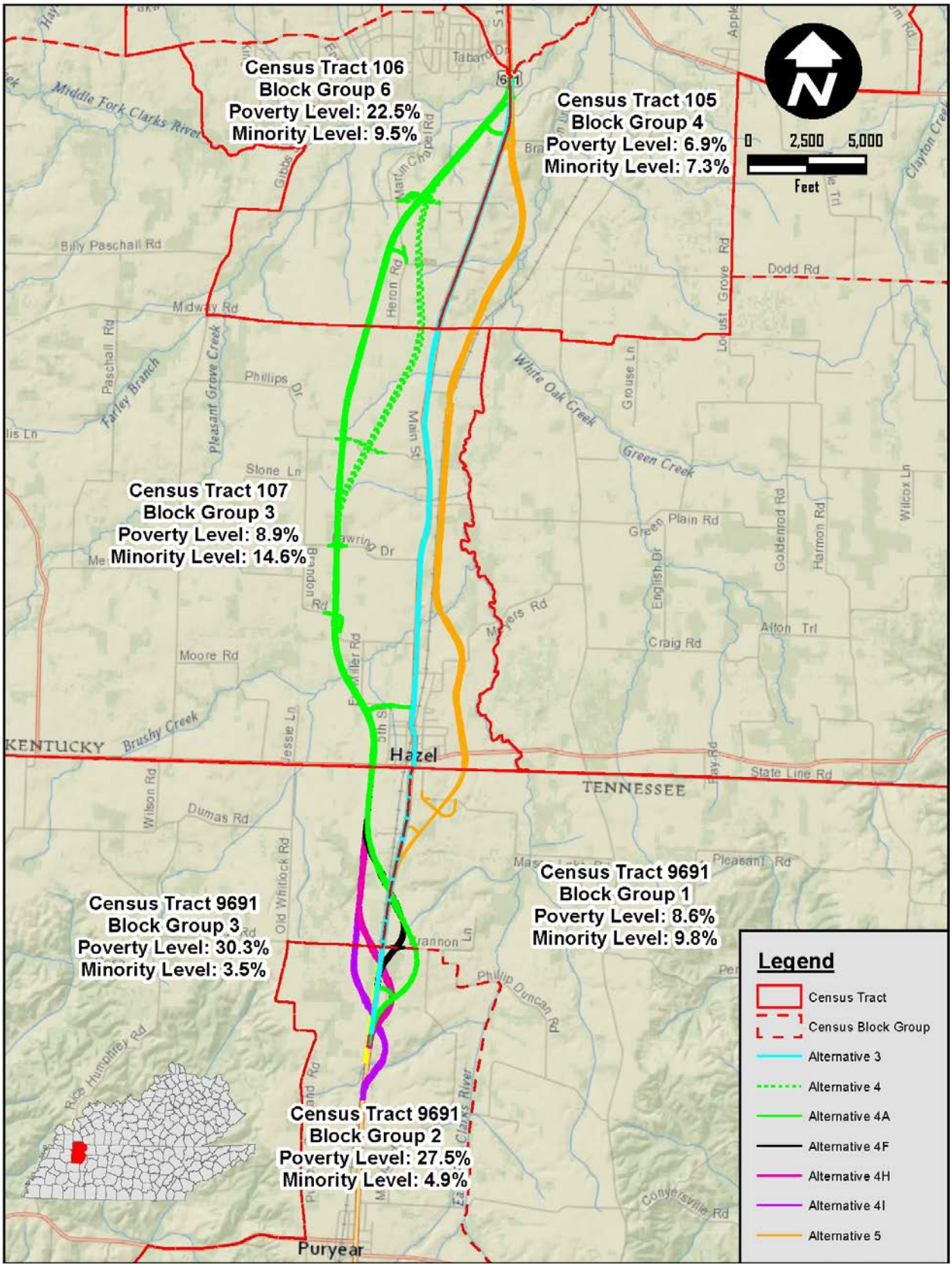


Figure 43: Study Area Census Tract Block Groups and Environmental Justice Data

3.7.2 Right-of-Way Requirements, Relocations and Displacements

Construction of the roadway will necessitate the conversion of lands currently in agricultural, residential, commercial, and other uses, to transportation use. The right of way required for each alternative is detailed in Table 19. Due to terrain, constructability, and other engineering considerations, relocations are unavoidable, though efforts will be made throughout the project development process to minimize the required relocations to the extent practicable.

Table 19: Right-of-Way Requirements

	Alternative									
	3	**4**	**4A**	**4/4F**	**4A/4F**	**4/4H**	**4A/4H**	**4/4I**	**4A/4I**	**5**
Right of Way	70 ac; 226 parcels	240 ac; 63 parcels	249 ac; 66 parcels	240 ac; 60 parcels	249 ac; 63 parcels	237 ac; 61 parcels	246 ac; 64 parcels	248 ac; 67 parcels	257 ac; 70 parcels	192 ac; 45 parcels

For a discussion of additional right-of-way requirements associated with the construction of a US 641 to Alternatives 4/4A connector, see Section 3.11.

3.7.2.1 Residential Relocations

Residential relocations are spread throughout the Study Area. The numbers of residential relocations are roughly similar, with the exception of Alternative 3 requiring the most at 23, and Alternatives 4 and 5 requiring the fewest at nine (Table 20). The preferred alternative's (Alternative 4A and 4I) project length is slightly more than 8.5 miles and has ten relocations; nine in Kentucky and one in Tennessee. With ten relocations spread throughout those 8.5 miles, there is sufficient relocation housing available to accommodate those that would be displaced by the off-corridor alignments. The 23 relocations associated with Alternative 3 would be more challenging to relocate within the vicinity.

Table 20: Residential Relocations

	Alternative									
	3	**4**	**4A**	**4/4F**	**4A/4F**	**4/4H**	**4A/4H**	**4/4I**	**4A/4I**	**5**
Relocations	23	9	9	10	10	9	9	10	10	9

Some residents, especially those affected by the off-corridor alignments that impact sizeable agricultural properties, may have the opportunity to relocate on sufficient remainders of their parcels. On Alternative 3, several of the affected residences are mobile homes within a mobile home park, which could provide additional lots for relocation. If sites do not become available over the relocation period in response to elevated demand, and if occupants do not elect to move into conventional dwellings, Last Resort Housing measures may become necessary.

For a discussion of additional right-of-way requirements associated with the construction of a US 641 to Alternatives 4/4A connector, see Section 3.11.

3.7.2.2 Business Impacts and Relocations

Alternative 3 would impact nine businesses, ranging from a natural gas fueling station to a small corner store. These businesses are located close enough to the existing roadway that their structures would be impacted by the widened roadway. Some businesses along the corridor are destination services; however there are several, such as a gas station, that have greater reliance on drive-by traffic for their customers. The off-corridor alignments would not require the relocation of any businesses.

Interviews with businesses along the US 641 corridor were undertaken in January 2019. Owners of a furniture store, novelty shop, café, gas station, and several antique stores were concerned that the loss of traffic through the business district would negatively affect their businesses and employees. They rely on customers who drive by and, after seeing signs or storefronts, decide to stop and shop. The preferred alternative is less than one quarter of a mile from downtown Hazel, which will remain visible from the new road. To mitigate for impacts to the Central Hazel Historic District for the diversion of traffic created by an off-corridor alignment, the KY SHPO suggested in its letter dated April 17, 2019, that the adverse effect could be mitigated by listing the Central Hazel Historic District in the NRHP and providing signage on the new route to increase drivers' awareness of the nearby town. If implemented, such measures would not only mitigate the adverse effect to the historic district but they would also ameliorate the effects of traffic diversion on the downtown businesses.

3.7.2.3 Relocation Assistance

To minimize the unavoidable effects of right-of-way acquisition and displacement of people, the KYTC and TDOT offer a Relocation Assistance Program in accordance with the *Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970* (Public Law 91-646), as amended in 1987. Housing and relocation resources would be available to all residential and business relocatees without regard to race, creed, color, national origin, or economic status, as required by Title VI of the *Civil Rights Act of 1964*. In accordance with *Environmental Justice Executive Order 12898*, an analysis was conducted to identify any geographic areas containing disproportionately high concentrations of minority or low-income households. It was concluded that none of the proposed build alternatives would have a disproportionately high and adverse effect on minority or low-income populations.

3.8 Environmental Justice

The purpose of Executive Order 12898, Federal Actions to Address Environmental Justice (EJ) in Minority and Low-Income Populations, is to focus Federal attention on the environmental and human health condition in minority and low-income communities, to promote non-discrimination in Federal programs affecting human health and the environment, and to provide minority and low-income communities access to public information and an opportunity to participate in matters relating to the environment and human health. KYTC's 2014 Guidance Developed for Environmental Justice Analysis and TDOT's EJ guidance were followed to identify EJ populations that might be impacted by the proposed alternatives.

As discussed above, 89.7% of individuals in Calloway County and 87.5% of individuals in Henry County are White (Kentucky 87.8% and Tennessee 78.6% are White, respectively). Minorities represent 10.3% and 12.5% of the population in the two counties, respectively.

Ethnic characteristics in the three census tracts in Calloway County vary slightly with the percentages of White population identified for Census Tract 105 (90.6%), Census Tract 106 (86.4%), and Census Tract 107 (91.7%). Only Census Tract 107 – Block Group 3 has a higher percentage of minority population (14.6%) than Calloway County (10.3%). Part of this high percentage may be due to the small size of the block group (approximately 1,000 people). Alternative 4A/4I, the preferred alternative, may require approximately nine relocations within this block group. No minority relocations were identified during windshield surveys or discussions with local officials. No disproportionate or adverse impacts to minority residents were identified as a concern during discussions with local officials, residents, and attendees at the public meeting.

In Tennessee, Henry County has a minority population of 12.5% while Census Tract 9691 is 6.2% and Census Tract 9691 – Block Group 1 is 9.8%. In identifying potential EJ concerns, TDOT identifies two thresholds that may trigger further EJ review: 1) does block group EJ population have population greater than 50 percent of total block group; or 2) does the block group EJ population exceed the County average by ten percent.

As discussed in Section 3.7, both Calloway County and Henry County poverty rates are higher than those of their respective states, and two of the four Census Tract poverty rates are higher than that of their state (see Table 18 and Figure 43). Potentially affected block groups in Calloway County have lower poverty rates than the county as a whole, except for Census Tract 106 – Block Group 6 (22.5%; 0.1% higher than the county average). Block Group 6 includes part of Murray, which appears to be affecting the poverty rate for this block group. Alternative 4A/4I, the preferred alternative, would have two residential relocations in Block Group 6. One is the residence on a 48-acre farm, the other on a two-acre wooded lot. Based on a windshield survey, it does not appear that either of these residences have low-income owners.

In Henry County, Census Tract 9691 has a higher poverty rate (21.7%) than the county as a whole (19.7%). Census Tract 9691 – Block Group 1 has a lower poverty rate than Henry County as a whole (8.6% compared to 19.7%) while Census Tract 9691 – Block Group 2 (27.5%) and Census Tract 9691 – Block Group 3 (30.3%) are 7.8% and 10.6% higher than the county average, respectively. No block group has an EJ population greater than 50 percent of the total block group; therefore, the project does not meet TDOT's first threshold to trigger further EJ review. While Census Tract 9691 – Block Group 3 has a poverty rate percentage that exceeds the County average by more than ten percent (10.6%), no relocations would occur within this block group as part of the preferred alternative.

