II. EXISTING CONDITIONS

Characteristics of highways in the study area (KY 1460 and KY 1426) are identified in the following sections. Information is included on transportation systems, geometric characteristics, bridges, traffic conditions, vehicle crash history, adequacy ratings, environmental features, and geotechnical concerns. Applicable features are summarized from the KYTC Highway Information System (HIS) database as of October 2007 unless otherwise noted.

A. Highway Systems

Major highway systems information is shown for the study routes in **Table 2.1**, including the State Primary Road System, Functional Classification System, National Highway System (NHS), National Truck Network (NN), and Designated Truck Weight Class. System descriptions for the main classifications are listed below.

- State-maintained roads in Kentucky are classified into one of five categories under the State System, ranging from the highest order classification to the lowest as follows: Interstates, Parkways, Other State Primary roads, Rural Secondary roads, and Supplemental roads.
- One of 13 functional classification categories is assigned to each state-maintained road in Kentucky, based on the function the road provides and whether the location is urban or rural. These are classified from highest to lowest and by geographic designation such as: Rural Interstate, Urban Interstate, Other Rural Freeways and Expressways (Principal Arterial), Other Urban Freeways and Expressways (Principal Arterial), Other Rural Principal Arterial, Other Urban Principal Arterial, Rural Minor Arterial, Urban Minor Arterial, Rural Major Collector, Urban Collector, Rural Minor Collector, Rural Local, and Urban Local.
- The National Highway System (NHS), first established in 1991 by the Intermodal Surface Transportation Efficiency Act (ISTEA), includes Interstate Highways and other significant Principal Arterials important to the nation's economy, defense, and mobility.
- The National Truck Network (NN) includes roads designated for use by commercial trucks with increased dimensions (102 inches wide; 13 feet, 6 inches high; semi-trailers up to 53 feet long; and trailers up to 28 feet long – not to exceed two trailers per truck).
- Kentucky Revised Statutes require weight limits on the state-maintained highway system. There are three (3) weight classification limits: (1) AAA – 80,000 lbs. maximum gross vehicle weight; (2) AA – 62,000 lbs. maximum gross vehicle weight; and (3) A – 44,000 lbs. maximum gross vehicle weight. For special circumstances, occasional exceptions may be granted for over-dimensional or overweight vehicles.

B. Geometric Characteristics

Geometric characteristics for the two major routes in the study area are listed in **Table 2.2**, including the number of lanes, lane widths, shoulder widths, roadway type, local terrain, and route speed limits.

Table 2.1 - Highway Systems Information

	KY 1460	KY 1426
State Primary System	State Secondary	State Secondary
National Truck Network (NN)	No	No
National Highway System (NHS)	No	No
Functional Classification	Urban Minor Arterial	Urban Minor Arterial
Truck Weight Class	A/AAA	AAA
Appalachian Development Highway System	No	No
Bike Route	No	No
Coal Haul (annual tons)	None	478,076
Extended Weight System	No	Yes
Forest Highway System	No	No
Scenic Byway System	No	No

Table 2.2 - Geometric Characteristics Information

KY 1460
Pike County – MP 4.100 to MP 5.100 o Undivided, two lane highway o Rolling to Mountainous terrain o 10 to 12 foot lane widths with 1 to 2 foot shoulders o 45 mph posted speed limit o 0% passing sight distance
KY 1426
Pike County – MP 5.500 to MP 6.600 o Undivided, two lane highway o Mountainous terrain o 12 foot lane widths o Shoulders vary from 2 foot curb to 11 foot paved shoulder o 45 mph posted speed limit o Passing sight distance data unavailable

C. Bridges

Two structures lie within the project area.

At milepoint 4.639 on KY 1460, a 26 foot long culvert spans Lower Chloe Creek. With a sufficiency rating of 82.6, this bridge is neither functionally obsolete nor structurally deficient.

Just north of the Huffman Avenue/Summit Drive intersection on KY 1426, Chloe Creek passes under the roadway again in a reinforced concrete box culvert. This structure is 144 feet long with a 10 foot wide cross-section. Bridge ratings are not available for this structure.

Culverts under KY 1460 (top) and KY 1426 (bottom)

D. Traffic and Operations

Existing (Year 2007) and estimated future traffic and operational conditions for each major route in the study area are discussed in the following subsections.

