**TABLE OF CONTENTS** **PAGE**

1.0 INTRODUCTION....1
2.0 PROJECT HISTORY....2
3.0 STUDY AREA DESCRIPTION....3
4.0 EXISTING TRANSPORTATION SYSTEM....4
4.1 Roadways....4
4.1.1 I-75....4
4.1.2 I-71....5
4.1.3 US 50....6
4.1.4 Local Roads....6
4.2 Geometric Design Standards....6
4.2.1 Brent Spence Bridge....9
4.2.2 I-71/I-75 Mainline....9
4.2.3. Interchanges....9
4.3 Pavement Conditions....9
4.3.1 Kentucky....9
4.3.2 Ohio....10
4.4 Bridge Conditions....11
4.4.1 Brent Spence Bridge....11
4.5 Transit Systems....18
4.5.1 Transit Authority of Northern Kentucky....18
4.5.2 Southwest Ohio Regional Transit Authority....18
4.6 Railroads....19
4.7 Airports....19
4.8 Water Transportation....19
4.9 Bicycle and Pedestrian Transportation....20
5.0 TRAFFIC ANALYSIS....20
5.1 Methodology....21
5.2 Existing Conditions (2005)....21
5.2.1 Mainline Segment Analysis....21
5.2.2 Ramp-Freeway Junctions....24
5.2.3 Local Street At-Grade Intersections....26
5.3 Future Conditions (2030)....31
5.3.1 Mainline Segment Analysis....31
5.3.2 Ramp-Freeway Junctions....33
5.3.3 Local Street At-Grade Intersections....36
5.4 Travel Time Study....39
5.4.1 Peak AM Hours (7:30 – 8:30)....39
5.4.2 Peak PM Hours (4:30 – 5:30)....40
5.5 Travel Origin and Destination....40
5.5.1 Travel Pattern....40
5.5.2 Travel Time....41
6.0 CRASH ANALYSIS....41
6.1 Kentucky Transportation Cabinet Crash Reports....41
6.1.1 Kentucky Crash Data Observations....42
6.2. Ohio Department of Transportation Crash Reports....43
6.2.1 Ohio Safety Hot Spots and Highway Safety Program Listings....43
6.2.2 Ohio Congestion Rankings....43
6.3 Ohio Department of Public Safety (ODPS) Crash Reports....44
6.4 Ohio Crash Data Observations....45

7.0 NATURAL ENVIRONMENT .... 47
7.1 Wetlands .... 47
7.2 Streams and Rivers .... 47
7.3 Floodplains .... 47
7.4 Threatened and Endangered Species .... 48
7.4.1 State Listed Species .... 48
7.4.2 Federally listed Species .... 49
7.5 Habitat .... 50
8.0 GEOTECHNICAL .... 50
8.1 Topography .... 50
8.2 Geology .... 51
8.2.1 Kentucky Geology .... 51
8.2.2 Ohio Geology .... 52
8.3 USDA Soil Survey Review .... 52
8.4 Seismic Characteristics .... 53
8.5 Landslides .... 53
8.6 Soil Test Borings .... 54
8.7 Geotechnical Design and Construction Considerations .... 54
8.7.1 Bridge Structure Foundations .... 54
8.7.2 Roadway Considerations .... 55
8.7.3 Excavations .... 55
9.0 SOCIAL ENVIRONMENT .... 56
9.1 Land Use .... 56
9.1.1 Zoning - Kentucky .... 56
9.1.2 Zoning - Ohio .... 56
9.2 Community Characteristics .... 57
9.2.2 Population .... 59
9.2.1 Environmental Justice .... 63
9.3 Community Services and Facilities .... 64
9.4 Development Trends .... 66
9.4.1 Kentucky .... 66
9.4.2 Ohio .... 68
10.0 CULTURAL RESOURCES .... 70
10.1 Historic Resources .... 70
10.1.1 Kentucky .... 70
10.1.2 Ohio .... 70
10.2 Archaeological Resources .... 72
10.2.1 Kentucky .... 72
10.2.2 Ohio .... 72
11.0 HAZARDOUS MATERIALS .... 73
12.0 AIR QUALITY .... 73
13.0 REVIEW OF RELATED STUDIES .... 74

**LIST OF TABLES** **PAGE**

Table 4-1: Design Deficiencies on I-71 and I-75 Within The Study Area .... 7
Table 4-2: I-75 Mainline in Kentucky .... 10
Table 4-3: I-75 Mainline in Ohio .... 10
Table 4-4: I-71 Mainline in Ohio .... 10
Table 4-5: US 50 Mainline in Ohio .... 11

**List of Tables Continued** **Page**

Table 4-6: Kentucky Bridge Conditions ..... 12
Table 4-7: Ohio Bridge Conditions ..... 15
Table 5-1: 2005 I-75 Northbound Mainline Segments ..... 21
Table 5-2: 2005 I-75 Southbound Mainline Segments ..... 22
Table 5-3: 2005 I-71 Northbound Mainline Segments ..... 23
Table 5-4: 2005 I-71 Southbound Mainline Segments ..... 23
Table 5-5: 2005 US 50 Westbound Mainline Segments ..... 23
Table 5-6: 2005 US 50 Eastbound Mainline Segments ..... 23
Table 5-7: 2005 I-75 Northbound Ramps ..... 24
Table 5-8: 2005 I-75 Southbound Ramps ..... 25
Table 5-9: 2005 I-71 Northbound Ramps ..... 25
Table 5-10: 2005 I- 71 Southbound Ramps ..... 25
Table 5-11: 2005 US 50 Westbound Ramps ..... 26
Table 5-12: 2005 US 50 Eastbound Ramps ..... 26
Table 5-13: 2005 Local Street Intersections ..... 27
Table 5-14: 2030 I-75 Northbound Mainline Segments ..... 31
Table 5-15: 2030 I-75 Southbound Mainline Segments ..... 32
Table 5-16: 2030 I-71 Northbound Mainline Segments ..... 32
Table 5-17: 2030 I-71 Southbound Mainline Segments ..... 32
Table 5-18: 2030 US 50 Westbound Mainline Segments ..... 33
Table 5-19: 2030 US 50 Eastbound Mainline Segments ..... 33
Table 5-20: 2030 I-75 Northbound Ramps ..... 33
Table 5-21: 2030 I-75 Southbound Ramps ..... 34
Table 5-22: 2030 I-71 Northbound Ramps ..... 35
Table 5-23: 2030 I-71 Southbound Ramps ..... 35
Table 5-24: 2030 US 50 Westbound Ramps ..... 35
Table 5-25: 2030 US 50 Eastbound Ramps ..... 36
Table 5-26: 2030 Brent Spence Bridge Study Area Intersections ..... 36
Table 6-1: Highway Safety Program Listings in the Study Area ..... 43
Table 6-2: Safety Hot Spots ..... 43
Table 6-3: Congested Sections ..... 44
Table 6-4: Ohio Crash rates by segment. ..... 45
Table 7-1: State Listed Threatened and Endangered Species Within the Study Area ..... 48
Table 7-2: Federally Listed Threatened and Endangered Species Within the Study Area ..... 50
Table 9-1: Demographic Information By City/County (2000) ..... 60
Table 9-2: Demographic Information By Census Tract ..... 60
Table 9-3: Study Area Employment ..... 61
Table 9-4: Commuting Trends Within The Study Area ..... 62
Table 9-5: Low Income and Minority Populations ..... 63
Table 9-6: Community Facilities Within the Study Area ..... 64
Table 10-1: NRHP Listed Resources Within the Study Area ..... 71
Table 10-2: Historic Districts Within the Study Area ..... 71
Table 10-3: Recorded Archaeological Sites Within the Study Area ..... 72

**LIST OF EXHIBITS**

Exhibit 1 Regional Map
Exhibit 2 Study Area
Exhibit 3 Wetlands, Streams & 100-Year Floodplain
Exhibit 4 Soils
Exhibit 5 Land Use
Exhibit 6 Neighborhoods
Exhibit 7 2000 Census Tracts
Exhibit 8 Minority Populations
Exhibit 9 Low Income Population
Exhibit 10 Community Facilities
Exhibit 11 Cultural Resources
Exhibit 12 Hazardous Materials
Exhibit 13 Cincinnati MetroMoves Proposed Commuter Rail Plan
Exhibit 14 Cincinnati MetroMoves Proposed Light Rail Plan
Exhibit 15 Cincinnati MetroMoves Proposed Streetcar Service Plan

**APPENDICES**

Appendix A Review of Existing Geometrics for Mainline and Ramps (Ohio/Kentucky)
Appendix B Travel Time Study
Appendix C Origin Destination Study
Appendix D Safety Study

# 1.0 INTRODUCTION

Interstate 75 (I-75) is a major north-south transportation corridor through the Midwestern United States linking Ohio and Kentucky with Toledo, Ohio and Detroit, Michigan to the north, and Atlanta, Georgia and Miami, Florida to the south. I-75 is among the longest and busiest continuous interstate trade corridors on the continent, creating a 2,200-mile major trade corridor from Canada to the Port of Miami. According to the Federal Highway Administration (FHWA) estimates, I-75 is among the busiest trucking routes in North America, with truck traffic approaching six billion miles annually.

I-75 is one of Ohio's oldest interstate highways. Since its original construction in the 1950s, traffic has increased beyond what was originally envisioned. Trucks have become larger and heavier over the past four decades. Equally important is the substantial growth in truck traffic, with truck traffic accounting for 20 percent of the traffic volume.

I-75 within the Greater Cincinnati/Northern Kentucky region is a major thoroughfare for local and regional mobility (Exhibit 1). Locally, it connects to I-71, I-74 and US Route 50. The Brent Spence Bridge provides an interstate connection over the Ohio River and carries both I-71 and I-75 traffic. The bridge also facilitates local travel by providing access to downtown Cincinnati, Ohio and Covington, Kentucky. Safety, congestion and geometric problems exist on the structure and its approaches. The Brent Spence Bridge, which opened to traffic in 1963, was designed to carry 80,000 vehicles per day. Currently, 150,000 vehicles per day use the Brent Spence Bridge and traffic volumes are projected to increase to 200,000 vehicles per day in 2025.

The I-75 corridor within the Greater Cincinnati/Northern Kentucky region is experiencing problems, which threaten the overall efficiency and flexibility of this vital trade corridor. Areas of concern include, but are not limited to, growing demand and congestion, land use pressures, environmental concerns, adequate safety margins, and maintaining linkage in key mobility, trade, and national defense highways.

The I-75 corridor has been the subject of numerous planning and engineering studies over the years and is a strategic link in the region's and the nation's highway network. As such, the Ohio Department of Transportation (ODOT) and the Kentucky Transportation Cabinet (KYTC), in cooperation with the FHWA, are proposing to improve the operational characteristics of I-75 and the Brent Spence Bridge in the Greater Cincinnati/Northern Kentucky region through a major transportation project. The purpose of this project is to:

- improve traffic flow and level of service,
- improve safety,
- correct geometric deficiencies, and
- maintain links in key mobility, trade, and national defense transportation corridors.

# 2.0 PROJECT HISTORY

The Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) identified High Priority Corridors on the National Highway System (NHS). Among these corridors are I-75 from Toledo to Cincinnati and I-71 between Columbus and Cincinnati. The 2005 federal surface transportation legislation (Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users [SAFETEA-LU]), continued funding for the High Priority Corridors.

In response to ISTEA, ODOT completed a statewide transportation study and strategic plan, *Access Ohio* in 1993, which was updated in 2004. This document identified "Transportation Efficiency and Economic Advancement Corridors" also known as "macro corridors" throughout the state of Ohio. These corridors are defined as "highways with statewide significance that provide connectivity to population and employment centers in Ohio and the nation by accommodating desired movements of persons and goods". The I-75 corridor is included in the list of macro corridors.

In 1999, KYTC completed its current long-range multimodal transportation plan (Kentucky Transportation Cabinet, *Statewide Transportation Plan FY 1999 – 2018*, December 1999). The transportation plan consists of two basic components – the short range element, which is the Six-Year Transportation Plan, and the long-range element, which is a 14-year plan identifying highway corridor needs that have a relatively high priority.

Kentucky's Recommended Six-Year Transportation Plan FY 2005-2010 lists six "Mega-Projects" (projects that will cost or are in excess of $1 billion). The I-71/I-75 Brent Spence Bridge Project is one of the six "Mega-Projects". The plan notes that I-71/I-75 Brent Spence Bridge "is the focal point for some of the heaviest traffic volumes in Kentucky", which not only provide a link between two major urban centers (Covington, Kentucky and Cincinnati, Ohio) but also connects the region to one of the nation's busiest airports, the Cincinnati/Northern Kentucky International Airport located in Boone County, Kentucky. FHWA's *Freight Facts and Figures 2004* reports that the Cincinnati/Northern Kentucky International Airport ranks 15$^{th}$ of the top 25 US airports based on landed weight of air cargo in 2002.

The Ohio-Kentucky-Indiana Regional Council of Governments (OKI) and the Miami Valley Regional Planning Commission (MVRPC), the Metropolitan Planning Organizations serving the I-75 corridor, formed a partnership in 2000 to undertake a transportation investment analysis of the section of the I-75 corridor from northern Kentucky to Piqua, Ohio to address the current and future transportation issues in the corridor. This analysis, known as the *North-South Transportation Initiative* (2004) was a traditional Major Investment Study (MIS) conducted as part of the merged National Environmental Policy Act (NEPA) process. One goal of this study was to identify strategies to ensure that the I-75 corridor remains effective and efficient at moving people and goods through the region. The study addressed major improvements to all existing modes of transportation and identified appropriate transportation alternatives that need to be incorporated into the Regional Transportation Plans. A preferred program of projects was defined based upon a thorough assessment of transportation needs and consensus of where the region wants to be.

The *North-South Transportation Initiative* recommended a number of capacity and safety improvements for the I-71 and I-75 corridor in Kentucky and I-75 in Ohio. The southern limit of the study area for this project was the I-71/I-75 Interchange in Kentucky. The northern limit was on I-75 north of Piqua, Ohio. A number of major replacements and rehabilitations were recommended for advancement into the NEPA Process as a part of the *North-South Transportation Initiative*. One key recommendation was the replacement or rehabilitation of the Brent Spence Bridge in order to provide for improved capacity, access, and safety in this portion of the corridor.

KYTC initiated an engineering feasibility study to investigate replacement options for the Brent Spence Bridge in 2003. The results of this study are documented in the *Brent Spence Bridge Feasibility and Constructability Study* (2005). The study area for this analysis began south of Kyles Lane in Kentucky and extended to the Western Hills Viaduct in Ohio. Concurrently, ODOT began evaluating a number of alternatives for improving segments of I-75 in Ohio, from the area north of the Western Hills Viaduct, to a point north of I-275.

Two projects north of the Brent Spence Bridge are also addressing issues recommended by the *North-South Transportation Initiative,* the Thru-the-Valley project (PID 76256) and the Mill Creek Expressway project (PID 76257). These two ODOT projects are being conducted as part of an overall program to improve I-75 and are being conducted so that preserving right-of-way and assuring that short term improvements made to the corridor build on each other and provide improved capacity.

# 3.0 STUDY AREA DESCRIPTION

The project study area is located along a 6.5-mile segment of I-75 within the Commonwealth of Kentucky and the State of Ohio. The study area is shown on Exhibit 2 and is 2.82 square miles in size. The southern limit of the project is 2,800 feet south of the midpoint of the Kyles Lane Interchange on I-71/I-75 in Fort Wright, south of Covington, Kentucky. The northern limit of the project is 1,500 feet north of the midpoint of the Western Hills Viaduct interchange on I-75 in Cincinnati, Ohio.

The eastern and western limits of the study area generally follow the existing alignment of I-75. From the south, the study area is a 1,500-foot wide corridor centered on I-75 northward towards the city of Covington. At Covington, the eastern and western study area boundaries widen and follow city streets as described below:

- Western project limits (from south to north):
    - At KY 5$^{th}$ Street in the city of Covington, the western boundary extends in the northwesterly direction across the Ohio River to US 50, approximately 1,000 feet west of the Freeman Avenue Interchange.
    - The western limit extends northerly parallel to Dalton Avenue to Hopkins Street.
    - The western limit extends westerly along Hopkins Street to the western limits of Union Terminal, where it then extends northerly along the western limits of Union Terminal to Kenner Street.

  - The western limit follows easterly along Kenner Street to the intersection with Dalton Avenue.
  - The western limit parallels Dalton Avenue to north of Findlay Street, where it follows in the northerly direction with a consistent 750-foot offset from the I-75 centerline.

- Eastern project limits (from south to north):
  - In the city of Covington, the eastern boundary follows Philadelphia Street to its intersection with KY 5th Street.
  - The eastern boundary follows KY 5th Street to its intersection with Main Street and then follows Main Street to the Ohio River.
  - The eastern boundary parallels the Clay Wade Bailey Bridge across the Ohio River to Pete Rose Way in the city of Cincinnati.
  - Through downtown Cincinnati, the eastern boundary follows OH 2nd Street and US 50 eastbound to approximately the I-71/US 50 interchange over Broadway Avenue, north on Broadway Avenue then westerly along OH 4th Street to Plum Street, then northward until it reaches West Court Street.
  - From West Court Street, the eastern boundary extends west to Linn Street, where it follows Linn Street to Central Parkway.
  - The eastern boundary extends north paralleling Central Parkway to Linn Street.
  - From Linn Street, the eastern boundary extends westerly to Bank Street.
  - From Bank Street, the eastern limits extend in the northerly direction with a consistent 750-foot offset from the I-75 centerline.

# 4.0 EXISTING TRANSPORTATION SYSTEM

Existing transportation facilities within the project study area include interstate highways, US routes, local roads, bus transit routes and hub locations, Ohio River water ports, freight rail lines, and bicycle routes. While passenger vehicle and truck freight modes are the most significant modes of transportation within the study area, each facility plays a role in mobility within the overall region. The following sections provide an overview of transportation facilities within the study area.

## 4.1 Roadways

### 4.1.1 I-75

Through the study area, the I-75 mainline varies between three and four lanes in each direction, with auxiliary lanes in certain locations. From the southern project terminus to KY 4th Street in Kentucky, I-71/I-75 northbound consists of three travel lanes. At KY 4th Street, a fourth travel lane is added to the northbound lanes, which continues into Ohio over the Brent Spence Bridge to the I-71/I-75 Interchange in Cincinnati. There are four southbound travel lanes between the Brent Spence Bridge and the southern project terminus.

I-75 has three interchanges in the Kentucky portion of the study area:

- Kyles Lane Interchange - This is a full movement diamond interchange at Kentucky mile post 189, which is the southern terminus of the study area.
- KY 12th Street/Pike Street Interchange – This is a full movement split diamond interchange that provides access to both Pike and KY 12th Streets.
- KY 4th Street/ KY 5th Street Interchange – This is a full movement interchange that provides access to the local road network in Covington. KY 4th Street provides one way westbound access to I-71/75 in both directions, while KY 5th Street provides the in-bound access to Covington.

