Elrod Road / Natcher Parkway Interchange Study

Warren County, Kentucky • Item No. 3-130.00
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KENTUCKY TRANSPORTATION CABINET

GRESHAM SMITH AND PARTNERS

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Executive Summary

The Elrod Road/Natcher Parkway Interchange Study began in late 2007. The purpose of the study was to determine the viability of adding an interchange to Natcher Parkway near the Elrod Road overpass. A previous study for Three Springs Road (KY 884) included the Elrod Interchange Study as a recommendation. The Three Springs Road study determined that local access to Natcher Parkway was not feasible at Three Springs Road due to the close proximity of I-65 and Three Springs Road, but could be beneficial at another location between Nashville Road (US 31W) and I-65.

This study includes environmental and geotechnical overviews, traffic modeling, crash and traffic analyses, and alternatives development and recommendations. The following sections summarize the study's findings.

Study Area

Smallhouse Road north to Cave Mill Road, Three Springs Road to the east, and Neal Howell Road to the south comprise the area of influence for this study (Figure E.1). The study area is basically centered at the existing Elrod Road overpass at Natcher Parkway. The Elrod Road overpass is located approximately 1.6 miles west of the I-65/Natcher Parkway interchange.

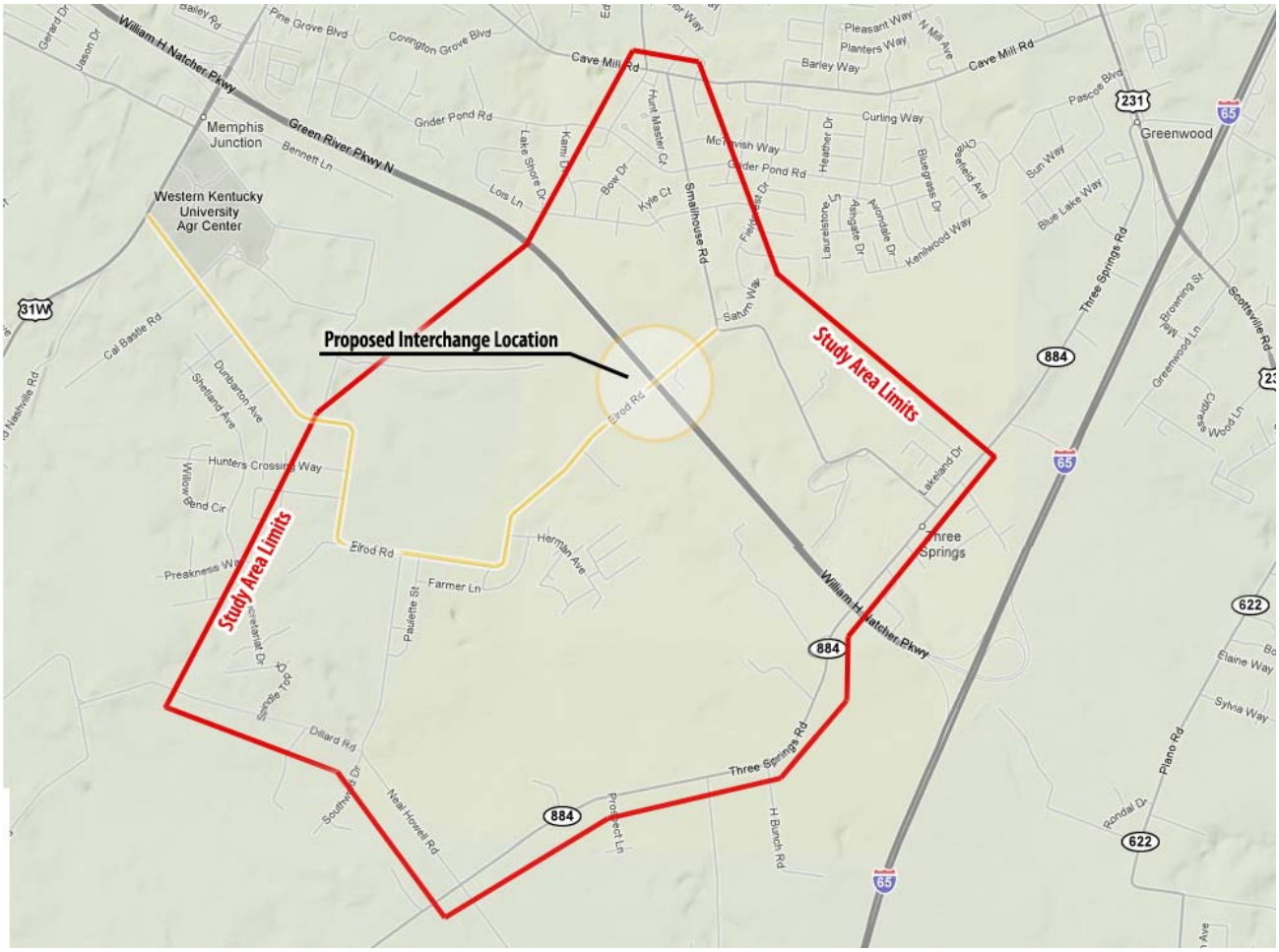


Figure E.1 - Study Area

New residential development along Elrod Road as well as development extending south of Neal Howell Road impacts the study area. Other notable destinations contributing to or expected to contribute to congestion in the area include several churches, the Western Kentucky University Farm, Griffin Park and a proposed elementary school.

Developing the purpose and need statement began with the problem statement on the KYTC Project Identification Form (PIF). After several discussions, the project team, local officials and general public agreed on this final purpose and need statement:

> *Rapid residential and commercial growth is occurring on the southern side of Bowling Green. Motorists have limited options for accessing the Natcher Parkway in southern Bowling Green and Warren County and must rely on the heavily congested routes of US 231 (Scottsville Road), KY 884 (Three Springs Road) and US 31W (Nashville Road) to reach various destinations. Additionally, mobility in the existing study area network is limited for motorists, pedestrians, bicyclists and transit users.*
>
> *The purpose of this interchange study is to improve the safety and efficiency of travel in the Elrod Road/Smallhouse Road area and to provide better connection for travelers along this existing transportation network to the Natcher Parkway.*

Data Analysis

GS&P prepared an environmental overview for the study area. The data research and field reconnaissance found that the environmental concerns within the study area are typical for a previously agricultural area in transition to residential uses. In the areas where an interchange may be constructed for Elrod Road on the Natcher Parkway, environmental concerns relative to air quality, traffic noise, aquatic resources, threatened and endangered species, agricultural activity, community facilities, and UST/hazardous material sites do not appear to be significant.

The geotechnical overview of the study area determined that there are no significant findings that would necessitate choosing one alternative over another. The geotechnical conditions in the study area are typical for the karst plain of south central Kentucky.

The Elrod Road corridor does not meet current KYTC design standards due to the lack of signing and striping in some areas, sharp horizontal curves, narrow lane widths and narrow shoulders. Overall crash rates are low in the study area and crashes typically occurred at horizontal curves. The recommendation of minor improvements or 'spot' improvements addressed necessary countermeasures. These are discussed further in the final recommendations section of the report.

Existing traffic conditions are acceptable in the area with levels of services no worse than a LOS of C. However, 2037 projections show LOS D, E and F in some locations. While there are traffic congestion problems at the terminal points of Elrod Road and Smallhouse Road, the traffic modeling shows that problems compound along this corridor when new access opens up to Natcher Parkway near the existing Elrod Road overpass. Providing an additional interchange along Natcher Parkway could potentially alleviate problems that are currently occurring at Three Springs Road (KY 884) to the east, Cave Mill Road to the north, and Nashville Road (US 31W) to the west. The improved level of service on these roads is negligible when compared to the negative impacts that the project would have on Elrod Road and secondary connecting streets. See Section 2.2 of the report for a more detailed description of the traffic analysis.

Proposed Alternatives

The study considered four types of interchanges: diamond, SPUI (single point urban interchange), folded (or flop) and a barbell design which would incorporate a roundabout on each side at the terminus of the ramps on Elrod Road. The study also included a No-Build alternative. During the public meetings, the preferred interchange type was the diamond interchange . The public found the flop diamond confusing, but the team carried it into the alternatives development since it would minimize impacts to a cemetery on the southeast corner of the overpass.

The study also considered three interchange locations: far west of the existing overpass (Alternative A), just west of the existing overpass (Alternative B), and at the existing overpass (Alternative C). The estimated costs of the alternatives range from $8.8 to $10.6 million. Note that these do not include optional improvements.

Figure E.2 – Alternative A – $9.4 Million

Figure E.3 – Alternative B - $8.8 Million

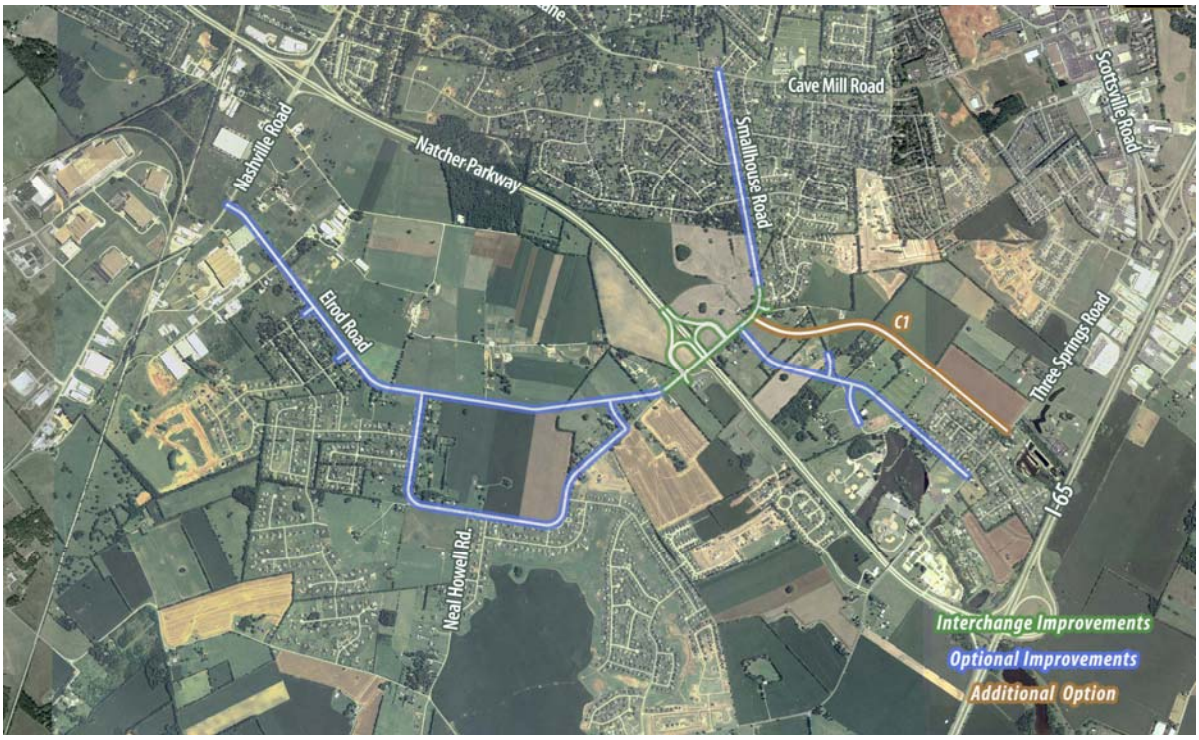


Figure E.4 – Alternative C - $10.6 Million

The final conclusions from the study include the following:

- All of the build alternatives would support economic development (residential growth) in the area.
- None of the alternatives would reduce traffic congestion in the area.
- Public support for the alternatives was not strong. (Parishioners of the proposed Holy Spirit Catholic Church who live outside the area seemed to be the most vocal supporters.)
- All alternatives would result in some level of disruption either to homes, Western Kentucky University property or the churches. Alternatives B and C would be difficult to build while maintaining traffic flow due to removing the existing overpass.
- Development of an interchange would require the City/County to complete the road projects on Smallhouse Road and Elrod Road in the study area prior to construction of the interchange.

The preferred alternatives based on public comments are Alternative A (far west) and the No Build Alternative. Upon analysis of the alternatives and their inability to fulfill the purpose and need, the study recommends:

- *No interchange at this location.*
- *Safety improvements along Smallhouse Road (Spot Improvements) from KY 884 to Cave Mill Road.*
- *An interchange feasibility study for a site on I-65 south of the I-65/Natcher Parkway interchange.*

1.0 Introduction

In late 2007, the Kentucky Transportation Cabinet initiated an interchange study to determine the viability of adding an interchange to the Natcher Parkway near the Elrod Road overpass. This study began as a result of a recommendation from a previous study for Three Springs Road (KY 884). The first study identified a potential need for local access to Natcher Parkway between Nashville Road (US 31W) and Interstate 65. It should be noted that an interchange was not considered as a viable option at Three Springs Road and Natcher Parkway due to its proximity to I-65 (approximately 2,900 feet). Minimum spacing for urban interchanges is typically about one mile, according to the American Association of State Highway and Transportation Officials' *A Policy on Geometric Design of Highways and Streets 2001.* Only 0.5 miles separates KY 884 and I-65 along the Natcher Parkway. Based on the KY 884 study, the local officials indicated that an interchange with Elrod Road may be added to the KYTC's Unscheduled Needs List.