1. 2007 Volumes and Performance

Historic traffic volume information from the KYTC CTS database and turning movement counts conducted in August 2007 provided an overview of traffic conditions in the existing transportation network. **Figure 2.1** shows the most recent annual daily traffic (ADT) volumes in the study area. **Figure 2.2** shows the results of the turning movement counts at the primary study intersections for both AM (7:00 - 8:00 a.m.) and PM (2:45 - 3:45 p.m.) peak hours. An early PM peak hour was used to capture the effects of school traffic.

Level of Service (LOS) is a qualitative measure of highway traffic conditions, as defined in the *2000 Highway Capacity Manual* (HCM), published by the Transportation Research Board (TRB). Individual levels of service characterize these conditions in terms of speed, travel time, freedom to maneuver, traffic interruptions, and comfort and convenience. Six levels of service are defined and given letter designations from A to F, with LOS A as the best condition, representing free flow conditions, and ranging to LOS F, the worst condition, representing severe congestion and/or time delays. Typically, a minimum of LOS D is considered acceptable in urban areas and LOS C is considered acceptable in rural areas.

Analysts used Synchro 7 and SimTraffic 7, standard traffic analysis applications, to analyze the LOS at key study intersections. Because of the close spacing between intersections, considering only the LOS for each intersection does not provide a full indication of system performance. Additional measures were evaluated on a network-wide basis to provide a comparative basis for later alternative evaluations. Key parameters reported include:

- Delay Per Vehicle – The amount of time, in seconds, a single vehicle was delayed (due to intersection control devices or other traffic) while traveling through the network;
- Total Delay – The total hours of delay experienced by all vehicles in the network during the analysis period: 60 minutes for this exercise;