In Ohio, between the I-71/I-75 Interchange and the northern project terminus, the number of travel lanes on I-75 varies from two to four with numerous entrance and exit ramps. From the I-71/I-75 interchange, there are two northbound lanes on I-75 with exit ramps to OH 5th Street in Cincinnati and to US 50 westbound.

In the vicinity of the Linn Street overpass, I-75 northbound becomes four lanes. A left hand exit is provided at Harrison Avenue (Western Hills Viaduct) via a short clover leaf ramp from I-75 northbound. Southbound I-75 access to Harrison Avenue is provided by a single right hand exit. Only Harrison Avenue (Western Hill Viaduct) westbound movements are provided from I-75 northbound and southbound at this interchange.

There are additional points of access to I-75 northbound from downtown Cincinnati, located at OH 4th Street, OH 6th Street, OH 9th Street, Ezzard Charles Drive, and Winchell Avenue, just north of Bank Street. There is no access to I-75 northbound from the collector distributor of OH 3rd Street. Access from I-71/US 50 (Fort Washington Way) south and westbound traffic to northbound I-75 acts as a collector distriubutor system which collects traffic from OH 4th Street, and OH 6th Street and includes an exit ramp to Ezzard Charles Drive prior to merging with I-75 northbound.

I-75 southbound, in Ohio, has four travel lanes at the northern limits of the study area in the vicinity of Harrison Avenue (Western Hills Viaduct). Access from I-75 southbound is available to Western Avenue, Ezzard Charles Drive, Freeman Avenue (US 50 westbound), and OH 7th Street exit. Additionally, a left hand exit carries traffic to OH 5th Street, OH 2nd Street, and I-71 northbound/US 50 eastbound at Fort Washington Way.

#### 4.1.2 I-71

I-71 is merged with the I-75 mainline through Kentucky and over the Brent Spence Bridge. In Kentucky, the I-71 mainline varies between three and four lanes in each direction, with auxiliary lanes in certain locations along with the three interchanges described above.

At the north end of the Brent Spence Bridge in Ohio, the I-71/I-75 interchange provides full movements between the two interstate routes with I-71 heading to the northeast across Fort Washington Way while I-75 continues to the north. Fort Washington Way was reconstructed in 2000 to improve the capacity, congestion, and substandard geometry of this southernmost portion of I-71 in Ohio. The Ohio northbound portion of I-71 has exit ramps to/from OH 2nd Street and US 50 eastbound, and a connection from I-

75 southbound. The Ohio southbound portion of I-71 has exit ramps to/from US 50 westbound and OH 3rd Street, and connection to I-75 northbound.

#### 4.1.3 US 50

US 50 is located in the Ohio portion of the study area and runs in a westerly/easterly direction paralleling the Ohio River. US 50 primarily consist of two lanes in each direction. The exception is where it transitions across the I-71/I-75 interchange area and where it reduces to a single lane in each direction. US 50 west of I-75 (westerly section) consists of a partial interchange at Freeman Avenue which provides access to US 50 in both directions from Freeman Avenue as well as an off ramp from US 50 eastbound to Freeman Avenue. The Freeman Avenue interchange provides access to I-75 northbound and from I-75 southbound via Freeman Avenue. This western section also contains a ramp to Linn Street from US 50 westbound and a ramp from Linn Street to US 50, eastbound. The western section of US 50 has connections going to I-75 southbound, OH 5th Street, I-71 northbound, and OH 2nd Street, with access from I-75 northbound and OH 6th Street.

US 50, east of I-75 (easterly section), is part of the Fort Washington Way system. The eastbound, easterly section includes ramp connections to/from I-71 northbound and OH 2nd Street. The westbound easterly section includes connections from I-71 southbound with connections to OH 3rd Street, I-71 southbound and I-75 northbound. The easterly section of US 50 also has connections with I-471 just east of the project limits.

#### 4.1.4 Local Roads

Primary local roads within the study include Crescent Avenue and Main Street/Clay Wade Bailey Bridge in Covington. Primary local streets within the study area in Ohio include 2nd Street, 3rd Street, Elm Street, Mehring Way, Pete Rose Way, Central Avenue, Gest Street, Freeman Avenue, Winchell Avenue, Western Avenue, and Spring Grove Avenue.

### 4.2 Geometric Design Standards

Several of the existing design features of the I-71/I-75 corridor located in the Greater Cincinnati/Northern Kentucky area do not meet currently acceptable design criteria for interstate highways as defined by the American Association of State Highway and Transportation Officials (AASHTO), KYTC, and ODOT. This can be attributed to the age of the facilities, which were early interstate construction projects completed in the 1950s. Since that time, design standards for interstate highways have changed. As a result, the design of the I-71 and I-75 facilities at many locations within the study area do not meet current design standards for numerous features including lane widths, shoulder widths, horizontal and vertical clearances, and horizontal and vertical geometry. The operational design of the Brent Spence Bridge, with its reduced travel lane and shoulder widths, is the most frequently noted substandard feature; however, as described in Table 4-1, other structures (e.g. ramps) as well as at-grade highways do not meet currently acceptable design standards for an interstate facility. The design standard deficiencies at specific locations are described in greater detail in Appendix A.

**Table 4-1: Design Deficiencies on I-71 and I-75 Within The Study Area**

| Location | Design Issues |
|---|---|
| Kyles Lane Interchange | Vertical grades for southbound entrance/exit ramps exceed design criteria. |
| I-71/I-75 (Kyles Lane Interchange to KY12th Street Interchange) | One curve is constructed with an undesirable combination of vertical and horizontal geometry. |
| KY 12th Street Interchange | Vertical clearances for several structures are less than the required clearances. Horizontal curve at the I-75 crossing over Pike Street does not meet current design criteria. |
| KY 9th Street | Shoulder widths in this area are less than the minimum required width. Vertical clearances of two structures are less than the required clearances. |
| KY 5th Street Interchange | Design inconsistencies in this area include design of vertical curves and associated limited stopping sight distances, horizontal curves with radii that do not meet current design criteria, vertical grade of the southbound exit ramp from I-75 to KY 5th Street, and the length of the deceleration zone along the same ramp. |
| KY 4th Street Interchange | The length of the acceleration ramp from KY 4th Street to northbound I-75 is substantially shorter than the length required to meet design criteria. |
| Brent Spence Bridge - Kentucky Approaches | Lane widths, shoulder widths, and bridge widths are not consistent with the current design criteria. |
| Brent Spence Bridge | Lane widths, shoulder widths, and bridge widths are not consistent with the current design criteria. |
| Brent Spence Bridge - Ohio Approaches | Lane widths, shoulder widths, and vertical curve lengths and associated stopping sight distances are not consistent with the current design criteria. |
| I-71 Connector | Design inconsistencies on connector ramps include design of vertical curves and associated limited stopping sight distances, horizontal curves with radii that do not meet current design standards and vertical clearance over the railroad. |
| Fort Washington Way Connector | Horizontal curves on directional ramps do not meet current design criteria. |
| I-75 (Brent Spence Bridge to US 50 Expressway Interchange | Deficiencies include vertical curves with limited sight distances, horizontal curves with reduced radii, vertical clearance (over railroad bridge), lane widths (bridges) and shoulder widths. |
| OH 4th Street Ramps | Deficiencies include horizontal curves with reduced radii, reduced vertical clearances, and limited shoulder widths. |
| US 50 Expressway Interchange | Design inconsistencies include vertical curves with limited sight distances, horizontal curves with reduced radii; lane widths, shoulder widths; vertical clearances; and length of acceleration zone (entrance ramp from 6th Street Expressway). |
| US 50-OH 5th Street Connector | Design inconsistencies include a vertical curve with limited sight distance, a horizontal curve with reduced radii; shoulder widths; vertical clearances over roadways; and undesirable horizontal geometry (exit ramp on left side). |

**Table 4-1: Design Deficiencies on I-71 and I-75 Within The Study Area**

| Location | Design Issues |
|---|---|
| US 50 Expressway Interchange | Design inconsistencies include vertical curves with limited sight distances, horizontal curves with reduced radii; lane widths, shoulder widths; vertical clearances; and length of acceleration zone (entrance ramp from US 50 Expressway). |
| OH 7th Street Ramp | Ramp to eastbound OH 7th Street includes vertical curves with limited sight distance and reduced shoulder widths. |
| OH 7th- OH 8th Street Connector | Vertical clearances over I-75 do not meet required standard. |
| OH 9th Street Connector | Vertical and horizontal clearances and shoulder widths do not meet current design standards. |
| OH 9th Street Interchange | Vertical and horizontal alignments for ramps do not meet current design standards. |
| I-75 (OH 8th Street to Linn Street) | Vertical and horizontal clearances and shoulder widths do not meet current design standards. |
| Western Avenue Interchange | Ramps do not meet design criteria for vertical curves and stopping sight distances; and shoulder widths. Southbound I-75 on ramp also does not meet criteria for vertical clearance and lane width. |
| I-75 Mainline (Linn Street to Gest Street) | Vertical clearance under Gest Street Ramp and pedestrian overpass do not meet minimum requirement. Horizontal clearance at Gest Street overpass is reduced because of bridge pier in median. |
| Gest Street Ramps | Vertical alignments and shoulder widths for ramps do not meet current design standards. |
| I-75 Mainline (Gest Street to Ezzard Charles Drive) | Vertical grades are below minimum desired grade; median shoulder widths are less than design standard. |
| Ezzard Charles Drive Overpass | Vertical clearance under overpass does not meet minimum requirement. Horizontal clearance at overpass is reduced because of bridge pier in median. |
| Winchell Avenue Ramps | Vertical alignments and shoulder widths for ramps do not meet current design standards |
| I-75 Mainline (Ezzard Charles Drive to Western Hills Viaduct) | Vertical clearances over Liberty and Bank Streets and Harrison Avenue do not meet minimum required clearance. Shoulder widths do not meet design criteria. Just south of the Bank Street overpass, vertical curve length does not meet minimum required length. |
| Western Hills Viaduct Interchange | Design inconsistencies include vertical curves with limited sight distances, horizontal curves with reduced radii; shoulder widths; vertical clearances over local roadways and interstate; limited length of acceleration zone for the northbound onramp; and left side exit ramp for I-75 northbound to Western Viaduct. |
| I-75 Mainline (North of Western Hills Viaduct Interchange) | Shoulder widths do not meet current design criteria. |

#### 4.2.1 Brent Spence Bridge

The Brent Spence Bridge was opened in 1963, as a double-deck truss structure designed to carry three 12-foot travel lanes in both directions over the Ohio River. In 1985, design deficiencies were added to the bridge to accommodate an additional travel lane on the bridge in each direction to add capacity for additional traffic volumes. The original safety curb on the bridge was retrofitted to New Jersey Barrier style barrier and the existing travel lanes were reduced in width to accommodate four 11-foot lanes with one-foot shoulders. In addition to the design deficiencies on the bridge, the approaches on either side are also characterized by design deficiencies, such as narrow travel lanes and reduced shoulder widths. The substandard lane widths and lack of shoulders result in unacceptable operational deficiencies and create potential safety hazards for motorists.

#### 4.2.2 I-71/I-75 Mainline

Deficiencies identified along the I-71/I-75 mainline include reduced shoulder widths, restricted vertical and horizontal clearances for overhead structures and substandard vertical and horizontal curvature. In addition, the vertical grade of the facility is problematic at two locations. Between Kyles Lane and KY 12$^{th}$ Street in Covington, the vertical grade is approximately five percent. Six degrees vertical grade is the maximum desirable grade for an interstate facility. The second problem area exists between Gest Street and the Winchell Avenue crossing. At this location, the grade does not meet the minimum desired grade for an interstate highway.

#### 4.2.3. Interchanges

The ramps at the majority of the interchanges along I-71/I-75 do not meet design criteria for several features including reduced vertical and horizontal curve lengths with associated reduced stopping sight distances; narrow travel lane and shoulder widths, steep grades, and substandard vertical clearances where the ramps are over other transportation facilities. There are two interchanges with left hand exit ramps (I-75 northbound to Western Hills Viaduct and I-75 southbound to the OH 5$^{th}$-US 50 Connector eastbound and I-71 northbound).

### 4.3 Pavement Conditions

Pavement conditions for I-71, I-75, and US 50 within the study area were provided by KYTC Pavement Condition Evaluation Form for Interstates and Parkways (October 2005) and ODOT Pavement Condition Ratings (PCRs) (December 2004).

#### 4.3.1 Kentucky

Table 4-2 summarizes the pavement data for I-75 in Kentucky. According to KYTC, a pavement condition evaluation ranking of 0 to 50 is considered very good. Only new, superior (or nearly new) pavements are likely to be smooth enough and distress free (sufficiently free of cracks and patches) to qualify for this category.

**Table 4-2: I-75 Mainline in Kentucky**

| Direction | Begin Section | End Section | Length | PCE Value |
|---|---|---|---|---|
| Northbound | 188.33 | 190.75 | 2.42 miles | 43.5 |
| Southbound | 188.33 | 190.75 | 2.42 miles | 48.2 |
| Northbound | 190.75 | 191.22 | 0.46 miles | 7.5 |
| Southbound | 190.75 | 191.22 | 0.46 miles | 16.2 |

The pavement in Section 188.334 to 190.754 was originally placed in 1994 and showed some signs of wheel-path cracking and joint deterioration according to an October 2005 visual inspection. No rutting was reported. The pavement in Section 190.754 to 191.222 was originally placed in 1992 with a 1.5 inch overlay in 2003. No signs of wheel-path cracking, joint deterioration raveling or rutting were reported according to an October 2005 visual inspection.

### 4.3.2 Ohio

Tables 4-3 and 4-4 summarize the pavement data for I-75 and I-71 in Ohio. According to ODOT Pavement Standards, a rating below 65 is deficient, a rating between 75 and 90 is good and a rating above 90 is very good. Pavement sections of I-75 and I-71 in Ohio were rated above 90.

**Table 4-3: I-75 Mainline in Ohio**

| Direction | Begin Section | End Section | Length | PCE Value |
|---|---|---|---|---|
| Northbound | 0.22 | 0.90 | 0.68 | 94 |
| Southbound | 0.22 | 0.90 | 0.68 | 94 |
| Northbound | 0.90 | 4.14 | 3.24 | 91 |
| Southbound | 0.90 | 4.14 | 3.24 | 92 |

**Table 4-4: I-71 Mainline in Ohio**

| Direction | Begin Section | End Section | Length | PCE Value |
|---|---|---|---|---|
| Northbound | 0.56 | 1.15 | 0.59 | 97 |
| Southbound | 0.56 | 1.15 | 0.59 | 97 |
| Northbound | 1.15 | 1.34 | 0.19 | 97 |
| Southbound | 1.15 | 1.34 | 0.19 | 97 |
| Northbound | 1.34 | 2.75 | 1.41 | 92 |
| Southbound | 1.34 | 2.75 | 1.41 | 95 |
| Northbound | 2.75 | 5.00 | 2.25 | 90 |
| Southbound | 2.75 | 5.00 | 2.25 | 95 |

Table 4-5 summarizes the pavement data for four sections of US 50 in Ohio. The ratings range from good (75 to 90) to very good (above 90).

**Table 4-5: US 50 Mainline in Ohio**

| Direction | Begin Section | End Section | Length | PCE Value |
|---|---|---|---|---|
| Eastbound | 19.26 | 19.80 | 0.54 | 78 |
| Westbound | 19.26 | 19.80 | 0.54 | 75 |
| Eastbound | 19.80 | 20.22 | 0.42 | 81 |
| Westbound | 19.80 | 20.22 | 0.42 | 76 |
| Eastbound | 20.22 | 20.76 | 0.54 | 87 |
| Westbound | 20.22 | 20.76 | 0.54 | 96 |
| Eastbound | 21.37 | 22.00 | 0.63 | 94 |
| Westbound | 21.37 | 22.00 | 0.63 | 96 |

## 4.4 Bridge Conditions

Bridge conditions are measured by a sufficiency rating as shown in the Tables 4-6 and 4-7. This rating is based on regular required inspections. It is used to distinguish eligibility for rehabilitation or replacement. A newly constructed bridge has a sufficiency rating of 100. A bridge with a rating less than 50 qualifies for replacement using federal bridge program funds. If a bridge requires immediate rehabilitation to remain open, has weight restrictions, or has been closed, then it is considered as structurally deficient (SD). If a bridge has deck geometry, load carrying capacity, clearance or approach alignments that are not consistent with design standards, then it is considered as functionally obsolete (FO). Tables 4-6 and 4-7 present data from KYTC and ODOT for bridges within the study area from Bridge Inventory and Bridge Inspection Reports.

### 4.4.1 Brent Spence Bridge

The 1998 National Bridge Inventory inspection gave the Brent Spence Bridge a Sufficiency Rating of 73 on a 100-point scale, but rated the bridge as being functionally obsolete because its design features are not consistent with its operational characteristics. A more recent inspection conducted in 2000 also found that the Brent Spence Bridge was functionally obsolete and that the Sufficiency Rating had dropped to 64.

In November 2002, a Fracture Critical Inspection of the Brent Spence Bridge was completed for KYTC, which included inspection of the Kentucky approach spans as well as the main spans over the Ohio River. The inspection noted few changes in the condition of the bridge based on a comparison of the inspection ratings for November 2002 inspection with the previous April 2001 inspection. The two inspection ratings vary with respect to deck condition, which received higher ratings in the November 2002 inspection; and the condition of the superstructure, which received lower ratings for four characteristics evaluated (stringers, girders and beams; trusses and inspection walk; bearing devices; and deflection/vibration under load).