This study includes analysis of data collected from environmental resources, geotechnical findings, and crash data as well as traffic modeling, proposed alternatives and final recommendations.

1.1 Project Location

The study area centers on the existing Elrod Road overpass at Natcher Parkway, which is approximately 1.6 miles west of the I-65/Natcher Parkway interchange. The study area limits encompass Smallhouse Road north to Cave Mill Road, Three Springs Road to the east, and extends south to Neal Howell Road.

The Elrod Road corridor provides a vital link and serves as the primary collector between Three Springs Road (KY 884) to the east, Cave Mill Road to the north, Nashville Road (US 31W) to the west and the growing residential development extending south in the study area.

This study evaluates if adding an additional access point to Natcher Parkway near the existing Elrod Road overpass would help to reduce congestion and travel time along the Elrod Road corridor, on US 231, Three Springs Road (KY 884), and Nashville Road (US 31W) and also meet future traffic demands that further residential growth will bring.

There are a substantial amount of subdivisions and residences within the study area and there is potential for more residential growth in the southern portion of the study area. There are also several destinations along the corridor including, but not limited to, churches, farms, parks and a proposed school.

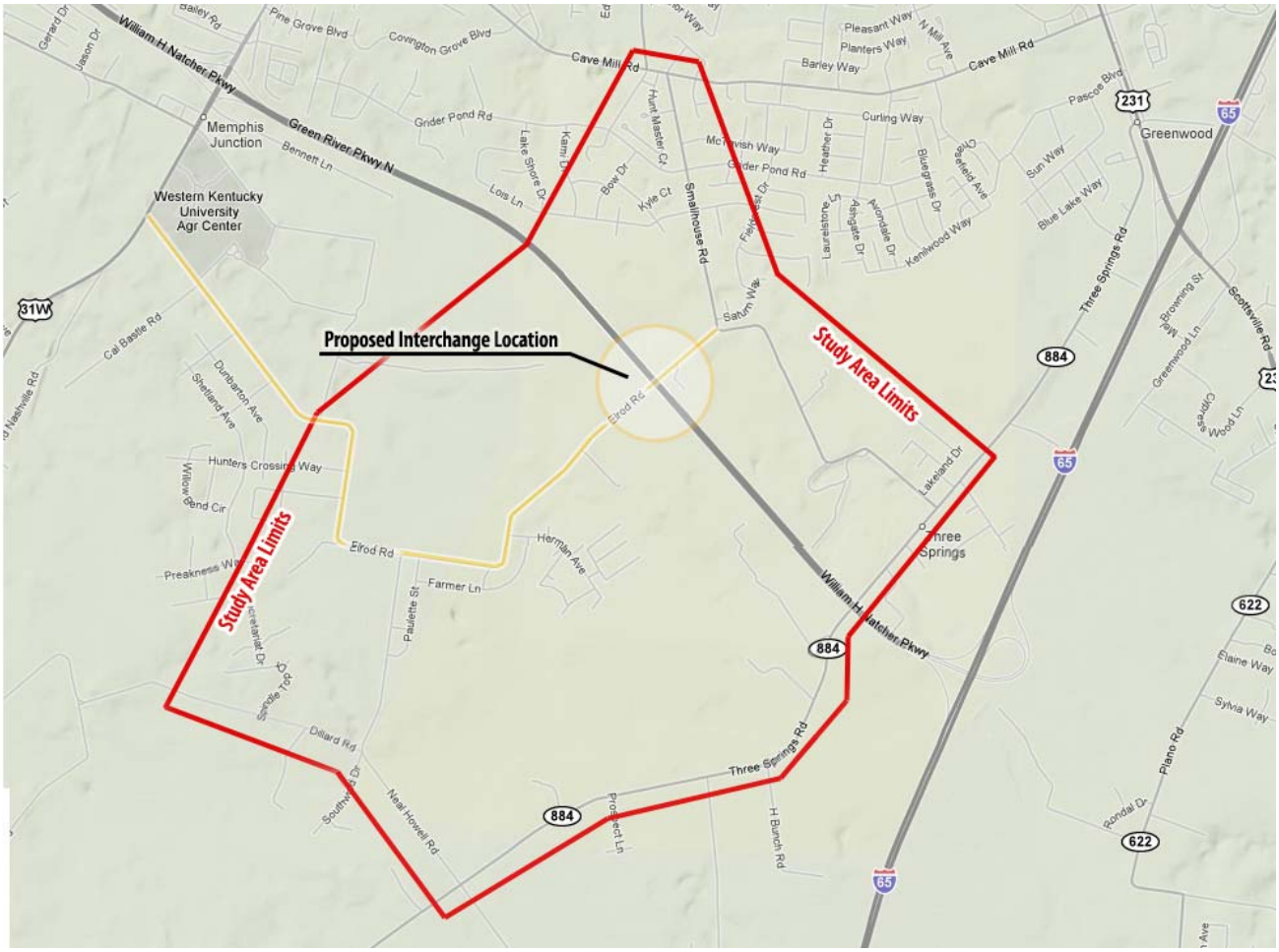


Figure 1.1 - Study Area

1.2 Purpose and Need

The project team decided early that the purpose and need should generally follow the problem statement found on the KYTC Project Identification Form. The project goals should include the following items:

- **Access:** *Providing additional access to Natcher Parkway will hopefully lighten the burden that is currently being experienced along the Elrod Road corridor as well as US 231 (Scottsville Road), KY 884 (Three Springs Road) and US 31W (Nashville Road).*
- **Mobility**: *A bike/pedestrian connection should be closely examined especially with the new school being constructed and the heavy use of the Griffin Park with use of the Greenways Master Plan.*
- **Safety:** *There has been public outcry for reduced speeds and flashing beacon installation south of the project particularly at Matlock and Neal Howell Roads. There are geometrically deficient areas within the study area that need to be examined. Signing and striping in the area is either non-existent in areas, or deficient in others.*
- ***Connection**: Improving secondary connections that are vital to effectively moving traffic between analysis zones is key to the success of the project.*
- **Security**: *The proposed interchange could potentially alleviate some access problems associated with emergency vehicles encountering congestion by providing them with an alternative route.*
- **Economic Development**: *Existing and planned residential development has driven the need for an alternative route and direct access point to Elrod from Natcher due to the congestion and overcrowding of existing routes such as US 231 and KY 884.*

With these items in mind Gresham, Smith and Partners (GS&P) presented the following draft purpose and need statement to local officials on December 10, 2007:

> *In an effort to accommodate the rapid residential and commercial growth on the southern side of Bowling Green, this interchange will greatly improve the safety and efficiency of travel in the area by providing access to the Natcher Parkway and therefore allowing motorists to reach various destinations without using the heavily congested routes of US 231 (Scottsville Road), KY 884 (Three Springs Road) and US 31W (Nashville Road). This interchange and its connections into the existing network will be developed with regard to addressing the mobility and safety of motorists, pedestrians, bicyclists and transit users in the area.*

After several project team and public meetings, GS&P presented the final purpose and need statement at the project team meeting conducted on March 7, 2008.

> *Rapid residential and commercial growth is occurring on the southern side of Bowling Green. Motorists have limited options for accessing the Natcher Parkway in southern Bowling Green and Warren County and must rely on the heavily congested routes of US 231 (Scottsville Road), KY 884 (Three Springs Road) and US 31W (Nashville Road) to reach various destinations. Additionally, mobility in the existing study area network is limited for motorists, pedestrians, bicyclists and transit users.*
>
> *The purpose of this interchange study is to improve the safety and efficiency of travel in the Elrod Road/Smallhouse Road area and to provide better connection for travelers along this existing transportation network to the Natcher Parkway.*

GS&P also presented the purpose and need statement at subsequent Local Officials, Stakeholders and Public Meetings; however, meeting participants did not suggest any changes. Meeting narratives from local officials, stakeholders as well as public meetings are included in the appendix and summarized in Section 4.2.

2.0 Existing Conditions

2.1 Roadway Characteristics

The Natcher Parkway divides the study area. This north-south urban freeway carries over 17,000 vehicles per day. The Natcher Parkway is a divided freeway with two, 12-foot lanes in each direction and a 28-foot median. The closest access point to the Natcher Parkway is at US 31W (Nashville Road), approximately two miles from the Elrod Road overpass.

Smallhouse Road is located north of the Natcher Parkway. This County Road has two, 10-foot lanes with little or no shoulders. Elrod Road connects US 31W to Smallhouse Road. It currently has 10-foot driving lanes with little or no striping or shoulders. There are no pedestrian or bicycle facilities currently on any portion of Elrod Road or Smallhouse Road; however, Basil Griffin Park is used as a staging area for cyclists that use the study area for events. Several 90 degree turns exist along the corridors and at each of these locations, there are little to no advanced warning signs.

There are ten (10) access points on Elrod Road and seven (7) access points on Smallhouse Road that serve subdivisions. This is noteworthy especially on Smallhouse Road where the higher volume of traffic and the lack of left turn lanes for opposing motorists turning into a subdivision cause queues to form.

The intersection of Elrod Road and Smallhouse Road is currently configured as a three-way stop. In the field, the study team observed that motorists traveling through this intersection tend to treat the stop sign as a yield condition. This occurred on each leg of the intersection.

The intersection of Smallhouse Road and Cave Mill Road on the north side of the study area offsets the north/south segment of Smallhouse Road in effect creating two intersections. The study team also observed that motorists turning left onto Cave Mill Road have a difficult time, thus exacerbating queue lengths along Smallhouse Road.

Notable existing and planned traffic destinations in the study area are:

- A new elementary school planned along Elrod Road directly across from Herman Avenue
- Calvary Baptist Church located adjacent to the existing Elrod Road Overpass, including a cemetery
- Holy Spirit Church, which is planning a new facility on the north side of the east leg of Smallhouse Road
- Trinity Free Will Baptist Church on the east leg of Smallhouse Road
- Pennyroyal Horse Farm located off of Elrod Road just southwest of the existing overpass
- Western Kentucky University's agricultural campus located on the north side of the west leg of Elrod Road.
- The Aviation Heritage Park located at the end of the east leg of Smallhouse Road at the intersection of Smallhouse Road and Three Springs Road (KY 884).
- The KOA campground (a state, local and regional attraction), which is nearby and brings tourists in from across the state and country

Table 2.1 Existing Conditions

Item	William H. Natcher Parkway	Smallhouse Road	Elrod Road
Route	WN - 9007	CR - 1235	CR - 1240
Actual Traffic Count	17,100	12,300	N/A
Year of Actual Traffic Count	2006	2003	N/A
Average Right of Way Width	275'	50' *	50' *
Extended Weight System	Parkway	N/A	N/A
Functional Classification	Urban Freeway	County Road	County Road
Lane Width	12'	10' *	10' *
Number of Lanes	4	2	2
Road Type	Divided Highway	Undivided	Undivided
Median	Depressed	N/A	N/A
Width of Median	28'	N/A	N/A
Posted Speed Limit	70 mph	35 mph	35 mph
Outside Shoulder Width	10'	N/A	N/A
Truck Weight Class	AAA	N/A	N/A

* Estimation

There is rapid residential growth in the southern portion of the study area, and the traffic generated here strains not only the Elrod Road corridor but also the intersections of Three Springs Road to the east and Nashville Road to the west.

2.2 Traffic Volumes and Levels of Service

GS&P conducted traffic counts within the study area on Elrod Road, Smallhouse Road and the Natcher Parkway and developed levels of service (LOS) based upon the counts. LOS is an indication of congestion and delay along corridors or at intersections. An LOS of A indicates good, free flow conditions and an LOS of F indicates severe congestion. The 2007 levels are shown in Figure 2.1.

Existing traffic conditions are good in the area with levels of services no worse than a LOS of C. However, 2037 projections show LOS D, E and F in some locations. While there are traffic congestion problems at the terminal points of Elrod Road and Smallhouse Road, the traffic modeling shows that problems compound along this corridor when new access opens up to Natcher Parkway near the existing Elrod Road overpass. GS&P anticipates that providing an additional interchange along Natcher would alleviate problems currently generated at Three Springs Road (KY 884) to the east, Cave Mill Road to the north, and Nashville Road (US 31W) to the west; the increased level of service is negligible when compared to the negative impacts that the project would have on Elrod Road and secondary connecting streets.