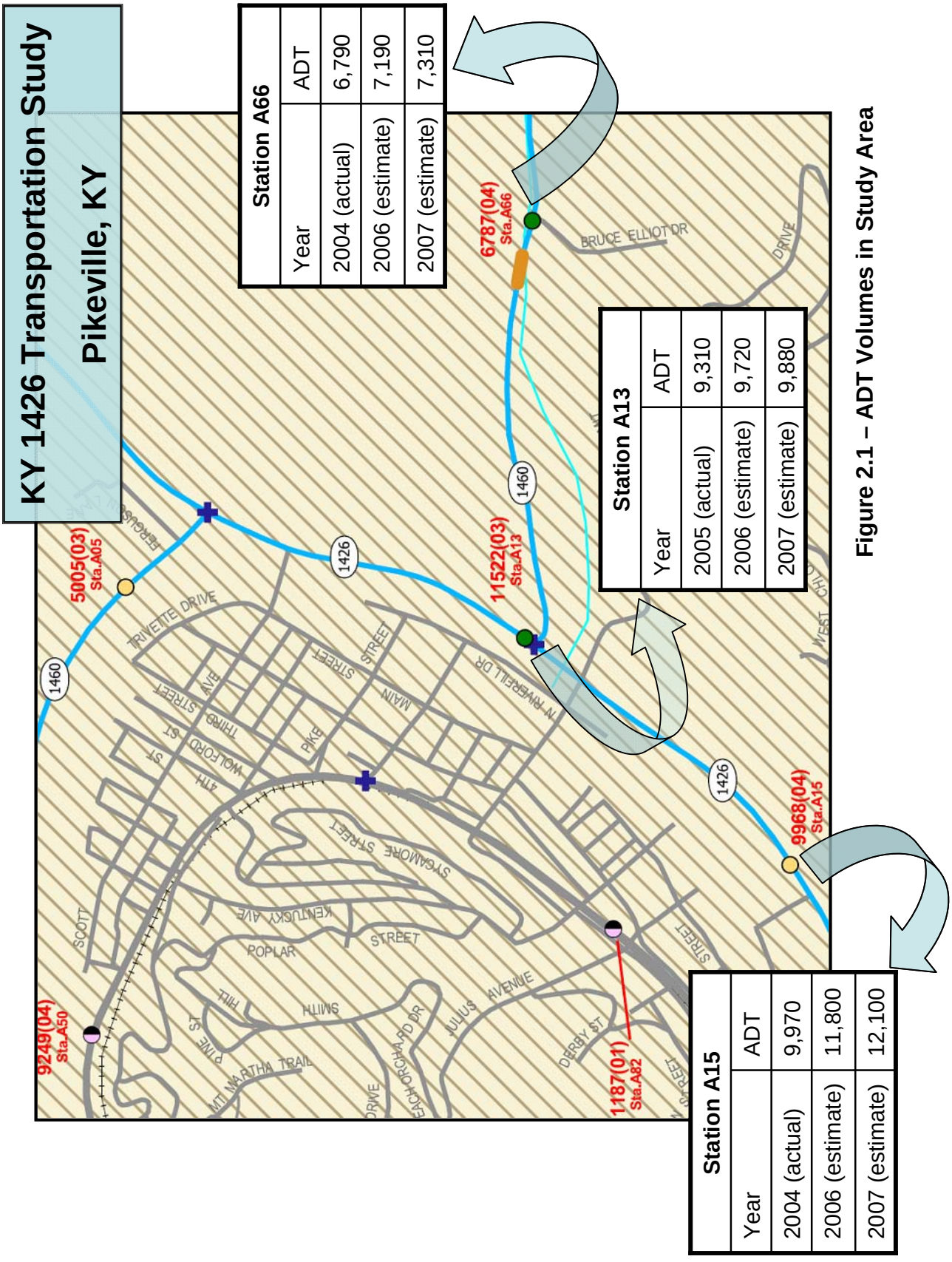
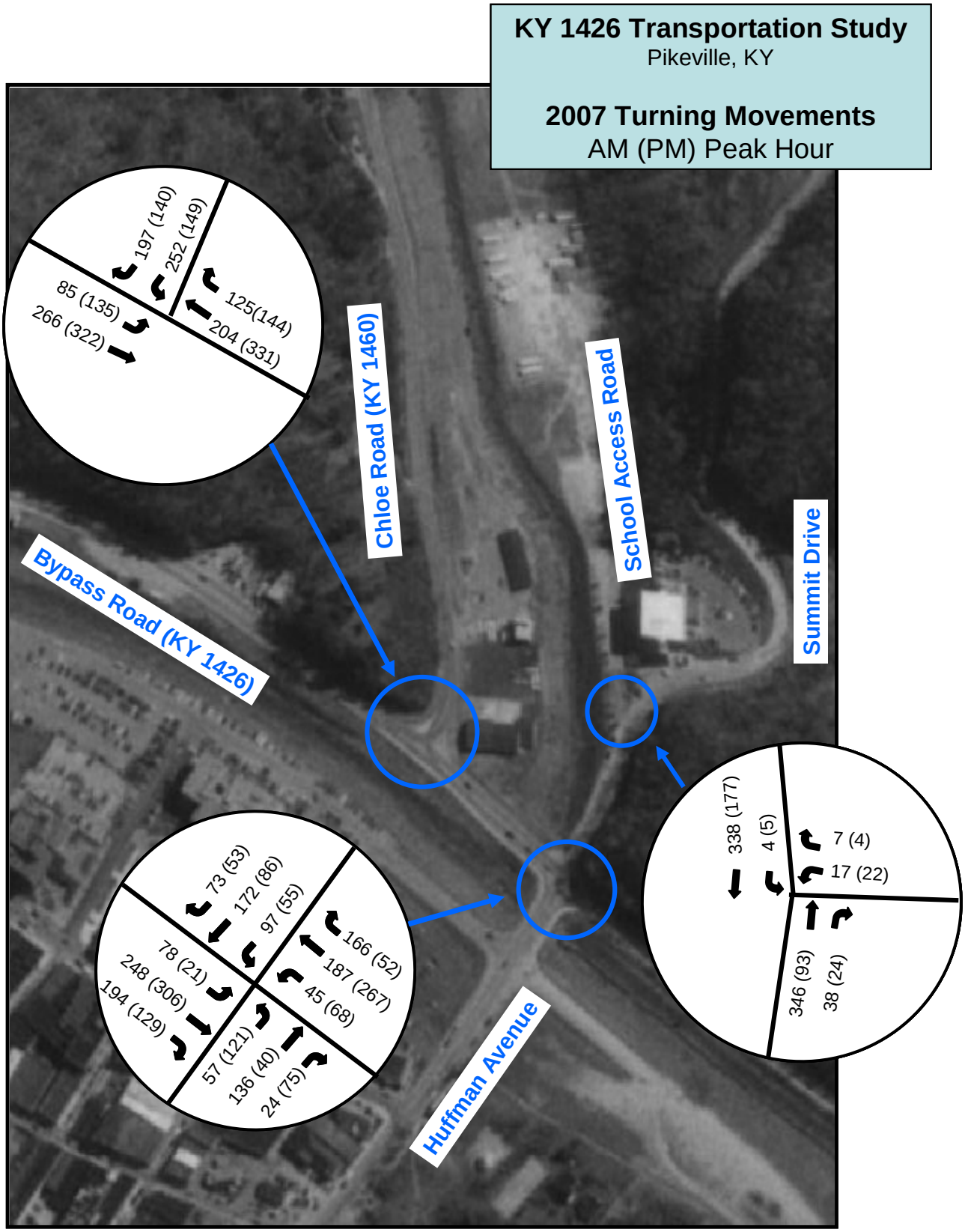


