APPENDIX B – TRAFFIC FORECAST REPORT
Traffic Forecast Report and Bike/Ped Accommodation Assessment for Barren County Scoping Study - Major Widening on KY-90 Item No. 03-8819.00

Prepared for:

Prepared by:
Justin Harrod
Division of Planning
Kentucky Transportation Cabinet
October 22, 2015
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Commonly Used Abbreviations and their Descriptions

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>ADT</td>
<td>Average Daily Traffic</td>
</tr>
<tr>
<td>ATR</td>
<td>Automatic Traffic Recorder</td>
</tr>
<tr>
<td>BCI</td>
<td>Bicyclists Comfort Index</td>
</tr>
<tr>
<td>D-Factor</td>
<td>Directional Factor</td>
</tr>
<tr>
<td>DHV</td>
<td>Design Hour Volume</td>
</tr>
<tr>
<td>ESAL</td>
<td>Equivalent Single Axle Load</td>
</tr>
<tr>
<td>FC</td>
<td>Functional Class</td>
</tr>
<tr>
<td>GR</td>
<td>Growth Rate</td>
</tr>
<tr>
<td>K-Factor</td>
<td>K-30th hour Factor</td>
</tr>
<tr>
<td>KYSTM</td>
<td>Kentucky Statewide Model</td>
</tr>
<tr>
<td>MP</td>
<td>Mile Point</td>
</tr>
<tr>
<td>PHF</td>
<td>Peak Hour Factor</td>
</tr>
<tr>
<td>RUCA</td>
<td>Road User Cost Analysis</td>
</tr>
<tr>
<td>T%</td>
<td>Truck Percentage</td>
</tr>
</tbody>
</table>

Without any adjustment
A permanent & continuous recording station
Ratings of bicyclists’ comfort level
Percentage of dominant flow to total
30th highest hour of a year
A measure of traffic’s impact on roadway
Refers to a road’s importance
A value normally compounded annually
DHV divided by ADT (DHV/ADT)
A computerized representation of KY roads
Miles increase easterly and northerly
Considers a 15 minute spike in an hourly count
The total cost to daily users and overall Project
The number of trucks divided by total volume
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Vicinity Map

KY-90
Station 005D40
MP 0.300
2015 ADT = 9,000

KY-90
Station 005D35
MP 0.700
2013 ADT = 8,200
2013 T% = 17.1%

KY-90
Station 005D37
MP 1.300
2014 ADT = 9,000

KY-90
Station 005B30
MP 8.300
2015 ADT = 9,100
2015 T% = 16.1%

Legend

Scoping Study-Widening
Traffic Count Station

Barren County
Major Widening on KY-90
Item #03-8819.00

KYTC Division of Planning
Traffic Forecast Executive Summary

Barren County: Scoping Study - Major Widening on KY-90
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Traffic Forecast Executive Summary
Barren County: Major Widening
Item No. 03-8819.00

FORECAST SUMMARY
This project calls for a scoping study for major widening from Sanders Street in Cave City to US-68 (Glasgow Outer Loop) in Glasgow. The purpose of this report is to analyze current and future traffic utilizing KY-90 between MP 0.160 to MP 8.574.

FORECAST TYPE
The following types of forecasts were developed:

- 2015 and 2040 Average Daily and Design Hourly Truck Percent Forecasts
- 2015 and 2040 ADT and DHV values
- 20-year ESALs
- Bicycle and Pedestrian Accommodation Assessment

DESIGN-YEAR/GROWTH FACTORS
The Kentucky State Data Center forecasts that Barren County’s population will increase 0.70% annually over the next 20 years. Exponential growth analyses performed on historical data at traffic stations 005D40(MP 0.300), 005D35(MP 0.700), 005D37(MP 1.300), and 005B30(MP 8.300) on KY-90, suggests traffic volumes have been increasing. Therefore, a growth rate of 1.10% was used for the purpose of this forecast.