GS&P initiated traffic forecasts to determine the 2037 traffic volumes within the study area and performed the following traffic forecasting activities at this stage of the project:

- Refinement of the Bowling Green/Warren County Travel Demand Model (TDM) for the Elrod Road Interchange Study Area
- Development of the No-Build Alternative (Existing-Plus-Committed) Roadway Network.

Figure 2.2 displays the 2037 levels of service that GS&P established for the roadways in the study area. While the level of service analysis (detailed in Appendix A) shows significant congestion on the arterial facilities in the northern part of the study area, only a slight LOS drop is evident along the Elrod Road corridor in the 2037 design year.

GS&P prepared a full traffic forecasting report separately from this report and submitted it to the Kentucky Transportation Cabinet.

2.3 Other Transportation Projects in the Area

The no-build alternative includes the existing configuration of Elrod Road and any projects that were committed or anticipated to be completed according to the Bowling Green/Warren County Metropolitan Planning Organization's adopted Transportation Improvement Program. The list of committed capacity expansion projects follows:

Project	Description
KY 2158 (Cumberland Trace)	Relocation of intersection with Scottsville Road (US 231) at Mel Browning Street to Cherry Farm Lane at Scottsville Road (US 231)
Natcher Parkway Extension	4-lane freeway from I-65 to US 31W at Upton Road (east of Dye Ford Road) with interchange at Plano Road (KY 622)
I-65	Widening to 6 lanes from Cater-Sims Road southward to Tennessee State Line
I-65/US 31W Interchange Reconstruction	Replace existing rural diamond interchange with single-point-urban-diamond interchange
Lovers Lane (KY 880)	Widening to 4 lanes from Cemetery Road (KY 234) to Scottsville Road (US 231)
Three Springs Road (KY 884)	Widening to 4 lanes from Scottsville Road (US 231) to Flea Land
Nashville Road (US 31W)	Widening to 4 lanes from Campbell Lane (US 231) to Dillard Road

NOTE: The forecast year for the Bowling Green/Warren County Travel Demand Model used for the Elrod Study was 2030 based on development activity projected for the year 2030 for the metro area. The travel model cannot project traffic for other years unless you generate new development forecasts for the metro area for those years. The design year of 2037 is utilized as a standard 30 year projection from the year the study commenced.

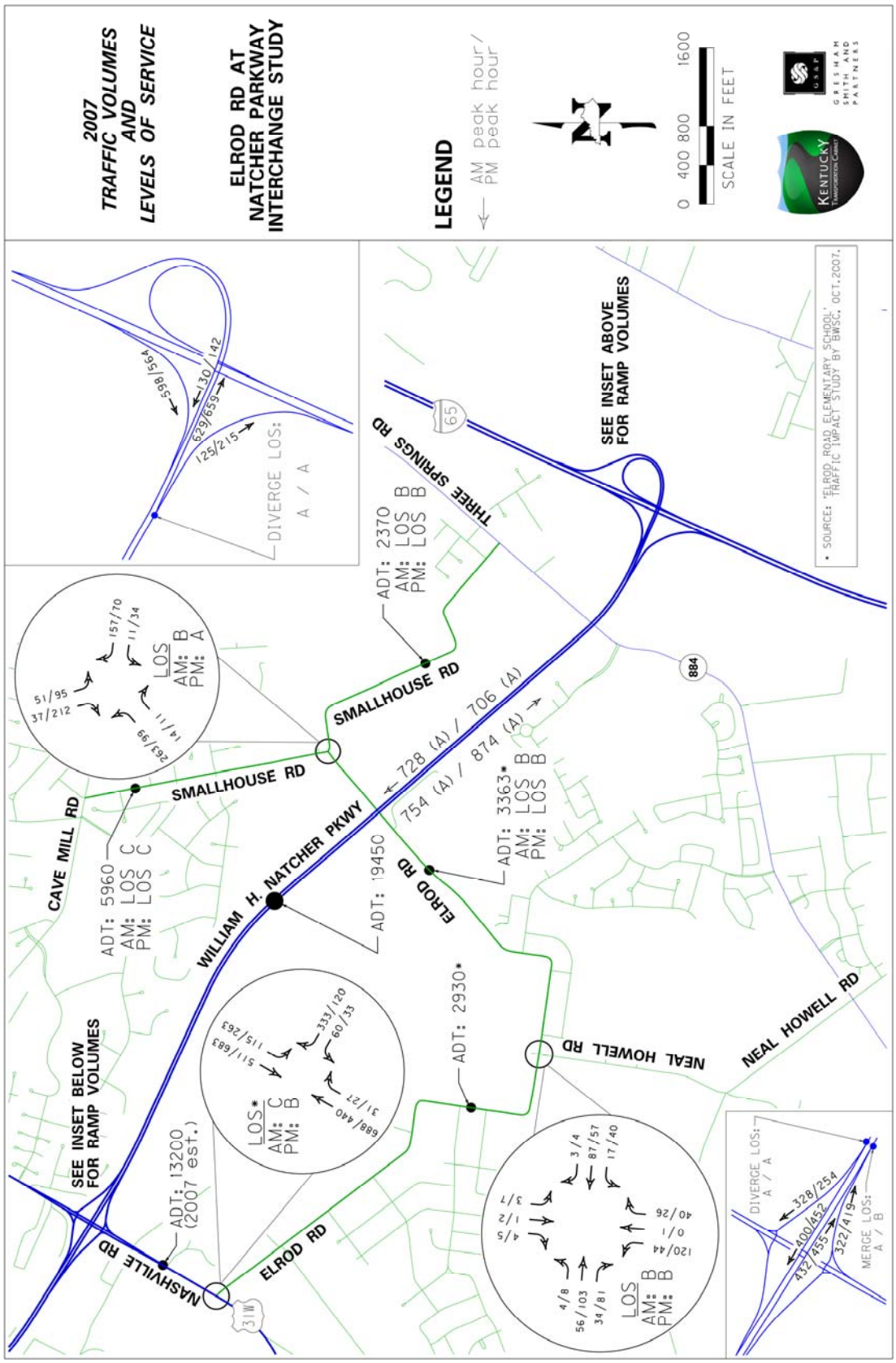


Figure 2.1 – 2007 Traffic Volumes and Levels of Service

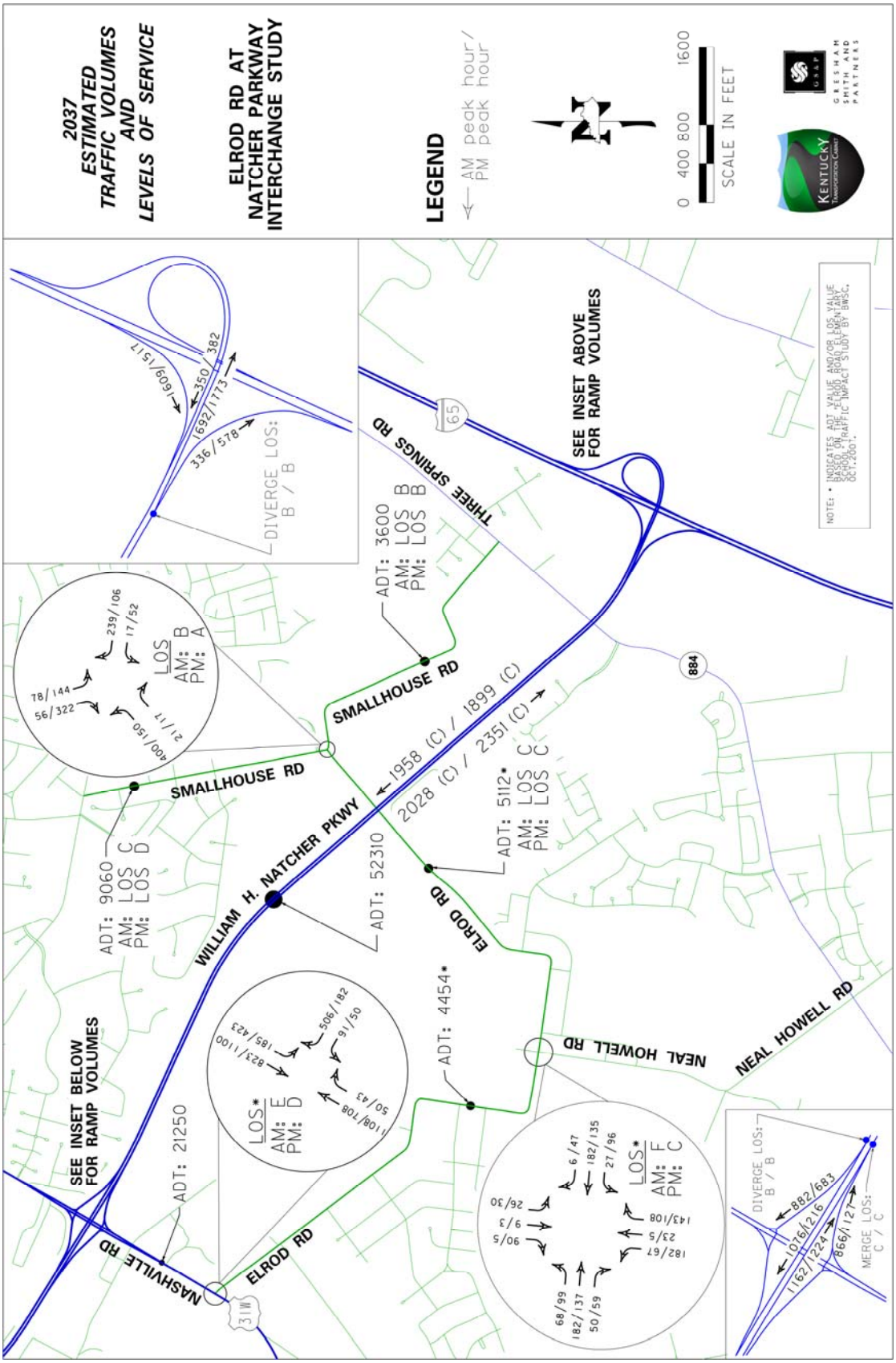


Figure 2.2 – 2037 Traffic Volumes and Levels of Service for the Existing-Plus-Committed Scenario

2.4 Crash Data

GS&P collected crash data from January 2004 through December 2006. The complete list of crashes can be found in Appendix B. Figure 2.3 (next page) illustrates the location and basic information about the crashes.

While the number of crashes in the study area is not significant, reoccurring patterns did emerge from the data collection. The crash data graphic in Figure 2.3 shows that the majority of the crashes occur in one of three locations in the study area:

- Sharp (and poorly signed curves) along Elrod Road and Smallhouse Road
- The three-way stop at Elrod Road and Smallhouse Road
- Rear end collisions attributed to several closely spaced subdivision entrances and left turn movements that do not have a dedicated left turn lane along Smallhouse Road extending north to Cave Mill Road