## Table 4-6: Kentucky Bridge Conditions

| District | Prefix | County | Route | Bridge Number | Non-parallel/ Parallel | Sufficiency Rating | Number of Main Bridge Spans | Number of Approach Spans | Location | Mile Point | Description | Feature Crossed | Road Name | Maximum Bridge Span Length (feet) | Bridge Width (feet) | Bridge Length (feet) | Year Built | Functionally Obsolete/ Structurally Deficient | Last Inspection Date | Average Daily Traffic | Year of Average Daily Traffic Count |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6 | MP | 59 | 75 | B00038 | N | 87.6 | 3 | 0 | Northbound Lane 0.4 Miles South of KY 5th Street Interchange | 190.75 | 3-50 feet RCDGS Widened w/PCIB's | KY 9th Street in Covington | New Covington-Lexington | 50 | 54.7 | 159 | 1-Sep-60 | F | 14-Jan-04 | 133602 | 1-Jan 03 |
| 6 | MP | 59 | 75 | B00038 | P | 87.6 | 3 | 0 | Southbound lane 0.4 Miles South of KY 5th Street Interchange | 190.75 | 3-50 feet RCDGS Widened w/PCIB's | KY 9th Street in Covington | New Covington-Lexington | 50 | 54.7 | 159 | 1-Sep-60 | F | 14-Jan-04 | 133602 | 1-Jan-03 |
| 6 | MP | 59 | 75 | B00039 | N | 90.9 | 1 | 0 | Southbound Exit Ramp at KY 5th Street Interchange | 191.19 | 1-30 feet RCDG (Ramp B-2)1-31 feet RCDG (5th Street) | KY 5th Street Interchange | New Covington-Lexington | 31 | 37 | 63 | 1-Sep-63 | - | 14-Jan-04 | 133602 | 1-Jan-03 |
| 6 | MP | 59 | 75 | B00040 | N | 61.0 | 1 | 4 3 | Approach to Brent Spence Bridge | 191.19 | Steel IB (Multi Spans) See Bridge Drawing No. 1495 | KY 3rd - 4th – 5th Streets in Covington | New Covington-Lexington | 75 | 30 | 118 7 | 1-Sep-63 | F | 30-Nov-05 | 133602 | 1-Jan-03 |
| 6 | MP | 59 | 75 | B00041 | N | - | 1 | 5 | Pedestrian Overpass KY 5th Street Interchange | 191.19 | 10.75-13.25-13.75 feet RC Steps and Landings; 87.5 feet Pre | Northbound I-75 Exit Ramp to KY 5th Street | Pedestrian Overpass | 86 | 29.8 | 149 | 1-Sep-68 | - | 14-Jan-04 | 20 | 1-Sep-88 |
| 6 | MP | 59 | 75 | B00043 | N | 79.9 | 3 | 0 | Northbound Lane 0.75 Miles Northeast of US 25 Overpass | 188.33 | 3-50 feet RCDGS Widen w/PCIB's | Rivard Drive in Fort Wright | New Covington-Lexington | 50 | 66.8 | 159 | 1-Sep-60 | - | 12-Jan-04 | 134981 | 1-Jan-03 |
| 6 | MP | 59 | 75 | B00043 | P | 63.4 | 3 | 0 | Southbound Lane 0.75 Miles Northeast of US 25 Overpass | 188.33 | 3-50 feet RCDG's Widened w/PCIB's | Rivard Drive in Fort Wright | New Covington-Lexington | 50 | 78.2 | 159 | 1-Sep-60 | F | 12-Jan-04 | 134981 | 1-Jan-03 |
| 6 | MP | 59 | 75 | B00044 | N | 85.2 | 3 | 9 | Northbound Lane 0.3 Miles North of Jefferson Street Overpass | 190.52 | 1-40 and 8-53 feet RCDG-56-80-56 feet CONT RCDG Span | US25,KY1120, (11th - 12th - Lewis in Covington) | New Covington-Lexington | 80 | 54.7 | 684 | 1-Sep-60 | F | 13-Jan-04 | 137312 | 1-Jan-04 |

## Table 4-6: Kentucky Bridge Conditions

| District | Prefix | County | Route | Bridge Number | Non-parallel/ Parallel | Sufficiency Rating | Number of Main Bridge Spans | Number of Approach Spans | Location | Mile Point | Description | Feature Crossed | Road Name | Maximum Bridge Span Length (feet) | Bridge Width (feet) | Bridge Length (feet) | Year Built | Functionally Obsolete/ Structurally Deficient | Last Inspection Date | Average Daily Traffic | Year of Average Daily Traffic Count |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6 | MP | 59 | 75 | B00044 | P | 85.2 | 3 | 9 | Southbound Lane 0.3 Miles North of Jefferson Street Overpass | 190.52 | 1-40 and 8-53 feet and 56-80-56 feet CONT RDCG Span | KY 11th – 12th Lewis in Covington | New Covington-Lexington | 80 | 54.7 | 684 | 1-Sep-60 | F | 13-Jan-04 | 137312 | 1-Jan-04 |
| 6 | MP | 59 | 75 | B00046 | N | 66.0 | 3 | 0 | Brent Spence Bridge Over Ohio River | 191.41 | 2-453 feet Anchor Arm Spans and 1-830.5 feet Main Span DBL. D | Ohio River | Covington-Cincinnati | 831 | 92 | 1737 | 1-Sep-63 | F | 3-Oct-05 | 148614 | 1-Jan-03 |
| 6 | MP | 59 | 1072 | B00047 | N | 89.3 | 4 | 0 | 0.2 Miles South of Junction US 25-42 | 1.39 | 50-75 feet - 75-50 feet CONT. RCDG Unit - 11 Degree 30 | I-75 | Kyle's Lane in Fort Wright | 75 | 86 | 254 | 1-Sep-60 | F | 12-Jan-04 | 15908 | 1-Jan-03 |
| 6 | MP | 59 | 25 | B00049 | N | 74.5 | 3 | 7 | Clay Wade Bailey Bridge Over Ohio River | 13.62 | 2-400,1-675 Trusses, 2-155 CONT WSP,2-130 CT.40-66-50 SSW | Ohio River | Covington-Cincinnati | 675 | 42.5 | 2209 | 1-Sep-74 | - | 3-Oct-05 | 11545 | 1-Jan-04 |
| 6 | MP | 59 | 75 | B00087 | N | 87.6 | 1 | 0 | I-75 Northbound Exit East to KY 5th Street | 190.68 | 1-53 feet PC1B Span and 60 DEG Skew | Pike Street On-ramp to I-75 north | New Covington to Lexington – Ramp "G" over Ramp "Y" | 53 | 26 | 80 | 1-Sep-93 | F | 13-Jan-04 | 133602 | 1-Jan-04 |
| 6 | MP | 59 | 75 | B00088 | N | 86.5 | 3 | 0 | At Junction of KY 9th Street Covington to North | 190.75 | 51-53-51 feet CONT PC1B Spans | KY 9th ST (I-75 Northbound) Ramp "G" | New Covington to Lexington Ramp "G", , I-75 Northbound to KY 5th Street. | 53 | 26 | 159 | 1-Sep-93 | F | 13-Jan-04 | 133602 | 1-Jan-03 |
| 6 | MP | 59 | 75 | B00089 | N | 85.2 | 3 | 0 | Pike Street to I-75 Northbound Over KY 9th Street | 190.57 | 53-53-50 feet CONT PCIB Spans | KY 9th Street in Covington | New Covington to Lexington (Ramp "Y", Pike Street | 53 | 26 | 159 | 1-Sep-93 | F | 13-Jan-04 | 137312 | 1-Jan-03 |

## Table 4-6: Kentucky Bridge Conditions

| District | Prefix | County | Route | Bridge Number | Non-parallel/ Parallel | Sufficiency Rating | Number of Main Bridge Spans | Number of Approach Spans | Location | Mile Point | Description | Feature Crossed | Road Name | Maximum Bridge Span Length (feet) | Bridge Width (feet) | Bridge Length (feet) | Year Built | Functionally Obsolete/ Structurally Deficient | Last Inspection Date | Average Daily Traffic | Year of Average Daily Traffic Count |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6 | MP | 59 | 75 | B00090 | N | 87.6 | 3 | 0 | I-75 Southbound Exit to Pike Street | 190.75 | 51 -53- 51 feet CONT PC1B Spans | KY 9th Street in Covington | New Covington to Lexington Ramp "C" | 53 | 26 | 160 | 1-Sep-93 | F | 13-Jan-04 | 133602 | 1-Jan-03 |
| 6 | RR | 59 | 2374 | RR0602 | N | - | 10 | 0 | Approach to Clay Wade Bailey Bridge | 0.33 | Multi-Span Steel Girders- RR OH | CSX Railroad | KY 2374 (KY 3rd Street) | 1 | 34 | 150 | 1-Sep-30 | - | 18-Nov-05 | 8235 | 1-Dec-01 |
| 6 | RR | 59 | 25 | RR0610 | N | - | 28 | 0 | Main Street Between KY 4th and 5th Streets | 0.01 | Steel Girder | CSX Railroad Over Main Street in Covington | CSX Railroad Over Main Street in Covington | 60 | 35 | 1700 | 1-Sep-30 | - | 18-Nov-05 | 3907 | 1-Sep-97 |

Notes:
Prefix – MP=Maintenance Project; RP=Rural Secondary Project; CR=County Road; RR=Railroad
RCDG = Reinforced Concrete Deck Girder
w/PCIB's = With Precast Concrete I-Beams
WSP = Welded Steel Plate girder
CONT RCDG = Continuous Reinforced Concrete Deck Girder
CONT PCIB = Continuous Precast Concrete I-Beam

**Table 4-7: Ohio Bridge Conditions**

| District | Structure File Number | County | Route | Straight Line Mileage | Special Designation | Feature Intersected* | Year Built | General Appraisal | Sufficiency Rating | Structurally Deficient/Functionally obsolete | Inspected Date | Deck Area (square feet) | Total Number of Spans | Maximum Span Length (feet) | Overall Length (feet) | Inspection Responsibility |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 08 | 3102971 | HAM | 00050 | 1976 | - | Freeman Avenue | 1966 | 7 | 088.0 | FO | 10/07/04 | 48,782 | 11 | 93 | 706 | State |
| 08 | 3103005 | HAM | 00050 | 1980 | L | Nsrr;Csrr; Linn Street | 1966 | 7 | 089.2 | FO | 10/08/04 | 41,474 | 9 | 149 | 795 | State |
| 08 | 3103064 | HAM | 00050 | 1980 | R | Nsrr;Csrr; Linn Street | 1966 | 7 | 092.0 | FO | 10/08/04 | 40,903 | 8 | 148 | 784 | State |
| 08 | 3103099 | HAM | 00050 | 2013 | L | Gest Street; US 50*West Ramp | 1963 | 7 | 079.0 | FO | 10/08/04 | 15,253 | 3 | 91 | 227 | State |
| 08 | 3103129 | HAM | 00050 | 2013 | R | Gest Street | 1963 | 7 | 079.0 | FO | 10/08/04 | 11,722 | 3 | 91 | 205 | State |
| 08 | 3103153 | HAM | 00050 | 2028 | L | I-75;Ramp=I-75*S-US 50* East | 1963 | 6 | 077.0 | FO | 10/21/04 | 42,442 | 6 | 111 | 524 | State |
| 08 | 3103161 | HAM | 00050 | 2028 | M | I-75 Southbound and Ramp | 2000 | 8 | 091.8 | | 10/21/04 | 16,081 | 4 | 177 | 495 | State |
| 08 | 3103188 | HAM | 00050 | 2028 | R | I-75*South | 1963 | 7 | 093.0 | FO | 10/21/04 | 7,815 | 2 | 97 | 182 | State |
| 08 | 3103226 | HAM | 00050 | 2064 | L | OH 3rd Street | 1999 | 8 | 088.3 | - | 12/06/04 | 26.049 | 6 | 143 | 758 | State |
| 08 | 3103234 | HAM | 00075 | 0023 | R | I-71 Northbound OH 3rd Street | 2000 | 8 | 088.6 | - | 10/26/04 | 28,546 | 4 | 192 | 644 | State |
| 08 | 3103269 | HAM | 00071 | 0040 | L | Central Avenue and OH 3rd Street | 2000 | 9 | 092.7 | - | 09/13/04 | 24,251 | 4 | 207 | 646 | State |
| 08 | 3103293 | HAM | 00050 | 2065 | - | OH 3rd Street and Central Avenue | 2000 | 8 | 088.3 | - | 12/06/04 | 40,957 | 6 | 182 | 917 | State |
| 08 | 3105458 | HAM | 00075 | 0252 | - | Western Hills Viaduct | 1931 1978 | 7 | 066.0 | FO | 11/15/04 | 22,540 | 3 | 120 | 370 | State |
| 08 | 3105946 | HAM | 00071 | 0000 | L | I-71*North; 3rr; I-75* North; 9usr;St | 1963 | 5 | 064.0 | FO | 12/01/04 | 107,543 | 40 | 127 | 2,683 | State |
| 08 | 3105970 | HAM | 00071 | 0000 | R | 3rr;US 27;I-75;US 42 | 1963 | 5 | 062.0 | FO | 12/01/04 | 145,551 | 35 | 186 | 3,043 | State |
| 08 | 3106020 | HAM | 00071 | 0040 | R | Central Avenue | 2001 | 9 | 065.7 | - | 09/13/04 | 46,780 | 7 | 206 | 833 | State |
| 08 | 3106055 | HAM | 00071 | 0056 | - | Plum Street Pedestrian Walk | 2000 | 8 | 068.4 | - | 09/14/04 | 9,881 | 1 | 66 | | State |
| 08 | 3106071 | HAM | 00071 | 0065 | - | Elm Street | 2000 | 9 | 087.8 | - | 09/14/04 | 7,922 | 2 | 84 | 171 | State |
| 08 | 3106195 | HAM | 00071 | 0073 | - | Race Street | 2000 | 9 | 087.8 | - | 09/14/04 | 18,245 | 2 | 84 | 171 | State |
| 08 | 3108791 | HAM | 00075 | 0022 | L | Third Street; Csrr | 1963 | 5 | 085.0 | - | 10/21/04 | 23,982 | 6 | 78 | 428 | State |
| 08 | 3108805 | HAM | 00075 | 0022 | R | 2rr;Th St *East; US 42; | 1963 | 7 | 073.0 | FO | 10/21/04 | 42,722 | 14 | 117 | 1,187 | State |

**Table 4-7: Ohio Bridge Conditions**

| District | Structure File Number | County | Route | Straight Line Mileage | Special Designation | Feature Intersected* | Year Built | General Appraisal | Sufficiency Rating | Structurally Deficient/Functionally obsolete | Inspected Date | Deck Area (square feet) | Total Number of Spans | Maximum Span Length (feet) | Overall Length (feet) | Inspection Responsibility |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | US 50*East | | | | | | | | | | |
| 08 | 3108821 | HAM | 00075 | 0024 | R | Central Avenue | 2000 | 9 | 022.0 | - | 10/26/04 | 5,296 | 2 | 118 | 161 | State |
| 08 | 3108872 | HAM | 00075 | 0030 | - | US 50 Eastbound; US 50 Eastbound To OH 2nd Street | 1998 | 8 | 093.0 | - | 10/25/04 | 8,697 | 3 | 70 | 265 | State |
| 08 | 3108945 | HAM | 00075 | 0070 | - | OH 7th Street*East | 1963 | 7 | 090.0 | FO | 10/26/04 | 39,568 | 5 | 148 | 628 | State |
| 08 | 3109003 | HAM | 00075 | 0086 | - | I-75*South Ramp; 9th St*W | 1963 | 5 | 065.0 | FO | 10/26/04 | 10,097 | 4 | 120 | 304 | State |
| 08 | 3109038 | HAM | 00075 | 0089 | - | 8th St*W; 9th St *W | 1963 | 6 | 069.2 | FO | 10/26/04 | 22,518 | 5 | 121 | 535 | State |
| 08 | 3109062 | HAM | 00075 | 0087 | W | Gest St Within Ir R/W | 1963 | 8 | 096.0 | - | 10/26/04 | 8.611 | 4 | 73 | 245 | State |
| 08 | 3109097 | HAM | 00075 | 0105 | - | Linn Street | 1961 | 6 | 079.5 | FO | 10/28/04 | 37,911 | 7 | 85 | 426 | State |
| 08 | 3109127 | HAM | 00075 | 0125 | - | Ramp=Freeman Ave*N-I-75*N | 1961 | 7 | 075.0 | FO | 11/03/04 | 11,700 | 3 | 118 | 278 | State |
| 08 | 3109151 | HAM | 00075 | 0125 | E | Pedestrian Crosswalk | 1961 | 7 | N/A | - | 11/05/04 | 291 | 1 | 36 | 36 | State |
| 08 | 3109186 | HAM | 00075 | 0126 | W | Rmp=(Western Ave*S)-I-75*S | 1961 | 7 | 071.7 | | 11/03/04 | 2,852 | 1 | 70 | 81 | State |
| 08 | 3109216 | HAM | 00075 | 0143 | - | Ezzard Charles Drive*E | 1961 | 7 | 094.0 | FO | 11/05/04 | 8,837 | 2 | 84 | 173 | State |
| 08 | 3109240 | HAM | 00075 | 0146 | - | Ezzard Charles Drive *W | 1961 | 7 | 094.0 | FO | 11/05/04 | 8,687 | 2 | 85 | 170 | State |
| 08 | 3109275 | HAM | 00075 | 0173 | - | Liberty Street | 1961 | 7 | 096.0 | - | 11/05/04 | 30,850 | 4 | 55 | 199 | State |
| 08 | 3109305 | HAM | 00075 | 0191 | - | Findlay Street | 1961 | 7 | 097.0 | - | 11/05/04 | 24,607 | 3 | 71 | 175 | State |
| 08 | 3109364 | HAM | 00075 | 0219 | - | Bank Street | 1961 | 7 | 098.0 | - | 11/08/04 | 28,460 | 4 | 51 | 189 | State |
| 08 | 3109399 | HAM | 00075 | 0240 | L | Harrison Avenue | 1961 | 7 | 098.0 | - | 11/08/04 | 13,713 | 3 | 65 | 160 | State |
| 08 | 3109429 | HAM | 00075 | 0240 | R | Harrison Avenue | 1961 | 8 | 098.0 | - | 11/08/04 | 17,567 | 3 | 64 | 160 | State |
| 08 | 3109453 | HAM | 00075 | 0249 | W | Spring Grove Avenue | 1963 | 7 | 096.0 | - | 11/08/04 | 6,760 | 3 | 108 | 221 | State |
| 08 | 3109488 | HAM | 00075 | 0253 | W | Spring Grove Avenue | 1963 | 7 | 097.0 | - | 11/08/04 | 6.211 | 3 | 105 | 203 | State |
| 08 | 3109518 | HAM | 00075 | 0261 | R | Ramp=I-75*N-W. Hills Viaduct*W | 1961 | 7 | 075.0 | FO | 11/15/04 | 6.243 | 3 | 104 | 204 | State |
| 08 | 3111644 | HAM | 00264 | 1636 | R | I-75*S;Usr-Ir Ramp;US 50*E | 1963 | 6 | 077.0 | FO | 12/16/04 | 21,550 | 6 | 107 | 516 | State |

**Table 4-7: Ohio Bridge Conditions**

| District | Structure File Number | County | Route | Straight Line Mileage | Special Designation | Feature Intersected* | Year Built | General Appraisal | Sufficiency Rating | Structurally Deficient/Functionally obsolete | Inspected Date | Deck Area (square feet) | Total Number of Spans | Maximum Span Length (feet) | Overall Length (feet) | Inspection Responsibility |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 08 | 3111679 | HAM | 00264 | 1647 | R | I-75*N ;Ramp=I-75*N-US 50*W | 1963 | 6 | 077.0 | FO | 12/16/04 | 7,524 | 3 | 64 | 171 | State |
| 08 | 3111709 | HAM | 00264 | 1653 | R | US 50*W;I-75*N Ramp | 1963 1968 | 7 | 096.0 | - | 12/15/04 | 14,499 | 3 | 79 | 192 | State |

* Feature Intersected can be further defined and photographs available at www.dot.state.oh.us/sfn/

## 4.5 Transit Systems

Two major transit systems, Transit Authority of Northern Kentucky (TANK) and Southwest Ohio Regional Transit Authority (SORTA) provide service throughout the region.