Figure 2.1 – ADT Volumes in Study Area

Figure 2.2 – 2007 Hourly Volumes at Key Intersections



- Total Stops – The total number of times all vehicles traveling through the network during the 60 minute analysis period dropped below a speed of 10 mph;
- Travel Time – The total time spent by all vehicles in the network or waiting to enter the network during the analysis period;
- Average Speed – The average speed throughout the network, including stopped time and time spent waiting to enter the network, given in mph; and
- Conflict Points – The number of locations within an intersection where vehicle paths merge, diverge, or intersect.

Results are summarized in **Table 2.3** for the AM and PM peak hours, based on the existing geometrics and control devices.

Table 2.3 – Performance Measures for 2007 Existing Network

Measure	AM Peak	PM Peak
Delay Per Vehicle (sec)	85.2	35.6
Total Delay (hr)	48.2	17.9
Total Stops	3,279	1,781
Travel Time (hr)	83.0	47.5
Average Speed (mph)	14	22
Conflict Points - Network wide	50	50
Conflict Points - Bypass	41	41
LOS at Key Intersections		
KY 1426 at Huffman	D	C
KY 1426 at KY 1460	B	C
School Access at Summit Dr*	B	B

**Note: LOS reported for stop-controlled approach at unsignalized intersections*

Analyzed intersections along KY 1426 operate at LOS C during the PM peak hour. During the AM peak hour period, peak school traffic volumes and peak daily commuter volumes overlap: volumes accessing the school and traveling inbound on KY 1460 are higher than during the PM peak hour. This results in increased delays, worse LOS, and longer queues at intersections.

Pikeville Elementary School significantly impacts traffic operations during the peak hours: high volumes of cars access the site during a 15-30 minute peak as students are dropped off and picked up. Cars arrive before the school day ends then must wait to pick up students; local input and field observation confirm that afternoon traffic queues up and affects operations along Summit Drive to the KY 1426 intersection.

2. Future Volumes and Performance

Annual growth throughout the study area was examined based on historic traffic growth rates and community development patterns. The aggressive terrain severely limits developable space in the region; over the last 20 years, traffic volumes on the study area highways have grown by less than 1% per year.

Assuming no improvements to the existing infrastructure, the analysis was repeated with various annual growth rates to determine operational conditions for a future No Build scenario. It is unlikely that actual volume increases will reach even 1% annually; the school's student capacity will limit traffic growth for this institution, and the majority of the Chloe Ridge neighborhood is developed already. By 2030, assuming 1% growth, the KY 1426 intersection with Huffman degrades to LOS F for the AM period; all other

intersections analyzed were within acceptable levels. As expected, other performance measures increased (with the exception of average speed, which decreased) with the increase in vehicles for both analysis periods, indicating performance deteriorates.

E. Crash History

To analyze vehicle crash history trends, crash records were assimilated from the KYTC-maintained CRASH database for reported incidents from 2002 to 2006. Wilbur Smith Associates (WSA) used the methodology developed by the Kentucky Transportation Center (KTC). This analysis locates roadway "segments" based upon traffic volumes and geometric characteristics to identify crash concentrations. It also determines the location of 1/10 mile "spots" which demonstrate high crash frequencies. Each segment or spot is assigned a critical rate factor (CRF) based on formulas published by KTC. The CRF is one measure of the safety of a road; it compares the crash rate to the average crash rate for sections of roadway of the same functional classification throughout the state. If the CRF is 1.00 or greater, it is assumed that crashes are happening due to circumstances that cannot be attributed to random occurrence.