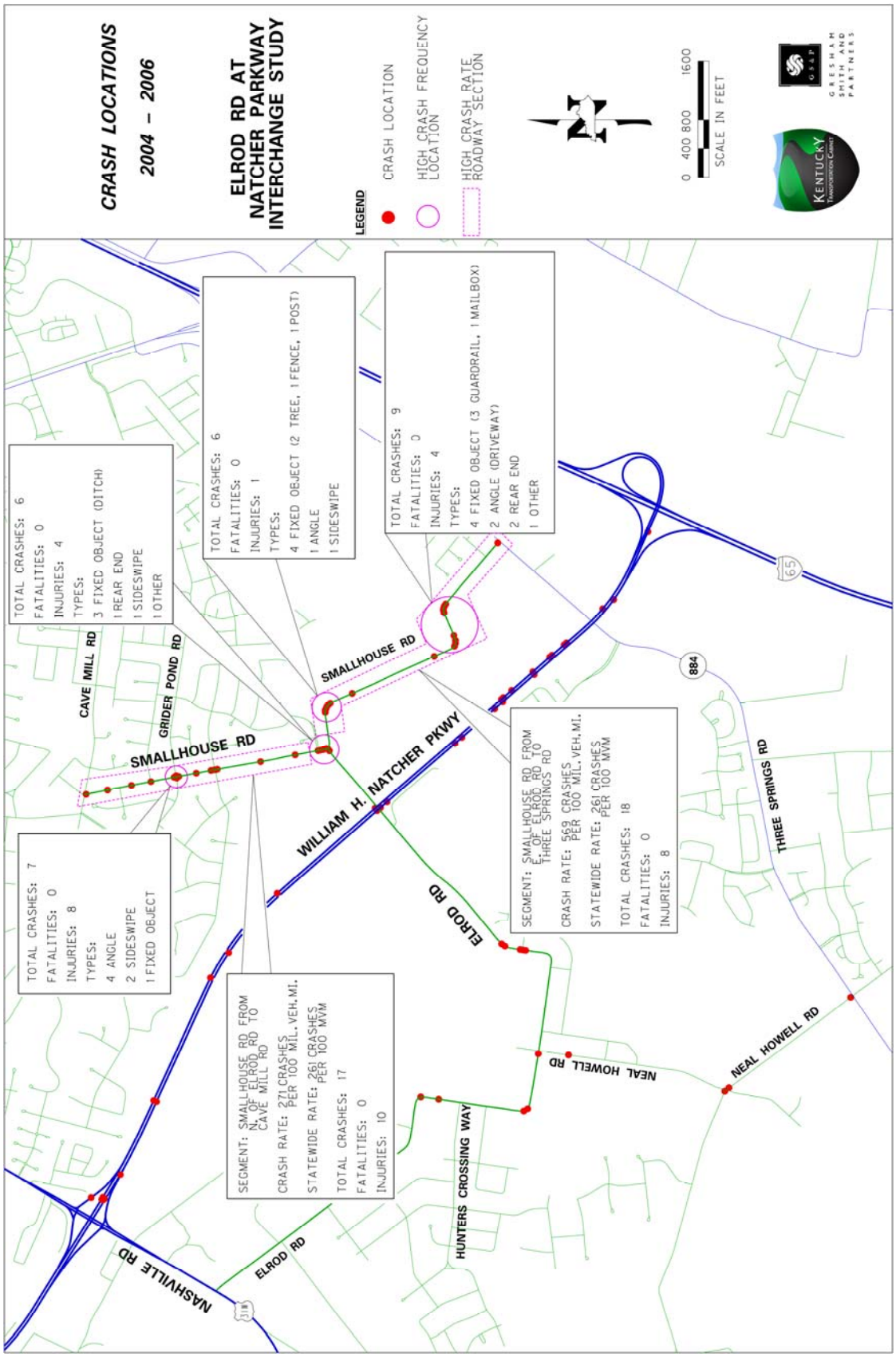


Figure 2.3 – Crash Data

3.0 Environmental Setting

3.1 Environmental Overview

The environmental overview document uncovered several issues that exist in the study area and are shown in Figure 3.1. The list of items discovered included such things as oil/gas wells, sinkholes, Indiana Bat summer maternity habitat, Western Kentucky University (WKU) Farm, wetlands, floodplains, cemetery and churches, aviation Heritage Park, Griffin Park, KOA (Kampgrounds of America) and schools located along the Elrod Road corridor.

According to the environmental overview document, preliminary data research and subsequent field reconnaissance, environmental concerns within the study area are typical for a previously agricultural area in transition to residential use. Environmental concerns relative to air quality, traffic noise, aquatic resources, threatened and endangered species, agricultural activity, communities and community facilities, and UST/hazardous material sites do not appear to be significant in areas where an interchange may be constructed for Elrod Road and the Natcher Parkway.

Specific findings for each of the environmental categories are:

Environmental Justice **–** The team anticipates that proposed alternatives would not negatively affect any of the socio-economics of the area. An environmental justice report found that there were no concentrations of minority or low-income populations in the study area.

Air Quality **–** The team anticipates that proposed alternatives would negatively affect the attainment status in the study area.

Traffic Noise – The three noise sensitive areas identified in the study area are Calvary Baptist Church, Pennroyal Farm Stables, and a group of three homes located north of Natcher Parkway on Elrod Road. The sites should be further examined if proposed changes are made to Elrod Road.

Aquatic Resources – There are 21 potential wetlands in the study area; however, most of these are manmade farm ponds. It is unlikely that impacts will be made to the naturally existing wetlands because of the karst conditions in the study area.

Threatened and Endangered Species – Indiana and gray bats either currently use or could potentially use areas within the study area for habitats. Any proposed alignment changes will require compliance with Section 7 of the Endangered Species Act for the Indiana bat.

Agricultural Activity – There are currently three agricultural businesses or institutions in the study area. These include the Western Kentucky University farm, Holladay Hill Stables and Pennroyal Farm Stables. Pennroyal Farm stables could potentially be impacted by all three proposed improvements.

Community and Community Facilities – There are several communities in the study area and to a lesser degree community facilities. Proposed improvements will more than likely impact residences and the Calvary Baptist Church and adjacent cemetery which is located near the existing Natcher Parkway overpass on Elrod Road. The most significant community resource in the study area is Basil W. Griffin Park which would present Section 4(f) and 6(f) concerns if impacted. Proposed improvements detailed in this report do not anticipate any impacts to said park.

UST / Hazardous Materials – A gas well site and UST was identified on the Western Kentucky University farm as well as a Bowling Green VOR UST tank. These represent the most significant potential hazards in the study area.

3.2 Resource Agency Coordination

The team sent notifications out to the agencies listed in Table 3.1. The notifications asked the agency for the following information:

- Comments on the project goals or purpose and need for the project,
- Significant issues or concerns that may need addressing,
- Any conservation or development plans your agency or organization has ongoing or is aware of in the project area,
- Locations of any known areas, issues, or resources so that impacts can be minimized, mitigated, or avoided early in the process, and
- Any mitigation strategies that should be considered.

Table 3.1 provides a complete list of comments received from the various resource agencies. A full copy of the original mailing list, letter and written responses can be found in Appendix D.

3.3 Geotechnical Overview

The project team conducted a geotechnical review of the study area using documents, maps, interviews with local residences and by field reconnaissance. The findings show that geotechnical conditions in the study area are typical for the karst plain of south central Kentucky.

Karst is the terrain, generally underlain by limestone or dolomite, in which the topography is chiefly formed by the dissolving of rock. Karst regions can be characterized by sinkholes, sinking streams, subterranean drainage and caves. With karst prone areas, regulation of development is crucial to protect the public health, safety and welfare. Regulation of the development and use of environmentally constrained lands can allow for safe and appropriate construction, storm water management and ground water quality.

Construction sites in this area routinely encounter depressions and sinkholes as well as soil collapse during construction or after operations cease. The recommendation of the geotechnical overview is to leave any “open throat” sinkholes undisturbed (by physical fill material or additional drainage run-off).

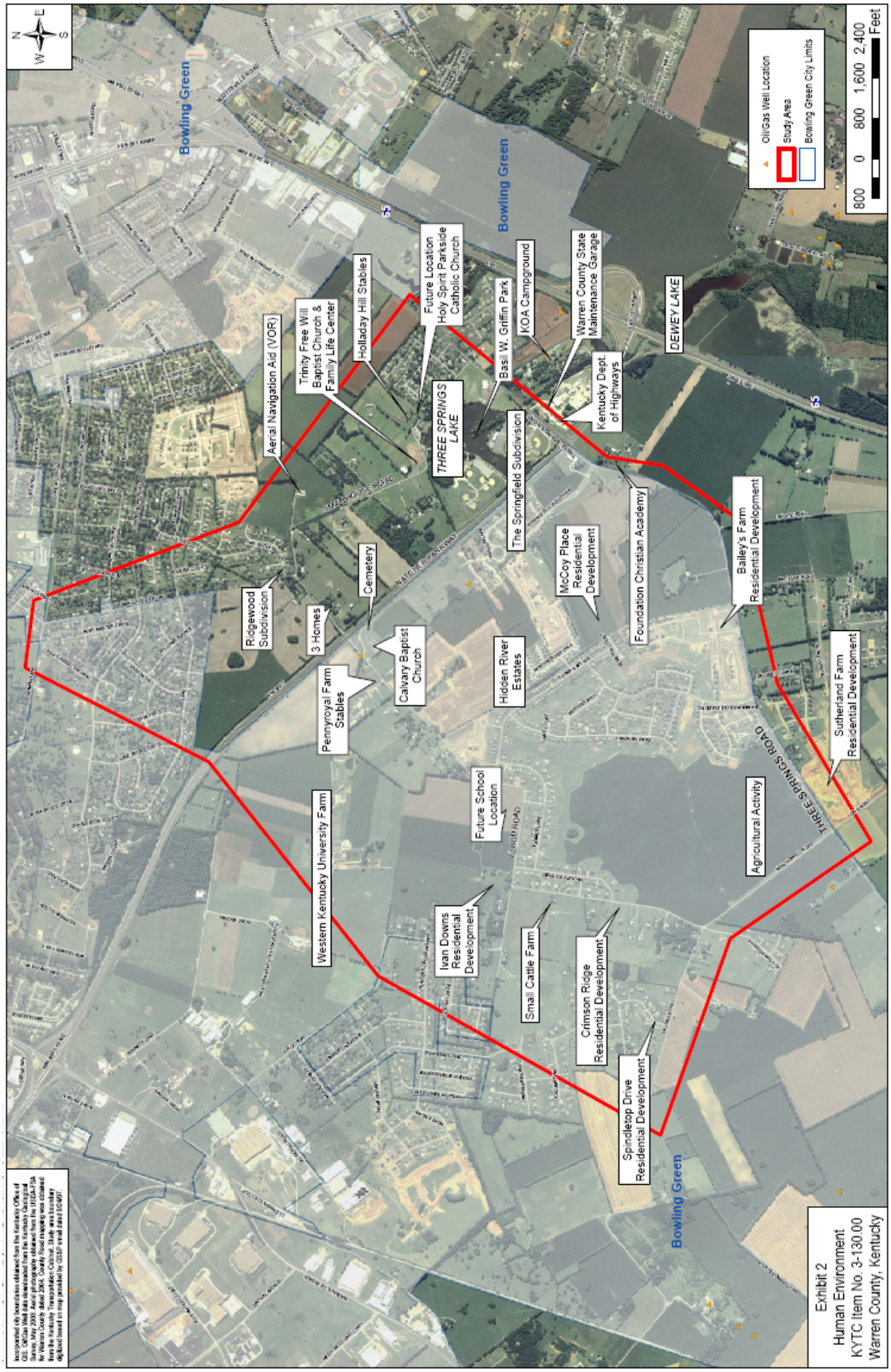


Figure 3.1 – Environmental Issues Exhibit (a full size version is included in Appendix C)

Table 3.1 – Resource Agency Comments

Agency	Comment
KY Division of Air Quality	401 KAR 63:010 and 401 KAR 63:005 would apply during construction of this project.
KY Division of Water	The groundwater branch recommends that a professional hydrologist or geo-hydrologist be utilized to ensure that groundwater in the area will not be adversely affected by this project. Kentucky DOT is exempted from the requirements for a stream construction permit per KY 151.250. Any excess material disposed of outside the DOT right of way and in the regulatory floodplain will require a permit.
Natural Preserves Commission	No comment
Department for Environmental Protection/ Division of Waste Management	No comment
Department of Military Affairs/Boone National Guard Center	The Department of Military Affairs cannot identify any issues or concerns that affect the development of subject project.
KY Heritage Council	There are many architectural resources as well as previously recorded archaeological sites within the study area. The Section 106 review process must be completed prior to the approval of the expenditure of any federal funds.
KY Airport Zoning Commission	Any structure or construction equipment that exceeds 133 feet above ground level would require a permit from the KY Airport Zoning Commission. The proposed study is located app. 14,600 ft from the BG Airport.
KY Commission on Human Rights	No comment
KY Department of Agriculture	No comment
KY Department of Fish & Wildlife Resources	The Kentucky Fish and Wildlife Information System indicate that state/federal threatened and endangered species are known to occur near the project study area.
KY Division of Forestry	No forestry concerns in this area.
KY Division of Waster Management	Link to Superfund report attached to email.
KY State Police	Would be beneficial for the following reasons: Reduce traffic congestion on US 31-W and KY 884; reduce traffic volume on Smallhouse Rd; provide better access to the area for Emergency Responders; better traffic flow should result in fewer crashes.
KY Tourism Council	The addition of the new interchange should not have any detrimental effect on the area tourist attractions, hotels and restaurants…Creating safer roadways and less congestion on Three Springs Rd and Nashville Rd would create a more positive experience for the tourists to those areas.