### 4.5.1 Transit Authority of Northern Kentucky

TANK operates a traditional bus-only service with fixed local and express routes, primarily from Northern Kentucky cities and suburbs in Boone, Campbell and Kenton counties to downtown Cincinnati. Ridership is highest during weekday peak periods, but service on most routes is provided during off-peak periods on weekdays and weekends. Several TANK express routes operate along I-71/I-75 and use the Brent Spence Bridge. TANK also provides the Southbank Shuttle, which connects the downtowns and riverfronts of Cincinnati, Covington, Newport and Bellevue, along with special event service; a route between Cincinnati, Covington and the Cincinnati-Northern Kentucky International Airport; and Regional Area Mobility Program (RAMP), a paratransit service for persons with disabilities.

TANK is in the process of developing a long-range Transit Network Study to guide the potential growth in transit service in Northern Kentucky for the next several years. TANK's primary source of local operating funds are earnings taxes in Campbell and Kenton counties and general fund appropriations from Boone County.

### 4.5.2 Southwest Ohio Regional Transit Authority

SORTA operates Metro, a traditional bus-only service with fixed local and radial routes serving the city of Cincinnati, portions of Hamilton County and limited portions of Butler, Clermont and Warren counties. The Metro network is primarily radial, with most routes focusing on downtown Cincinnati, where Metro connects with TANK service. There is some crosstown service, most of which serve Cincinnati's Uptown district (University of Cincinnati and medical center area).

Metro currently operates a substantial amount of service on I-71 and I-75 but does not use the Brent Spence Bridge. Metro also operates special event service, the "Parking Meter" shuttle that connects the central riverfront with downtown Cincinnati, and Access (a paratransit service for persons with disabilities).

SORTA completed its MetroMoves growth plan in 2002. It is being implemented in modest increments due to funding limitations. The MetroMoves plan called for the development of a network of transit hubs, crosstown routes and commuter lines. SORTA's primary source of local funding is a city of Cincinnati earnings tax dedicated specifically to transit uses. There is no countywide transit funding in southwest Ohio.

Several recent planning studies identify potential passenger rail alignments in the study area. *The Central Area Loop Study* (1999) identifies shared right-of-way on the Clay Wade Bailey Bridge for the Central Loop Streetcar which is proposed to provide rail connections between the three riverfront cities. The *I-71 Corridor Transportation Study Preliminary Draft Environmental Impact Statement* (July 2003) calls for the addition of a light rail transit (LRT) exclusive bridge immediately east of the Clay Wade Bailey Bridge. The *Regional Rail System Plan* identified a shared roadway/LRT lane on the Clay Wade Bailey Bridge as a value engineering alternative to the new LRT exclusive bridge.

## 4.6 Railroads

Rail transportation is an important component to the multimodal transportation system in study area. Several of the existing rail lines parallel I-75. The existing rail lines in the study area include:

- CSX Transportation
- Norfolk Southern
- Indiana and Ohio (I&O)
- Amtrak (passenger rail)

According to the Ohio Rail Development Commission, more than 250 freight trains per day pass through or have destinations within the study area.

CSX Transportation and Norfolk Southern have classification and intermodal yards in the Queensgate area of Cincinnati. CSX Transportation's Queensgate Yard has the capacity for 4,000 rail cars, and is one of the busiest freight rail yards in the Midwest.

CSX Transportation and Norfolk Southern have lines that parallel I-75. Two other railroad, Amtrak and Indiana and Ohio have "trackage rights" over these rail lines. More that 90 trains per day use the tracks in this corridor. Even though the two major railroads are competitors, they have a special operating agreement that allows each railroad to use the other's tracks due the rail congestion issues in this corridor.

The amount of freight that rail has the ability to carry is substantial. One fully loaded train car carries the same load as three semi-trucks. Intermodal traffic has been the fastest growing market segment of the rail industry over the past 20 years. Intermodal is defined in this case as trailer-on-flatcar (TOFC) or container-on-flatcar (COFC). This segment of the market is anticipated to continue to grow (*Access Ohio*, ODOT, 1995). Norfolk Southern has recently opened a new intermodal facility in Sharonville. Additional rail traffic may require rail capacity expansion in the heavily congested I-75 rail corridor.

## 4.7 Airports

The Greater Cincinnati/Northern Kentucky International Airport (CVG) is located in close proximity to the study area. It is a national hub for Delta and its regional airline connection partner (Comair). There are three terminals within CVG. Terminal One is served by US Airways, Terminal Two is served by American Airlines and United, and Terminal Three is served by Delta, Delta's connection Comair, Air France, Northwest Airlines, and Continental. To accommodate these airlines CVG opened their third north-south runway in December 2005 after 14 years of planning, public involvement, and construction.

## 4.8 Water Transportation

Commerce on the Ohio River is carried out by barge/towboat combinations. Towboats pushing up to 15 barges carry cargo between river terminals (*Ohio Department of Transportation Fact Book*). Barge is the primary mover of goods produced in the Ohio-Kentucky-Indiana Regional Council of Governments (OKI) region for market areas between 500 and 700 miles away (*Freight Transportation Study*, 1996). Nearly 14 million tons of cargo was shipped through water ports in Cincinnati in 1999, ranking it third in the amount of cargo handled on the Ohio River (*Freight Transportation Study*, 1996). One River Port and one bulk facility are located in close proximity to the study area. They handle coal, steel, iron ore, sand/gravel, fertilizers, chemicals, petroleum and grain.

## 4.9 Bicycle and Pedestrian Transportation

The Ohio-Kentucky-Indiana Regional Council of Governments (OKI) Regional Bicycle Plan, adopted in 1993 and amended in 2003, encouraged the development of bike paths, bike lanes, and shared use paths throughout the region. Bicycle racks have been installed on the entire SORTA fleet and are used extensively providing for an intermodal connection between bicycles and buses. There are portions of the regional network of shared use paths in the study area, which are summarized below.

- CSX/Western Corridor – This is an abandoned rail corridor, which provides connections to the Mill Creek Greenway Trail and the Ohio River Trail.

- Ohio River Trail – This is a network of trails along the Ohio River known collectively as the Ohio River Trail. Ultimately this network of trails will provide connections from the Central Riverfront Park west through Queensgate and ultimately the Western Riverfront Trail west along River Road to Fernbank Park in Cincinnati and Shawnee Lookout Park. Some of this route will be designated as part of the Ohio to Erie Trail. The Cincinnati end is currently in the Central Riverfront Park but connections continuing west as far as Anderson Ferry are anticipated.

- KY Route 8 Path – This is an existing shared road facility along KY Route 8. It crosses the Ohio River on the Clay Wade Bailey Bridge to provide an interstate bicycle connection to the Ohio River Trail.

- Ohio Bike Route "O" Ohio River Scenic Byway – This is a shared facility bike route and is proposed for integration into the Ohio River Scenic Byway. Within the study area it uses State Street, OH 8$^{th}$ Street, Linn Street, Central Avenue to Mehring Way to connect to the Ohio River Trail.

- 1976 Cincinnati Bikeway Plan – This plan identified additional shared use corridors on downtown surface streets. The east-west routes in the study area include one way pairs of OH 7$^{th}$ and 9$^{th}$ streets, OH 2$^{nd}$ and 3$^{rd}$ streets, and Mehring Way. Regional bicycle planners anticipate specific improvements for bicycle facilities in the Mehring Way corridor that will impact the Brent Spence Bridge study area.

# 5.0 TRAFFIC ANALYSIS

A traffic analysis was conducted for I-75, I-71, US 50, and local street intersections within the study area. In order to obtain a detailed understanding of traffic patterns within the study area, I-75, I-71, and US 50 were divided into mainline segments and interchange ramp merge and diverge points. A total of 47 signalized intersections and eight unsignalized intersections of the local roadway network were studied. The analysis determined AM and PM design hour volumes and levels of service (LOS) for existing (2005) and future conditions (2030).

## 5.1 Methodology

Traffic counts were collected in the study area on Tuesdays, Wednesdays and Thursdays during September, October and November 2005. Traffic data for the at-grade intersections were collected using turning movement counts, while ramp traffic was collected using portable machine counters. Mainline volumes were determined from the I-75 Thru the Valley (HAM-75-10.10 [PID 76256]) study and the I-75 Mill Creek Expressway (HAM-75-2.30 [PID 76257]) study and carried through the study area. Select spot counts on the I-75 mainline were also used as check counts. Raw counts were converted to design hour volumes using a factor of 1.056, which was also utilized in the two adjacent HAM-75 projects referenced above.

Levels of service were determined for freeway segments, interchange ramp merge and diverge points, 47 signalized intersections and eight unsignalized intersections within the study area using Highway Capacity Software (HCS) version, HCS2000™, Version 4.1d.

Travel time was determined during December 2005 by driving during peak AM hours (7:30 – 8:30) and peak PM hours (4:30 – 5:30). A total of 15 travel runs were recorded during December 7 and 8, 2005 peak hours. Appendix B provides further discussion on methods employed to conduct the travel time study.

## 5.2 Existing Conditions (2005)

### 5.2.1 Mainline Segment Analysis

The following tables present the results of the 2005 existing condition analyses performed on the mainline segments of I-75, I-71, and US 50 within the study area. Locations with a LOS D are likely to degrade to a LOS of E or F in the design year (2030).

**Table 5-1: 2005 I-75 Northbound Mainline Segments**

| Segment | | AM | | | PM | | |
|---|---|---|---|---|---|---|---|
| From | To | Volume | LOS[1] | Density (pc/mi/ln)[2] | Volume | LOS | Density (pc/mi/ln)[2] |
| Kyles Lane Merge | West KY 12th Street Diverge | 5806 | E | 37.5 | 5092 | D | 29.7 |
| West KY 12th Street Diverge | West KY 5th Street Diverge | 5576 | D | 34.6 | 4596 | C | 25.8 |
| West KY 5th Street Diverge | Pike Street Merge | 4964 | D | 28.6 | 4098 | C | 22.6 |
| Pike Street Merge | West KY 4th Street Merge | 5866 | E | 38.3 | 4464 | C | 24.9 |
| Brent Spence Bridge South | Brent Spence Bridge North | 6964 | D | 30.9 | 5408 | C | 22.3 |
| I-71 Diverge | West OH 5th Street Diverge | 3429 | D | 30.2 | 3616 | D | 32.9 |
| West OH 5th Street Diverge | US 50 Diverge | 2845 | C | 23.6 | 3400 | D | 29.8 |
| US 50 Diverge | I-71 Merge | 2182 | B | 17.9 | 2771 | C | 22.9 |
| I-71 Merge | West OH 9th Street Merge | 3862 | B | 15.9 | 5750 | C | 23.9 |
| West OH 9th Street Merge | Freeman Avenue Merge | 4046 | B | 16.6 | 6621 | D | 28.6 |
| Freeman Avenue Merge | Ezzard Charles Drive Merge | 4599 | C | 18.9 | 7230 | D | 32.9 |

**Table 5-1: 2005 I-75 Northbound Mainline Segments**

| Segment | | AM | | | PM | | |
|---|---|---|---|---|---|---|---|
| From | To | Volume | LOS[1] | Density (pc/mi/ln)[2] | Volume | LOS | Density (pc/mi/ln)[2] |
| Ezzard Charles Drive Merge | Western Hills Viaduct Diverge | 4689 | C | 19.3 | 7550 | E | 35.6 |
| Western Hills Viaduct Diverge | Western Hills Viaduct/Bank Street Merge | 4316 | B | 17.7 | 6783 | D | 29.7 |
| North of Western Hills Viaduct Merge | | 5273 | C | 21.7 | 7611 | E | 36.2 |

[1] LOS = Level of Service
[2] pc/mi/ln = passenger car per mile per lane
* Capacity Exceeds HCS calculations

**Table 5-2: 2005 I-75 Southbound Mainline Segments**

| Segment | | AM | | | PM | | |
|---|---|---|---|---|---|---|---|
| From | To | Volume | LOS | Density (pc/mi/ln) | Volume | LOS | Density (pc/mi/ln) |
| North of Western Hills Viaduct | | 8304 | E | 44.3 | 5846 | C | 24.4 |
| Western Hills Viaduct Merge | Findlay Street Diverge | 9007 | D | 32.7 | 5642 | C | 18.5 |
| Findlay Street Diverge | Ezzard Charles Drive Diverge | 8372 | F | * | 5033 | C | 20.7 |
| Ezzard Charles Drive Diverge | Freeman Avenue Diverge | 7871 | E | 38.9 | 4842 | C | 19.9 |
| Ezzard Charles Drive Merge | West OH 7th Street Diverge | 7314 | D | 33.6 | 4660 | C | 19.1 |
| I-71 Diverge | West OH 9th Street Merge | 2959 | C | 24.7 | 2115 | B | 17.4 |
| West OH 9th Street Merge | US 50 Merge | 3126 | D | 26.5 | 2569 | C | 21.1 |
| US 50 Merge | I-71 Merge | 3673 | D | 33.8 | 3230 | D | 27.7 |
| Brent Spence Bridge North | Brent Spence Bridge South | 5280 | C | 21.8 | 7156 | D | 32.3 |
| West KY 5th Street Diverge | Pike Street Diverge | 4605 | C | 18.9 | 6429 | D | 27.5 |
| Pike Street Diverge | West KY 4th Street Merge | 4324 | B | 17.8 | 5836 | C | 24.3 |
| West KY 4th Street Merge | West KY 12th Street Merge | 4718 | C | 19.4 | 6739 | D | 29.4 |
| West KY 12th Street Merge | Kyles Lane Diverge | 5039 | C | 20.7 | 7277 | D | 33.3 |

[1] LOS = Level of Service
[2] pc/mi/ln = passenger car per mile per lane
* Capacity Exceeds HCS calculations

**Table 5-3: 2005 I-71 Northbound Mainline Segments**

| Segment | | AM | | | PM | | |
|---|---|---|---|---|---|---|---|
| From | To | Volume | LOS[1] | Density (pc/mi/ln)[2] | Volume | LOS[1] | Density (pc/mi/ln)[2] |
| South of OH West 2nd Street Diverge | | 3535 | D | 31.4 | 1792 | B | 14.6 |
| West OH 2nd Street Diverge | I-75 Southbound/ US 50 Merge | 2662 | C | 21.8 | 1498 | B | 12.2 |
| East of I-75 Southbound/US 50 Merge | | 5855 | C | 24.3 | 4254 | B | 17.4 |

[1] LOS = Level of Service
[2] pc/mi/ln = passenger car per mile per lane

**Table 5-4: 2005 I-71 Southbound Mainline Segments**

| Segment | | AM | | | PM | | |
|---|---|---|---|---|---|---|---|
| From | To | Volume | LOS[1] | Density (pc/mi/ln)[2] | Volume | LOS[1] | Density (pc/mi/ln)[2] |
| East of I-75 Northbound Diverge | | 3746 | B | 15.3 | 5566 | C | 22.9 |

[1] LOS = Level of Service
[2] pc/mi/ln = passenger car per mile per lane

**Table 5-5: 2005 US 50 Westbound Mainline Segments**

| Segment | | AM | | | PM | | |
|---|---|---|---|---|---|---|---|
| From | To | Volume | LOS[1] | Density (pc/mi/ln)[2] | Volume | LOS[1] | Density (pc/mi/ln)[2] |
| I-75 Northbound | West OH 6th Street Diverge | 1743 | A | 7.0 | 2656 | A | 10.7 |
| Gest Street Diverge | Dalton Avenue Diverge | 1249 | A | 5.0 | 2454 | A | 9.9 |
| Dalton Avenue Diverge | Freeman Avenue Merge | 773 | A | 4.2 | 2246 | B | 12.1 |
| West of Freeman Avenue Merge | | 955 | A | 5.1 | 2794 | B | 15.0 |

[1] LOS = Level of Service
[2] pc/mi/ln = passenger car per mile per lane

**Table 5-6: 2005 US 50 Eastbound Mainline Segments**

| Segment | | AM | | | PM | | |
|---|---|---|---|---|---|---|---|
| From | To | Volume | LOS[1] | Density (pc/mi/ln)[2] | Volume | LOS[1] | Density (pc/mi/ln)[2] |
| West of Freeman Avenue Diverge | | 3544 | C | 19.0 | 1115 | A | 6.0 |
| Freeman Avenue Diverge | Freeman Avenue Merge | 2851 | C | 23.2 | 938 | A | 7.6 |
| Freeman Avenue Merge | Linn Street Merge | 2920 | B | 15.7 | 1299 | A | 7.0 |
| Linn Street Merge | West OH 5th Street Diverge | 3055 | B | 12.3 | 1935 | A | 7.8 |
| West OH 5th Street Diverge | I-75 Southbound Diverge | 2548 | C | 20.6 | 1815 | B | 14.6 |

[1] LOS = Level of Service
[2] pc/mi/ln = passenger car per mile per lane

The AM design hour traffic on all three freeways in the study area occurs during the 7:30 to 8:30 period. The northbound and southbound lanes of I-75 north of the Brent Spence Bridge accommodate the highest volumes of traffic during the AM peak period. The northbound and southbound lanes of I-75 south of the Brent Spence Bridge accommodate more traffic during the PM peak period (4:30 to 5:30 PM). I-71 northbound and US 50 eastbound carry more traffic during the AM peak period, while I-71 southbound and US 50 westbound are more heavily traveled during the PM peak period. While no segments on I-71 or US 50 operate at LOS E or F, many segments on I-75 operate at LOS E or F, and several segments operate at LOS D.

### 5.2.2 Ramp-Freeway Junctions

Traffic congestion throughout the highway network is also due to the merge and diverge locations at interchanges along I- 75, I-71, and US 50. The following tables present the results for the 2005 existing condition analyses performed on interchange ramps of I-75, I-71, and US 50 within the study area. Locations with a LOS D are likely to degrade to a LOS of E or F in the design year (2030).

The traffic analyses determined that numerous interchanges on I-75 in the northbound and southbound directions currently operate at LOS D, E, and F during both the AM and the PM peak hours. Additionally, I-71 interchange ramps in the study area operate at LOS D and E during the AM and PM peak hours. The majority of ramps along US 50 currently operate at LOS A, B, and C in both the AM and PM peak hours.