If a location has a high CRF, it should be studied more specifically to ascertain if there are remedial actions that should be taken to improve the overall safety of the facility. Computations for the segments and key spots (with a CRF > 0.90) along the primary roadways are summarized in **Table 2.4**. Spots/segments with a CRF greater than 1.0 are shown in red for added emphasis.

Table 2.4 – High CRF Segments and Spots

Spot or Segment	Location			Length	Crashes				Critical Rate Factor (CRF)
	Route	BMP	EMP		Fatal	Injury	PDO	Total	
Segment	KY 1460	4.100	5.100	1.000	0	10	47	57	**1.15**
Segment	KY 1426	5.500	6.187	0.687	0	13	48	61	**1.10**
Segment	KY 1426	6.187	6.600	0.413	0	5	25	30	0.97
Spot	KY 1426	5.610	5.710	0.100	0	3	19	22	**1.82**
Spot	KY 1426	6.100	6.200	0.100	0	6	21	27	**2.47**
Spot	KY 1426	6.200	6.300	0.100	0	4	6	10	0.95
Spot	KY 1426	6.496	6.596	0.100	0	1	9	10	0.95
Spot	KY 1460	4.295	4.395	0.100	0	2	7	9	**1.05**
Spot	KY 1460	4.420	4.520	0.100	0	2	8	10	**1.17**
Spot	KY 1460	4.540	4.640	0.100	0	0	12	12	**1.41**
Spot	KY 1460	5.000	5.100	0.100	0	1	7	8	0.94

The spot with the highest crash rate lies on KY 1426 between the KY 1460 and Huffman Avenue/Summit Drive intersections (CRF = 2.47). KY 1460 and KY 1426 south of the KY 1460 intersection appear as high CRF segments in their entirety. The segment of KY 1426 north of the KY 1460 intersection has a CRF approaching 1.00 as well. The majority of the project area exhibits crash rates above state averages.

To gain a better understanding of prevailing trends and probable causation factors, analysts investigated crash data in light of severity and type. Crashes were divided into one of three severity categories: fatality, injury, or property damage only (PDO); no fatality crashes occurred in the project area during the analysis period. Analysts also investigated crash data based on crash type. Crash type trends (divided between the categories described below) suggest causation trends and provide valuable insight to mitigation strategies. The type classifications used to define cause include:

- Rear Ends – one car impacts the rear end of another which may be stopped or moving;
- Single Vehicle – a single vehicle impacts an external object (excluding another vehicle);
- Angle – one car is making a turning movement to/from an intersecting side road or entrance; and
- Other – all other accident types.

Figure 2.3 shows the location of reported vehicle crashes and presents the results of the investigation for the two high CRF spots falling in the project area.

Additional investigation was completed for the 1/10-mile spot occurring at KY 1426 between the intersections with KY 1460 and Huffman Avenue/Summit Drive (milepoints 6.1-6.2). At this spot, the majority of crashes (21 of 27) involved a vehicle stopping on the bypass; a second vehicle then either rear ended the stopped car or departed the driving lane to avoid collision. This suggests that frequent stops on KY 1426 (likely due to close intersection spacing and/or current signal timings) are contributing to the frequency of crashes. Analysts noted that there was an even directional distribution and that the majority of crashes (18 of 27) occurred in dry conditions. The distribution of crashes by time period at this spot, as shown in **Figure 2.4**, corresponds well to the number of cars on the road, with a slightly higher number occurring during 6 AM – 9 AM.

F. Adequacy Ratings

The KYTC HIS database provides an adequacy rating percentile for state-maintained arterials and most major collectors. The composite rating is based on the condition, safety, and service component scores of the route. The Condition Index considers only the condition of the road's pavement. The Safety Index is evaluated based on lane width, shoulder width, median widths, alignment, and critical Crash Rate Factors. The Service Index considers the route's Volume-to-Capacity (V/C) ratio and access control.

Table 2.5 depicts the adequacy ratings assigned to portions of the routes. Safety is the primary category affecting composite scores for both KY 1460 and KY 1426. Two of six segments fall into the lowest composite adequacy quartile statewide; all segments but one have a composite adequacy percentile less than 50%.