Agency	Comment
KY Transportation Cabinet/Office of Local Programs	It is the conclusion of this office that the addition of bicycle and pedestrian facilities in the study area would improve safety and efficiency of travel in the Elrod Road area and create a more diverse transportation network. At this point in the study it is too early to recommend whether bike lanes with sidewalks or a multi-use path would be more feasible. This can be determined by the number of access points that will be connecting to the roadway, and the amount of traffic.
U. S. Environmental Protection Agency/ Region 4	The upcoming NEPA document should fully evaluate all environmental impacts, cultural resource impacts, and Environmental Justice impacts, in addition to considering cumulative and secondary impacts of the alternatives. Best management practices (BMPs) that will prevent, reduce, or mitigate environmental impacts should be considered.
U.S Coast Guard	A Coast Guard permit is not required.
U.S. Army Corps of Engineers/Eastern Section	Referred to Louisville District for comment.
U.S. Army Corps of Engineers/Nashville District	Referred to Louisville District for comment.
U.S. Department of Agriculture/ Forest Service	Proposed activities are not likely to impact resources or facilities managed by the Daniel Boone National Forest.
U.S. Department of Transportation/Federal Aviation Administration	Project is not in airspace and should not impact aviation operations unless there is construction 200' above ground level.
U.S. Department of Agriculture/Natural Resources Conservation Service	The NRCS is concerned with potential impacts that the project might have upon prime farmland soils and additional farmlands of statewide importance. If federal dollars are to be used to convert important farmlands from agricultural uses to non-agricultural uses a Form AD-1006 (or Form NRCS-CPA-106 if the project is a corridor type project) must be submitted to the local NRCS office.
Underground Storage Tank Branch	The USTB identified two facilities with a total of six registered underground storage tanks. All six tanks have been removed and all activities are closed. There are no active USTs.
University of Kentucky/KY Geological Survey	Extensive comments attached re: review of maps, online searches and documents available in the files and on the Web site of the KY Geological Survey. No on-site investigation of the planning study area was conducted.
Warren County Schools/Transportation	"These changes are needed as soon as possible; however, I am concerned that the increase in traffic without major road improvements to Smallhouse, Elrod and Cave Mill could make this even more dangerous because of speeding. With the possibility of adding another school on Elrod Rd and our buses being able to enter Natcher via Elrod it would appear to make transport from and to Greenwood and Drakes Creek much easier."

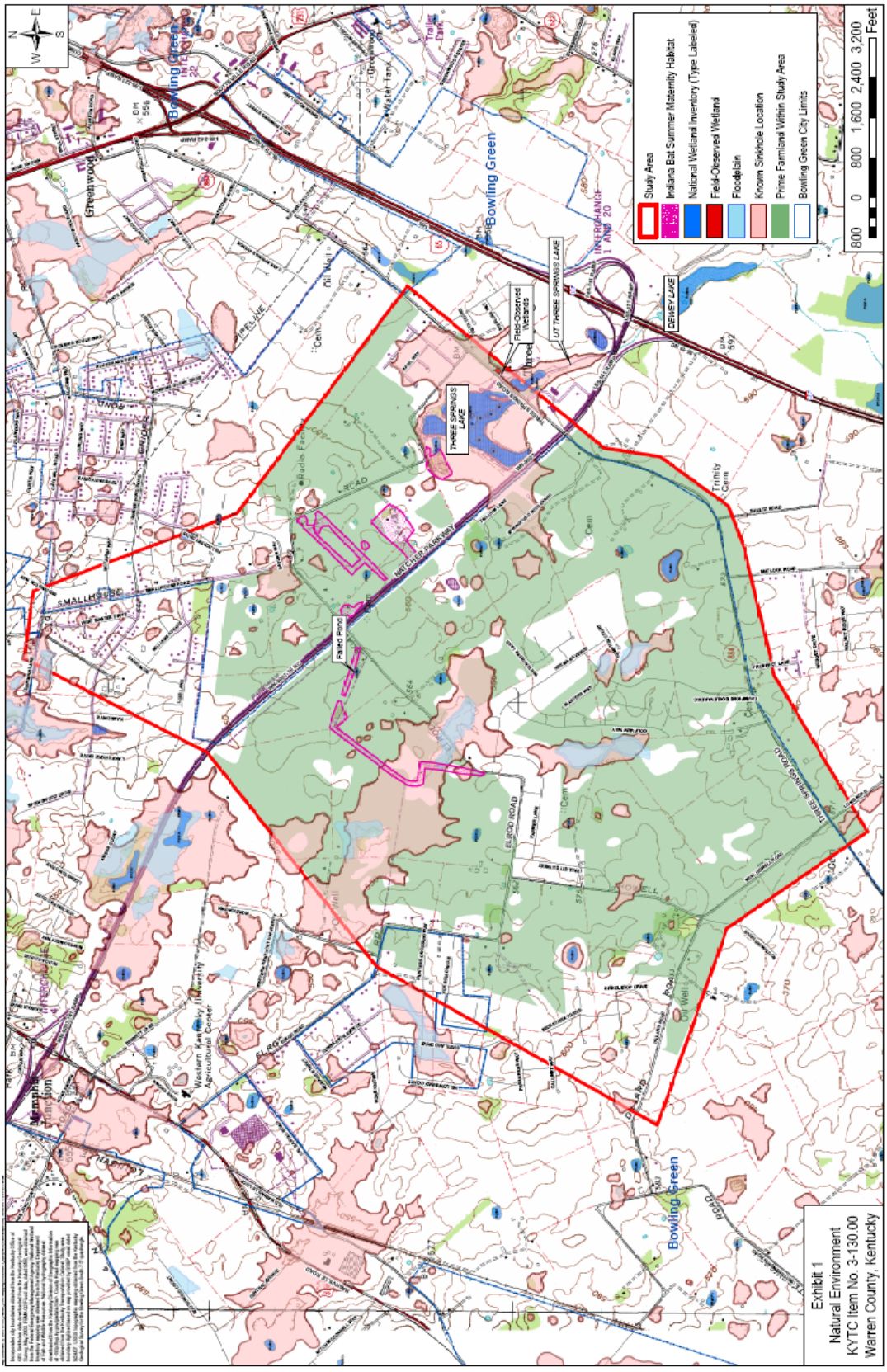


Figure 3.2 – Geotechnical Exploration Map (a full size version is included in Appendix D)

4.0 Alternatives Analysis

4.1 Alternatives Overview

Problems the team observed and quantified in the study area include:

- Congestion
- Narrow Roadways / No Shoulders
- 90 Degree Turns
- Lack of Striping
- Too Many Access Points
- Lack of Multi-Modal Accommodations
- Cave Mill / Smallhouse Offset
- Increased Development
- Underutilization of Natcher Parkway
- Agricultural Vehicles' Needs
- No Access to Multi-Lane Roads

In an effort to establish which options were best suited for further examination early in the study, GS&P checked to ensure that the options agreed with the purpose and need statement for the project at each step of decision-making in the alternative analysis:

> *Rapid residential and commercial growth is occurring on the southern side of Bowling Green. Motorists have limited options for accessing the Natcher Parkway in southern Bowling Green and Warren County and must rely on the heavily congested routes of US 231 (Scottsville Road), KY 884 (Three Springs Road) and US 31W (Nashville Road) to reach various destinations. Additionally, mobility in the existing study area network is limited for motorists, pedestrians, bicyclists and transit users.*
>
> *The purpose of this interchange study is to improve the safety and efficiency of travel in the Elrod Road/Smallhouse Road area and to provide better connection for travelers along this existing transportation network to the Natcher Parkway.*

Interchange Types

The team examined four types of interchanges: diamond, SPUI (single point urban interchange), folded (or flop) and a barbell design which would incorporate a round-about on each side at the terminus of the ramps on Elrod Road. Per discussions at the first team meeting, the team excluded partial interchanges from consideration.

The team eliminated the SPUI type interchange as a viable option because this type of interchange is normally utilized in densely populated urban areas, and it doesn't fit the context of Elrod Road. The team also eliminated the barbell interchange due to the likelihood of farm vehicles utilizing the interchange as well as right-of-way constraints primarily south of the existing overpass.

The two remaining interchange types carried forward were the diamond interchange and the folded (flop) interchange. Both of these fit the context of the study area better and accommodate the projected traffic demands.

Typical Sections

Early typical sections attempted to correct some of the observed deficiencies along the existing project corridor, namely narrow lane widths and the lack of multi-modal facilities. Multi-modal needs had not been determined previously, so the project team relied heavily upon information gathered from the stakeholders and public through the course of the public involvement plan. The design team developed the typical sections displayed in Figure 4.1 to meet the purpose and need statement as well as address the deficiencies observed in the study area.

The typical sections also contain solutions for multi-modal access. The initial expectation was that the entire Elrod Road corridor would be three lanes; one lane in each direction and a center turn lane. Smallhouse Road would remain as two lanes, with improvements.

The initial proposed typical section included curb and gutter as well as pedestrian facilities on parts of Elrod Road and Smallhouse Road extending east to Three Springs Road. Early public involvement made the design team aware of the large number of bicyclists who travelled within the study area. A designated 4-foot bike lane was proposed for the entire length of Elrod Road; it would extend east along Smallhouse Road to provide access to Griffin Park.

Revised Typical Sections

Due to Kentucky Transportation Cabinet's Practical Design approach, anticipated budget constraints and the team revisiting the context of the area, the typical section was modified to a more rural section. The new typical section eliminated the curb and gutter, narrowed the width of the traveled way, and also eliminated pedestrian and designated bicycle lanes. As an alternative, bicyclists can use the proposed paved shoulders on Elrod Road. The team developed the revised typical section shown in Figure 4.2 to agree with Kentucky Transportation Cabinet's Practical Design guidelines.