To supplement field information gathered, the questionnaire distributed at the public meeting (March 12, 2019) included a question asking whether the construction of the project would create any hardship for the respondents. Most responses received to the question expressed a reluctance to relocating or loss of property. None of the responses suggested an impact to persons with interdependencies, a hardship due to loss of support services, or separation from individuals relied upon for maintaining a quality of life.

Study of the area did not identify any areas where low-income or minority populations are predominantly located. The population appears to be dispersed in the area. None of the alternatives will impact any businesses or organizations that provide services or support to low-income populations. Impacts to the EJ population will not substantially differ from those effects to be realized by the remaining population. Benefits of the project in the form of improved safety and reduced travel times will be recognized by all area residents and travelers.

Based on the above discussion and analysis, the US 641 reconstruction project will not cause disproportionately high and adverse effects on any minority or low-income populations in accordance with the provisions of E.O. 12898 and FHWA Order 6640.23. No further EJ analysis is required.

3.7.3 Agricultural Impacts

Calloway County makes a small contribution to Kentucky's agricultural industry. In 2017, Calloway County ranked 82 of the total 120 Kentucky counties in the total value of agricultural products sold. In Tennessee, Henry County ranks 11 of 95 counties in the total value of agricultural products sold. Soybeans were the most commonly planted crop by acreage in 2017 in both counties.

The total market value of agricultural products sold by Calloway County farms decreased from $109,701,000 in 2012 to $97,718,000 in 2017. Animal Sales accounted for 40% of agricultural products sold, while Crop Sales constituted 60%. The total market value of agricultural products sold by Henry County farms increased from $91,561,000 in 2012 to $94,096,000 in 2017. Livestock Sales accounted for 38% of sales in 2012, while 62% was attributed to Crop Sales.[15]

Table 21 shows a decrease in the number of farms in Calloway and Henry Counties during the past 20 years, while the average size of farms has increased. Total farm acres in Calloway County have decreased while the total farm acres in Henry County has increased slightly.

Table 21: Historical Farm Numbers and Acreages[16]

Year	Number of Farms	Total Farm Acres	Average Farm Size
Calloway County			
1997	864	157,616	182
2002	819	169,407	207
2007	888	157,761	178
2012	821	176,076	214
2017	710	135,521	191
Henry County			
1997	1,005	201,482	200
2002	965	193,512	201
2007	958	193,416	202
2012	826	204,557	248

[15] National Agricultural Statistics Service. www.nass.usda.gov.

[16] National Agricultural Statistics Service. www.nass.usda.gov.

Year	Number of Farms	Total Farm Acres	Average Farm Size
2017	710	203,991	287

Mapping of the build alternatives, with corresponding right-of-way requirements, was submitted to the Calloway and Henry County Natural Resources Conservation Services (NRCS) offices for a Land Evaluation and Site Assessment (LESA).The assessment is intended to protect farmland and assess factors that are important about the affected land other than its agricultural value alone. These criteria are scored and impacts resulting in scores of 160 or less are given a minimal level of consideration for protection. As a part of this scoring, the LESA form identifies prime and/or unique farmland located within the project impact area (see Appendix J).

Overall farmland/soil impacts in Calloway County would be greater than in Henry County, but no proposed build alternative would have impacts resulting in a LESA score of over 160. A summary of the prime farmland impacts and LESA scores is presented in Table 22. These impacts are anticipated to be minor and do not require additional mitigation. If design modifications result in substantially greater impacts to farmland, further coordination with NRCS will be undertaken to consider the effects of those modifications.

Table 22: Prime Farmland Impacts (Acres/LESA Score)

	Alternative									
	3	4	4A	4/4F	4A/4F	4/4H	4A/4H	4/4I	4A/4I	5
Calloway County	54.57/ 110	114.2/ 140	120.1/ 141	114.2/ 140	120.1/ 141	114.2/ 140	120.1/ 141	114.2/ 140	120.1/ 141	111.98/ 148
Henry County	2.1/ 110	18.2/ 128	18.2/ 128	17.3/ 128	17.3/ 128	29.1/ 128	29.1/ 128	29.3/ 128	29.3/ 128	10.2/ 131
Total Prime Farmland (Acres)	56.67	132.4	138.3	131.5	137.4	143.3	149.2	143.5	149.4	122.18

For a discussion of additional farmland impacts associated with the construction of a US 641 to Alternatives 4/4A connector, see Section 3.11.

3.9 Pedestrian and Bicycle Facilities

Bicycle and pedestrian facilities do not currently exist on US 641 or other roads being crossed by US 641, nor in the areas surrounding the project. No local planning or zoning long-range plans exist that would require any bicycle or pedestrian facilities. The project team does not recommend constructing these facilities at the current time. However, the 12-foot shoulders (10-foot paved) will provide improved areas for pedestrians and cyclists who may choose to use this route. This design is in compliance with the FHWA Bicycle and Pedestrian Design Guidance and with the KYTC Pedestrian and Bicycle Travel Policy and TDOT's Multimodal Access Policy. Pedestrian and bicycle safety and mobility would not be improved under the No-Build Alternative.

3.10 Hazardous Materials

Hazardous materials are substances that have or would have, when combined with other materials, a harmful effect on humans or the natural environment. Hazardous materials are regulated under the Resource Conservation and Recovery Act (RCRA) of 1976, as amended; the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980; and the Superfund Amendments and Reauthorization Act (SARA) of 1986.

Several resources were utilized during the Phase I Environmental Site Assessment (ESA) conducted for the proposed project, including regulatory databases; coordination with state, local, and federal environmental agencies; aerial photographs and topographic maps; Sanborn information; and on-site field investigations. A database report provided by Environmental Data Resources, Inc. (EDR) of Shelton, Connecticut, identified 64 reported references identifying 16 unique sites with potential environmental concerns. Data from this report was reviewed with consideration of the alternative alignments to identify locations for field review. An additional six sites with potential environmental concerns were located within or adjacent to the build alternatives during field reconnaissance. The TDEC Field Office identified six water wells located within one-half mile of project alternatives being considered in Tennessee. Two are located in proximity to Alternative 3 and another is near the Alternative 5 approach with Mason Lake Road (see Figure 44). None of these properties would be impacted by the preferred alternative. The KDOW did not identify any known water wells in Kentucky. The Phase I ESA is included in Appendix K.

Several 55-gallon drums and other potential hazardous materials containers were observed at private residences, farms, and businesses during site reconnaissance. Dump sites that are located at businesses, farms, and private residential property may contain hazardous waste. These sites could pose an issue during construction due to the potential for contaminated soils. Several agricultural structures (barns, sheds, etc.) were observed and it is expected that fertilizers, insecticides, and herbicides have likely been used in farming practices and may have been stored at these locations. Figure 44 shows the locations of the identified sites with potential Recognized Environmental Conditions (RECs).

Table 23 identifies these sites and the alternative(s) that could be affected by the past use of these properties. Alternative 3 impacts the greatest number of sites of concern due to the development and historic use of properties along the existing corridor. The preferred alternative (Alternative 4A and 4I) will not impact any identified sites with potential RECs.

Based on the review of the aforementioned records and site reconnaissance, a Phase II investigation may be advisable prior to right-of-way acquisition or construction affecting properties of concern, if impacted by the selected alternative. Due to the number of known hazardous material sites and the potential for isolated dump and burn sites on private properties, contamination is likely to be present, regardless of the alternative selected, with the exception of the No-Build Alternative.

Asbestos survey and sampling will be completed, as appropriate, for structures to be demolished for the road construction. Asbestos sampling should also be considered for any bridges to be removed along the selected alternative. In addition, in the event that hazardous substances/wastes are encountered within the proposed right of way, their disposition shall be subject to the applicable sections of the Resource

Conservation and Recovery Act of 1976, as amended; the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended; and the Tennessee Hazardous Waste Management Act of 1983.

Spills on highways are a potential source of water quality degradation and a possible public health hazard. The Kentucky Division of Emergency Management, the Kentucky Division of Waste Management and the Tennessee Emergency Management Agency all have responsibilities and authority for coordination of state and local agencies during accidents involving hazardous materials.