TRUCK PERCENTAGE
The truck percentage was estimated based on a 24-hour classification count at Station 005D35 at MP 0.700. Therefore, a truck percentage of 17.1% and a growth rate of 0.50% were used for the purpose of this forecast.
Summary Map

Major Widening on KY-90
MP 0.160 to MP 8.574
2015/40 ADT = 9,000/12,000
2015/40 DHV = 1,100/1,400
2015/40 %T (ADT) = 17.1%/19.0%
2015/40 %T (DHV) = 11.4%/12.9%
20 Year ESALs = 8,100,000

Barren County
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Legend

- Scoping Study-Widening
- Traffic Count Stations

0 1.5 3
Miles

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**FORECAST OF EQUIVALENT SINGLE AXLE LOAD ACCUMULATIONS-4 LANE (20-year)**

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<th>ROUTE ID:</th>
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<tbody>
<tr>
<td>County</td>
<td>Barren</td>
</tr>
<tr>
<td>Road Name</td>
<td>Happy Valley Rd.</td>
</tr>
<tr>
<td>Functional Class</td>
<td>6 - Rural Minor Arterial</td>
</tr>
<tr>
<td>Project Description</td>
<td>KY-90 Scoping Study - Major Widening</td>
</tr>
<tr>
<td>Scenario</td>
<td>Build</td>
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<td>Segment Description</td>
<td>Same</td>
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<table>
<thead>
<tr>
<th>Full Route Unique Identifier</th>
<th>005-KY-0090-000</th>
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<tr>
<td>Date</td>
<td>10/05/15</td>
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<tr>
<td>Forecaster</td>
<td>Justin Harrod</td>
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<table>
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<tr>
<th>REFERENCES:</th>
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<tbody>
<tr>
<td>Previous Forecasts</td>
<td>None</td>
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| Traffic Volume | 005D40 |
| Milepoint      | 0.300 |
| Truck Percent  | 005D35 |
| Milepoint      | 0.700 |
| ESALs Information | 2013 Aggregated ESALS |
| Growth Rate    | 1.10% |

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<thead>
<tr>
<th>TRAFFIC PARAMETERS:</th>
<th>Present</th>
<th>Growth Rate</th>
<th>Construction Year</th>
<th>Median Year</th>
<th>Design Year</th>
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<tr>
<td></td>
<td>2015</td>
<td>2020</td>
<td>2030</td>
<td>2040</td>
<td></td>
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<tr>
<td>Volume (AADT)</td>
<td>6000</td>
<td>1.10%</td>
<td>6000</td>
<td>11000</td>
<td>12000</td>
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<tr>
<td>Percent Trucks (%)</td>
<td>17.10%</td>
<td>0.50%</td>
<td>18.00%</td>
<td>18.00%</td>
<td>19.00%</td>
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<tr>
<td>Number of Trucks</td>
<td>1500</td>
<td>1.6%</td>
<td>1700</td>
<td>2000</td>
<td>2300</td>
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<tr>
<td>Percent Trucks Hauling Coal (%)</td>
<td>0.00%</td>
<td>0.00%</td>
<td>0.00%</td>
<td>0.00%</td>
<td>0.00%</td>
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</table>

<table>
<thead>
<tr>
<th>Non-Coal Trucks:</th>
<th>Axles/Truck</th>
<th>ESALs/Axe</th>
<th>2015</th>
<th>2020</th>
<th>2030</th>
<th>2040</th>
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<tr>
<td>Axles/Truck</td>
<td>3.200</td>
<td>0.00%</td>
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<tr>
<td>ESALs/Axe</td>
<td>0.291</td>
<td>1.00%</td>
<td>0.306</td>
<td>0.339</td>
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<table>
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<td>Axles/Truck</td>
<td>0.000</td>
<td>0.000</td>
</tr>
<tr>
<td>ESALs/Axe</td>
<td>0.000</td>
<td>0.000</td>
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</table>