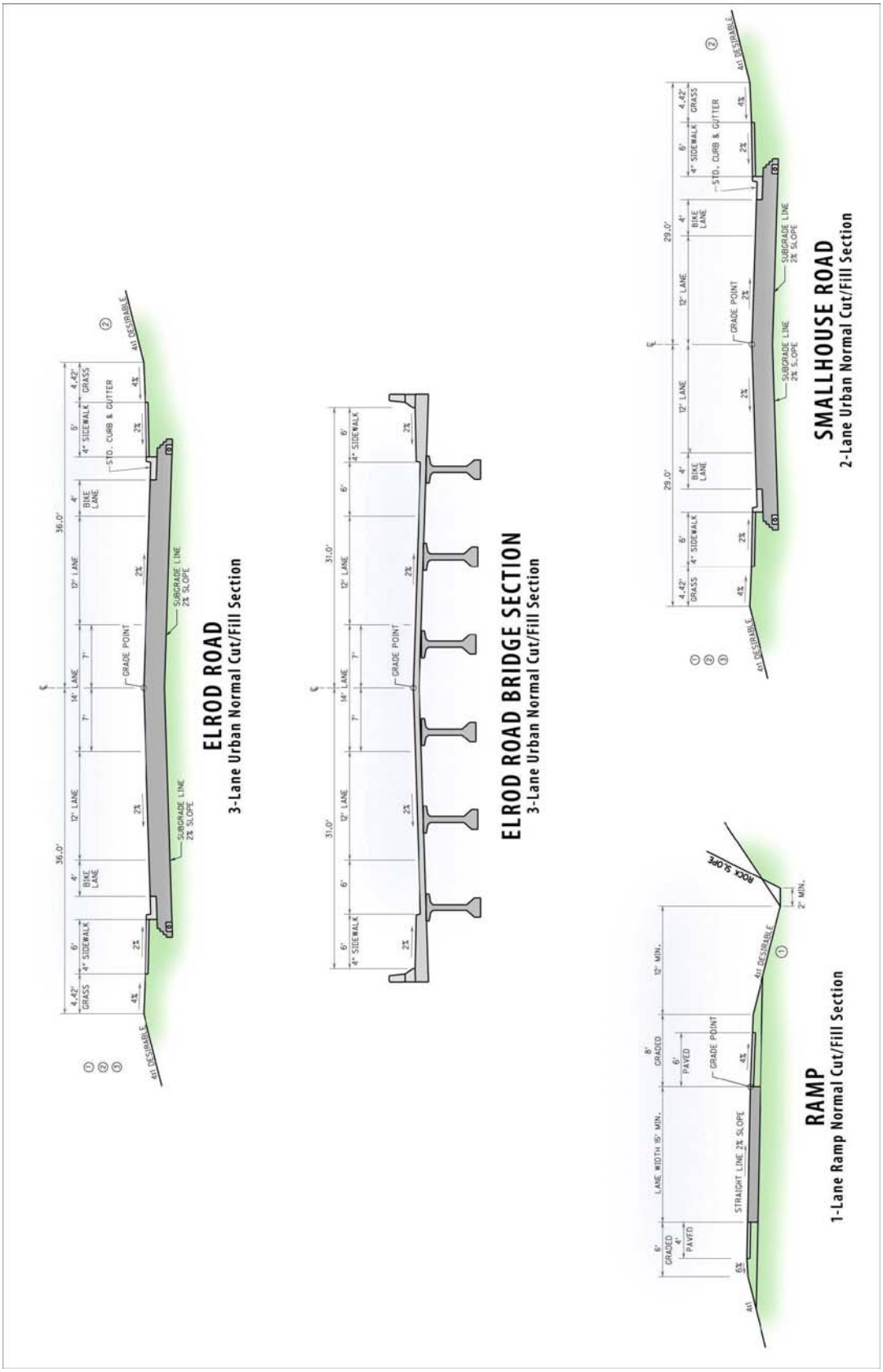


Figure 4.1 – Initial Proposed Typical Sections

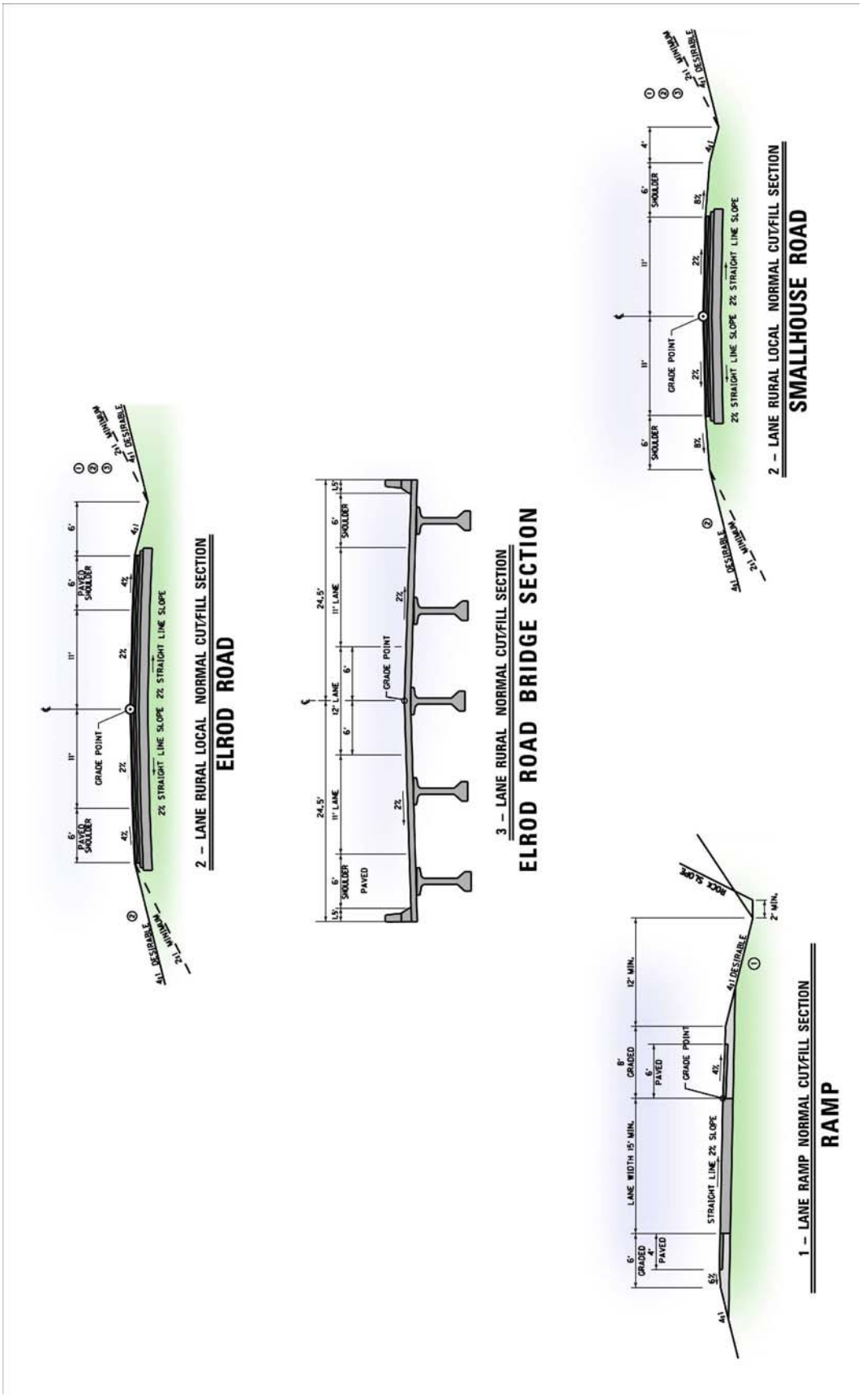


Figure 4.2 – Proposed Typical Sections with Practical Design guidelines applied

With the updated typical section, most of Elrod Road would remain a 2-lane section. The roadway would widen near the proposed overpass to account for required interchange left turn storage lanes. Larger images of all typical sections are in Appendix E.

Horizontal Alignments

Before any alignments were conceptualized, GS&P paid special attention to existing roadway deficiencies. The team collected crash data and analyzed the entire study area. The majority of the crashes on file were due to rear end collisions attributed to turns into subdivisions. The remaining crashes appeared to be concentrated at the sharp curves in the project area or at the three-way stop located at the intersection of Elrod Road and Smallhouse Road. Several of the crashes on the sharp curves along Elrod Road and Smallhouse Road occurred after dark. In the field, GS&P observed that signing for curves along Elrod Road needed improvement, providing drivers with better warning of approaching sharp turns. Crash data for the study area are shown in Figure 2.3.

GS&P developed alignment options to address the geometric deficiencies as well as to accommodate the typical section and provide a new access point to Natcher Parkway near the existing Elrod Road overpass.

The design team gave special consideration to a plan previously developed by the City-County Planning Commission and presented to Western Kentucky University (WKU). The original plan utilized a corridor at the south edge of the WKU property and constructed a new interchange approximately 400 feet northwest of the existing Elrod Road overpass.

The team initially drafted eight options to evaluate. Each option attempted to avoid the potentially problematic areas discovered in the environmental phase (denoted in Figure 4.3 with yellow stars). A detailed graphic of each of the eight initial options is in Appendix F. Figure 4.3 shows all eight options together, providing an overview of the options. There are also several alternatives in each option showing different types of interchanges.

The project team compared each alternative's pros and cons to narrow the focus to three proposed alternatives and a no-build option to present to the public. The criteria used to evaluate each alternative included impact on adjacent facilities, land use impacts, economic impacts, constructability impacts, safety benefits, probable design, construction, ROW and utility impacts, and traffic impacts.

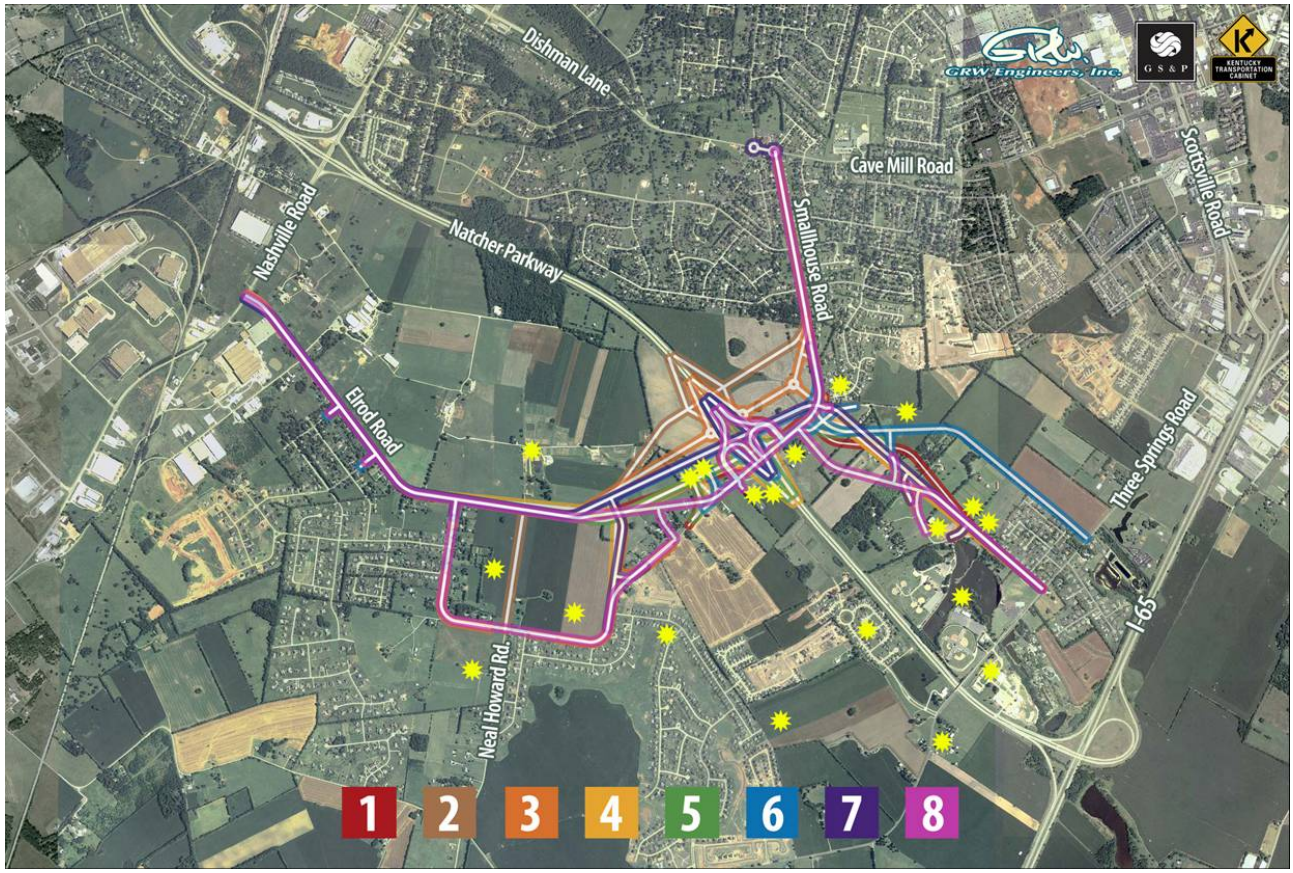


Figure 4.3 – Eight Initial Alignments

Each of the three alternatives was broken down into three different portions to accommodate different City, County and State funding sources. Figures 4.4, 4.5, and 4.6 designate portions of each alternative to the initial interchange improvements (green), second tier optional improvements (blue), and third tier optional improvements (orange). Larger scale versions of each are included in Appendix G.

The following alternatives have several optional and additional improvements shown. These proposed improvements should be considered interchangeable since they can be applied to any of the interchange options. Because of this, all of the possible improvements are not shown in each of the following interchange alternatives.

Optional improvements (shown in blue on Figures 4.4 - 4.6) include:

- Widen the westernmost portion of Elrod Road that extends to Nashville Road to allow through traffic to proceed unencumbered by left turn traffic into the subdivisions.
- Improve the radii on the 90 degree curves on the southernmost portion of Elrod Road and include MUTCD compliant signing to alert motorists of the condition.
- Re-align the east leg of Smallhouse Road that extends to Three Springs Road to eliminate 90 degree curves near the park.
- Widen Smallhouse Road between Elrod Road and Cave Mill Road to help combat the lower level-of-service currently experienced there. This is only a partial solution as the major problem lies with the intersection configuration at Smallhouse Road and Cave Mill Road.

Figure 4.4 – Alternative "A"

Alternative "A" was developed to minimize impacts to properties along Elrod Road. There is a significant advantage during construction because the majority of this alignment is on undeveloped farmland. This alternative, however, also left the largest residual piece of property on the WKU property, meaning there was a significant portion of land that would be cut-off from their main property.

Some *additional options* were examined and presented to the public. These were considered additional to the interchange option and the optional improvements indicated in green and blue in Figure 4.4 above. They are as follows:

- A1 – Small connector to connect the proposed relocated Elrod Road to the existing Elrod Road in case a decision was made that eliminated the direct connection between the western most optional improvements (shown in blue) to the newly relocated interchange.
- A2 – A re-aligned Smallhouse Road to potentially improve safety by eliminating the sharp turns near the park.
- A3 – A newly aligned roadway to potentially improve safety by avoiding the existing sharp turns on Smallhouse Road.
- A4 – A round-about to allow users a legal yield condition at the three-way intersection.

Figure 4.5 – Alternative "B"

Alternative "B" was developed to lessen potential right-of-way impacts compared to Alternative "A"; however, by moving the interchange closer to the existing Elrod Road overpass, there is a potential to impact more property owners even though total right-of-way needs could be less.

Some *additional options* were examined and presented to the public. These were considered additional to the interchange option and the optional improvements indicated in green and blue in Figure 4.5 above. They are as follows:

- B1 – This alignment could eliminate the need for the green connection between the western most optional improvements on Elrod Road (shown in blue) to the proposed interchange.
- B2 – A newly aligned roadway could potentially improve safety by avoiding the existing sharp turns on Smallhouse Road. This could replace the Smallhouse Road alignment shown in blue in Figure 4.5.

Figure 4.6 – Alternative "C"

Alternative "C" was developed to utilize as much of existing Elrod Road right-of-way as possible. A flop interchange type eliminates the residual piece of land on the WKU property.

Some *additional options* were examined and presented to the public. These were considered additional to the interchange option and the optional improvements indicated in green and blue in Figure 4.6 above. They are as follows:

- C1 – A newly aligned roadway could potentially improve safety by avoiding the existing sharp turns on Smallhouse Road. This could replace the Smallhouse Road alignment shown in blue in Figure 4.6.