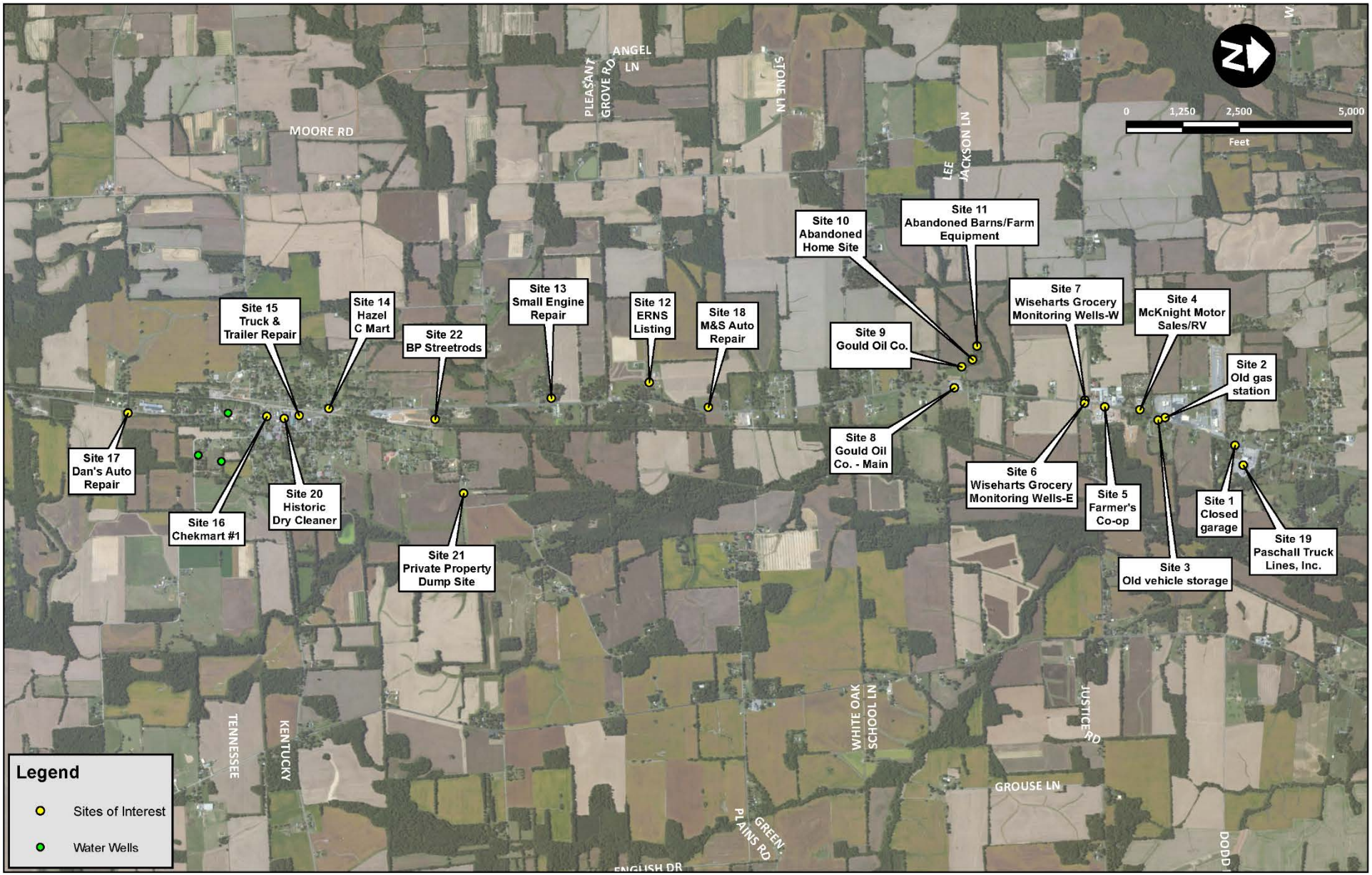


Figure 44: Potential Hazardous Materials Site Locations

Table 23: Potential Hazardous Material Sites

Site Name	Alternatives Impacting Site	Identification Source	Recognized Environmental Condition
Site 1 – Closed garage	Alternative 3	Site reconnaissance	Yes
Site 2 – Former gas station	Alternative 3	EDR Area/Corridor Report	Yes
Site 3 – Old vehicle storage	Alternative 3	Site reconnaissance	Yes
Site 4 – McKnight Junkyard/Motor Sales/RV	Alternative 3	EDR Area/Corridor Report	Yes
Site 5 – Henry's Farm Co-op	Alternative 3	EDR Area/Corridor Report	No
Site 6 – Former Wiseharts Grocery (monitoring wells)	Alternative 3	EDR Area/Corridor Report	Yes
Site 7 – Private residence (monitoring wells across US 641 from Site 6)	Alternative 3	EDR Area/Corridor Report	Yes
Site 8 – Gould Oil Co.	Alternative 3	EDR Area/Corridor Report	Yes
Site 9 – Gould Oil Co.	Alternative 2	Site reconnaissance	Yes
Site 10 – Abandoned home site	Alternative 2	Site reconnaissance	Yes
Site 11 – Abandoned barns/farm equipment	Alternative 1 Alternative 4	Site reconnaissance	Yes
Site 12 – ERNS Listing	None	EDR Area/Corridor Report	No
Site 13 – Small engine repair	Alternative 3	EDR Area/Corridor Report	Yes
Site 14 – Hazel C Mart	Alternative 3	EDR Area/Corridor Report	Yes
Site 15 – Truck and trailer repair	Alternative 3	EDR Area/Corridor Report	Yes
Site 16 – Chekmart #1	Alternative 3	EDR Area/Corridor Report	Yes
Site 17 – Dan's Auto Repair	Alternative 3	EDR Area/Corridor Report	Yes
Site 18 – M&S Auto Repair	Alternative 3	EDR Area/Corridor Report	Yes
Site 19 – Paschall Truck Lines, Inc.	Alternative 3	EDR Area/Corridor Report	No
Site 20 – Historic dry cleaner	Alternative 3	EDR Area/Corridor Report	No
Site 21 – Private property dump site	Alternative 5	Site reconnaissance	Yes
Site 22 – BP Streetrods	None	EDR Area/Corridor Report	No

3.11 Environmental Impacts of Alternatives 4/4A to US 641 Connector

Three connection options between Alternatives 4/4A and US 641 have been considered in detail. Design considerations, operational conditions, and the environmental impacts of each are discussed in the following sections. These impacts are in addition to those that have been identified in previous sections for Alternatives 4/4A.

Option C1

This connector option would improve EW Miller Road and provide a stop condition at its intersections with Alternatives 4/4A and US 641. All through traffic on Alternatives 4/4A would be directed onto the connector. The section of Alternatives 4/4A between EW Miller Road and State Line Road would be signed for local access. Realigning the western end of EW Miller Road and minor widening along its length would impact five acres on 11 additional parcels but would not require any relocations.

No additional impacts to historic properties would result from this option and potential for additional archaeological impacts would be considered negligible since most of the alignment is along an existing road where disturbance has occurred. There would be no impacts to Section 4(f) or Section 6(f) properties associated with this option. No properties with RECs would be affected by Option C1.

Widening of the road and replacing an existing culvert, would impact approximately 211 feet of additional stream. The stream is an intermittent unnamed tributary to Brushy Creek with water quality typical of streams through agricultural areas. There would be no wetlands impacted by the alternative. With the exception of 0.9 acres of trees that would be affected (Indiana bat and northern long-eared bat habitat), the alignment would not impact any threatened or endangered species habitat.

Noise impacts for the Kentucky section of the project are reported in the 2019 *Traffic Noise Impact Analysis, Reconstruction of US 641 and SR 54 Calloway County, Kentucky and Henry County, Tennessee, Item No. 1-314.2*, hereafter referenced as the Kentucky Noise Study (see Appendix E). The report provides a discussion of the buffer that should be maintained between the proposed roadway and neighboring development to avoid a future noise impact as a result of exceeding the NAC. The report concludes that a traffic noise impact will not be experienced within 100 feet of the roadway. This conclusion was based upon traffic traveling on four lanes at 55 mph. On EW Miller Road, traffic would be slowed to 35 mph. The predicted noise levels at varying distances from the roadway under these circumstances are shown in Table 24. Noise levels are not predicted to exceed the NAC, even when receptors are located within 35 feet of the roadway.

Table 24: Roadway Offset and Predicted Corresponding Noise Levels

Distance between Roadway and Adjacent Development	Predicted Noise Level
35 feet	65.4 dBA L_{eq}
50 feet	63.7 dBA L_{eq}
75 feet	61.0 dBA L_{eq}
100 feet	58.8 dBA L_{eq}

The receptor nearest the roadway on EW Miller Road would be located 46 feet from the edge of new pavement. Noise levels at residences along EW Miller Road will not exceed the NAC.

The potential for a noise impact as a result of an increase of more than 10 dBA L_{eq} when compared with existing conditions was also considered. In an *Addendum* to the Kentucky Noise Study (See Appendix E), the noise impacts for Option C1 are documented. Ambient conditions were recorded to accurately determine the existing noise conditions and were compared with predicted traffic noise levels when all US 641 traffic was assumed to use the connector. Modeling of Option C1 was considered to be the worst-case scenario since it includes stop conditions on each end and connector turn lanes at each intersection, which brings the edge of pavement closest to adjacent residences. The analysis concluded that one residence (Site 153) will experience a substantial noise increase (10.1 dBA L_{eq} increase) for both Options C1 and C2. It further concluded that residences more than 50 feet from the edge of proposed pavement would not experience an increase of more than 10 dBA L_{eq}. No other receptors along EW Miller Road would be located within 50 feet of the edge of proposed pavement. In accordance with KYTC Noise Policy (2015), "if a proposed barrier wall would not provide a minimum 5 dB(A) reduction for, at minimum, three (3) impacted receptors, it will not be considered acoustically feasible." With only one receptor experiencing a noise impact, noise abatement measures are not proposed.

This option would convert approximately 4.4 acres of agricultural land to transportation use. Alternatives 4/4A in Kentucky propose to convert 114.2 and 120.1 acres of prime farmland to transportation use, respectively. These proposed conversions resulted in respective NRCS LESA scores of 140 and 141. The additional prime farmland acreage for Option C1 would have a negligible effect on the project's LESA score, which would remain lower than 160 and be given only a minimal level of consideration by the NRCS for protection.

Option C2

Option C2 would provide for free-flowing traffic movement along an improved EW Miller Road between the new roadway (Alternatives 4/4A) and US 641. There would be no stop conditions along this connector, which would improve traffic flow when compared with Option C1. Curves with a 35 mph design speed would transition traffic to the EW Miller Road corridor from US 641 and Alternatives 4/4A. Like with Option C1, EW Miller Road would be improved west of Fifth Street to include two 12-foot lanes with six-foot shoulders; east of Fifth Street, two 12-foot lanes with curb and gutter are proposed. Signage, and potentially additional safety measures, would be deployed along Alternatives 4/4A to ensure the slowing of southbound traffic before reaching the curve onto the western end of the connector. The section of Alternatives 4/4A from Option C2 to State Line Road would be signed for local traffic. When the Tennessee section of the project is completed, the connection between EW Miller Road and Alternatives 4/4A would be modified to a T-intersection, much like C1. This change would require some pavement removal and realignment of the western end of the connection that is not required with C1. The eastern end of the connection could remain as free-flowing movement or could also be changed to a T-intersection.

Option C2 has a slightly larger footprint on the western end to provide sufficient right of way for a curve with a 35 mph design speed but, overall, the right of way required (4.5 acres) is slightly reduced since turn

lanes are not needed at each end of the connector. There would be 14 additional parcels affected by the improvements. The right of way required to facilitate the 35 mph curve connecting EW Miller Road and existing US 641 would impact the Hazel Methodist Church parsonage, resulting in a relocation.

No additional impacts to historic properties would result from this option and potential for additional archaeological impacts would be considered very low since most of the alignment is along an existing road where disturbance has occurred. There would be no impacts to Section 4(f) or Section 6(f) properties associated with this option. No properties with RECs would be affected by Option C2.

Widening of the road and replacing an existing culvert, would impact approximately 211 feet of stream. The stream is an intermittent small unnamed tributary to Brushy Creek with water quality typical of streams through agricultural areas. There would be no wetlands impacted; one pond would be removed. With the exception of 0.7 acres of trees that would be affected (Indiana bat and northern long-eared bat habitat), the alignment would not impact any threatened or endangered species habitat.

The Kentucky Noise Study (see Appendix E) provides a discussion of the buffer that should be maintained between the proposed roadway and neighboring development to avoid a future noise impact. Regarding the NAC, the report concludes that a traffic noise impact would not be experienced within 100 feet of the proposed roadway. This conclusion was based upon traffic traveling on four lanes at 55 mph. On EW Miller Road, traffic would be slowed to 35 mph. The predicted noise levels at varying distances from the roadway under these circumstances are shown in Table 24. Noise levels are not predicted to exceed the NAC, even when receptors are located as close as 35 feet to the roadway. The receptor nearest the roadway on EW Miller Road would be located approximately98 feet from the edge of new pavement. No receptors on EW Miller Road are predicted to experience a traffic noise impact as a result of exceeding the NAC. The potential for a substantial increase over existing noise levels was also considered. With Option C2, Site 153, which experienced a substantial noise increase with Option C1, will be similarly affected by Option C2. All other residences are too distant to experience a substantial noise increase (Addendum to Kentucky Noise Study; see Appendix E). In accordance with KYTC Noise Policy (2015), “if a proposed barrier wall would not provide a minimum 5 dB(A) reduction for, at minimum, three (3) impacted receptors, it will not be considered acoustically feasible.” With only one receptor experiencing a noise impact, noise abatement measures are not proposed.

This option would convert approximately 3.9 acres of agricultural land to transportation use. Alternatives 4/4A in Kentucky propose to convert 114.2 and 120.1 acres of prime farmland to transportation use, respectively. These proposed conversions resulted in respective NRCS LESA scores of 140 and 141. The additional prime farmland acreage for C2 would have a negligible effect on the project’s LESA score, which would remain lower than 160 and be given only a minimal level of consideration by the NRCS for protection.

Option C3

Option C3 would construct a new connector road, located generally 300-500 feet north of EW Miller Road, and would provide for free-flowing traffic movement between the new roadway (Alternatives 4/4A) and US 641. There would be no stop conditions along this connector, which would improve traffic flow when

compared with Option C1. A 45 mph design speed curve would transition traffic between Alternatives 4/4A and the new connector; a 35 mph curve would be constructed at the connection with existing US 641. EW Miller Road would be signed for 35 mph. Signage, and potentially additional safety measures, would be deployed along Alternatives 4/4A to ensure the slowing of southbound traffic before reaching the curve onto the western end of the connector. The section of Alternatives 4/4A from Option C3 to State Line Road would be signed for local traffic. Much like with Option C1, when the Tennessee section of the project is completed, the connection with Alternatives 4/4A would be modified to a T-intersection. Like with Option C2, this change would require some pavement removal and realignment of the western end of the connection that is not required with Option C1. The eastern end of the connection could remain as free-flowing movement or could also be changed to a T-intersection.