<table>
<thead>
<tr>
<th>ESAL CALCULATIONS:</th>
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<tbody>
<tr>
<td>10 Design ESALs in Critical Lane</td>
<td>3,500,000</td>
</tr>
<tr>
<td>20 Design ESALs in Critical Lane</td>
<td>8,100,000</td>
</tr>
<tr>
<td>40 Design ESALs in Critical Lane</td>
<td>21,000,000</td>
</tr>
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</table>

General Comments:

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**eLink to Detailed Traffic Forecast Files in ProjectWise**
Bicycle and Pedestrian Review for Project #03-8819.00

Project Overview:
- This is a corridor study for KY-90 (Happy Valley Road) in Barren County between Sanders Street in Cave City and extends to the intersection with US-68 including the city limits of Glasgow.

Local Governments/Regional Bicycle and Pedestrian Plan:
- The Glasgow Alternative Transportation Endeavor (GATE) Master Plan
  1. Project Descriptions - Chapter 5, pages 7 & 9
  2. Mapping - Greenway crossing KY-90 (Figure 3)
  3. Implementation Plans - Chapter 6, pages 2 & 3

- Cave City is also coordinating with Edmonson, Warren, and Hart Counties to develop a regional non-motorized transportation plan that includes the GATE Master Plan. This is in the early stages of development (no formal plan as of October 2015).
  [https://cavecitykentucky.wordpress.com/2015/07/10/cave-region-group-wants-to-create-trail-towns/](https://cavecitykentucky.wordpress.com/2015/07/10/cave-region-group-wants-to-create-trail-towns/)

Existing conditions:
- KY-90
  a. ADT range is 8400-9100
  b. Posted speed limit is 45 MPH (MP 0.160- MP 1.364)
  c. Posted speed limit is 55 MPH (MP 1.364-8.574)
  d. Paved shoulder space is 6‘ or greater
  e. The Bicyclists Comfort Index (BCI*) average for this corridor is a C. Some portions between MP 3.100-7.000 have a BCI of D.
  f. Current bicycle activity within the project corridor (low to moderate) (Figure 1)

Logical termini with in project limits:
- Cave City Area
  1. Brian Doyle Park
  2. Restaurants
  3. Mammoth Cave Wildlife Museum
  4. Grocery Stores
  5. Residential Areas (low income housing)
  6. Employment Centers
  7. Shopping Centers

- Glasgow Area
  1. Beaver Trail Park
  2. Poynters Lake
  3. Restaurants
  4. American Legions Park
The KYTC Bicycle and Pedestrian program team recommendations are:

 Entire Project Area (MP 0.160-8.560) - All treatments - Good, Better, and Best Scenarios

✓ Agreements should be created such that the local government is responsible for the incidental maintenance (cleaning/removal of debris, replacing markings, signage, and repair) of these pedestrian and/or bicycle facilities in their areas.
✓ Provide a 10 foot gap space every 40-60 feet within the rumble strip/stripes (Figure 5) on any constructed shoulder over 4 feet in width to better accommodate pedestrian and bicycle travel for the entire project area.
✓ Special consideration should be taken at MP 8.200-8.560 since it is in flood hazard area.

Best:
Cave City Area (MP 0.160-3.174)
• Construct a shared-use facility, 10 foot wide or wider, in the cardinal direction (eastern side) of the roadway for the northern portion of the project area. This would provide a connection and completion of a current loop route identified by the Strava© Bicycle Travel Heat Source Map (Figure 2) as well as provides accommodations for pedestrians.
  ✓ This would provide a BCI* rating A (from a D) for the MP 0.160-3.174.

Glasgow Area (MP 7.000-8.560)
• A constructed a shared-use facility, 10 foot or wider, to accommodate pedestrian and bicycle travel from the intersection of KY-90 & Poynter Road to the intersection of KY-90 & US-68. The GATE Master Plan has bicycle routes and a planned greenway system route (multi-use path) that crosses KY-90 near the city limit area (Figure 3). This facility type would encourage and accommodate the level B & C bicycle rider.
  ✓ This would provide a BCI* rating A (from a D) for the MP 7.000-8.560.