The following is the list of issues presented to the local officials, at the team meeting and to the public as a synopsis of the pros and cons of each alternative and options:

Interchange Alternative "A"
- Minimizes impacts to properties surrounding the interchange.
- Impacts properties on Smallhouse Road northwest of overpass.
- Requires construction of connector road(s) to existing Elrod Road.

Interchange Alternative "B"
- Minimizes impacts to properties surrounding the interchange.
- Minimizes non-accessible land on WKU Agricultural Farm.
- Impacts properties on Elrod Road north of overpass.
- Requires the existing overpass to be demolished.

Interchange Alternative "C"
- Minimizes the footprint and utilizes as much of existing Elrod Road as possible.
- Minimizes impacts to access to properties along existing Elrod Road in the vicinity of the interchange.
- Creates maintenance of traffic difficulties during construction.

Final cost estimates for the interchange portion of each alternative were generated using preliminary design and right-of-way impacts. The results are as follows:

Table 4.1 - Elrod Road Interchange Project – Cost Estimates*

Item	Alternate A	Alternate B	Alternate C
	($ mil)	($ mil)	($ mil)
Design	0.8	0.8	0.8
Construction	5.6	5.7	7.3
Right-of-Way	2.7	2.0	2.2
Utilities	0.3	0.3	0.3
Total	**9.4**	**8.8**	**10.6**

***Does not include optional improvements to Elrod Road or Smallhouse Road as shown in Figures 4.4, 4.5 or 4.6.**

The corresponding preliminary designs used to estimate each alternative can be found in Appendix H along with the final copy of the estimates.

Additional Intersection Options
The following modifications of the Elrod Road/Smallhouse Road intersection were also considered. Any of the intersection types could be used; however, the traffic model was unable to differentiate any level of service differences between the options.

Continuous Flow from Elrod Road to Smallhouse Road (shown as a roundabout)
- Eliminates the 3-way stop that currently exists.
- Includes a stop sign for one leg of the intersection.
- Favors movements with highest traffic; traffic volumes will determine which leg has to stop.

Four-Way Stop at Elrod Road and Smallhouse Road
- Creates a four-way stop that allows access to the existing south leg of Elrod Road.
- Does not favor any movement.

Continuous Flow from Elrod Road to Smallhouse Road with Smallhouse East Realigned

- Eliminates the 3-way stop that currently exists.
- Includes a stop sign for one leg of the intersection.

Traffic Analysis

GS&P produced a traffic model for the existing system. Once the three alternatives were selected, GS&P also developed a model for each of the three proposed systems that includes the optional tiered improvements. The forecast year for the Bowling Green/Warren County Travel Demand Model used for the Elrod Study was 2030 based on development activity projected for the year 2030 for the metro area. The traffic models included the development of turning movement forecasts, level-of-service analysis and the identification of any additional solutions that would alleviate roadway deficiencies. Because of the close proximity to one another, proposed interchange options A & B would produce no significant impacts to traffic movement when compared to each other. For this reason, only one model was built for options A & B.

GS&P compared the AM design hour, PM design hour and daily turning movement forecasts generated for the two adjacent existing interchanges (at Nashville Road to the west and Interstate 65 to the east) with the projected volumes for the three build alternatives at the Elrod Road Interchange. GS&P also compared traffic impacts for the mainline and adjacent interchanges.

After the model analysis was complete, GS&P presented the results to the project team. In each of the proposed alternatives, a decrease in level-of-service was evident not only on Elrod Road, but also on secondary connector streets in the study area.

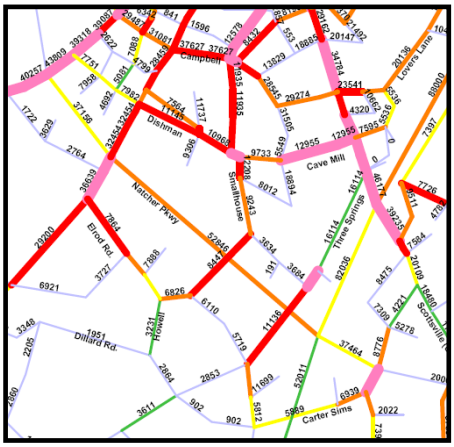


Figure 4.7 - Results of the Existing Model Analysis

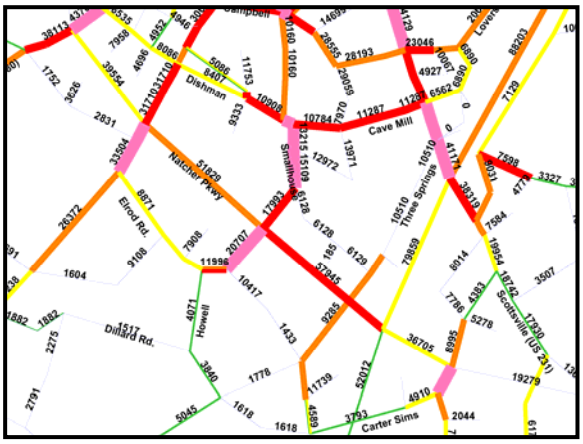
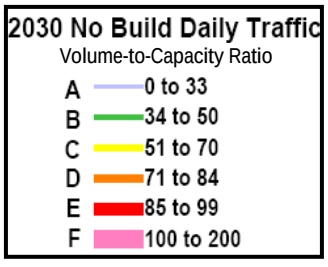


Figure 4.8 - Results of Alternatives A & B



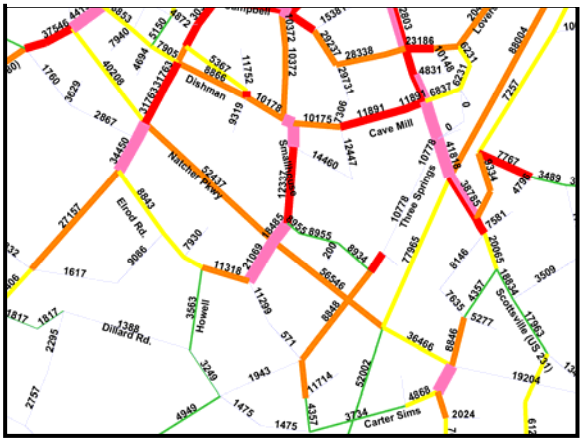


Figure 4.9 - Results of Alternatives C

When comparing the daily traffic assignment for each alternative to the no-build alternative, the following LOS observations are made for the design year of 2030 (more detailed information is included in Table 4.2):

1) The LOS improves on:
    a. Russellville Road (US 68/KY 80) south of the Natcher Parkway.
    b. Three Springs Road (KY 884) between Matlock Road and Smallhouse Road.
    c. Dishman Lane from Nashville Road (US 31W) to Cave Mill Road.
    d. Cave Mill Road from Grinder Pond Road to Scottsville Road (US 231).
    e. Smallhouse Road from Campbell Lane (US 231) to Cave Mill Road.
    f. Elrod Road from Nashville Road (US 31W) to west of Howell Road (due to the proposed improvement of two-lane Elrod Road).
2) The LOS deteriorates on:
    a. Smallhouse Road from Cave Mill Road to Elrod Road (due to increased traffic accessing the new interchange).
    b. Elrod Road from east of Howell Road through the Natcher Parkway Interchange area to Smallhouse Road.

Each of the alternatives increased traffic on Elrod Road by more than 200%. This increase, coupled with the 3-lane section on Elrod Road through the interchange, produced lower LOS at the interchange and along the project corridor. Increases in traffic on Elrod Road also resulted in increases on Smallhouse Road and Cave Mill Road. The intersection of Smallhouse Road and Cave Mill Road is of particular interest because it is currently operating at a low LOS and any increase in traffic resulting from a new interchange at Elrod Road would add to the severity of this problem. The City of Bowling Green is currently studying the intersection.

Results for each of the build alternatives:

- In each of the three alternatives carried forward, severe congestion at the intersection of Smallhouse Road and Cave Mill Road will be exacerbated by an interchange if no other improvements are made at this intersection
- Each of the alternatives will strain the connections for the study area. Namely: Smallhouse Road to Cave Mill Road, Smallhouse Road to Three Springs Road, and Elrod Road west to Nashville Road (US 31W).
- None of the alternatives produced sufficient diversion of traffic on Russellville Road (US 68 / KY 80) or Nashville Road (US 31W) through the Natcher Parkway interchange areas to achieve a minimum acceptable LOS in the year 2030.
- Regardless of the alternatives, the forecasted traffic for the proposed Elrod Road Interchange indicates that the interchange overpass will eventually need to be widened to four through lanes to accommodate 2030 traffic.
- Each of the alternatives provides some relief to Three Springs Road south of Smallhouse Road in the year 2030.
- Alternative “A” resulted in the most effective use of the programmed four-lane improvements to Three Springs Road north of Smallhouse Road.
- Alternative “C” resulted in the least increase in traffic on Smallhouse Road north to Cave Mill Road and it also provided the most relief to the I-65 / US 231 interchange.

Except for the minor comments regarding some slight benefits to surrounding streets contained in the list above, there are no conclusive differences in traffic operation between each of the alternatives. The traffic forecasting report notes this and also suggests that public input be used to further justify the choice of a preferred alternative which would include the three proposed alternatives and the no-build option.

Table 4.2 - Alternatives / No-Build Option ADT and Levels of Service

		Existing	No-Build 2030		Alternative A 2030		Alternative A2 2030		Alternative C 2030	
Route	Termini	Daily Traffic Count (date)	ADT	V/C Ratio	ADT	V/C Ratio	ADT	V/C Ratio	ADT	V/C Ratio
Russellville Road (US 68/KY80)	Memphis Junction Rd. to Natcher Pkwy	22643 ('04)	40257	F	38113	E	37895	E	37546	E
Russellville Road (US 68/KY80)	Natcher Pkwy to Dishman Rd.	23584 ('04)	43809	F	43701	F	42294	F	44192	F
Nashville Road (US 31W)	Memphis Junction Rd. to Natcher Pkwy	11005 ('04)	37860	F	34696	F	34905	F	35661	F
Nashville Road (US 31W)	Natcher Pkwy to Dishman Rd.	18910 ('01)	32454	E	31710	E	31706	E	31763	E
Three Springs Road (KY 884)	Matlock Rd. to Old Smallhouse Road	5193 ('01)	11136	E	9285	D	8862	D	8848	D
Three Springs Road (KY 884)	Old Smallhouse Rd. to New Smallhouse Rd.		12197	F	9084	D	8945	D	10687	E
Three Springs Road (KY 884)	New Smallhouse Rd. to Scottsville Rd. (US 231)	6829 ('01)	16114	B	10510	A	12466	B	10778	A
Dishman Road	Russellville Rd.(US 68) to Nashville Rd. US 31W)	10917 ('03)	8341	C	8187	C	8050	C	8173	C
Dishman Road	Nashville Rd. US 31W) to Cave Mill Rd.	8311 ('04)	11145	E	8407	C	8548	C	8866	D
Cave Mill Road	Dishman Rd. to Smallhouse Rd.	13660 ('02)	10968	E	10908	E	10589	D	10178	D
Cave Mill Road	Smallhouse Rd. to Grinder Pond Rd.	10526 ('03)	9733	D	10784	E	10548	D	10175	D
Cave Mill Road	Grinder Pond Rd. to Scottsville Rd. (US 231)	12569 ('04)	12955	F	11287	E	11708	E	11891	E
Smallhouse Road	Campbell Ln. (US 231) to Cave Mill Rd.	12270 ('03)	11935	E	10160	D	10171	D	10372	D
Smallhouse Road	Cave Mill Rd. to Elrod Road	5951 ('07)	12208	E	15109	F	13835	F	12498	F
Smallhouse Road	Elrod Rd. to Three Springs Rd.	2333 ('07)	3634	A	6129	A	92	A	8955	B
New Smallhouse Road (A2)	Elrod Rd. to Three Springs Rd.						7093	B		
Natcher Parkway	Russellville Rd. (US 68) to Nashville Rd. (US 31W)	16804 ('04)	37156	C	39554	C	39729	C	40208	C
Natcher Parkway	Nashville Rd. (US 31W) to Elrod Road	17341 ('04)	52846	D	51829	D	52082	D	52437	D
Natcher Parkway	Elrod Rd. to I-65	17341 ('04)	52846	D	57945	E	56401	D	56546	D
Natcher Parkway	I-65 to Plano Rd. (KY 662)		37464	C	36705	D	35625	C	36446	C
Natcher Parkway	Plano Rd. (KY 662) to Scottsville Rd. (US 231)		20069	A	19279	A	18575	A	19204	A
Neal Howell Road	Elrod Rd. to Dillard Rd.	2360 ('07)	3231	B	4071	B	4051	B	3563	B
Elrod Road	Nashville Rd. to New Elrod Rd (west of Howell Rd.)	5350 ('07)	7864	E	9226	C	9355	C	9148	C
New Elrod Road	West of Howell Rd. to East of Howell Road		6826	D	11996	D	12045	D	11318	D
New Elrod Road	East of Howell Rd. to Natcher Parkway	3363 ('07)	8447	E	20707	F	21297	F	21069	F
New Elrod Road	Natcher Parkway to Smallhouse Road	3363 ('07)	8447	E	17993	E	17272	E	18485	F
I-65	Natcher Parkway to Scottsville Rd. (US 231)	43800 ('04)	82036	C	79859	C	77320	C	77965	C
Scottsville Road (US 231)	Three Springs Rd. (KY 884) to I-65	37114 ('04)	46177	F	41171	F	42473	F	41818	F
I-65	Scottsville Rd. (US 231) to Cemetery Rd. (KY 234)	45676 ('04)	88000	D	88203	D	88007	D	88004	D
Scottsville Road (US 231)	I-65 to Cumberland Trace (KY 2158)	23938 ('04)	39235	F	38319	E	39411	F	38785	F

4.2 Alternatives Refinement

This section serves as a timeline of events that details the development and refinement of each alternative. Some of the methods employed by the project team to gather public input will be detailed here as well. Complete meeting minutes are included in the Appendices.