Since this option would be entirely on new alignment, avoiding the developed areas along EW Miller Road, it would convert more acreage (7.7 acres) to transportation use than either C1 or C2, though it would only affect four additional parcels. The right of way required to facilitate the 35 mph curve connecting EW Miller Road to existing US 641 would require one relocation; near the western end of the connector, impacts to a septic system would require an additional relocation.

No additional impacts to historic properties would result from this option and there would be a low potential for additional archaeological impacts. There would be no impacts to Section 4(f) or Section 6(f) properties associated with this option. No properties with RECs would be affected.

Construction of Option C3 would result in an impact to 267 feet of an intermittent tributary to Brushy Creek. Impacts are higher with this alternative due to the passing of the stream beneath both Option C3 and the proposed Fifth Street extension. The water quality is typical of streams through agricultural areas. No wetlands would be affected by this option. With the exception of 1.2 acres of trees that would be affected (Indiana bat and northern long-eared bat habitat), the alignment would not impact any threatened or endangered species habitat.

The Kentucky Noise Study, developed to assess the traffic noise impacts for those sections of the proposed alternatives located in Kentucky, provides a discussion of the buffer that should be maintained between the proposed roadway and neighboring development to avoid a future noise impact. The report concludes that sites located more than 100 feet from the proposed alternatives would not experience a traffic noise impact. This analysis assumed traffic moving at 55 mph. Only one receptor (Site 98) is located within 100 feet of the alternative. The property lies northwest of the intersection of US 641 and EW Miller Road. The distance to US 641 was reported as 97.1 feet. When C3 passes this receptor, it is within existing right of way and would be essentially the same distance from the residence as the existing roadway. The evaluation of Alternative 3, which would improve along the existing US 641 corridor, predicted a noise level at this location to be 63.1 dBA L_{eq}. No noise impact would occur as a result of exceeding the NAC. The potential for a substantial increase over existing noise levels was also considered. Nearest residences are more than 150 feet from Option C3, too distant to experience a substantial noise increase (Addendum to Kentucky Noise Study; see Appendix E). Since there will be no noise impacts from Option C3, noise abatement measures are not proposed.

Option C3 would convert approximately 7.7 acres of agricultural land to transportation use. Alternatives 4/4A in Kentucky propose to convert 114.2 and 120.1 acres of prime farmland to transportation use, respectively. These proposed conversions resulted in respective NRCS LESA scores of 140 and 141. The additional agricultural acreage impacted by C3 would have a negligible effect on the project's LESA score, which would remain lower than 160 and be given only a minimal level of consideration by the NRCS for protection.

Summary

A summary of the environmental impacts of the three proposed Alternatives 4/4A to US 641 Connectors is provided in Table 25. These additional impacts are considered in conjunction with those identified for Alternative 4 or 4A in Kentucky.

Table 25: Summary of Impacts for Connectors

Connector Options			
	C1	**C2**	**C3**
Right of way	5 acres/11 parcels	5 acres/ 14 parcels	10 acres/4 parcels
Relocations	0	1	2
Historic Properties	No impact	No impact	No impact
Archaeological Resources	Low potential to impact NRHP eligible sites	Low potential to impact NRHP eligible sites	Low potential to impact NRHP eligible sites
Stream Impacts	211 feet	211 feet	267 feet
Wetland Impacts	None	None	None
Threatened or Endangered Species	0.9 acres trees removed; no other T&E impacts	0.7 acres trees removed; no other T&E impacts	1.2 acres trees removed; no other T&E impacts
Noise Assessment	Substantial noise increase for one receptor; Abatement not acoustically feasible	Substantial noise increase for one receptor; Abatement not acoustically feasible	No traffic noise impact

3.12 Visual

In the Study Area, the existing US 641 corridor is dominated by light residential and commercial land uses, which are interspersed with forested and agricultural areas. The view from the existing road varies considerably throughout the Study Area, as it begins in a rural agricultural area, passes through the city of Hazel, and continues northward through rural residential areas with occasional small businesses located along the roadway. US 641 then passes through a more densely populated commercial area with auto businesses, a farm co-op, a bus sales business, and other warehouse-type buildings; the existing alignment in the Study Area terminates in an area surrounded by agricultural fields.

Aside from Alternative 3, which would follow the existing alignment, the build alternatives would largely convert rural residential and agricultural land uses to transportation right of way. The off-corridor

alignments would alter the existing viewshed by removing trees, fields, and houses; however, there are few homes and no businesses that would remain adjacent to the proposed build alternatives, and therefore, any visual impacts will affect few residents. Travelers using the relocated section of US 641 will, at least initially, experience a more rural viewshed with very little development along the corridor, when compared to the existing US 641. It is unknown whether the viewshed will evolve over time, but since the project is driven by safety and not growth, immediate development along the new corridor is not expected.

Overall, although the build alternatives, including the preferred alternative, will have visual effects, those effects would not be adverse.

3.13 Construction Impacts

The proposed project is anticipated to produce a beneficial, short-term economic impact by stimulating the local economy in terms of construction-related jobs, sales, income, government revenue, and expenditures. Highway construction activities would have minimal and temporary air, water quality, noise, traffic circulation, and associated impacts in the area. Adherence to the KYTC's *Standard Specifications for Road and Bridge Construction,* TDOT's *Standard Specifications for Road and Bridge Construction*, and conditions of required permits will minimize these temporary impacts.

Air Quality: The air quality impact would be temporary, and primarily in the form of diesel-powered construction equipment emissions and dust from exposed earth. Air pollution associated with airborne particle creation would be effectively controlled through the use of watering or the application of calcium chloride in accordance with the KYTC's *Standard Specifications for Road and Bridge Construction* and TDOT's *Standard Specifications for Road and Bridge Construction,* as directed by the KYTC and TDOT Construction Project Manager. All equipment shall be maintained to a satisfactory condition to minimize pollutant emissions. Structures will only be removed after completion of an assessment for the presence of asbestos and appropriate notification of regulatory agencies, as applicable.

Noise: Vibration and noise impacts would originate from the movement of heavy equipment, blasting, pile driving, and vibratory compaction of embankments. Noise control measures, as outlined in the KYTC's *Standard Specifications for Road and Bridge Construction* and TDOT's *Standard Specifications for Road and Bridge Construction*, will be enforced by the State's Construction Project Manager. The KYTC and TDOT will be responsible for assessing construction noise and notifying the contractor of excessive noise levels.

Traffic Circulation: Construction sequencing and maintenance of traffic would be planned and scheduled to minimize traffic delays. Coordination with local fire, EMS, hospitals, etc. would occur prior to construction to assure adequate accessibility for emergency vehicles is maintained. Signs would be used, as appropriate, to provide notice of road closures and other pertinent information to the traveling public. The local news media would be notified in advance of road closings and other construction-related activities that could excessively inconvenience the local residents, allowing motorists to plan travel routes in advance. Property access would be maintained to the maximum extent practical throughout

construction. Traffic delays would be controlled to the maximum extent possible where many construction operations are in progress simultaneously.

Water Quality: Sediment and Erosion Control Plans, as required by the KYTC's *Standard Specifications for Road and Bridge Construction* and TDOT's *Standard Specifications for Road and Bridge Construction*, would identify measures for ensuring that water quality is maintained, such as: temporary placement of sod, mulching, sandbagging, slope drains, sediment basins, sediment checks, artificial coverings, and berms. Storm water discharges will be managed in accordance with the Kentucky Pollutant Discharge Elimination System (KPDES) and Tennessee National Pollutant Discharge Elimination System (NPDES) storm water permits. A Storm Water Pollution Prevention Plan will be developed in accordance with permit requirements, the KYTC's *Standard Specifications for Road and Bridge Construction*, and TDOT's *Standard Specifications for Road and Bridge Construction,* and in support of required storm water construction permits in each state. Inspections will be routinely conducted to ensure that control measures are properly functioning and effective. Where control measures are ineffective, measures shall be corrected or improved prior to additional work occurring in the area.

Wetlands: Impacts to wetlands will only occur after securing appropriate permits from the regulatory agencies with jurisdiction. Impacts will be limited to those required for the construction and identified in the permits. Erosion control measures will be implemented to minimize impacts to wetlands adjacent to the project.

Waste Disposal: Solid wastes generated during the construction will be managed in accordance with applicable regulatory requirements and the KYTC's *Standard Specifications for Road and Bridge Construction* and TDOT's *Standard Specifications for Road and Bridge Construction*. Wastes and hazardous materials will be stored in a manner that protects them from on-going construction activities and prevents accidental spills. Should hazardous materials be encountered in the construction area, the Contractor shall handle and dispose of the materials in accordance with applicable state and federal regulations.

Archaeological Sites: Should an unknown archaeological site be discovered during construction, the work in the area shall cease and the State Construction Project Manager will notify the KYTC Division of Environmental Analysis or TDOT Environmental Division, as appropriate. No further work will be conducted at the site until necessary consultation requirements with each SHPO, as necessary, and American Indian Tribes has been completed.

3.14 Indirect and Cumulative Effects

Indirect effects are defined as those effects "which are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable. Indirect effects may include growth inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems" (40 CFR 1508.8). Though most indirect effects related to a highway project are related to induced changes in growth (rate or location), other indirect effects may include storm water runoff impacts to receiving streams or wetlands which, over time, can degrade water quality downstream.

Cumulative impacts are defined as “the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions… [and] can result from individually minor but collectively significant actions taking place over a period of time” (40 CFR 1508.7). The understanding of what are past, present, and reasonably foreseeable future actions is key to the assessment of these impacts. The affected environment or existing conditions in the Study Area are the result of the collective impacts of past human actions that have altered the environment, e.g., farming, the construction of existing US Highway 641, and residential and commercial development. Impacts from present actions include ongoing construction of any projects in the area, whether they be public or private such as residential and commercial development. Reasonably foreseeable future actions are other planned and programmed transportation projects and other planned development that is likely to occur in the immediate area. For purposes of this analysis, this project is treated as a reasonably foreseeable project. Impacts from past, present, and reasonably foreseeable actions are important to this assessment if they impact the same resources as those affected by this project.

Calloway and Henry Counties, continue to experience growth; however, much of the growth has occurred outside the Study Area in the incorporated areas of Murray, Puryear, and Paris. There is no planning or zoning in the unincorporated areas of Calloway County, Kentucky or Henry County, Tennessee. Growth in these areas has outpaced what has been experienced in the more rural areas that connect these towns, including that through which the proposed project would be constructed. Though some minor growth may occur along the project mainline, most indirect growth from the project would likely occur in the incorporated areas of the counties. Traffic volumes have been steady for the last 10-15 years and are not expected to substantially increase with or without the project. The KYTC has completed design and will be widening US 641 between Glendale Road in Murray, Kentucky (Item No. 1-314.10) and the bridge over the Middle Fork Clarks River. The project is scheduled to begin construction in the summer of 2019 and is considered a reasonably foreseeable project. TDOT plans to initiate preliminary design and environmental review for the improvement of US 641 south of the project documented in this Environmental Assessment, extending to Paris, Tennessee. The project is part of Tennessee’s Improving Manufacturing, Public Roads and Opportunities for a Vibrant Economy (IMPROVE) Act, which carries a commitment for delivery of the project; therefore, it is also considered to be reasonably foreseeable. Table 26 summarizes the cumulative effects of the US 641 project.