**Table 5-7: 2005 I-75 Northbound Ramps**

| Ramp | Junction | AM | | PM | |
|---|---|---|---|---|---|
| | | LOS[1] | Density (pc/mi/ln)[2] | LOS[1] | Density (pc/mi/ln)[2] |
| Kyles Lane Entrance Ramp | Merge | E | 36.0 | D | 30.3 |
| West KY 12th Street Exit Ramp | Diverge | E | 36.5 | D | 33.7 |
| West KY 5th Street Exit Ramp | Diverge | E | 35.8 | D | 31.2 |
| Pike Street Entrance Ramp | Merge | E | 35.1 | C | 26.0 |
| West 4th Street Entrance Ramp** | Add Lane | E | 38.3 [U] | C | 24.9 [U] |
| I-71 Northbound Exit Ramp** | Drop Lane | D | 33.5 [R] | D | 32.9 [D] |
| West OH 5th Street Exit Ramp | Diverge | E | 35.4 | E | 37.2 |
| US 50 Exit Ramp | Diverge | E | 35.6 | E | 35.4 |
| I-71 Entrance Ramp** | Add Lane | B | 17.9 [U] | C | 24.4 [R] |
| West OH 9th Street Entrance Ramp | Merge | B | 14.4 | C | 20.4 |
| Freeman Avenue Entrance Ramp | Merge | B | 16.0 | C | 21.3 |
| Ezzard Charles Drive Entrance Ramp | Merge | B | 16.0 | C | 23.0 |
| Western Hills Viaduct Exit Ramp | Diverge | C | 20.8 | E | 35.3 |
| Bank Street Entrance Ramp | Merge | B | 18.9 | C | 24.4 |

[1] LOS = Level of Service
[2] pc/mi/ln = passenger car per mile per lane
* Failed capacity check for ramp or freeway (implies that the density exceeds the capacity of the facility)
** Values represent the result for the worst operating component of the ramp junction
[R] – Ramp operates the worst
[U] – Upstream freeway operates the worst
[D] – Downstream freeway operates the worst

### Table 5-8: 2005 I-75 Southbound Ramps

| Ramp | Junction | AM | | PM | |
|---|---|---|---|---|---|
| | | LOS[1] | Density (pc/mi/ln)[2] | LOS[1] | Density (pc/mi/ln)[2] |
| Western Hills Viaduct Exit Ramp | Diverge | F* | 37.3 | D | 28.6 |
| Western Hills Entrance/Findlay Street Exit | Weave | F* | 44.4 | C | 25.3 |
| Ezzard Charles Drive Exit Ramp | Diverge | F* | 38.1 | C | 22.0 |
| Freeman Avenue Exit Ramp | Diverge | F* | 36.9 | C | 22.6 |
| Ezzard Charles Drive Entrance/ West 7th Street Exit | Weave | E | 35.5 | B | 19.3 |
| I-71/West OH 5th Street Exit Ramp** | Drop Lane | C | 25.8 [R] | C | 19.2 [R] |
| West OH 9th Street Entrance Ramp | Merge | D | 30.4 | C | 25.2 |
| US 50 Entrance Ramp | Merge | F* | 35.9 | D | 31.8 |
| I-71 Entrance Ramp** | Add Lane | D | 33.8 [U] | E | 39.1 [R] |
| West OH 5th Street Exit Ramp | Diverge | D | 29.5 | E | 37.8 |
| Pike Street Exit Ramp | Diverge | C | 22.9 | D | 32.4 |
| West KY 4th Street Entrance Ramp | Merge | B | 15.8 | B | 19.5 |
| West KY 12th Street Entrance Ramp | Merge | B | 19.8 | C | 26.4 |
| Kyles Lane Exit Ramp | Diverge | C | 26.6 | E | 38.3 |

[1] LOS = Level of Service
[2] pc/mi/ln = passenger car per mile per lane
* Failed capacity check for ramp or freeway (implies that the density exceeds the capacity of the facility)
** Values represent the result for the worst operating component of the ramp junction
[R] – Ramp operates the worst
[U] – Upstream freeway operates the worst
[D] – Downstream freeway operates the worst

### Table 5-9: 2005 I-71 Northbound Ramps

| Ramp | Junction | AM | | PM | |
|---|---|---|---|---|---|
| | | LOS[1] | Density (pc/mi/ln)[2] | LOS[1] | Density (pc/mi/ln)[2] |
| West OH 2nd Street Exit Ramp | Diverge | E | 35.2 | B | 18.1 |
| I-75 Southbound Entrance Ramp** | Add Lane | D | 26.7 [R] | C | 22.4 [R] |

[1] LOS = Level of Service
[2] pc/mi/ln = passenger car per mile per lane
** Values represent the result for the worst operating component of the ramp junction
[R] – Ramp operates the worst
[U] – Upstream freeway operates the worst
[D] – Downstream freeway operates the worst

### Table 5-10: 2005 I- 71 Southbound Ramps

| Ramp | Junction | AM | | PM | |
|---|---|---|---|---|---|
| | | LOS[1] | Density (pc/mi/ln)[2] | LOS[1] | Density (pc/mi/ln)[2] |
| West OH 3rd Street Entrance Ramp | Merge | B | 16.1 | E | 36.4 |
| I-75 Northbound/US 50 Exit Ramp** | Drop Lane | C | 18.6 [R] | D | 26.9 [D] |

[1] LOS = Level of Service
[2] pc/mi/ln = passenger car per mile per lane
** Values represent the result for the worst operating component of the ramp junction
[R] – Ramp operates the worst
[U] – Upstream freeway operates the worst
[D] – Downstream freeway operates the worst

**Table 5-11: 2005 US 50 Westbound Ramps**

| Ramp | Junction | AM | | PM | |
|---|---|---|---|---|---|
| | | LOS[1] | Density (pc/mi/ln)[2] | LOS[1] | Density (pc/mi/ln)[2] |
| I-75/I-71 Entrance Ramp** | Add Lane | B | 12.7 [R] | B | 14.8 [R] |
| Gest Street Exit Ramp | Diverge | B | 13.3 | B | 15.8 |
| Dalton Avenue Exit Ramp** | Drop Lane | A | 7.8 [R] | B | 12.1 [D] |
| Freeman Avenue Entrance Ramp | Merge | A | 6.0 | B | 16.8 |

[1] LOS = Level of Service
[2] pc/mi/ln = passenger car per mile per lane
** Values represent the result for the worst operating component of the ramp junction
[R] – Ramp operates the worst
[U] – Upstream freeway operates the worst
[D] – Downstream freeway operates the worst

**Table 5-12: 2005 US 50 Eastbound Ramps**

| Ramp | Junction | AM | | PM | |
|---|---|---|---|---|---|
| | | LOS[1] | Density (pc/mi/ln)[2] | LOS[1] | Density (pc/mi/ln)[2] |
| Freeman Avenue Exit Ramp** | Drop Lane | C | 23.2 [D] | A | 7.6 [D] |
| Freeman Avenue Entrance Ramp** | Add Lane | C | 23.2 [U] | A | 7.6 [U] |
| West OH 6th Entrance/West 5th Exit | Weave | B | 16.2 | B | 10.7 |
| I-75 Southbound Exit Ramp** | Drop Lane | D | 29.3 [D] | B | 17.0 [D] |

[1] LOS = Level of Service
[2] pc/mi/ln = passenger car per mile per lane
** Values represent the result for the worst operating component of the ramp junction
[R] – Ramp operates the worst
[U] – Upstream freeway operates the worst
[D] – Downstream freeway operates the worst

### 5.2.3 Local Street At-Grade Intersections

Within the study area 47 signalized and eight unsignalized local street intersections were analyzed. Table 5-13 presents the intersections evaluated and the results obtained for each location. Locations with a LOS D are likely to degrade to a LOS of E or F in the design year (2030). The highlighting reflects the overall intersection level of service and not individual movements.

**Table 5-13: 2005 Local Street Intersections**

| Intersection | Time Period | Eastbound | | Westbound | | Northbound | | Southbound | | Overall | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Delay | LOS | Delay | LOS | Delay | LOS | Delay | LOS | Delay | LOS |
| West KY 4th Street and Crescent Avenue (Stop Controlled) | AM | - | - | 10.8 | B | - | - | - | - | - | - |
| | PM | - | - | 13.7 | B | - | - | - | - | - | - |
| West 4th Street and Philadelphia Street | AM | - | - | 36.8 | D | 9.5 | A | 35.5 | D | 30.6 | C |
| | PM | - | - | 40.4 | D | 18.7 | B | 42.3 | D | 36.5 | D |
| West KY 4th Street and Bakewell Street | AM | - | - | 14.1 | B | 14.3 | B | 14.4 | B | 14.2 | B |
| | PM | - | - | 16.1 | B | 15.9 | B | 15.7 | B | 16.1 | B |
| West KY 4th Street and Main Street | AM | - | - | 17.8 | B | 17.9 | B | 12.7 | B | 17.0 | B |
| | PM | - | - | 20.9 | C | 15.3 | B | 21.1 | C | 20.5 | C |
| West KY 5th Street and Crescent (Stop Controlled) | AM | - | - | 9.7 | A | - | - | - | - | - | - |
| | PM | - | - | 11.2 | B | - | - | - | - | - | - |
| West KY 5th Street and Philadelphia Street | AM | 18.4 | B | - | - | 17.8 | B | 18.3 | B | 18.3 | B |
| | PM | 18.8 | B | - | - | 16.6 | B | 18.1 | B | 18.4 | B |
| West KY 5th Street and Bakewell Street (Stop Controlled) | AM | - | - | - | - | 18.9 | C | 17.4 | C | - | - |
| | PM | - | - | - | - | 14.3 | B | 14.3 | B | - | - |
| West KY 5th Street and Main Street | AM | 18.7 | B | - | - | 18.2 | B | 18.4 | B | 18.5 | B |
| | PM | 18.9 | B | - | - | 14.0 | B | 19.1 | B | 18.3 | B |
| Pike Street and Bullock Street | AM | 35.4 | D | 9.9 | A | - | - | 36.5 | D | 32.0 | C |
| | PM | 32.5 | C | 35.0 | C | - | - | 34.5 | C | 34.4 | C |
| Pike Street and Jillians Way | AM | 44.1 | D | 7.5 | A | 42.9 | D | - | - | 39.5 | D |
| | PM | 21.9 | C | 21.7 | C | 21.7 | C | - | - | 21.8 | C |
| West KY 12th Street and Bullock Street (Stop Controlled) | AM | 10.6 | B | 11.2 | B | - | - | 10.7 | B | 10.8 | B |
| | PM | 9.6 | A | 13.0 | B | - | - | 11.5 | B | 11.8 | B |
| West KY 12th Street and Jillians Way (Stop Controlled) | AM | 20.7 | C | 25.3 | D | 13.2 | B | - | - | 21.4 | C |
| | PM | 20.9 | C | 39.9 | E | 33.7 | D | - | - | 32.9 | D |
| Kyles Lane and Dixie Highway | AM | 187.6 | F | 178.5 | F | 181.8 | F | 21.0 | C | 181.4 | F |
| | PM | 118.8 | F | 118.1 | F | 124.3 | F | 21.7 | C | 119.6 | F |
| I-75 Southbound Ramps and Kyles Lane | AM | - | - | 21.9 | C | 14.0 | B | 22.0 | C | 18.7 | B |
| | PM | - | - | 52.4 | D | 44.8 | D | 56.7 | E | 50.9 | D |

**Table 5-13: 2005 Local Street Intersections**

| Intersection | Time Period | Eastbound | | Westbound | | Northbound | | Southbound | | Overall | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Delay | LOS | Delay | LOS | Delay | LOS | Delay | LOS | Delay | LOS |
| I-75 Northbound Ramps and Kyles Lane | AM | 71.1 | E | - | - | 75.4 | E | 4.1 | A | 51.5 | D |
| | PM | 26.7 | C | - | - | 26.2 | C | 16.6 | B | 22.2 | C |
| Highland Pike and Kyles Lane | AM | 22.8 | C | 205.4 | F | 197.0 | F | 31.0 | C | 146.8 | F |
| | PM | 30.5 | C | 225.0 | F | 24.4 | C | 231.7 | F | 161.6 | F |
| Bank Street and Dalton Avenue | AM | 13.5 | B | 15.9 | B | 14.0 | B | 15.1 | B | 14.8 | B |
| | PM | 12.7 | B | 19.3 | B | 17.2 | B | 19.4 | B | 18.3 | B |
| Bank Street and Winchell Avenue | AM | 14.0 | B | 13.6 | B | 13.9 | B | - | - | 13.9 | B |
| | PM | 14.8 | B | 14.7 | B | 14.5 | B | - | - | 14.6 | B |
| Central Avenue and Linn Street | AM | 25.1 | C | 14.5 | B | 16.2 | B | 25.1 | C | 22.2 | C |
| | PM | 17.4 | B | 27.5 | C | 16.5 | B | 26.7 | C | 23.6 | C |
| Bank Street and Linn Street (Stop Controlled) | AM | 10.8 | B | - | - | - | - | - | - | - | - |
| | PM | 12.6 | B | - | - | - | - | - | - | - | - |
| Findlay Street and Dalton Avenue | AM | 16.5 | B | 19.4 | B | 19.0 | B | 11.4 | B | 15.6 | B |
| | PM | 19.5 | B | 21.0 | C | 20.0 | C | 10.9 | B | 16.1 | B |
| Findlay Street and Western Avenue | AM | 14.0 | B | 14.1 | B | - | - | 14.1 | B | 14.1 | B |
| | PM | 14.3 | B | 13.5 | B | - | - | 14.1 | B | 14.1 | B |
| Findlay Street and Winchell Avenue | AM | 14.1 | B | 13.2 | B | 13.9 | B | - | - | 13.9 | B |
| | PM | 14.2 | B | 13.6 | B | 14.3 | B | - | - | 14.2 | B |
| West Liberty Street and Dalton Avenue | AM | 13.8 | B | 14.9 | B | 13.9 | B | 15.4 | B | 14.9 | B |
| | PM | 14.6 | B | 16.3 | B | 14.7 | B | 16.6 | B | 15.9 | B |
| West Liberty Street and Western Avenue | AM | 14.3 | B | 14.5 | B | - | - | 14.2 | B | 14.3 | B |
| | PM | 13.9 | B | 14.3 | B | - | - | 14.5 | B | 14.3 | B |
| West Liberty Street and Winchell Avenue | AM | 14.9 | B | 13.8 | B | 14.8 | B | - | - | 14.6 | B |
| | PM | 14.0 | B | 15.3 | B | 15.0 | B | - | - | 14.9 | B |
| West Liberty Street and Linn Street | AM | 15.9 | B | 15.1 | B | 15.6 | B | 15.3 | B | 15.6 | B |
| | PM | 15.1 | B | 17.5 | B | 16.5 | B | 16.0 | B | 16.5 | B |
| Ezzard Charles Drive Westbound and Western Avenue | AM | - | - | 13.8 | B | - | - | 14.1 | B | 14.1 | B |
| | PM | - | - | 14.0 | B | - | - | 13.9 | B | 13.9 | B |

**Table 5-13: 2005 Local Street Intersections**

| Intersection | Time Period | Eastbound | | Westbound | | Northbound | | Southbound | | Overall | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Delay | LOS | Delay | LOS | Delay | LOS | Delay | LOS | Delay | LOS |
| Ezzard Charles Drive Westbound and Winchell Avenue | AM | - | - | 14.5 | B | 14.2 | B | - | - | 14.3 | B |
| | PM | - | - | 17.4 | B | 17.7 | B | - | - | 17.6 | B |
| Ezzard Charles Drive Eastbound and Western Avenue | AM | 15.7 | B | - | - | - | - | 15.6 | B | 15.6 | B |
| | PM | 13.9 | B | - | - | - | - | 14.1 | B | 14.1 | B |
| Ezzard Charles Drive Eastbound and Winchell Avenue | AM | 14.8 | B | - | - | 14.7 | B | - | - | 14.8 | B |
| | PM | 13.5 | B | - | - | 13.5 | B | - | - | 13.5 | B |
| Ezzard Charles Drive and Linn Street | AM | 13.6 | B | 11.8 | B | 13.3 | B | 12.9 | B | 13.2 | B |
| | PM | 12.7 | B | 13.7 | B | 13.4 | B | 12.9 | B | 13.3 | B |
| Gest Street and Dalton Avenue | AM | 15.9 | B | 15.8 | B | 16.1 | B | 16.0 | B | 16.0 | B |
| | PM | 17.7 | B | 17.5 | B | 13.5 | B | 17.8 | B | 17.0 | B |
| Gest Street and Western Avenue | AM | 15.0 | B | 14.9 | B | - | - | 15.1 | B | 15.0 | B |
| | PM | 15.4 | B | 14.5 | B | - | - | 15.0 | B | 15.1 | B |
| Gest Street and Freeman Avenue | AM | 17.5 | B | 27.6 | C | 26.9 | C | 27.0 | C | 25.8 | C |
| | PM | 16.7 | B | 28.3 | C | 26.1 | C | 26.3 | C | 24.1 | C |
| Linn Street and Gest Street | AM | 15.2 | B | 17.1 | B | 17.0 | B | 9.8 | A | 15.1 | B |
| | PM | 16.6 | B | 16.8 | B | 17.1 | B | 10.1 | B | 15.5 | B |
| West Court Street and Linn Street (Stop Controlled) | AM | 11.7 | B | 12.6 | B | - | - | - | - | - | - |
| | PM | 15.7 | C | 17.7 | C | - | - | - | - | - | - |
| West OH 8th Street and Dalton Avenue | AM | 13.9 | B | 20.5 | C | 17.8 | B | 20.2 | C | 17.2 | B |
| | PM | 16.2 | B | 27.0 | C | 14.5 | B | 28.8 | C | 24.4 | C |
| West OH 8th Street and Freeman Avenue | AM | 25.0 | C | 21.6 | C | 25.4 | C | 22.2 | C | 24.0 | C |
| | PM | 24.1 | C | 23.2 | C | 22.5 | C | 24.0 | C | 23.6 | C |
| West OH 8th Street and Linn Street | AM | 22.7 | C | 19.8 | B | 21.5 | C | 20.9 | C | 22.0 | C |
| | PM | 22.8 | C | 22.7 | C | 20.0 | B | 23.2 | C | 22.4 | C |
| West OH 6th Street and Linn Street | AM | - | - | - | - | - | - | 7.9 | A | - | - |
| | PM | - | - | - | - | - | - | 10.7 | B | - | - |
| Dalton Avenue and Linn Street | AM | 15.4 | B | 16.4 | B | 16.6 | B | 15.3 | B | 16.0 | B |
| | PM | 21.4 | C | 13.1 | B | 20.2 | C | 18.1 | B | 18.8 | B |