Good:
Cave City Area (MP 0.160-3.174) – If Curb and Gutter Cross Section is used:
• In the area of MP 0.160-1.369, construct a sidewalk, 5 feet or wider, on both sides of the roadway within the urban project area.
• In the area of MP 0.160-3.174, construct a separated bicycle facility, 8 feet or wider, with a two-foot buffer space (minimum) in the cardinal direction (eastern side) of the roadway for the northern portion of the project area (Figure 4A Urban, Figure 4B Rural). This would provide a connection to and complete a current loop route identified by the Strava© Bicycle Travel Heat Source Map (Figure 2).
  ✓ This would provide a BCI* rating A (from a D) for the MP 0.160-3.174

Glasgow Area (MP 7.000-8.560)
• In the area of MP 8.420-8.574, construct a sidewalk, 5 feet or wider, on both sides of the roadway for the urban areas.
• Constructed a separated bicycling facility, 8 feet or wider, to accommodate bicycle travel from the intersection of KY-90 & Poynter Road to the intersection of KY-90 & US-68. The GATE Master Plan has bicycle routes and a planned greenway system route (multi-use path) that crosses MP 7.000- 8.560 on KY-90 near the city limit area (Figure 3). This facility type would encourage and accommodate the level B bicycle rider.
  ✓ This would provide a BCI*rating A (from a D) for the MP 7.000-8.560.
Entire Project (MP 0.160-8.560) If Rural Cross Section is used:
- Construct a paved shoulder, 6 feet or wider, for the entire project area.
- Place a second white stripe within the shoulder, 2-3 feet to the right on the travel lane (Figure 4B). Then use bicycle route signs -MUTCD # D11-1 (Figure 5). The second white stripe is a buffer and provides guidance for the bicyclists to stay as far right as practicable. This is not a dedicated bicycle facility; the bicycle rider or “sharrow” pavement marking should not be used.
  - The Bicyclists Comfort Index (BCI*) would go from D to B.

**Fair:**

Urban Portions (MP 0.160-1.369 & 8.420-8.574) - If Curb and Gutter Cross Section is used:
- Construct a sidewalk, 5 feet or wider, on both sides of the roadway for the urban project area (MP 0.160-1.369 & 8.420-8.574).

**In Rural Cross Section:**
- Construct a shoulder, 6 feet or wider.
  - The Bicyclists Comfort Index (BCI*) would remain a C.
Figure 2 / Strava Heat Source Map for Bicycle Travel Activity around Cave City /
http://labs.strava.com/heatmap/#12/-85.96176/37.13230/gray/bike

Figure 3 / Proposed Greenway system corridor in Glasgow / http://www.glasgow-ky.com/planning/Greenway/Greenway.htm / Chapter 5, page 9
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Figure 3A / Example of separated bike lane with curb and gutter cross section

Figure 3B / Example of separated bike area with rural cross section

- FHWA Separated Bicycle Lane Planning & Design Guidance: https://www.fhwa.dot.gov/environment/bicycle_pedestrian/publications/separated_bikelane_pdg/page00.cfm
Figure 4 / Gap spacing for shoulder rumble strip/stripes) /
http://safety.fhwa.dot.gov/roadway_dept/pavement/rumble_strips/t504039/

Figure 5 / MUTCD signage for city or county bicycle routes/
*Bicyclists Comfort Index (BCI):*

The 1999 AASHTO Guide provides some qualitative guidance on choosing the appropriate facility type, but largely suggests that bicycle facility selection is a policy decision to be made by State and local agencies. The facility selection guidance is largely centered on the skill levels of bicyclists and what types of facilities they prefer. The 1999 AASHTO Guide defines three bicycle user types (these were first defined in a 1994 FHWA report):

1. Type A (Advanced).
2. Type B (Basic).
3. Type C (Children).


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October 21, 2015