Figure 2.3 – High Crash Spot Data

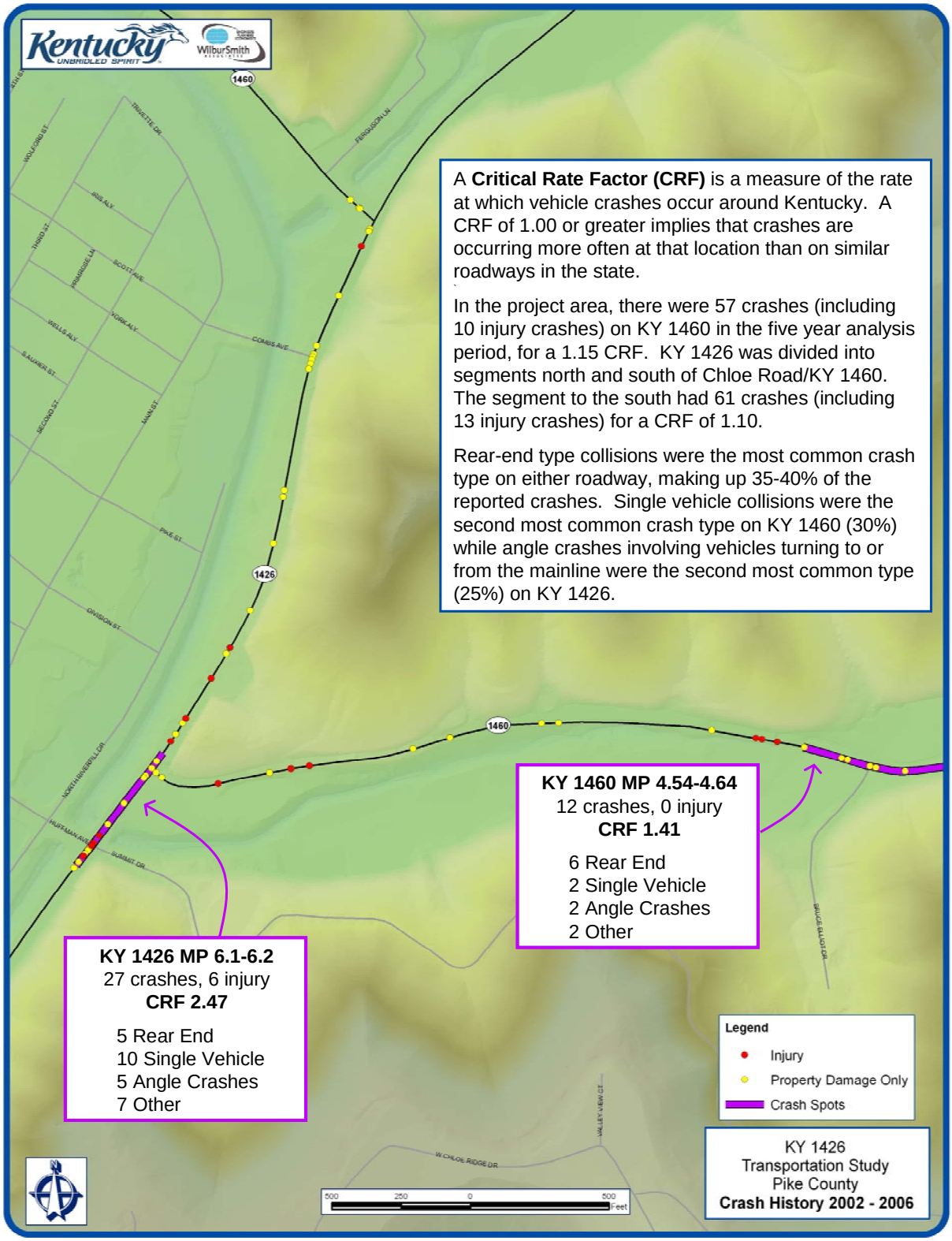


Figure 2.4 – Time Distribution of Crashes at Spot (KY 1426 MP 6.1-6.2)