**Table 5-13: 2005 Local Street Intersections**

| Intersection | Time Period | Eastbound | | Westbound | | Northbound | | Southbound | | Overall | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Delay | LOS | Delay | LOS | Delay | LOS | Delay | LOS | Delay | LOS |
| Central Avenue and West Court Street | AM | 15.2 | B | 13.1 | B | 15.2 | B | - | - | 15.0 | B |
| | PM | 12.8 | B | 13.8 | B | 13.5 | B | - | - | 13.4 | B |
| West OH 9th Street and Central Avenue | AM | - | - | 13.4 | B | 13.3 | B | 12.3 | B | 13.3 | B |
| | PM | - | - | 17.9 | B | 17.8 | B | 14.0 | B | 17.7 | B |
| West OH 7th Street and Central Avenue | AM | 17.4 | B | - | - | 17.6 | B | - | - | 17.4 | B |
| | PM | 13.7 | B | - | - | 13.5 | B | - | - | 13.6 | B |
| West OH 6th Street and Central Avenue | AM | - | - | 14.3 | B | 14.1 | B | - | - | 14.2 | B |
| | PM | - | - | 15.2 | B | 15.5 | B | - | - | 15.2 | B |
| West OH 5th Street and Central Avenue | AM | 26.0 | C | - | - | 25.3 | C | 12.7 | B | 25.4 | C |
| | PM | 18.8 | B | - | - | 19.4 | B | 8.8 | A | 17.6 | B |
| West OH 4th Street and Central Avenue | AM | - | - | 16.6 | B | 15.6 | B | 16.5 | B | 16.1 | B |
| | PM | - | - | 30.0 | C | 30.4 | C | 25.6 | C | 29.9 | C |
| West OH 3rd Street and Central Avenue | AM | 37.2 | D | 38.0 | D | 30.5 | C | 36.9 | D | 37.2 | D |
| | PM | 35.4 | D | 37.4 | D | 36.5 | D | 35.4 | D | 36.6 | D |
| West OH 4th Street and Plum Street | AM | - | - | 12.7 | B | - | - | 12.8 | B | 12.7 | B |
| | PM | - | - | 14.0 | B | - | - | 14.3 | B | 14.0 | B |
| West OH 3rd Street and Plum Street | AM | - | - | 12.4 | B | - | - | 12.4 | B | 12.4 | B |
| | PM | - | - | 12.4 | B | - | - | 12.7 | B | 12.4 | B |
| West OH 4th Street and Elm Street | AM | - | - | 13.9 | B | 13.9 | B | - | - | 13.9 | B |
| | PM | - | - | 16.2 | B | 16.5 | B | - | - | 16.3 | B |
| West OH 3rd Street and Elm Street | AM | - | - | 14.1 | B | 14.2 | B | - | - | 14.1 | B |
| | PM | - | - | 14.4 | B | 14.5 | B | - | - | 14.4 | B |
| West OH 2nd Street and Elm Street | AM | 14.5 | B | - | - | 14.8 | B | - | - | 14.5 | B |
| | PM | 13.8 | B | - | - | 13.5 | B | - | - | 13.7 | B |
| West OH 3rd Street and Clay Wade Bailey Bridge | AM | 20.6 | C | 11.7 | B | 19.9 | B | - | - | 18.0 | B |
| | PM | 59.2 | E | 64.9 | E | 54.5 | D | - | - | 60.6 | E |

In general, most of the intersections in the study area currently operate at a LOS B and C. However, the intersections adjacent to the Kyles Lane Interchange at the southern end of the study area operate at a LOS F during both the AM and PM peak periods. Several intersections in Kentucky operate at a LOS D. The West 3rd Street and Central Avenue intersection in Cincinnati operates at a LOS D during both AM and PM peak periods. The West 3rd Street and Clay Wade Bailey Bridge intersection in Cincinnati operates at LOS E during the PM peak hour.

## 5.3 Future Conditions (2030)

Year 2030 volumes were obtained using the OKI regional travel demand model assignments as a basis for applying a hybrid mix of the ratio and additive methods. The 2005 design hour volumes were adjusted to reflect the design hour volumes in Year 2030. For at-grade intersections, these volumes were then adjusted to maintain balanced flow through the respective corridors.

### 5.3.1 Mainline Segment Analysis

The following tables present the results of the 2030 future condition analyses performed on the mainline segments of I-75, I-71, and US 50 within the study area.

**Table 5-14: 2030 I-75 Northbound Mainline Segments**

| Segment | | AM | | | PM | | |
|---|---|---|---|---|---|---|---|
| From | To | Volume | LOS[1] | Density (pc/mi/ln)[2] | Volume | LOS[1] | Density (pc/mi/ln)[2] |
| Kyles Lane Merge | West KY 12th Street Diverge | 7736 | F | * | 6434 | F | * |
| West KY 12th Street Diverge | West KY 5th Street Diverge | 7594 | F | * | 6011 | E | 40.5 |
| West KY 5th Street Diverge | Pike Street Merge | 7001 | F | * | 5610 | D | 35.0 |
| Pike Street Merge | West KY 4th Street Merge | 8008 | F | * | 6028 | E | 40.8 |
| Brent Spence Bridge South | Brent Spence Bridge North | 9253 | F | * | 6884 | D | 30.3 |
| I-71 Diverge | West OH 5th Street Diverge | 5348 | F | * | 4628 | F | * |
| West OH 5th Street Diverge | US 50 Diverge | 4460 | F | * | 4340 | F | * |
| US 50 Diverge | I-71 Merge | 3626 | D | 33.1 | 3737 | D | 34.9 |
| I-71 Merge | West OH 9th Street Merge | 5996 | C | 25.1 | 6971 | D | 30.9 |
| West OH 9th Street Merge | Freeman Avenue Merge | 6204 | D | 26.2 | 7610 | E | 36.2 |
| Freeman Ave Merge | Ezzard Charles Drive Merge | 6612 | D | 28.6 | 8156 | E | 42.3 |
| Ezzard Charles Drive Merge | Western Hills Viaduct Diverge | 6699 | D | 29.1 | 8,766 | F | * |
| Western Hills Viaduct Diverge | Western Hills Viaduct/Bank Street Merge | 6236 | D | 26.4 | 8,134 | E | 42.0 |
| North of Western Hills Viaduct Merge | | 7104 | D | 31.9 | 8,850 | F | * |

1 LOS = Level of Service
2 pc/mi/ln = passenger car per mile per lane
* Capacity Exceeds HCS calculations

**Table 5-15: 2030 I-75 Southbound Mainline Segments**

| Segment | | AM | | | PM | | |
|---|---|---|---|---|---|---|---|
| From | To | Volume | LOS[1] | Density (pc/mi/ln)[2] | Volume | LOS[1] | Density (pc/mi/ln)[2] |
| North of Western Hills Viaduct | | 9333 | F | * | 7688 | E | 36.9 |
| Western Hills Viaduct Merge | Findlay Street Diverge | 9985 | E | 40.2 | 7662 | C | 25.8 |
| Findlay Street Diverge | Ezzard Charles Diverge | 9345 | F | * | 7023 | D | 31.3 |
| Ezzard Charles Drive Diverge | Freeman Avenue Diverge | 8934 | F | * | 6763 | D | 29.5 |
| Ezzard Charles Drive Merge | West OH 7th Street Diverge | 8516 | F | * | 6750 | D | 29.5 |
| I-71 Diverge | West OH 9th Street Merge | 3951 | E | 39.2 | 3526 | D | 31.5 |
| West OH 9th Street Merge | US 50 Merge | 4228 | F | * | 4124 | E | 43.5 |
| US 50 Merge | I-71 Merge | 4781 | F | * | 4904 | F | * |
| Brent Spence Bridge North | Brent Spence Bridge South | 6636 | D | 28.7 | 9114 | F | * |
| West KY 5th Street Diverge | Pike Street Diverge | 6158 | C | 26.0 | 8641 | F | * |
| Pike Street Diverge | West KY 4th Street Merge | 5821 | C | 24.3 | 8034 | E | 40.8 |
| West KY 4th Street Merge | West KY 12th Street Merge | 6199 | D | 26.2 | 9125 | F | * |
| West KY 12th Street Merge | Kyles Lane Diverge | 6505 | D | 27.9 | 9671 | F | * |

[1] LOS = Level of Service
[2] pc/mi/ln = passenger car per mile per lane

**Table 5-16: 2030 I-71 Northbound Mainline Segments**

| Segment | | AM | | | PM | | |
|---|---|---|---|---|---|---|---|
| From | To | Volume | LOS[1] | Density (pc/mi/ln)[2] | Volume | LOS[1] | Density (pc/mi/ln)[2] |
| South of West OH 2nd Street | | 3905 | E | 37.8 | 2256 | C | 18.4 |
| West OH 2nd Street Diverge | I-75 Southbound/ US 50 Merge | 3097 | D | 26.0 | 1866 | B | 15.3 |
| East of I-75 Southbound/US 50 Merge | | 6290 | D | 26.5 | 4621 | C | 18.9 |

[1] LOS = Level of Service
[2] pc/mi/ln = passenger car per mile per lane

**Table 5-17: 2030 I-71 Southbound Mainline Segments**

| Segment | | AM | | | PM | | |
|---|---|---|---|---|---|---|---|
| From | To | Volume | LOS[1] | Density (pc/mi/ln)[2] | Volume | LOS[1] | Density (pc/mi/ln)[2] |
| East of I-75 Northbound Diverge | | 4327 | B | 17.7 | 6086 | C | 25.4 |

[1] LOS = Level of Service
[2] pc/mi/ln = passenger car per mile per lane

**Table 5-18: 2030 US 50 Westbound Mainline Segments**

| Segment | | AM | | | PM | | |
|---|---|---|---|---|---|---|---|
| From | To | Volume | LOS[1] | Density (pc/mi/ln)[2] | Volume | LOS[1] | Density (pc/mi/ln)[2] |
| I-75 Northbound | West OH 6th Street Diverge | 1961 | A | 7.9 | 2816 | B | 11.3 |
| Gest Street Diverge | Dalton Avenue Diverge | 1258 | A | 5.1 | 2574 | A | 10.4 |
| Dalton Avenue Diverge | Freeman Avenue Merge | 799 | A | 4.3 | 2302 | B | 12.4 |
| West of Freeman Avenue Merge | | 960 | A | 5.2 | 2730 | B | 14.7 |

[1] LOS = Level of Service
[2] pc/mi/ln = passenger car per mile per lane

**Table 5-19: 2030 US 50 Eastbound Mainline Segments**

| Segment | | AM | | | PM | | |
|---|---|---|---|---|---|---|---|
| From | To | Volume | LOS[1] | Density (pc/mi/ln)[2] | Volume | LOS[1] | Density (pc/mi/ln)[2] |
| West of Freeman Ave | | 3462 | C | 18.6 | 1110 | A | 6.0 |
| Freeman Avenue Diverge | Freeman Avenue Merge | 2906 | C | 23.7 | 972 | A | 7.8 |
| Freeman Avenue Merge | Linn Street Merge | 2965 | B | 15.9 | 1329 | A | 7.1 |
| Linn Street Merge | West OH 5th Street Diverge | 3112 | B | 12.5 | 2088 | A | 8.4 |
| West OH 5th Street Diverge | I-75 Southbound Diverge | 2563 | C | 20.7 | 1963 | B | 15.8 |

[1] LOS = Level of Service
[2] pc/mi/ln = passenger car per mile per lane

In 2030, it is projected that almost all of I-75 within the study area will operate at a LOS D, E or F in the AM and PM peak hours. The northbound lanes of I-71 will operate at LOS D and E during the AM peak. The I-71 southbound lanes during the AM and PM peak hours and the northbound lanes during the PM peak hours will operate at LOS B and C. Design hour volumes estimated for US 50 indicate that it will continue to operate at LOS A, B, and C.

### 5.3.2 Ramp-Freeway Junctions

The following tables present the results for the 2030 future condition analyses performed on interchange ramps of I-75, I-71, and US 50 within the study area.

**Table 5-20: 2030 I-75 Northbound Ramps**

| Ramp | Junction | AM | | PM | |
|---|---|---|---|---|---|
| | | LOS[1] | Density (pc/mi/ln)[2] | LOS[1] | Density (pc/mi/ln)[2] |
| Kyles Lane Entrance Ramp | Merge | F* | 45.9 | F* | 37.4 |
| West KY 12th Street Exit Ramp | Diverge | F* | 43.4 | F* | 49.2 |
| West KY 5th Street Exit Ramp | Diverge | F* | 43.1 | F* | 37.3 |
| Pike Street Entrance Ramp | Merge | F* | 46.9 | F* | 34.5 |

**Table 5-20: 2030 I-75 Northbound Ramps**

| Ramp | Junction | AM | | PM | |
|---|---|---|---|---|---|
| | | LOS[1] | Density (pc/mi/ln)[2] | LOS[1] | Density (pc/mi/ln)[2] |
| West OH 4th Street Entrance Ramp** | Add Lane | F* | [U] | E | 40.8 [U] |
| I-71 Northbound Exit Ramp** | Drop Lane | F* | [U] | F* | [D] |
| West OH 5th Street Exit Ramp | Diverge | F* | 54.3 | F* | 47.2 |
| US 50 Exit Ramp | Diverge | F* | 45.8 | F* | 44.6 |
| I-71 Entrance Ramp** | Add Lane | D | 33.1 [U] | D | 34.9 [U] |
| West OH 9th Street Entrance Ramp | Merge | C | 20.4 | C | 22.9 |
| Freeman Avenue Entrance Ramp | Merge | C | 20.4 | F* | 23.3 |
| Ezzard Charles Drive Entrance Ramp | Merge | C | 21.5 | F* | 24.7 |
| Western Hills Viaduct Exit Ramp | Diverge | D | 30.0 | F* | 39.8 |
| Bank Street Entrance Ramp | Merge | C | 23.1 | F* | 27.9 |

[1] LOS = Level of Service
[2] pc/mi/ln = passenger car per mile per lane
* Failed capacity check for ramp or freeway (implies that the density exceeds the capacity of the facility)
** Values represent the result for the worst operating component of the ramp junction
[R] – Ramp operates the worst
[U] – Upstream freeway operates the worst
[D] – Downstream freeway operates the worst

**Table 5-21: 2030 I-75 Southbound Ramps**

| Ramp | Junction | AM | | PM | |
|---|---|---|---|---|---|
| | | LOS[1] | Density (pc/mi/ln)[2] | LOS[1] | Density (pc/mi/ln)[2] |
| Western Hills Viaduct Exit Ramp | Diverge | F* | 41.5 | E | 35.8 |
| Western Hills Entrance/Findlay Street Exit | Weave | F* | 51.2 | E | 36.1 |
| Ezzard Charles Drive Exit Ramp | Diverge | F* | 41.8 | D | 31.0 |
| Freeman Avenue Exit Ramp | Diverge | F* | 40.8 | D | 30.4 |
| Ezzard Charles Drive Entrance/West OH 7th Street Exit | Weave | E | 42.3 | D | 29.7 |
| I-71/ West OH 5th Street Exit Ramp** | Drop | E | 39.2 [D] | D | 31.5 [D] |
| West OH 9th Street Entrance Ramp | Merge | F* | 40.2 | F* | 39.0 |
| US 50 Entrance Ramp | Merge | F* | 45.8 | F* | 46.8 |
| I-71 Entrance Ramp** | Add | F* | [D] | F* | [R] |
| West OH 5th Street Exit Ramp | Diverge | D | 34.2 | F* | 44.9 |
| Pike Street Exit Ramp | Diverge | D | 29.9 | F* | 42.1 |
| West KY 4th Street Entrance Ramp | Merge | B | 19.0 | F* | 22.4 |
| West KY 12th Street Entrance Ramp | Merge | C | 24.7 | F* | 33.6 |
| Kyles Lane Exit Ramp | Diverge | D | 32.7 | F* | 48.6 |

[1] LOS = Level of Service
[2] pc/mi/ln = passenger car per mile per lane
* Failed capacity check for ramp or freeway (implies that the density exceeds the capacity of the facility)
** Values represent the result for the worst operating component of the ramp junction
[R] – Ramp operates the worst
[U] – Upstream freeway operates the worst
[D] – Downstream freeway operates the worst

**Table 5-22: 2030 I-71 Northbound Ramps**

| Ramp | Junction | AM | | PM | |
|---|---|---|---|---|---|
| | | LOS[1] | Density (pc/mi/ln)[2] | LOS[1] | Density (pc/mi/ln)[2] |
| West OH 2nd Street Exit Ramp | Diverge | F* | 38.9 | C | 22.6 |
| I-75 Southbound Entrance Ramp** | Add Lane | D | 26.7 [R] | C | 22.4 [R] |

[1] LOS = Level of Service
[2] pc/mi/ln = passenger car per mile per lane
* Failed capacity check for ramp or freeway (implies that the density exceeds the capacity of the facility)
** Values represent the result for the worst operating component of the ramp junction
[R] – Ramp operates the worst
[U] – Upstream freeway operates the worst
[D] – Downstream freeway operates the worst

**Table 5-23: 2030 I-71 Southbound Ramps**

| Ramp | Junction | AM | | PM | |
|---|---|---|---|---|---|
| | | LOS[1] | Density (pc/mi/ln)[2] | LOS[1] | Density (pc/mi/ln)[2] |
| West OH 3rd Street Entrance Ramp | Merge | B | 18.3 | F* | 39 |
| I-75 Northbound/US 50 Exit Ramp** | Drop Lane | C | 21.3 [R] | D | 32.5 [D] |

[1] LOS = Level of Service
[2] pc/mi/ln = passenger car per mile per lane
* Failed capacity check for ramp or freeway (implies that the density exceeds the capacity of the facility)
** Values represent the result for the worst operating component of the ramp junction
[R] – Ramp operates the worst
[U] – Upstream freeway operates the worst
[D] – Downstream freeway operates the worst

**Table 5-24: 2030 US 50 Westbound Ramps**

| Ramp | Junction | AM | | PM | |
|---|---|---|---|---|---|
| | | LOS[1] | Density (pc/mi/ln)[2] | LOS[1] | Density (pc/mi/ln)[2] |
| I-75/I-71 Entrance Ramp | Add | B | 14.5 | B | 14.4 [R] |
| Gest Street Exit Ramp | Diverge | B | 15.6 | B | 16.8 |
| Dalton Avenue Exit Ramp** | Drop | A | 7.5 [R] | B | 12.4 [D] |
| Freeman Avenue Entrance Ramp | Merge | A | 6.0 | B | 16.1 |

[1] LOS = Level of Service
[2] pc/mi/ln = passenger car per mile per lane
** Values represent the result for the worst operating component of the ramp junction
[R] – Ramp operates the worst
[U] – Upstream freeway operates the worst
[D] – Downstream freeway operates the worst

**Table 5-25: 2030 US 50 Eastbound Ramps**

| Ramp | Junction | AM | | PM | |
|---|---|---|---|---|---|
| | | LOS[1] | Density (pc/mi/ln)[2] | LOS[1] | Density (pc/mi/ln)[2] |
| Freeman Avenue Exit Ramp | Drop | C | 23.7 [D] | A | 7.8 [D] |
| Freeman Avenue Entrance Ramp | Add Lane | C | 23.7 [U] | A | 7.8 [U] |
| West OH 6th Entrance/ West OH 5th Exit | Weave | B | 16.7 | B | 12.0 |
| I-75 Southbound Exit Ramp | Drop | D | 29.3 [D] | B | 17.0 [D] |

[1] LOS = Level of Service
[2] pc/mi/ln = passenger car per mile per lane
** Values represent the result for the worst operating component of the ramp junction
[R] – Ramp operates the worst
[U] – Upstream freeway operates the worst
[D] – Downstream freeway operates the worst

Traffic analyses indicate that most of the ramp junctions on I-75 will degraded to a LOS F in 2030 during both the AM and PM peak hours. The I-71 northbound ramps during the AM peak and southbound ramps during the PM peak will operate at LOS D and F. The majority of design hour volumes estimated for US 50 westbound and eastbound ramps indicate that they will continue to operate at LOS A, B, and C.