LOCAL OFFICIALS MEETING #1 – Held on December 10, 2007

The first local officials meeting was held to introduce the officials to the study area and introduce them to a rough list of milestones for this study. GS&P also presented a draft purpose and need statement.

STAKEHOLDERS MEETING #1 – Held on December 10, 2007

GS&P presented stakeholders with similar information to the information given to local officials. Stakeholders voiced some concerns about existing conditions in the study area. Three teams were formed to help identify problems in the Elrod Road corridor, which were used to develop the purpose for this study. The attendance list, meeting minutes and results from the team activity can be found in Appendix J.

PUBLIC MEETING #1 – Held on February 7, 2008

GS&P further developed the presentation used in the stakeholders meeting to include draft environmental findings, preliminary traffic volumes and crash data. The presentation included environmental considerations, traffic volumes, crash history, draft purpose and need, design considerations, and schedules. Two hundred-and-three people attended and were given the opportunity to participate in an issues exercise. The attendees indicated that their top three concerns were 1) narrow lanes, shoulders, sharp curves, lack of striping and poor visibility (35.3%), 2) too much congestion/increased traffic (33.8%), and 3) lack of access to the Natcher Parkway (17.6%).

LOCAL OFFICIALS MEETING #2 – Held on April 28, 2008

The project team reviewed the inventory of existing conditions at this meeting and the input received from the first public meeting. The top concerns were:

- Too much congestion/increased traffic
- Poor visibility
- Narrow lanes
- Lack of striping
- Narrow shoulders
- Too many driveways
- Sharp curves
- No bike facilities
- Large vehicles (trucks, tractors, RVs)
- No pedestrian facilities
- Lack of access to Natcher Parkway
- Other (see below)
    - Speeding
    - Frequent cracks and potholes
    - Too many traffic lights
    - Traffic lights not in sync
    - Drivers not observing 3-way stop at Smallhouse Road and Elrod Road

Previously, the team decided it would only examine two types of interchanges: diamond interchange and a folded (flop) interchange. They also determined that the alignment should be staged in phases for construction to allow for separate funding sources to apply to different sections.

The practical application of the betterment procedure on the typical sections, often known as "practical solutions", was also formally presented. The project team also informed the local officials of the steps involved in selecting the three alternatives including a no-build alternative. GS&P shared preliminary cost estimates with the public officials as well.

STAKEHOLDERS MEETING #2 – Held on May 8, 2008

GS&P presented the same information to the stakeholders as was presented to the local officials. The team requested that stakeholders provide input on a form that was then used to quickly develop a snapshot of public opinion. GS&P then developed three forms to cover different areas of potential concern. The meeting minutes and attendance list can be found in Appendix J.

PUBLIC MEETING #2 – Held on May 29, 2008

A complete review of the input received from Public Meeting #1, as well as previous Stakeholder meetings, was presented to the public. This was the first opportunity that the public had to see and give input on the alternatives, typical sections and the interchange types. None of the build alternatives were strongly supported by the public as indicated in Figure 4-10. All public input was gathered from attendees and was compiled and presented at the final team meeting held on July 31, 2008. The survey forms that were used as well as the PowerPoint presentations for each of the public meetings can be found in Appendix J.

Elrod Road/Natcher Parkway Interchange Study Exercise Results Public Meeting #2: May 29, 2008				
Step 1: Interchange Alternative	Like the Best	Like Some Aspects	Like the Least	Composite (Percent of Possible Points)
A	19	13	9	30.1%
B	13	17	12	27.8%
C	12	9	36	29.4%
Do Nothing	13	0	0	12.7%
TOTAL RESPONSES	57	39	57	306.0

Figure 4-10 - Results of Public Meeting #2 Exercise

5.0 Recommendations

The *project goals* for the proposed Elrod Road Interchange at Natcher Parkway according to the accepted purpose and need are as follows:

- Meet the needs of rapid residential and commercial growth in southern Bowling Green
- Attempt to alleviate congestion on US 231 (Scottsville Road), KY 884 (Three Springs Road) and US 31W (Nashville Road) by providing additional access to Natcher Parkway
- Improve mobility in the study area network for motorists, pedestrians, bicyclists and transit users
- Improve the safety and efficiency of travel in the Elrod Road / Smallhouse Road area

Utilizing the traffic forecasting analysis and comparing each of the alternatives, GS&P developed a matrix that would give a snapshot of how each alternative compared against all available options, including the no-build option. The method used to compare each alternative was color coded, with GREEN having the most favorable result, YELLOW having moderate results, and RED having poor results. While this system seems very simple, GS&P analyzed the actual assignment of each color very closely by examining information received from the public input efforts or analysis conducted over the course of this preliminary design process.

ELROD ROAD INTERCHANGE PROJECT
EVALUATION FACTORS

Evaluation Factor	No Build	Alt. A	Alt. B	Alt. C	A Intchg.	B Intchg.	C Intchg.
Safety							
Mobility							
Connectivity							
Access							
Disruption to Existing Neighborhoods							
Economic Development							
Property Impacts							
WKU Impacts							
Impacts to Churches							
Impacts to Parks							
Costs							
Impact on New School							
Congestion							
Lane/Shoulder Widths							
Multi-modal							
Public Acceptance							
Constructability							

Table 5.1 – Alternative Evaluation Factors Quick Glance

Ultimately, while the alternatives do meet some of the requirements of the purpose and need, the traffic forecasting report made it clear that a new interchange and associated improvements would adversely impact not only the Elrod Road corridor but also the secondary streets. The benefits that each alternative presented were negated when the effects to the surrounding areas were factored in. The team recommended that a ***no-build*** option be selected due to the data presented above.

The final recommendation for the study includes:

- *No interchange built at this location.*
- *Safety improvements along Smallhouse Road (Spot Improvements) from KY 884 to Cave Mill Road.*
- *An interchange feasibility study for a site on I-65 south of the I-65/Natcher Parkway Interchange.*

The study further advises that the recommendations be implemented in accordance with the schedule below in order to support traffic flow and growth in southern Warren County and increase safety in the study area.

Project & Agency Responsible	Description	Time Frame	Costs
Smallhouse Safety Improvements (Curves) – Warren County	Improve radii at curve near Trinity Freewill Baptist Church and Griffin Park	Immediate (<1 year)	N/A*
Smallhouse/Elrod Intersection Improvement – Warren County	Improve intersection through either a roundabout or by creating a T-intersection with continuous flow from Smallhouse west to Elrod Road. In addition, straighten curve just east of intersection on Smallhouse Road.	Near Term (<5 years)	$100,000 (Design) $400,000 (Right of Way) $100,000 (Utilities) $400,000 (Construction)
I-65 Interchange Feasibility Study – Kentucky Transportation Cabinet	Conduct an interchange feasibility study to improve access to I-65 from Southern Warren County in the general area of the proposed Southwest Parkway.	Near Term (<5 years)	$350,000 (Planning)
Smallhouse Road Widening – City of Bowling Green	Update Smallhouse road to a three-lane section with curb and gutter to allow for left turn lanes.	Mid-Term (5 to 10 years)	$250,000 (Design) $750,000 (Right of Way) $750,000 (Utilities) $2,500,000 (Construction)

*Improvement being done by Holy Spirit Catholic Church as part of the development plans for the new church

Table 5.2 – Recommended Improvements

GS&P anticipated that our third and final public meeting would be held at Griffin Park, but because the no-build option was recommended, the public was informed through the local district Website, local newspaper article and through the flyer in Figure 5.1 that a no-build option was being recommended.

A final stakeholders meeting was held on September 4, 2008 where the recommendation was presented. The project team also tasked the stakeholders with getting this information to their neighbors as another means of information distribution.

Elrod Road/Natcher Parkway Interchange Study

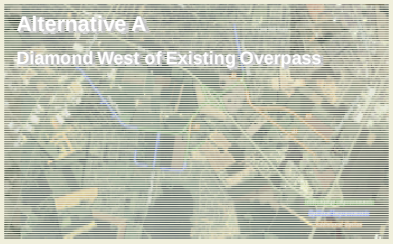
Warren County • Item 3-130.00

Draft Recommendation

Project Purpose

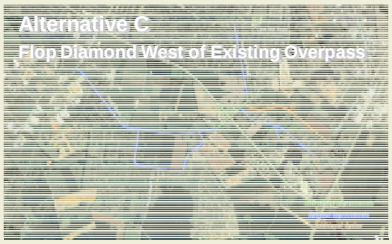
The purpose of this interchange study is to improve the safety and efficiency of travel in the Elrod Road/Smallhouse Road area and to provide better connection for travelers along this existing transportation network to the Natcher Parkway while minimizing disruption to existing neighborhoods .

Comparison of Interchange Options



- Minimizes impacts to properties surrounding the interchange.
- Impacts properties on Smallhouse Road northwest of overpass and WKU.
- Requires connector road(s) to existing Elrod Road.
- Costs $9.2m
- Does not improve congestion
- Preferred by public but only by a small margin.

- Minimizes impacts to properties surrounding the interchange.
- Minimizes non-accessible land on WKU Agricultural Farm.
- Impacts properties on Elrod Road north of overpass.
- Requires the existing overpass to be removed.
- Costs $7.1m
- Does not improve congestion
- Not preferred by public.



- Minimizes the footprint and utilizes as much of the existing Elrod Road as possible.
- Minimizes impacts to access for properties along existing Elrod Road in the vicinity of the interchange.
- Creates maintenance of traffic difficulties during construction.
- Costs $6.8m
- Does not improve congestion.
- Least preferred by public.

PUBLIC MEETING EXERCISE RESULTS
Public Meeting #2: May 29, 2008

Interchange Alternative	Like the Best	Like Some Aspects	Like the Least	Composite (Percent of Possible Points)
A	19	13	9	30.1%
B	13	17	12	27.8%
C	12	9	36	29.4%
Do Nothing	13	0	0	12.7%
Total Responses	57	39	57	306

EVALUATION FACTORS

Evaluation Factor	No Build	Alt. A	Alt. B	Alt. C
1. Purpose and Need	Poor	Fair	Fair	Fair
2. Disruption to Existing Neighborhoods	Good	Fair	Fair	Good
3. Economic Development	Fair	Good	Good	Good
4. Property Impacts	Good	Fair	Poor	Good
5. WKU Impacts	Good	Poor	Fair	Fair
6. Impacts to Churches	Good	Good	Poor	Fair
7. Impacts to Parks	Good	Good	Good	Good
8. Costs	Good	Fair	Fair	Good
9. Impact on New School	Fair	Good	Good	Good
10. Alignment	Fair	Good	Good	Good
11. Lane/Shoulder Widths	Poor	Good	Good	Good
12. Multi-modal	Poor	Fair	Fair	Fair
13. Public Acceptance	Fair	Fair	Fair	Fair
14. Constructability		Good	Fair	Fair

Good Fair Poor

Conclusions

- The alternatives range from $6.8 to $9.2 and would aid in economic development (residential growth) in the area.
- None of the alternatives would reduce traffic congestion in the area.
- Public support for the alternatives was not strong. Parishioners who live outside the area seemed to be the most vocal supporters.
- All alternatives would result in some level of disruption to either homes, WKU or the churches, and Alternatives B and C would be difficult to build while maintaining traffic flow due to removing the existing overpass.
- Development of an interchange would require City/County to complete the road projects on Smallhouse Road and Elrod Road in Study Area first.

Draft Recommendation

- *NO INTERCHANGE BE BUILT AT THIS LOCATION*
- *SAFETY IMPROVEMENTS BE MADE ALONG SMALLHOUSE ROAD*
- *INTERCHANGE FEASIBILITY STUDY BE CONDUCTED FOR SITE SOUTH OF THE I-65/NATCHER PARKWAY*

Figure 5.1 – Recommendation Flyer