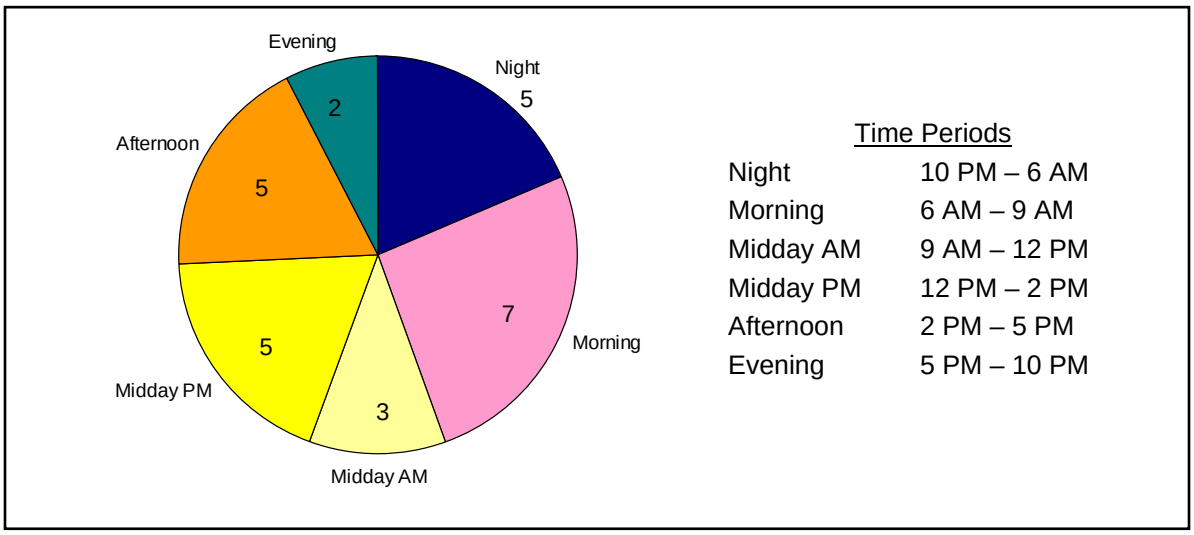


Table 2.5 - Adequacy Ratings

Begin MP	End MP	Section Length (miles)	Composite Adequacy Rating	Composite Adequacy Percentile	Safety Component	Service Component	Condition Component
KY 1460: MP 4.100 to MP 5.100							
4.100	4.802	0.702	44.1 of 100	13.20	1.6 of 45	20.0 of 25	22.5 of 30
4.802	5.070	0.268	58.1 of 100	27.60	25.6 of 45	10.0 of 25	22.5 of 30
5.070	5.100	0.030	75.6 of 100	68.56	25.6 of 45	20.0 of 25	30.0 of 30
KY 1426: MP 5.500 to MP 6.600							
5.500	6.025	0.525	63.6 of 100	38.27	13.6 of 45	20.0 of 25	30.0 of 30
6.025	6.165	0.140	62.6 of 100	36.53	13.6 of 45	19.0 of 25	30.0 of 30
6.165	6.600	0.435	44.1 of 100	13.20	1.6 of 45	20.0 of 25	22.5 of 30

G. Environmental Features

A variety of natural and man-made environmental features can be found in the project area. **Figure 2.5** provides an environmental footprint map for the study area.

1. Natural Resources

The project area lies on the eastern side of Pikeville; KY 1426 provides an eastern bypass of the city. To the east of KY 1426, the mountainous terrain common to the region rises on either side of KY 1460. Chloe Creek flows alongside both KY 1426 and KY 1460, crossing KY 1460 at a culvert near milepoint 4.639 and crossing KY 1426 just north of the Huffman Avenue/Summit Drive intersection.