### 5.3.3 Local Street At-Grade Intersections

Table 5-26 presents the future 2030 results obtained for each intersection location. The highlighting reflects the overall intersection level of service and not individual movements. Seven intersections in Kentucky will operate at a LOS F in 2030. One intersection in Ohio will operate at a LOS E in 2030.

**Table 5-26: 2030 Brent Spence Bridge Study Area Intersections**

| Intersection | Time Period | Eastbound | | Westbound | | Northbound | | Southbound | | Overall | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Delay | LOS | Delay | LOS | Delay | LOS | Delay | LOS | Delay | LOS |
| West KY 4th Street and Crescent Avenue (Stop Controlled) | AM | - | - | 12.5 | B | - | - | - | - | - | - |
| | PM | - | - | 12.9 | B | - | - | - | - | - | - |
| West 4th Street and Philadelphia Street | AM | - | - | 63.2 | E | 10.1 | B | 59.4 | E | 52.6 | D |
| | PM | - | - | 59.0 | E | 22.4 | C | 60.1 | E | 52.4 | D |
| West KY 4th Street and Bakewell Street | AM | - | - | 15.5 | B | 15.6 | B | 15.7 | B | 15.5 | B |
| | PM | - | - | 17.5 | B | 17.2 | B | 17.0 | B | 17.4 | B |
| West KY 4th Street and Main Street | AM | - | - | 134.6 | F | 129.8 | F | 27.2 | C | 111.7 | F |
| | PM | - | - | 124.1 | F | 10.1 | B | 127.0 | F | 117.8 | F |
| West KY 5th Street and Crescent (Stop Controlled) | AM | - | - | 9.5 | A | - | - | - | - | - | - |
| | PM | - | - | 11.0 | B | - | - | - | - | - | - |
| West KY 5th Street and Philadelphia Street | AM | 18.4 | B | - | - | 18.3 | B | 19.1 | B | 18.5 | B |
| | PM | 17.5 | B | - | - | 15.0 | B | 17.3 | B | 17.0 | B |

**Table 5-26: 2030 Brent Spence Bridge Study Area Intersections**

| Intersection | Time Period | Eastbound | | Westbound | | Northbound | | Southbound | | Overall | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Delay | LOS | Delay | LOS | Delay | LOS | Delay | LOS | Delay | LOS |
| West KY 5th Street and Bakewell Street (Stop Controlled) | AM | - | - | - | - | 22.5 | C | 34.5 | D | - | - |
| | PM | - | - | - | - | 12.6 | B | 13.4 | B | - | - |
| West KY 5th Street and Main Street | AM | 32.8 | C | - | - | 19.2 | B | 33.7 | C | 28.1 | C |
| | PM | 44.6 | D | - | - | 5.9 | A | 44.6 | D | 39.9 | D |
| Pike Street and Bullock Street | AM | 42.5 | D | 10.1 | B | - | - | 42.8 | D | 39.1 | D |
| | PM | 54.4 | D | 54.0 | D | - | - | 56.2 | E | 54.9 | D |
| Pike Street and Jillians Way | AM | 44.3 | D | 8.9 | A | 44.0 | D | - | - | 41.3 | D |
| | PM | 25.0 | C | 22.1 | C | 25.0 | C | - | - | 23.6 | C |
| West KY 12th Street and Bullock Street (Stop Controlled) | AM | 125.0 | F | 18.5 | C | - | - | 20.3 | C | 70.0 | F |
| | PM | 12.6 | B | 14.8 | B | - | - | 16.1 | C | 15.2 | C |
| West KY 12th Street and Jillians Way (Stop Controlled) | AM | 252.0 | F | 21.5 | C | 12.0 | B | - | - | 161.5 | F |
| | PM | 66.1 | F | 74.6 | F | 31.6 | D | - | - | 60.0 | F |
| Kyles Lane and Dixie Highway | AM | 340.5 | F | 241.7 | F | 344.3 | F | 25.4 | C | 316.9 | F |
| | PM | 214.4 | F | 215.6 | F | 212.5 | F | 24.9 | C | 212.3 | F |
| I-75 Southbound Ramps and Kyles Lane | AM | - | - | 22.1 | C | 14.2 | B | 21.8 | C | 18.6 | B |
| | PM | - | - | 62.8 | E | 38.4 | D | 57.8 | E | 52.2 | D |
| I-75 Northbound Ramps and Kyles Lane | AM | 65.8 | E | - | - | 62.2 | E | 4.3 | A | 43.2 | D |
| | PM | 24.6 | C | - | - | 25.4 | C | 17.3 | B | 21.6 | C |
| Highland Pike and Kyles Lane | AM | 24.0 | C | 208.5 | F | 207.2 | F | 85.7 | F | 163.4 | F |
| | PM | 273.0 | F | 237.9 | F | 17.7 | B | 270.0 | F | 188.3 | F |
| Bank Street and Dalton Avenue | AM | 13.5 | B | 16.1 | B | 14.0 | B | 15.9 | B | 15.3 | B |
| | PM | 10.3 | B | 24.3 | C | 21.1 | C | 24.0 | C | 22.6 | C |
| Bank Street and Winchell Avenue | AM | 13.9 | B | 13.6 | B | 14.0 | B | - | - | 13.9 | B |
| | PM | 15.0 | B | 15.1 | B | 15.1 | B | - | - | 15.1 | B |
| Central Avenue and Linn Street | AM | 28.4 | C | 13.3 | B | 20.2 | C | 27.7 | C | 24.1 | C |
| | PM | 15.7 | B | 29.7 | C | 18.8 | B | 29.9 | C | 24.9 | C |
| Bank Street and Linn Street (Stop Controlled) | AM | 11.8 | B | - | - | - | - | - | - | - | - |
| | PM | 14.0 | B | - | - | - | - | - | - | - | - |
| Findlay Street and Dalton Avenue | AM | 17.3 | B | 20.6 | C | 18.4 | B | 11.3 | B | 15.2 | B |
| | PM | 19.3 | B | 20.7 | C | 20.4 | C | 11.2 | B | 16.4 | B |
| Findlay Street and Western Avenue | AM | 14.0 | B | 14.2 | B | - | - | 13.9 | B | 14.0 | B |
| | PM | 14.4 | B | 13.5 | B | - | - | 14.1 | B | 14.1 | B |
| Findlay Street and Winchell Avenue | AM | 14.2 | B | 13.3 | B | 14.0 | B | - | - | 14.0 | B |
| | PM | 14.6 | B | 13.9 | B | 14.7 | B | - | - | 14.6 | B |
| West Liberty Street and Dalton Avenue | AM | 14.9 | B | 15.7 | B | 13.3 | B | 16.0 | B | 15.1 | B |
| | PM | 14.3 | B | 16.6 | B | 14.6 | B | 16.6 | B | 15.9 | B |
| West Liberty Street and Western Avenue | AM | 14.8 | B | 14.5 | B | - | - | 14.7 | B | 14.7 | B |
| | PM | 13.6 | B | 14.6 | B | - | - | 14.9 | B | 14.6 | B |
| West Liberty Street and Winchell Avenue | AM | 15.3 | B | 13.6 | B | 15.1 | B | - | - | 14.8 | B |
| | PM | 13.3 | B | 16.4 | B | 16.0 | B | - | - | 15.6 | B |
| West Liberty Street and Linn Street | AM | 16.3 | B | 15.2 | B | 16.3 | B | 15.7 | B | 16.0 | B |
| | PM | 14.5 | B | 17.6 | B | 17.4 | B | 17.3 | B | 17.0 | B |
| Ezzard Charles Drive Westbound and Western Avenue | AM | - | - | 14.0 | B | - | - | 13.8 | B | 13.8 | B |
| | PM | - | - | 14.4 | B | - | - | 14.3 | B | 14.3 | B |

**Table 5-26: 2030 Brent Spence Bridge Study Area Intersections**

| Intersection | Time Period | Eastbound | | Westbound | | Northbound | | Southbound | | Overall | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Delay | LOS | Delay | LOS | Delay | LOS | Delay | LOS | Delay | LOS |
| Ezzard Charles Drive Westbound and Winchell Avenue | AM | - | - | 15.9 | B | 15.6 | B | - | - | 15.7 | B |
| | PM | - | - | 20.7 | C | 20.0 | B | - | - | 20.5 | C |
| Ezzard Charles Drive Eastbound and Western Avenue | AM | 14.6 | B | - | - | - | - | 14.1 | B | 14.2 | B |
| | PM | 14.4 | B | - | - | - | - | 14.6 | B | 14.6 | B |
| Ezzard Charles Drive Eastbound and Winchell Avenue | AM | 14.3 | B | - | - | 14.6 | B | - | - | 14.4 | B |
| | PM | 13.6 | B | - | - | 13.8 | B | - | - | 13.7 | B |
| Ezzard Charles Drive and Linn Street | AM | 13.3 | B | 12.2 | B | 13.8 | B | 12.7 | B | 13.2 | B |
| | PM | 12.8 | B | 14.4 | B | 14.7 | B | 13.2 | B | 14.0 | B |
| Gest Street and Dalton Avenue | AM | 16.8 | B | 16.4 | B | 16.3 | B | 16.3 | B | 16.4 | B |
| | PM | 17.5 | B | 17.3 | B | 13.8 | B | 17.8 | B | 17.0 | B |
| Gest Street and Western Avenue | AM | 15.4 | B | 15.4 | B | - | - | 15.3 | B | 15.3 | B |
| | PM | 15.2 | B | 14.3 | B | - | - | 15.3 | B | 15.0 | B |
| Gest Street and Freeman Avenue | AM | 23.3 | C | 40.2 | D | 36.0 | D | 40.0 | D | 37.4 | D |
| | PM | 15.3 | B | 26.6 | C | 26.5 | C | 26.2 | C | 23.2 | C |
| Linn Street and Gest Street | AM | 14.5 | B | 18.3 | B | 17.9 | B | 10.7 | B | 15.7 | B |
| | PM | 17.3 | B | 18.0 | B | 17.9 | B | 10.6 | B | 16.3 | B |
| West Court Street and Linn Street (Stop Controlled) | AM | 11.8 | B | 14.5 | B | - | - | - | - | - | - |
| | PM | 17.6 | C | 19.7 | C | - | - | - | - | - | - |
| West OH 8th Street and Dalton Avenue | AM | 15.2 | B | 21.1 | C | 17.9 | B | 20.6 | C | 17.7 | B |
| | PM | 17.3 | B | 28.0 | C | 13.6 | B | 28.0 | C | 24.3 | C |
| West OH 8th Street and Freeman Avenue | AM | 26.1 | C | 21.3 | C | 25.2 | C | 22.6 | C | 24.4 | C |
| | PM | 24.0 | C | 22.5 | C | 22.2 | C | 23.2 | C | 23.1 | C |
| West OH 8th Street and Linn Street | AM | 25.9 | C | 17.0 | B | 26.1 | C | 24.4 | C | 24.4 | C |
| | PM | 22.0 | C | 22.9 | C | 21.5 | C | 22.8 | C | 22.5 | C |
| West OH 6th Street and Linn Street | AM | - | - | - | - | - | - | 8.2 | A | - | - |
| | PM | - | - | - | - | - | - | 12.3 | B | - | - |
| Dalton Avenue and Linn Street | AM | 16.4 | B | 17.2 | B | 17.5 | B | 14.4 | B | 16.5 | B |
| | PM | 23.4 | C | 13.9 | B | 24.0 | C | 17.9 | B | 19.8 | B |
| Central Avenue and West Court Street | AM | 16.0 | B | 13.6 | B | 16.1 | B | - | - | 15.8 | B |
| | PM | 12.9 | B | 13.7 | B | 13.7 | B | - | - | 13.5 | B |
| West OH 9th Street and Central Avenue | AM | - | - | 13.9 | B | 14.1 | B | 12.3 | B | 14.0 | B |
| | PM | - | - | 18.9 | B | 18.8 | B | 14.2 | B | 18.7 | B |
| West OH 7th Street and Central Avenue | AM | 18.4 | B | - | - | 18.5 | B | - | - | 18.4 | B |
| | PM | 14.5 | B | - | - | 14.5 | B | - | - | 14.5 | B |
| West OH 6th Street and Central Avenue | AM | - | - | 16.0 | B | 15.7 | B | - | - | 15.9 | B |
| | PM | - | - | 19.6 | B | 19.6 | B | - | - | 19.6 | B |
| West OH 5th Street and Central Avenue | AM | 28.9 | C | - | - | 27.7 | C | 14.9 | B | 28.2 | C |
| | PM | 25.1 | C | - | - | 24.3 | C | 7.1 | A | 22.5 | C |
| West OH 4th Street and Central Avenue | AM | - | - | 21.0 | C | 20.8 | C | 20.7 | C | 20.9 | C |
| | PM | - | - | 33.9 | C | 36.6 | D | 35.9 | D | 35.2 | D |
| West OH 3rd Street and Central Avenue | AM | 38.7 | D | 37.2 | D | 37.4 | D | 37.6 | D | 37.7 | D |
| | PM | 68.8 | E | 67.3 | E | 62.6 | E | 68.5 | E | 66.3 | E |
| West OH 4th Street and Plum Street | AM | - | - | 13.1 | B | - | - | 13.1 | B | 13.1 | B |
| | PM | - | - | 15.2 | B | - | - | 15.5 | B | 15.2 | B |

**Table 5-26: 2030 Brent Spence Bridge Study Area Intersections**

| Intersection | Time Period | Eastbound | | Westbound | | Northbound | | Southbound | | Overall | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Delay | LOS | Delay | LOS | Delay | LOS | Delay | LOS | Delay | LOS |
| West OH 3rd Street and Plum Street | AM | - | - | 12.6 | B | - | - | 12.4 | B | 12.6 | B |
| | PM | - | - | 13.6 | B | - | - | 13.3 | B | 13.6 | B |
| West OH 4th Street and Elm Street | AM | - | - | 15.0 | B | 15.2 | B | - | - | 15.2 | B |
| | PM | - | - | 15.6 | B | 15.8 | B | - | - | 15.7 | B |
| West OH 3rd Street and Elm Street | AM | - | - | 15.2 | B | 14.9 | B | - | - | 15.1 | B |
| | PM | - | - | 17.3 | B | 17.8 | B | - | - | 17.4 | B |
| West OH 2nd Street and Elm Street | AM | 15.7 | B | - | - | 15.5 | B | - | - | 15.7 | B |
| | PM | 14.7 | B | - | - | 14.8 | B | - | - | 14.7 | B |
| West OH 3rd Street and Clay Wade Bailey Bridge | AM | 23.1 | C | 16.7 | B | 23.0 | C | - | - | 21.0 | C |
| | PM | 30.3 | C | 31.2 | C | 30.5 | C | - | - | 30.8 | C |

## 5.4 Travel Time Study

In order to obtain an understanding of travel times within the study area, a travel time study was conducted in December 2005, along the I-75 mainline from the Kyles Lane Interchange, in Kentucky to the Western Hills Viaduct (Harrison Avenue exit), in Ohio. Travel times were also recorded between interchanges. The analysis determined average delays during peak hours within the study area. The travel time study is in Appendix B.

### 5.4.1 Peak AM Hours (7:30 – 8:30)

The average I-75 southbound speed during the AM peak was no more than 10 miles per hour (mph) below the posted speed limit of 55 mph. Some sections of the corridor were traveled at speeds higher than the 55 mph posted speed limit. During this time the test vehicle never went below five mph, so no delay was recorded. The cumulative average travel time from Western Hills Viaduct to the Kyles Lane diverge was 5.60 minutes. This compares to a cumulative travel time of 5.64 minutes assuming a constant speed of 55 mph.

The average I-75 northbound speed during the AM peak was approximately 29 mph from Kyles Lane in Kentucky to the Brent Spence Bridge; however, the travel speed increased markedly on the Ohio side of the river. More than 23 seconds of delay, on average, occurred between the Kyles Lane merge and West KY 12th Street. The cumulative average travel time from the Kyles Lane merge to Western Hills Viaduct was 9.47 minutes, almost four minutes greater than the southbound travel time along the same corridor during the AM peak. The cumulative travel time assuming a constant speed of 55 mph was 5.69 minutes, which was also almost four minutes less than the average.

The Cincinnati Central Business District (CBD) lies in the middle of the I-75 corridor. Intuitively, this suggests that during the AM peak when commuters are traveling to work, travel speeds would be less traveling northbound from Kyles Lane to just north of Brent Spence Bridge and would then increase in Ohio. It also could indicate that travel speeds would be less traveling southbound from Western Hills Viaduct to the Brent Spence Bridge and then might increase in Kentucky. In the case of the I-75 northbound traffic, this appears to be true. However, the I-75 southbound traffic seems to travel at high speeds throughout the corridor.

### 5.4.2 Peak PM Hours (4:30 – 5:30)

The average I-75 southbound speed during the PM peak was below the posted speed limit (55 mph) along the entire corridor. It was particularly slow between Ezzard Charles Drive and the I-71 merge where the average speeds in this area were below 20 mph. Two sections (Western Hills Viaduct to the Findlay Street Diverge and Ezzard Charles Drive to the Freeman Avenue Ramp) had average delays greater than 10 seconds, which means that the traffic stream was either stopped or moving at speeds below five mph for an average duration of 10 seconds. The cumulative average travel time from Western Hills Viaduct to the Kyles Lane diverge was 14.73 minutes, which was nine minutes greater than the southbound travel time along the same corridor during the AM peak. The cumulative travel time, assuming a constant speed of 55 mph, was 5.64 minutes, which was also more than nine minutes less than the average.

The average I-75 northbound speed during the PM peak was above the posted speed limit (55 mph) along the entire corridor except between West KY 5th Street and the Brent Spence Bridge in Kentucky. The cumulative average travel time from the Kyles Lane merge to the Western Hills Viaduct was 5.60 minutes, which was more than nine minutes less than the travel time in the southbound direction. This compares to a cumulative travel time of 5.69 minutes assuming a constant speed of 55 mph.