Table 26: Summary of Cumulative Effects

Resource/ Impacts from Past and Present Actions	Impact from Proposed Project	Foreseeable Future Action	Cumulative Effects
Farmland			
Minor residential and other land use changing development has occurred south of Murray and into Tennessee, but at a slow pace. Outside the US 641 corridor, the area is predominantly agricultural and undeveloped.	Right-of-way impacts of up to 262 acres with farmland impacts of as much as 149 acres will occur with a selection of a build alternative. Off-corridor alignments would split several farming properties.	No other future actions have been identified in this area. The road is not anticipated to result in significant changes in land use in the surrounding area	Some additional farmland conversion may occur, especially north of the project near Murray but the cumulative effects on this resource are expected to be low.
Water Quality			
Highway construction, residential and commercial development, development of public utilities, agricultural land uses, etc. have contributed to some diminishment of water quality in the area.	Selection of a build alternative will result in potential impacts to 4,519 linear feet of streams and WWCs, and 13.91 acres of wetlands. Temporary impacts to water quality would occur during construction.	Future land use around the corridor within the county is likely to remain in agricultural use south of the Clarks River. North of the river, development is intensifying around the city of Murray, including high density residential, office, and light industrial uses. This trend is expected to continue regardless of whether the project is constructed though an improved connection to I40 along the US 641 corridor could accelerate this growth	Continued growth in the Murray area and possible expansion of that growth southward is expected to occur regardless of whether the project is constructed and will be expected to have some minor additional impact on water quality in the area. There are no formal plans for development in the Study Area.
Threatened, and Endangered Species			
Construction of US Highway 641 and the connector roads and bridges, residential and commercial development, development of public utilities, clearing for agricultural purposes, etc. have affected listed species and their habitats	No impacts to potential habitat of Price's Potato bean, piping plover or interior least tern. Potential impacts to Indiana bat, northern long-eared and gray bat. Minimization measures such as seasonal tree cutting restrictions may be imposed to reduce project effects. Project impacts will not jeopardize the continued existence of the species	Continued development within region could reduce or further fragment forested bat habitat and further degrade water quality important to foraging habitat Continued highway improvements southward on US 641 to connect the region to I40 are planned and will potentially have additional impacts.	Continued development around Murray, and possible expansion of that growth southward, will likely result in some further loss or fragmentation of endangered species habitat This development is expected to occur regardless of whether the project is constructed.

Resource/ Impacts from Past and Present Actions	Impact from Proposed Project	Foreseeable Future Action	Cumulative Effects
Air Quality			
The region is relatively undeveloped and there have been no violations of NAAQS; Conformity does not apply.	The project is included in the Kentucky STIP. During construction some minor impacts to air quality may occur. KYTC and TDOT Standard Specifications will be enforced to minimize these effects.	If traffic increases at all, the growth is expected to be minimal and should not impact local or regional air quality. Murray will be expected to continue to grow. Should that growth come in the form of heavy industry, some additional air quality impacts may occur.	Growth around Murray is expected, regardless of whether the project is constructed. Continuing improvements in vehicle and fuel technology and resulting cleaner emissions will more than offset adverse effects from increases in volumes of vehicles. Since 1980, emissions associated with the six common pollutants (CO, lead, NOx, VOC, PM, and SO2) have decreased 63% while VMT has increased 94%. Cumulative effects on this resource are expected to be low.
Noise			
Receptors are primarily located along the existing corridor. Noise levels are not exceptionally high due to the traffic volumes and distance of the receptors from the roadway. There has been an increase in overall noise levels as development expanded along US 641 and vehicle trips increased.	Receptors experiencing traffic noise impacts are proximate to the existing road, many of which would be relocated if the road were widened. Receptors along the off-corridor alignments do not experience a traffic noise impact. For Options 1 and 2 that would connect Alternatives 4/4A with US 641, one receptor on EW Miller Road will experience a substantial noise increase until the Tennessee part of the project is constructed.	If traffic increases at all, the growth is expected to be minimal and should not create future traffic noise impacts. With construction of the Tennessee section of the project, noise impacts on EW Miller Road (Options 1 and 2) will be alleviated.	Cumulative effects as they relate to noise impacts, especially if an off-corridor alignment is selected, are expected to be low due to distance of receptors from the project and traffic volumes that, at most, are expected to marginally increase.

3.15 Permits

The construction of the project will require permits, approvals, or additional consultation with a number of state and federal agencies prior to construction. The following may not be an all-inclusive list but represents the future actions, identified to-date, which will be required for the approval of the construction.

USACE Section 404 Permit: Required for placement of fill material, including culverts, into a Water of the United States (WOUS). A permit for impacts to waters under the jurisdiction of the USACE, including wetlands, will be required prior to construction.

TVA Section 26a Permit: Under the Tennessee Valley Act, the TVA must approve impacts to waters in the Tennessee River watershed that may impede navigation or affect flood control. Following coordination with the TVA, it was concluded that the project is exempt from TVA permitting requirements (see Appendix N).

Kentucky Section 401 Water Quality Certification: A Section 401 Water Quality Certification, the companion state permit to the Section 404 USACE permit, must be approved by the Kentucky Division of Water (KDOW) prior to issuance of the Section 404 permit.

Kentucky Pollutant Discharge Elimination System (KPDES) Stormwater Construction Permit: Permit from the KDOW is required prior to land disturbance of one acre or more.

Tennessee Aquatic Resource Alteration Permit (ARAP): The approval of the TDEC Division of Water Pollution Control will be required for impacts to state waters, including wetlands, not addressed through the federal permitting process.

Tennessee Section 401 Water Quality Certification: A Section 401 Water Quality Certification, the companion state permit to the Section 404 USACE permit, must be approved by the TDEC Division of Water Pollution Control prior to issuance of the Section 404 permit.

Tennessee National Pollutant Discharge Elimination System (NPDES) Stormwater Construction Permit: Permit from the TDEC Division of Water Pollution Control is required prior to land disturbance of one acre or more.

3.16 Summary of Impacts

Through the alternative screening process, Alternatives 3, 4, 4A, 4F, 4H, 4I, and 5 emerged as those that satisfied the purpose and need for the project and represented a full range of alternatives. The anticipated environmental impacts for these proposed build alternatives have been considered and are summarized in Table 27.

Alternative 3 is the shortest of the build alternatives and creates less overall disturbance to the natural environment since it widens the roadway in the existing corridor and constructs a three-lane typical section for its entire length as opposed to other alternatives that will construct a four-lane divided or five-lane section. Stream (459’ perennial), wetland (1.48 acres), and forest (9 acres) impacts are the lowest among the alternatives. However, since it widens along the existing corridor, there is much greater

disruption to the human environment, requiring the relocation of 23 residences, 9 businesses, and 1 church. Historic properties have been largely avoided, though there is a minor strip taking from properties on the north end of the Central Hazel Historic District that was concluded to be No Adverse Effect and was evaluated as a *de minimis* Section 4(f) use. The alternative also had the fewest farmland (approximately 57 acres) impacts among the alternatives. It would impact 16 sites with RECs.

In regard to the off-corridor alternatives, perennial stream impacts are considerably higher for Alternative 4A/4I (1,283 feet mainline plus 211-267 feet on EW Miller Road). Alternative 5 impacts somewhat less perennial stream but a greater number of intermittent streams (2,426 feet) and the highest number of open water ponds (5). Wetland impacts range from three to eight acres for all alternatives except Alternative 4A/4H, which affects 13.91 acres of wetland. All off-corridor alternatives will have an adverse indirect effect to the Central Hazel Historic District; however, the KY SHPO indicated that with some mitigation, these might be reduced to No Adverse Effect. Alternatives 4 and 4A both involve a strip taking from the Roach Farm (FS 199) that is not considered to be adverse and is addressed with a Section 4(f) *de minimis* finding. Alternative 5 has an adverse visual effect to the Chestnut Grove AME Church. Archaeological potential impacts may be much higher with Alternative 5 due to its proximity to the East Fork of the Clarks River.

Noise impacts would occur at five residences with construction of Alternative 3. No noise impacts occur along the mainline of Alternatives 4 (including any of its variations in Kentucky and Tennessee) or Alternative 5. Until the Tennessee part of the project is constructed, up to one residence will experience noise impacts due to traffic being routed along an improved EW Miller Road. With construction of the southern section of the project, which is committed to begin within ten years of the right-of-way certification date, these effects will be alleviated. No noise abatement is proposed for any of the alternatives.

Off-corridor right-of-way impacts range from 192-262 acres affecting between 45 and 81 parcels and requiring relocation of nine to ten residences. Additional EW Miller Road impacts for Alternatives 4 and 4A would include five to ten acres of right of way and up to two relocations, depending on the option selected. Farmland impacts range from approximately 57 to 149 acres, with an additional five to ten acres of cropland being converted for the Alternative 4 and 4A EW Miller Connector. Alternative 4A would not impact any RECs; all other off-corridor alternatives would each impact one REC. These alternatives will all introduce a new roadway into a setting consisting primarily of open agricultural and undeveloped land and will have a visual effect on the surrounding area.

Some concerns have been raised that the off-corridor alignments may divert traffic from the City of Hazel that might otherwise stop and contribute to the local economy. Assuring easy access to the community from the new facility will be important to minimizing this potential effect. Alternatives 4 and 4A include an improved EW Miller Road and a second connection at State Street that will provide the needed access. Alternative 5 will make a connection at Mason Lake Road and State Line Road but improvements to these roadways are not included in the proposed alternative.

Concern with traffic diversion from the town was largely the basis for a finding of adverse effect to the Central Hazel Historic District during Section 106 review. Measures such as listing the district in the NRHP and providing signage on the new route directing travelers to the historic town have been identified as possible mitigation for this effect.