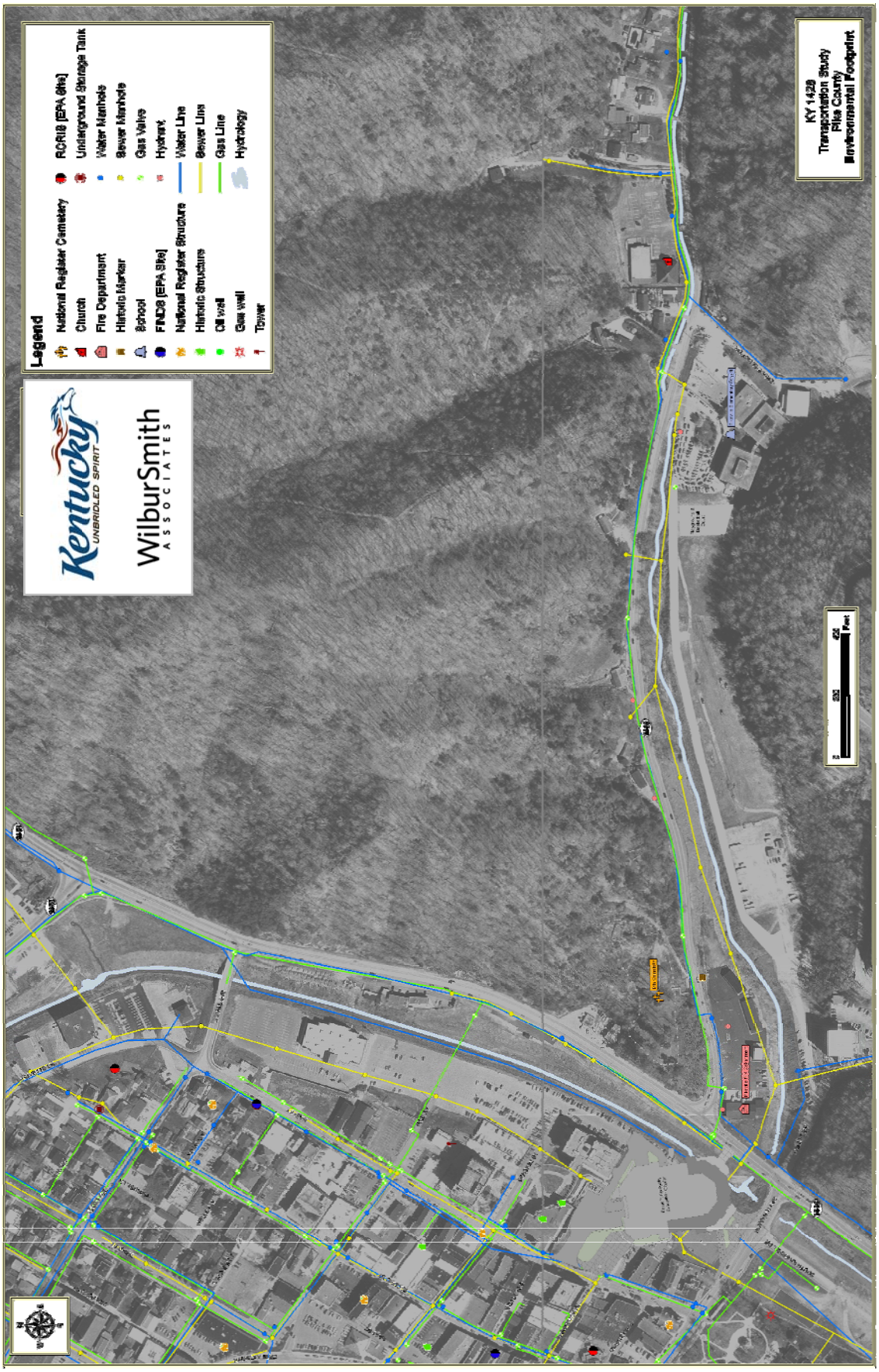


Figure 2.5 – Environmental Footprint

2. Man-made Resources

A number of community resource buildings lie along the study roadways: Pikeville Elementary School, the Pikeville Fire Station, the Eastern Kentucky Exposition Center, and several businesses. A historic cemetery sits atop a hill in the northeast quadrant of the KY 1426/KY 1460 intersection. There is also a historic marker along KY 1460 approximately 450 feet beyond the intersection with KY 1426. Gas, sewer, water, electric, telephone, and cable lines run along both roadways. There are several churches and historic structures near the project area, but these do not lie within the immediate vicinity likely to be impacted by any build scenarios.

H. Geotechnical Concerns

A known rockfall hazard occurs along KY 1426 between the intersections with KY 1460. A 120 foot tall rock cut on the eastern side of KY 1426 lies from 12.5-22 feet from the edge of the roadway. In the immediate vicinity of the recurring rockfalls, the average clearance is approximately 16 feet. Shales and sandstones primarily compose the embankment. Maintenance forces routinely must remove fallen stones from along the roadway; in 2007, this portion of KY 1426 had to be closed due to a rockfall event.