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Table 27: Summary of Impacts

Category Impacts	Alternative 3	Alternative 4	Alternative 4A	Alternative 4/4F	Alternative 4A/4F	Alternative 4/4H	Alternative 4A/4H	Alternative 4/4I	Alternative 4A/4I	Alternative 5
Length (mi)	7.81	8.23	8.22	7.76	7.75	8.04	8.03	8.65	8.64	6.76
Air Quality	No effects; Low potential for MSAT emissions	No effects; Low potential for MSAT emissions	No effects; Low potential for MSAT emission	No effects; Low potential for MSAT emission	No effects; Low potential for MSAT emissions	No effects; Low potential for MSAT emission	No effects; Low potential for MSAT emissions	No effects; Low potential for MSAT emission	No effects; Low potential for MSAT emissions	No effects; Low potential for MSAT emissions
Noise Assessment	Walls do not meet KYTC OR TDOT policy criteria	Walls do not meet KYTC OR TDOT policy criteria	Walls do not meet KYTC OR TDOT policy criteria	Walls do not meet KYTC OR TDOT policy criteria	Walls do not meet KYTC OR TDOT policy criteria	Walls do not meet KYTC OR TDOT policy criteria	Walls do not meet KYTC OR TDOT policy criteria	Walls do not meet KYTC OR TDOT policy criteria	Walls do not meet KYTC OR TDOT policy criteria	Walls do not meet KYTC OR TDOT policy criteria
Ecological Resources										
Significant Ecological Resources	None	None	None	None	None	None	None	None	None	None
Macroinvertebrates	No Significant Difference	No Significant Difference	No Significant Difference	No Significant Difference	No Significant Difference	No Significant Difference	No Significant Difference	No Significant Difference	No Significant Difference	No Significant Difference
Fishes	No Significant Difference	No Significant Difference	No Significant Difference	No Significant Difference	No Significant Difference	No Significant Difference	No Significant Difference	No Significant Difference	No Significant Difference	No Significant Difference
Flora	No Significant Difference	No Significant Difference	No Significant Difference	No Significant Difference	No Significant Difference	No Significant Difference	No Significant Difference	No Significant Difference	No Significant Difference	No Significant Difference
Birds, Mammals, Amphibians, Reptiles	No Significant Difference	No Significant Difference	No Significant Difference	No Significant Difference	No Significant Difference	No Significant Difference	No Significant Difference	No Significant Difference	No Significant Difference	No Significant Difference
Surface Water										
Perennial	459	588	492	648	552	588	492	1,379	1,283	975
Intermittent	476 linear feet; (none of excellent quality)	1,364 linear feet; (none of excellent quality)	1,364 linear feet; (none of excellent quality)	1,364 linear feet; (none of excellent quality)	1,364 linear feet; (none of excellent quality)	1,640 linear feet; (none of excellent quality)	1,640 linear feet; (none of excellent quality)	1,809 linear feet; (none of excellent quality)	1,809 linear feet; (none of excellent quality)	2,426 linear feet; (none of excellent quality)
Ephemeral	404 linear feet	1,039 linear feet	1,039 linear feet	1,039 linear feet	1,039 linear feet	1,039 linear feet	1,039 linear feet	1,039 linear feet	1,039 linear feet	258 linear feet
Wet Weather Conveyances	658 ft	112 ft	112 ft	186 ft	186 ft	388 ft	388 ft	388 ft	388 ft	82 ft
Ponds (no.)	0	0	0	1	1	1	1	1	1	5
Wetlands	1.48 acres	3.36 acres	3.36 acres	5.49 acres	5.49 acres	13.91 acres	13.91 acres	5.29 acres	5.29 acres	7.97 acres
Habitats										
Forested	9.0 acres	29.3 acres	29.6 acres	33.9 acres	34.2 acres	49.8 acres	50.1 acres	50.1 acres	50.4 acres	41.0 acres
Pasture	16 acres	8 acres	9 acres	8 acres	9 acres	8 acres	9 acres	8 acres	9 acres	10 acres
Agricultural	9 acres	125 acres	121 acres	148 acres	144 acres	164 acres	160 acres	177 acres	173 acres	85 acres
Commercial	12 acres	1 acres	0 acres	1 acres	0 acres	1 acres	0 acres	1 acres	0 acres	0 acres
Existing Right of Way	33 acres	8 acres	9 acres	8 acres	9 acres	8 acres	9 acres	8 acres	9 acres	7 acres
Total	100 acres	173 acres	173 acres		201 acres		232 acres		245 acres	149 acres
State and Federal T&E Species	Minor habitat impacts to listed species; Biological Assessment required for gray bat, Indiana bat and northern long-eared bat	Minor habitat impacts to listed species; Biological Assessment required for gray bat, Indiana bat and northern long-eared bat	Minor habitat impacts to listed species; Biological Assessment required for gray bat, Indiana bat and northern long-eared bat	Minor habitat impacts to listed species; Biological Assessment required for gray bat, Indiana bat and northern long-eared bat	Minor habitat impacts to listed species; Biological Assessment required for gray bat, Indiana bat and northern long-eared bat	Minor habitat impacts to listed species; Biological Assessment required for gray bat, Indiana bat and northern long-eared bat	Minor habitat impacts to listed species; Biological Assessment required for gray bat, Indiana bat and northern long-eared bat	Minor habitat impacts to listed species; Biological Assessment required for gray bat, Indiana bat and northern long-eared bat	Minor habitat impacts to listed species; Biological Assessment required for gray bat, Indiana bat and northern long-eared bat	Minor habitat impacts to listed species; Biological Assessment required for gray bat, Indiana bat and northern long-eared bat

Category Impacts	Alternative 3	Alternative 4	Alternative 4A	Alternative 4/4F	Alternative 4A/4F	Alternative 4/4H	Alternative 4A/4H	Alternative 4/4I	Alternative 4A/4I	Alternative 5
Historic Resources	*No Adverse Effect* finding on a strip taking from within Hazel HD from non-contributing elements.	*No Adverse Effect* finding on a strip taking from Roach Farm; Indirect *Adverse Effect* to Hazel HD; Mitigation suggested by SHPO to reduce impact to *No Adverse Effect*;	*No Adverse Effect* finding on a strip taking from Roach Farm; Indirect *Adverse Effect* to Hazel HD; Mitigation suggested by SHPO to reduce impact to *No Adverse Effect*;	*No Adverse Effect* finding on a strip taking from Roach Farm; Indirect *Adverse Effect* to Hazel HD; Mitigation suggested by SHPO to reduce impact to *No Adverse Effect*;	*No Adverse Effect* finding on a strip taking from Roach Farm; Indirect *Adverse Effect* to Hazel HD; Mitigation suggested by SHPO to reduce impact to *No Adverse Effect*;	*No Adverse Effect* finding on a strip taking from Roach Farm; Indirect *Adverse Effect* to Hazel HD; Mitigation suggested by SHPO to reduce impact to *No Adverse Effect*;	*No Adverse Effect* finding on a strip taking from Roach Farm; Indirect *Adverse Effect* to Hazel HD; Mitigation suggested by SHPO to reduce impact to *No Adverse Effect*;	*No Adverse Effect* finding on a strip taking from Roach Farm; Indirect *Adverse Effect* to Hazel HD; Mitigation suggested by SHPO to reduce impact to *No Adverse Effect*;	*No Adverse Effect* finding on a strip taking from Roach Farm; Indirect *Adverse Effect* to Hazel HD; Mitigation suggested by SHPO to reduce impact to *No Adverse Effect*;	Indirect *Adverse Effect* to Hazel HD; Mitigation suggested by SHPO to reduce impact to *No Adverse Effect*; Indirect *Adverse Effect to Chestnut Grove AME Church*;
Archaeological Resources	Low potential to impact National Register eligible sites	Low to moderate potential to impact National Register eligible sites	Low to moderate potential to impact National Register eligible sites	Low to moderate potential to impact National Register eligible sites	Low to moderate potential to impact National Register eligible sites	Low to moderate potential to impact National Register eligible sites	Low to moderate potential to impact National Register eligible sites	Low to moderate potential to impact National Register eligible sites	Low to moderate potential to impact National Register eligible sites	Greater potential to impact National Register eligible sites
Environmental Justice	No adverse and disproportionate impact on EJ populations	No adverse and disproportionate impact on EJ populations	No adverse and disproportionate impact on EJ populations	No adverse and disproportionate impact on EJ populations	No adverse and disproportionate impact on EJ populations	No adverse and disproportionate impact on EJ populations	No adverse and disproportionate impact on EJ populations	No adverse and disproportionate impact on EJ populations	No adverse and disproportionate impact on EJ populations	No adverse and disproportionate impact on EJ populations
Right of Way	70 acres; 226 parcels	240 acres; 63 parcels	249 acres; 66 parcels	240 acres; 60 parcels	249 acres; 63 parcels	237 acres; 61 parcels	246 acres; 64 parcels	248 acres; 67 parcels	257 acres; 70 parcels	192 acres; 45 parcels
Relocations	23 residences; 9 businesses; 1 church	9 residences; 4 garages; 2 barns	9 residences; 4 garages; 2 barns	10 residences; 4 garages; 2 barns	10 residences; 4 garages; 2 barns	9 residences; 4 garages; 2 barns	9 residences; 4 garages; 2 barns	10 residences; 4 garages; 2 barns	10 residences; 4 garages; 2 barns	9 residences; 3 garages; 9 barns
Replacement Housing	Housing units available	Housing units available	Housing units available	Housing units available	Housing units available	Housing units available	Housing units available	Housing units available	Housing units available	Housing units available
Community Resources	Improved access	Improved access	Improved access	Improved access	Improved access	Improved access	Improved access	Improved access	Improved access	Improved access
Roadway Safety	Improved geometrics and wider lanes	Improved geometrics, wider lanes with additional capacity and passing opportunities	Improved geometrics, wider lanes with additional capacity and passing opportunities	Improved geometrics, wider lanes with additional capacity and passing opportunities	Improved geometrics, wider lanes with additional capacity and passing opportunities	Improved geometrics, wider lanes with additional capacity and passing opportunities	Improved geometrics, wider lanes with additional capacity and passing opportunities	Improved geometrics, wider lanes with additional capacity and passing opportunities	Improved geometrics, wider lanes with additional capacity and passing opportunities	Improved geometrics, wider lanes with additional capacity and passing opportunities
Entrance/Intersection Safety	Access would be by permit leaving high numbers of potential conflict points along the route	Improved safety because of controlled access	Improved safety because of controlled access	Improved safety because of controlled access	Improved safety because of controlled access	Improved safety because of controlled access	Improved safety because of controlled access	Improved safety because of controlled access	Improved safety because of controlled access	Improved safety because of controlled access
Land Use	Irreversible land use changes but not as great as with other off-corridor alternatives	Land converted to road use is irreversible; few additional anticipated changes	Land converted to road use is irreversible; few additional anticipated changes	Land converted to road use is irreversible; few additional anticipated changes	Land converted to road use is irreversible; few additional anticipated changes	Land converted to road use is irreversible; few additional anticipated changes	Land converted to road use is irreversible; few additional anticipated changes	Land converted to road use is irreversible; few additional anticipated changes	Land converted to road use is irreversible; few additional anticipated changes	Land converted to road use is irreversible; few additional anticipated changes
Farmland Impacts (Prime and Unique Acres)	56.67	132.4	138.3	131.5	137.4	143.3	149.2	143.5	149.4	122.18
Pedestrian & Bicycle Facilities	No designated lanes, but improved, wider, paved shoulders	No designated lanes, but improved, wider, paved shoulders	No designated lanes, but improved, wider, paved shoulders	No designated lanes, but improved, wider, paved shoulders	No designated lanes, but improved, wider, paved shoulders	No designated lanes, but improved, wider, paved shoulders	No designated lanes, but improved, wider, paved shoulders	No designated lanes, but improved, wider, paved shoulders	No designated lanes, but improved, wider, paved shoulders	No designated lanes, but improved, wider, paved shoulders

Category Impacts	Alternative 3	Alternative 4	Alternative 4A	Alternative 4/4F	Alternative 4A/4F	Alternative 4/4H	Alternative 4A/4H	Alternative 4/4I	Alternative 4A/4I	Alternative 5
UST/Hazardous Materials	16 sites of environmental interest that may require additional investigation	1 sites of environmental interest that may require additional investigation	0 sites of environmental interest that may require additional investigation	1 sites of environmental interest that may require additional investigation	0 sites of environmental interest that may require additional investigation	1 sites of environmental interest that may require additional investigation	0 sites of environmental interest that may require additional investigation	1 sites of environmental interest that may require additional investigation	0 sites of environmental interest that may require additional investigation	1 sites of environmental interest that may require additional investigation
Visual Impacts	Minimal; widening on existing	Introduction of new road through rural landscape	Introduction of new road through rural landscape	Introduction of new road through rural landscape	Introduction of new road through rural landscape	Introduction of new road through rural landscape	Introduction of new road through rural landscape	Introduction of new road through rural landscape	Introduction of new road through rural landscape	Introduction of new road through rural landscape
Construction Activities	BMPs will be implemented in accordance with State's specifications	BMPs will be implemented in accordance with State's specifications	BMPs will be implemented in accordance with State's specifications	BMPs will be implemented in accordance with State's specifications	BMPs will be implemented in accordance with State's specifications	BMPs will be implemented in accordance with State's specifications	BMPs will be implemented in accordance with State's specifications	BMPs will be implemented in accordance with State's specifications	BMPs will be implemented in accordance with State's specifications	BMPs will be implemented in accordance with State's specifications
4(f) and 6(f) Resources	No Section 4(f) use; Property acquisition within Central Hazel Historic district all from non-contributing elements. There are no 6(f) resources impacted	Section 4(f) *de minimis* finding for impacts to Roach Farm; Indirect adverse effect of traffic diversion to Central Hazel Historic District not a constructive use; There are no Section 6(f) resources impacted	Section 4(f) *de minimis* finding for impacts to Roach Farm; Indirect adverse effect of traffic diversion to Central Hazel Historic District not a constructive use; There are no Section 6(f) resources impacted	Section 4(f) *de minimis* finding for impacts to Roach Farm; Indirect adverse effect of traffic diversion to Central Hazel Historic District not a constructive use; There are no Section 6(f) resources impacted	Section 4(f) *de minimis* finding for impacts to Roach Farm; Indirect adverse effect of traffic diversion to Central Hazel Historic District not a constructive use; There are no Section 6(f) resources impacted	Section 4(f) *de minimis* finding for impacts to Roach Farm; Indirect adverse effect of traffic diversion to Central Hazel Historic District not a constructive use; There are no Section 6(f) resources impacted	Section 4(f) *de minimis* finding for impacts to Roach Farm; Indirect adverse effect of traffic diversion to Central Hazel Historic District not a constructive use; There are no Section 6(f) resources impacted	Section 4(f) *de minimis* finding for impacts to Roach Farm; Indirect adverse effect of traffic diversion to Central Hazel Historic District not a constructive use; There are no Section 6(f) resources impacted	Section 4(f) *de minimis* finding for impacts to Roach Farm; Indirect adverse effect of traffic diversion to Central Hazel Historic District not a constructive use; There are no Section 6(f) resources impacted	Adverse effects to Chestnut Grove AME Church are indirect; Adverse effects of traffic diversion impacts to Central Hazel Historic District are indirect; No Constructive Use; No Section 4(f) use; There are no 6(f) resources impacted

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With all variations of Alternative 4, including the preferred Alternative 4A/4I, until the southern end of the project is constructed in Tennessee, a connection between the new alignment and the existing roadway for through traffic would be constructed along or slightly north of EW Miller Road. The additional impacts associated with the three connector options considered are summarized in Table 28.

Table 28: Summary of Impacts for EW Miller Road Connectors

Connector Options			
	C1	**C2**	**C3**
Right of way	5 acres/11 parcels	5 acres/ 14 parcels	10 acres/4 parcels
Relocations	0	1	2
Historic Properties	No impact	No impact	No impact
Archaeological Resources	Low potential to impact NRHP eligible sites	Low potential to impact NRHP eligible sites	Low potential to impact NRHP eligible sites
Stream Impacts	211 feet	211 feet	267 feet
Wetland Impacts	None	None	None
Threatened or Endangered Species	0.9 acres trees removed; no other T&E impacts	0.7 acres trees removed; no other T&E impacts	1.2 acres trees removed; no other T&E impacts
Noise Assessment	Substantial noise increase for one receptor; Noise abatement measures not proposed.	Substantial noise increase for one receptor; Noise abatement measures not proposed.	No traffic noise impact

4.0 Agency Coordination and Public Involvement

The project has been developed with the input of stakeholders including local officials, state and federal resource agencies, and the public. The project has a history of engaging the public and interested stakeholders dating back more than 15 years. The *Alternatives Study* completed in 2002 included a robust public involvement and outreach program that included two Public Information Meetings, two meetings with local officials, two coordination meetings with stakeholders, and outreach to a wide range of state and federal regulatory agencies. With the initiation of preliminary design and environmental work for the current project in 2018, re-engaging the public and stakeholders was identified as a priority.

4.1 Local Officials

Throughout project development, KYTC representatives have met with local officials to keep them apprised of progress. In many cases, local official updates have occurred through ongoing communication with individuals rather than through formal group meetings.

The US 641 Steering Committee was formed in the summer of 2017 to coordinate efforts for the advancement of the project. The committee consisted of local officials, industry leaders, Murray State University leadership, and elected officials. In August 2017, the KYTC met with the Steering Committee to present an update of ongoing efforts to initiate preliminary design and environmental review of the project (see Appendix L). The Steering Committee continued its efforts to advance the project, meeting again in December 2017. Due in part to the work of this group, the project was awarded a $23M BUILD grant in December 2018. The support of local officials, as demonstrated by a commitment of $500,000 each from the City of Murray and Calloway County, clearly signaled the desire of the local community and its leadership to construct the project.

Figure 45: US 641 Steering Committee Meeting Aug. 2, 2017

Local officials were formally briefed on the project on the afternoon of March 12, 2019, prior to the Public Meeting that followed that evening. The group was presented with a summary of project progress and details of the information that was to be presented for public comment. Support for the project was again clearly expressed by the group to KYTC officials.

4.2 Public Engagement

Early in project development, a mailing list was developed to identify residents in the area who may be affected by studies to be conducted for the project. Notification letters were sent to the more than 630

households, advising them that the project was underway and that project representatives might be seen in the area gathering information for ongoing studies.

On February 8, 2019, a trifold brochure with project information was sent to area residents to provide an update on the project, a map of alternatives being considered, and information regarding an upcoming public meeting scheduled for March 12, 2019. Fliers were distributed to all residents and businesses on the project mailing list. This same flier was also included in the handout materials prepared for the public meeting. A copy of the brochure is included in Appendix M.

Figure 46: March 12, 2019 Public Meeting Was Well-Attended

An informal open-format public meeting for the project was held at the Hazel Baptist Church Gymnasium on March 12, 2019. More than 500 people were estimated as attending the meeting and 252 are documented on a sign-in sheet that was available as the public entered the venue. A brief narrated PowerPoint presentation was shown on loop throughout the evening to provide details of the work completed on the project to that point, as well as an explanation of what could be expected as the project advanced. The alternatives under consideration were shown on large display boards spread throughout the venue, each manned by project representatives available to answer questions and listen to input provided by the public (see Figure 46). The identification of Alternative 4 or 4A as the "preliminary preferred alternative" was presented at the meeting for comment. An informational packet, including a comment form, was provided to each attendee as they entered the meeting. A copy of all materials presented at the meeting are provided in the meeting summary, which can be found in Appendix M.

The meeting resulted in the receipt of 164 comment forms, which provided crucial input from the community. The respondents were largely residents of the area and expressed a concern with safety on the existing roadway and, to a lesser degree, traffic delays. There were 75 people who indicated that the project might create a personal hardship. The majority of these concerns were related to property loss and/or other right-of-way issues. Fifteen respondents expressed concern with the division of farms or loss of farmland. Four responses expressed concern with the bypassing of Hazel by the off-corridor alignments and potential impacts to businesses and the town that could result. Of those who identified a preference for an alternative, the "preliminary preferred alternative" (4A) was selected nearly 2.5 times more than any other alternative.

4.3 Agency Coordination Letters

Early agency coordination letters were sent in July 2018 and January 2019 to numerous state and federal agencies to solicit comment on the proposed project. A list of the agencies contacted and the responses received are provided in Appendix N. Agencies such as the US Army Corps of Engineers (USACE), Kentucky

Division of Water (KDOW), and Tennessee Department of Environment and Conservation (TDEC), identified the potential need for future project approvals for project construction. The US Fish and Wildlife Service (USFWS), Kentucky Department of Fish and Wildlife (KDFWR), Kentucky Nature Preserves (KNP), and the TDEC Division of Water Resources, provided input regarding rare, threatened, and endangered species that may be present in the area. These responses were used to guide field assessment of the project and consideration of effects.

4.4 Railroad and Gas Line Coordination

All of the alternatives will overpass the existing Genesee and Wyoming Railroad, which lies just west of US 641 in Tennessee, is crossed by US 641 in north Hazel and then lies east of the existing alignment where it gradually diverges from the US 641 highway corridor to pass east of Murray. During preliminary design, existing railroad design plans were secured and considered during alternative development. Contact with the railroad will need to be initiated during the early stages of detailed design to assure that all railroad requirements for clearance, drainage, and right of way are addressed with the final design.

All of the alternatives will also cross a TransCanada high pressure gas line near the northern end of the project. Coordination with the gas company was initiated to identify design and construction challenges that could influence alternative development. Preliminary coordination has identified the following design and construction requirements:

- The gas company will require that ditch lines are a minimum of five feet above the pipes and that roadway driving lanes are a minimum of seven feet above the pipes.
- Prior to construction, the gas line will be exposed and inspected by TransCanada.
- Once the inspection is completed, an inert material with no sharp edges, such as bank gravel, will be placed to an elevation of at least three feet above the pipes.
- A minimum six-inch cap of concrete will be placed above the inert material.
- Roadway fill material can then be placed over the 6-inch concrete cap.

As detailed design is initiated, further coordination with the gas company will be conducted to ensure that requirements are considered when establishing grades and other aspects of the roadway design. Construction notes will be included, as necessary, to ensure that the work will satisfy the requirements of the gas company.

4.5 Section 106 Consulting Parties

In accordance with the requirements for consultation detailed in the National Historic Preservation Act, local officials, organizations with a recognized interest in historic preservation, and the public, including all owners of properties identified as eligible for the NRHP, were invited to participate in the evaluation and review of historic properties for the project. Invitation letters were sent to 13 identified local officials and preservation organizations (see Appendix G). The notice announced the public meeting that was scheduled in March 2019 and provided contact information to submit an application to participate in the consultation. Hard copies of the Consulting Party application forms were made available at the Public

Meeting as was the opportunity to submit the application online. Ten Consulting Parties participated in the consultation for the project (see Appendix G).

The results of the historic properties eligibility and effects assessments developed for the project were provided to the Consulting Parties for review and comment. A meeting of those participating was held on March 25, 2019, at the Hazel Community Center. A summary of the meeting, presentation materials, and other relevant documents are also provided in Appendix G.

A presentation discussing the eligibility and effects recommendations was presented to the attendees of the Consulting Parties meeting. For properties where adverse effects were identified, potential mitigation was also a topic of discussion. All participants were provided with a form for submittal of written comments; two comments were received, one from Mayor Paschall (Hazel) and the other from the Tennessee SHPO. As mitigation for the indirect adverse effects of bypassing the town, Mayor Paschall offered his support for mitigation measures, including: Nomination of the district for listing in the NRHP; creation of a Main Street Program; signage on the new route directing travelers to the historic town; and money for improvements to the "Hazel Historic Business District." The Tennessee SHPO requested copies of the Kentucky historic property assessment report with particular interest expressed for review of the proposed boundary of the Central Hazel Historic District.

Consultation with appropriate American Indian tribes will also be conducted for the project. The KYTC and the FHWA Kentucky Division Office will coordinate consultation with tribes that have expressed an interest in projects in Calloway County, Kentucky. These tribes are: The Shawnee Tribe, Absentee Shawnee Tribe of Indians of Oklahoma, Eastern Shawnee Tribe of Oklahoma, and Chickasaw Nation. All of these tribes have also expressed an interest in Henry County, Tennessee, so the consultation will address the entire project, including that part lying in Henry County. TDOT and the FHWA Tennessee Division Office will be responsible for consultation with the Cherokee Nation, Thlopthlocco Tribal Town, and the United Keetoowah Band of Cherokee Indians in Oklahoma, which have expressed an interest in projects occurring in Henry County, Tennessee.

Consultation will be undertaken in accordance with established procedures for each agency. The KYTC and FHWA Kentucky Division Office will await the results of the Phase I archaeological survey before initiating tribal consultation. If archaeological sites are identified that relate to pre-European occupation, summaries of the report will be provided to the tribes for review and comment. In accordance with established Tennessee procedures, TDOT has made preliminary contact with the Cherokee Nation, Thlopthlocco Tribal Town, and the United Keetoowah Band of Cherokee Indians in Oklahoma to determine interest in participating in the consultation for the project (see Appendix G). Interested tribes will be provided with copies of Section 106 materials for review and comment, including the Phase I archaeological survey report. Comments from the tribes will be considered in the execution of additional studies or other work on the project.

As mitigation measures are further discussed among the state transportation agencies and respective SHPOs, the Consulting Parties will be re-engaged to seek comment on the measures proposed to mitigate any adverse effects of the preferred alternative.

5.0 IDENTIFICATION OF THE PREFERRED ALTERNATIVE

A preferred alternative was identified after considering how well the various alternatives satisfied the project purpose and need; the environmental impacts of each alternative, as presented in Section 3.0; and the estimated costs, including environmental mitigation, acquisition of right of way, relocation of utilities, and construction. A summary of the costs for implementing the project are provided in Table 29. The cost for Alternatives 4, 4A, 4F, 4H, and 4I include the four-lane divided construction in Kentucky and the initial construction of the three-lane section on five-lane ultimate right of way in Tennessee. All costs are presented in 2019 dollars.

Table 29: Summary of Initial Costs ($1,000s)

Alternatives										
	3	**4**	**4A**	**4/4F**	**4A/4F**	**4/4H**	**4A/4H**	**4/4I**	**4A/4I**	**5**
Env. Mitig.	$1,020	$2,050	$1,870	$1,960	$1,780	$2,010	$1,830	$2,140	$1,960	$3,600
ROW/Util.	$29,260	$10,460	$11,440	$10,460	$11,440	$10,080	$11,060	$10,560	$11,540	$8,300
Construction	$29,650	$55,490	$56,330	$53,550	$54,390	$54,810	$55,650	$56,350	$57,190	$82,510
Total	**$59,930**	**$68,000**	**$69,640**	**$65,970**	**$67,610**	**$66,900**	**$68,540**	**$69,050**	**$70,690**	**$94,410**

A connection between the existing road and Alternatives 4 and 4A will be required until such time as the southern part of the project in Tennessee is constructed. One of three options for making this connection along or just north of EW Miller Road, would be constructed in conjunction with the alternative. The estimated costs for the connector options are provided in Table 30 and would be in addition to those shown in Table 29.

Table 30: Alternatives 4/4A to US 641 Connector Costs (1,000s)

Connector Options			
	C1	**C2**	**C3**
Environmental Mitigation	$90	$90	$110
ROW/Utilities	$700	$1,080	$1,220
Construction	$1,420	$2,100	$2,250
Total	**$2,210**	**$3,270**	**$3,580**

Table 31 presents the costs for planned future expansion of the section in Tennessee to include the ultimate five-lane typical section. The timing of this future work is unknown and depends on many variables that cannot be adequately considered in the development of these costs, so all estimates are presented in 2019 dollars.

Table 31: Summary of Additional Cost for Tennessee Ultimate Five-Lane ($1,000s)

Alternatives						
	4	**4A**	**4F**	**4H**	**4I**	**5**
Environmental Mitigation	$100	$100	$80	$90	$110	$30
Construction	$8,650	$7,990	$7,210	$7,660	$8,400	$4,830
Total	**$8,750**	**$8,090**	**$7,290**	**$7,750**	**$8,510**	**$4,860**

A Preliminary Line and Grade Meeting was held on February 8, 2019, to discuss the alternatives that had been developed, including Alternatives 1, 2, 3, 4, 4A, 4B, 4C, 4D, 4E, 4F, 4G, and 5. Alternatives 1 and 2 were found to adversely affect two farms (FS 199 and FS 201) determined to be eligible for the National Register of Historic Places (NRHP) and require a Section 4(f) use of the properties. With the successful identification of avoidance alternatives these alternatives were eliminated. Alternatives 4B, 4C, 4D, and 4E, which had been preliminarily evaluated as possible construction concepts in Tennessee, were also eliminated for the reasons discussed in Section 2.2.

Alternative 3, though an improvement over the existing condition, was considered not to meet the project purpose and need as well as the off-corridor alignments would, since it did not provide passing opportunities for farm equipment and other slow-moving traffic. There would also continue to be a restriction on traffic flow presented by the alternative passing through the city streets of Hazel. Though widened travel lanes and shoulders and improved geometrics would eliminate many safety concerns, regional connectivity benefits would be more limited than with off-corridor alignments. A minor strip taking from within the Central Hazel Historic District is not considered to be adverse and has been evaluated as a *de minimis* Section 4(f) use. Since the widened roadway is to be constructed on the existing alignment and consists of a three-lane section rather than four or five lanes, its ecological impacts were much fewer than other alternatives; however, it also affected 23 residential and nine commercial properties, resulting in nearly three times more right-of-way costs than other alternatives and considerably greater disruption of the community.

Alternative 5 traverses across flood plains of the East Fork of the Clarks River and its tributaries, wetlands, and streams, resulting in constructability issues and mitigation requirements that inflate its cost and make it the most expensive of the alternatives considered. It also has an unavoidable, indirect adverse effect (visual) to an eligible historic property, the Chestnut Grove AME Church, due to its intrusion into the rural setting of the site. Additionally, there is a much higher potential for significant archaeological sites on this alternative due to its proximity to the East Fork of the Clarks River.

Alternatives 4 and 4A in Kentucky are very similar, only diverging for a short length on the northern end of the project. Both alternatives avoid adverse effects to historic properties. The horizontal geometry of Alternative 4A is slightly preferred to Alternative 4, and Alternative 4A splits fewer agricultural properties. It provides good connection with Hazel, providing an improved alignment along EW Miller Street and a second connection at State Street. By providing a four-lane typical section with a depressed median, it will allow for safe passing of heavy farm equipment that frequently use the route. A minor strip taking from the NRHP-eligible Roach Farm is not considered to be adverse and has been evaluated as a *de minimis* Section 4(f) use. The cost is greater than that of Alternative 3, which provides only a three-lane section, and much less than Alternative 5. Because it better meets the purpose and need than Alternative 3; is significantly less expensive (approximately $20M savings); provides better access to Hazel; has fewer historic property impacts and is less likely to impact significant archaeological sites than Alternative 5; and has better geometry and splits fewer farms than Alternative 4; Alternative 4A was identified as the “preliminary preferred alternative” in Kentucky, pending receipt of public comment at a Public Meeting that was held on March 12, 2019.

Alternatives 3, 4, 4A, 4F, 4G, and 5 were presented to the public at the public meeting on March 12, 2019. Alternative 4A was identified as the "preliminary preferred alternative" on materials developed for the event. Public comments were received and, of those expressing an alternative preference, Alternative 4A was preferred more than 2:1. This indication of community support reinforced the earlier identification of Alternative 4A as the "preliminary preferred alternative" and resulted in the adoption of the alternative as the preferred alternative in Kentucky. The identification of Alternative 4A as the preferred alternative in Kentucky was announced via press release on April 9, 2019.

Comments received at the public meeting and during the comment period identified concerns for right-of-way and prime farmland impacts in the vicinity of where Alternatives 4/4A, 4F, and 4G converge with the existing US 641. TDOT initiated an evaluation of three additional alternatives (4H, 4I, and 4J) that had similar geometry to Alternatives 4F and 4G but returned to the existing alignment slightly further to the south than those alternatives. Alternatives 4G and 4J, which would have elevated the railroad and created a highway underpass, were eliminated from further consideration soon after the public meeting due to the potential complexities of acquiring railroad right of way; uncertainties regarding the extent of track reconstruction that would have been necessary; and concerns with impacts to US 641 that could have occurred while working in such proximity. As for Alternatives 4H and 4I, both variations are coincidental with Alternative 4F for approximately the first mile south of the state line. From the point where they diverge, the impacts associated with the additional length and southerly extension of the project were analyzed.

Neither Alternative 4H or 4I affects any additional historic properties, and archaeological impacts are expected to be similar with other alternatives west of the existing corridor. The additional length of the alternatives will add $2-5M to the project cost. Much of this additional expense will be recognized as a savings when TDOT implements the next section of US 641 improvements to the south of this project. There are additional ecological impacts, especially with Alternative 4H, which would construct through three sizeable wetlands, creating more than eight acres of additional wetland impact when compared with Alternative 4F and ten acres more than Alternatives 4/4A. Alternatives 4H and 4I would impact more forested acreage than any other alternative, affecting 16 acres more than Alternative 4F and 21 acres more than Alternatives 4/4A.

When comparing Alternatives 4H and 4I, several advantages to Alternative 4I were identified. Alternative 4I provides a better connection at Brannon Lane/Crossland Road. Alternative 4H does not provide a connection to Brannon Lane east of the new alternative. Traffic wanting to travel from Brannon Lane beyond the new roadway to Crossland Road would have to travel south to the proposed tie-in connection or north to State Line Road, then travel the new US 641 alignment to get to Crossland Road. Like Alternatives 4/4A and 4F, Alternative 4I provides an at-grade intersection that will allow for crossing of traffic on Brannon Lane/Crossland Road. Much of the additional stream impact with Alternative I was at the crossing of Mormon Branch. The existing culvert is a three-barrel box and exhibits heavy cracking in the headwalls and a sufficiency rating of 40.4. If US 641 were to be widened along the existing alignment in the future, it is expected that this culvert would be replaced. Replacing this culvert under a subsequent project would require that it be accomplished while maintaining traffic, perhaps with the need for a

temporary crossing. With Alternative 4I, future maintenance of traffic complexities that would come with implementing Alternatives 4/4A, 4H, or 4F, can be avoided.

Considering the concerns for right-of-way impacts and prime and unique farmland impacts associated with Alternatives 4/4A and 4F, identified through comments received at and following the public meeting, Alternatives 4H and 4I were determined to be preferable to Alternatives 4/4A and 4F. When comparing the advantages of Alternative 4I with Alternative 4H, the improved connectivity with Brannon Lane/Crossland Road, and the benefits of replacing the Mormon Branch crossing on a new alignment while not under traffic, make Alternative 4I the preferred alternative in Tennessee. Alternative 4A in Kentucky, in combination with Alternative 4I in Tennessee, is the preferred alternative for improvement of US 641.

With the award of a $23M BUILD grant, supplemented with KYTC traditional funding, construction of the Kentucky portion of the project is expected to begin in October 2020. The Tennessee section of the project will be programmed through traditional funding sources and will be constructed within ten years of the right-of-way certification date. Three options for a connection between the Preferred Alternative and existing US 641 during this interim period have been considered. The preferred option will be identified after considering public input received at the Public Hearing, which is to be conducted following publication of this Environmental Assessment.

The final selection of an alternative for the project will only occur after the Public Hearing and consideration of public and agency comments.