The CBD district lies in the middle of the I-75 corridor. During the PM peak, it would seem that traffic leaving the CBD would be heavier than traffic leaving the CBD due to commuters traveling home. However, the southbound traffic travels at speeds lower than the posted speed limit throughout the corridor and is slowest north of the Brent Spence Bridge. The northbound traffic travels above the posted speed limit throughout most of the corridor, only dropping below the posted speed limit south of the Brent Spence Bridge.

## 5.5 Travel Origin and Destination

An Origin Destination Study (OD) was completed during December 2005 to document and understand travel patterns and travel times of cars and trucks using the Brent Spence Bridge during morning, mid-afternoon, and evening peak periods. The OD study is in Appendix C. Five sites along I-75 (including the Brent Spence Bridge), I-71, US 50, and I-471 were monitored to investigate travel patterns within Greater Cincinnati area.

### 5.5.1 Travel Pattern

The OD study determined that of the cars using the Brent Spence Bridge approximately 40 percent were expected to be going to or coming from the other four study sites:

- I-71 at Oak Street overpass (approximately 20% to 25%);
- I-75 at Crescentville overpass (approximately 5% to 10%);
- I-471 at Daniel Beard Bridge (approximately 3% to 7%); and
- US 50 Ramps to/from I-71/I-75/I-471 (east of Daniel Beard Bridge, approximately 1% to 5%).

The remaining 60 percent of cars were going to, or coming from unknown locations.

The percentage of trucks remaining on the interstate/freeway system was higher than that of passenger vehicles. At least 70 percent of trucks using the Brent Spence Bridge were going to, or coming from the other four study sites:

- I-75 at Crescentville overpass (approximately 45% to 70%);
- I-71 at Oak Street overpass (approximately 20% to 30%);
- I-471 at Daniel Beard Bridge (approximately 1% to 8%); and
- US 50 Ramps (east of Daniel Beard Bridge, approximately 1% to 5%).

The remaining 30 percent of trucks were going to, or coming from unknown locations.

### 5.5.2 Travel Time

The longest of the OD pairs studied, Brent Spence Bridge and I-75 at the Crescentville overpass, ranged from 17 to 23 minutes. The average travel times were similar in both directions and were high during the morning and evening peak periods. Travel times were lower during the mid-afternoon (Appendix C). Average travel time for cars traveling between the Brent Spence Bridge and I-71 at Oak Street overpass ranged between 4.25 and 5.57 minutes. Travel time for cars between Brent Spence Bridge and Daniel Beard Bridge ranged between 5.30 and 8.25 minutes. Though the average travel time for cars traveling between Brent Spence Bridge and US 50 Ramps ranged between 2.92 and 4.43 minutes, the average travel time from Brent Spence Bridge to US 50 Ramps was 16.62 minutes during the morning peak period.

Trucks traveling between the Brent Spence Bridge and I-71 at Oak Street overpass had average travel times ranging from 4.45 to 5.58 minutes. Trucks traveling between the BSB and I-75 at Crescentville overpass had average travel times ranging from 18.18 to 23.75 minutes. Due to low volumes of trucks and/or low number of license plate matches, average travel time of trucks traveling between the Brent Spence Bridge and Daniel Beard Bridge, and between the Brent Spence Bridge and US 50 Ramps provided inconclusive results.

# 6.0 CRASH ANALYSIS

Crash data for the study area were provided by the KYTC Division of Traffic Operations Traffic Safety Data Service, and ODOT's Office of Roadway Safety and Mobility and Ohio Department of Public Safety. The data detail crashes occurring in the study area between 2001 and 2003. This information is presented in Appendix D – Safety Study (January 4, 2006).

## 6.1 Kentucky Transportation Cabinet Crash Reports

Crash reports from KYTC were analyzed to determine crash rates throughout the study area and to provide support for observations. Along the I-75 corridor within the study area, 676 accidents were logged between the years 2001 and 2003. The crash data in Appendix D show each accident for I-75 and include severity, location, date, time of day, weather condition, light condition, road condition, and accident type.

Along I-75, the crash severity rate (fatality accidents + injury accidents/total accidents) is 0.1953. Of the 676 total crashes, 349 of the accidents (51.6 percent) were attributed to rear-end type crashes; while another 219 (32.4 percent) were attributed to sideswipes.

Approximately 67.3 percent of the crashes occurred during daylight, and about 74.3 percent occurred on dry pavement. The data suggest that road and light conditions may not be large factors in influencing accidents since the majority of them took place during favorable situations.

Crash rates (accidents/100 million vehicle miles traveled) were also determined by the KYTC Division of Traffic Operations Traffic Safety Data Service. The overall crash rate for the I-71/I-75 corridor was found to be 130.363. The study area has a crash rate nearly 1.33 times higher than the average of 93 for the years 2000 to 2003 for similar types of roadways in Kentucky.

The Critical Rate Factor calculated by the KYTC Division of Traffic Operations Traffic Safety Data Service for this corridor was found to be 1.304. This number is nearly 7.67 times higher than the average of 0.17 in Kentucky for similar roadway types.

### 6.1.1 Kentucky Crash Data Observations

After reviewing the crash reports from KYTC and plotting the accidents in GIS, several observations were made about I-75 in the Kentucky portion of the study area.

*I-75 Northbound Observations*

- Approximately 56.4 percent of accidents that occurred on I-75 happened in the northbound lanes.
- There is a high concentration of single vehicle crashes near straight line mile (SLM) 189.7 on a curve.
- There is a high concentration of rear-end accidents at SLM 188.8 and 188.9 north of the Kyle's Lane Interchange.
- There is a high concentration of rear-end accidents at SLM 191.0 near the KY 12$^{th}$ Street/Pike Street Interchange.
- There is a high concentration of rear-end accidents at SLM 191.2 near the KY 5$^{th}$ Street Interchange.

*I-75 Southbound Observations*

- Approximately 53.6 percent of accidents that occurred on I-75 happened in the southbound lanes.
- There is a high concentration of rear-end accidents near the southbound KY 12$^{th}$ Street/Pike Street exit ramp.
- There is a high concentration of rear-end accidents near the KY 5$^{th}$ Street exit ramp from I-75 southbound.
- There is a high concentration of sideswipe accidents near the 5$^{th}$ Street exit ramp southbound.

The I-75 corridor through the study area within Kentucky has a crash rate higher than the statewide average. Additionally, the critical rate factor is over seven times higher than the statewide average. There are high concentrations of crashes at the KY 12$^{th}$ Street/Pike Street and 5$^{th}$ Street exits. Along I-75, more than half of the crashes are rear-end type accidents, which is an indicator of congestion already present along the corridor.

## 6.2. Ohio Department of Transportation Crash Reports

Traffic Crash data were obtained from ODOT's Office of Roadway Safety and Mobility for the study area, including I-75 from the Kentucky/Ohio border (SLM 0.0) to just north of the Western Hills Viaduct Interchange (SLM 2.9), and I-71 from the I-75 Interchange (SLM 0.32) to near Walnut Street (SLM 0.90). The data include ODOT's Highway Safety Program (HSP) High Crash Location Identification System (HCLIS), ODOT's list of Safety Hot Spots, a summary of crashes in the study area from ODOT and OH-1 reports for all crashes occurring between 2001 and 2003 within the study area.

### 6.2.1 Ohio Safety Hot Spots and Highway Safety Program Listings

Sections of I-71/I-75 on the HCLIS are shown in Table 6-1. This system is used to identify high hazard locations throughout Ohio. Many sections and interchanges located in the study area are on this list. Overall, four sections on I-75 and three sections on I-71 appear on the list. Three sections on I-75 in the Ohio portion of the study area rank in the top one hundred on the HCLIS list.

**Table 6-1: Highway Safety Program Listings in the Study Area**

| Location | Begin Mile | End Mile | Location Type | HCLIS Rank |
|---|---|---|---|---|
| I-75 Corridor Segments and Interchanges | 0.00 | 0.49 | Section | 22 |
| | 0.50 | 0.99 | Section | 28 |
| | 1.00 | 2.90 | Section | 36 |
| | 3.04 | 4.14 | Section | 170 |
| I-71 Corridor Segments and Interchanges | 0.00 | 0.29 | Section | 96 |
| | 0.30 | 0.59 | Section | 559 |
| | 0.60 | 1.10 | Section | 53 |

Source: ODOT Office of Roadway Safety and Mobility High Crash Location Identification System

Safety Hot Spots were identified using data from the Office of Roadway Safety and Mobility. The Hot Spot locations are based on the total number of accidents over a three year period in an area regardless of traffic volume and other factors. Ohio roadways are divided into two-mile segments, and the number of crashes is compared to a given frequency to establish if a hot spot exists. The entire study area in Ohio is included as a Safety Hot Spot. Table 6-2 lists the Safety Hot Spots in the Ohio portion of the study area.

**Table 6-2: Safety Hot Spots**

| Location | Begin Mile | End Mile | Number of Crashes | Number Fatal | Number of Injuries |
|---|---|---|---|---|---|
| I-75 Corridor Segments | 0.22 | 2.22 | 1005 | 4 | 239 |
| | 2.22 | 4.22 | 802 | 2 | 205 |
| I-71 Corridor Segments | 0.00 | 2.00 | 721 | 2 | 162 |

Source: ODOT Office of Roadway Safety and Mobility Safety Hot Spot List, 2001-2003

### 6.2.2 Ohio Congestion Rankings

One section of I-75 within the Ohio portion of the study area and two sections of I-71 are among the most congested in the state of Ohio. Congested areas are determined by calculating a roadway's volume to capacity ratio. Roadways with a ratio greater than one are considered congested. The section of I-71 from SLM 0.48 to 0.50 is ranked third and one of the I-75 sections from SLM 0.71 to 0.90 is ranked second. Table 6-3 displays the congested highway sections within the study area.

**Table 6-3: Congested Sections**

| Location | Begin Mile | End Mile | Rank |
|---|---|---|---|
| I-75 Corridor Segments | 0.71 | 0.90 | 2 |
| | 1.35 | 17.47 | 31 |
| I-71 Corridor Segments | 0.00 | 0.22 | 62 |
| | 0.48 | 0.50 | 3 |
| | 1.15 | 1.34 | 4 |

Source: ODOT Office of Roadway Safety and Mobility Congestion List

## 6.3 Ohio Department of Public Safety (ODPS) Crash Reports

Crash reports from ODPS were analyzed to determine crash rates and to provide support for observations made throughout the study corridor. Along I-75 within the Ohio portion of the study area, 1,049 accidents were logged between the years 2001 and 2003 and 150 accidents were logged on I-71 in the study area during this same time period.

Along I-75, the crash severity rate (fatality accidents + injury accidents/total accidents) is 0.233. Of the 1,049 total crashes, 504 of the accidents (48 percent) were attributed to rear-end type crashes; while another 256 (25.3 percent) were attributed to sideswipes. Approximately 67.8 percent of the crashes occurred during daylight and about 69.4 percent occurred on dry pavement. The data suggest that road and light conditions may not be large factors in influencing accidents since the majority of them occurred during favorable situations.

Along I-71, the crash severity rate is 0.188. Of the accidents on I-71, 37.3 percent were rear-ends, 16.7 percent were sideswipe and 14.7 percent were fixed object crashes. Approximately 58 percent of the crashes that occurred along I-71 happened on dry pavement (approximately 40 percent on non-dry pavement), and approximately 54.7 percent occurred during daylight hours (approximately 45 percent during evening and night). These data suggest that road and light conditions are not a large factor in influencing accidents, since crashes were nearly evenly spread between favorable and non-favorable conditions (with the majority of accidents happening during daylight hours on dry pavement).

Crash rates (accidents/million vehicle miles traveled) were also determined for segments along the I-75 and I-71 corridors in the study area. Each corridor was divided into smaller segments. Based on 2002 Average Daily Traffic Volumes (ADT), crash rates were calculated for each segment and compared to the statewide average. Crash rates for each corridor were calculated with an ADT that used a weighted average of the ADTs throughout the corridors. These crash rates are shown in Table 6-4.

**Table 6-4: Ohio Crash rates by segment.***

| Location | Begin Mile | End Mile | Crash Rate |
|---|---|---|---|
| I-75 Corridor Segments | 0.00 | 0.22 | 4.27 |
| | 0.22 | 0.41 | 5.90 |
| | 0.41 | 0.50 | 7.95 |
| | 0.50 | 0.63 | 8.30 |
| | 0.63 | 0.71 | 4.96 |
| | 0.71 | 0.86 | 2.42 |
| | 0.86 | 1.25 | 3.51 |
| | 1.25 | 1.43 | 3.10 |
| | 1.43 | 1.91 | 2.94 |
| | 1.91 | 2.52 | 2.55 |
| | 2.52 | 2.90 | 1.98 |
| I-71 Corridor Segments | 0.22 | 0.27 | 25.66 |
| | 0.27 | 0.48 | 6.27 |
| | 0.48 | 0.50 | 11.95 |
| | 0.50 | 0.90 | 1.85 |

*Intersection accidents are not included

The overall crash rates for all segments along both northbound and southbound I-75 were higher than the average crash rates for similar facilities in Ohio. The worst segment has a crash rate more than six times greater than the statewide average. Overall, the corridor has a crash rate of 3.54, which is more than two times greater than the Ohio statewide average rate of 1.338.

Along I-71, the crash rates for all of the segments are greater than the statewide average rates. The worst segment has a crash rate more than 19 times the statewide average. The overall crash rate for the corridor is 5.26 accidents per million vehicle miles traveled (acc/mvmt), which is nearly four times the statewide average rate of 1.338 acc/mvmt.

## 6.4 Ohio Crash Data Observations

After reviewing the crash reports from ODPS and plotting the accidents in GIS, several observations were made about the I-75 and I-71 corridors in the Ohio portion of the study area.

*I-75 Northbound Observations*

- Approximately, 44 percent of the accidents that occurred on I-75 happened in the northbound lanes.
- There is a high concentration of rear-end accidents at SLM 0.10 between the bridge and the I-71/I-75 Interchange.
- There is a high concentration of rear-end accidents at SLM 1.90 near the Findlay Street bridge.
- There is a high concentration of sideswipe accidents at SLM 0.20 near the I-71/I-75 Interchange.
- High concentrations of sideswipe crashes were observed at SLM 1.00 near the OH 9$^{th}$ Street entrance ramp.
- High concentrations of sideswipe crashes were observed at SLM 1.20 near the Gest Street entrance ramp.

- There is a high concentration of wet road conditions and fixed object accidents at SLM 1.30 on a curve near the ramp bridges for Gest Street
- There is a high concentration of wet road conditions and fixed object accidents at SLM 1.70 on a curve near the entrance ramp from Ezzard Charles.

*I-75 Southbound Observations*

- Approximately 56 percent of the accidents that occurred on I-75 happened in the southbound lanes.
- There is a high concentration of rear-end accidents at SLM 0.10 where I-75 and I-71 merge together.
- There is a high concentration of rear-end accidents at SLM 1.00 near the OH 9th Street exit ramp.
- There is a high concentration of wet road condition and rear-end accidents at SLM 1.50 near the Ezzard Charles exit.
- There is a high concentration of rear-end accidents at SLM 1.80 near the Western Hills Viaduct exit.
- There is a high concentration of fixed object accidents at SLM 1.40 near the exit for Ezzard Charles.
- There is a high concentration of sideswipe accidents on southbound I-75 at SLM 0.10 and 0.20 near the I-71/I-75 Interchange.
- There is a high concentration of sideswipe accidents near SLM 2.70 near the Western Hills Viaduct exit ramps.

*I-71 Northbound Observations*

- Approximately 57 percent of the accidents on I-71 were northbound.
- A high concentration of sideswipe crashes were observed near SLM 0.50, the area includes entrance traffic merging from US 50 SB and the OH 2nd Street exit.
- A high concentration of rear-end and sideswipe accidents were observed near SLM 0.80 between the Race Street and Vine Street bridges.

*I-71 Southbound Observations*

- A high concentration of fixed object crashes were observed near SLM 0.50 this area has merging traffic from 3rd Street and exit ramps to US 50 NB.
- There are high concentrations of rear-end accidents between SLM 0.70 and 0.80 between Elm Street and Vine Street.

Both the I-75 and I-71 corridors have been identified by ODOT as safety priorities. The entirety of both corridors (I-71 and I-75) in the study area appears on ODOT's Safety Hot Spot list. In addition, many segments on these corridors also appear on the HCLIS list. Most of the segment crash rates for individual years as well as overall exceed the Ohio statewide average rates. There are high concentrations of crashes near the I-71/I-75 Interchange. Congestion through the study area corridors are among the highest in Ohio. The segment on I-75 from SLM 0.71 to 0.90 ranked second and the segment on I-71 from SLM 0.48 to 0.50 ranked third in the state. Along I-75, almost half of the crashes are rear-end type accidents, which is an indicator of congestion already present along the corridor. As congestion continues to increase, the likelihood of additional accidents also increases.

# 7.0 NATURAL ENVIRONMENT

Natural resource information was gathered from the Kentucky State Nature Preserves Commission Natural Heritage Program (KSNCP), Commonwealth of Kentucky Department of Environmental and Public Protection Cabinet (KDEP), Kentucky Department of Fish and Wildlife Resources (KDFWR), Ohio Department of Natural Resources Division of Natural Areas and Preserves (ODNR), Ohio Environmental Protection Agency (OEPA), US Fish and Wildlife Service Reynoldsburg, Ohio ecological field office, and existing literature referencing the study area.

## 7.1 Wetlands

Potential wetland locations were obtained from KDFWR and ODNR Geographic Information Systems (GIS). Potential wetlands were identified in both Ohio and Kentucky and are shown on Exhibit 3.

The majority of wetlands are scattered throughout the Ohio portion of the study area. The wetlands are classified as open water bodies (i.e. ponds) and palustrine emergent (i.e. shallow marsh wetlands).

## 7.2 Streams and Rivers

The Ohio River is the major water resource within the study area. Smaller streams that may exist within the study area tend to drain to storm sewers that discharge outside the study area to either the Ohio River or the Licking River. These streams are low quality streams which have been modified by development with in the study area and may be considered non-jurisdicitional with the absence of hydric soils and ordinary high water mark. The locations of streams within the study area are shown on Exhibit 3.

The Ohio River is approximately 1,300 feet wide at the existing Brent Spence Bridge location. The normal pool elevation of the Ohio River in the area of the bridge is about 455 feet and the ordinary high water mark is approximately 468.5 feet

In the Northern Kentucky/Greater Cincinnati area, the Ohio River is used as a source of drinking water for over one million people in two states and is the site of increasingly intensive recreational use. Within the region, the Ohio River receives discharges from over 100 square miles of urban watershed, and other non-point sources associated with a major metropolitan area. The river's water quality, and its suitability for contact recreation in particular, is subject to rapid changes, particularly during and after precipitation events (Source: http://www.orsanco.org/empact, 2002).

There are no designated wild and scenic rivers, outstanding resource waters, high quality fishing streams or spawning areas in the study area.

## 7.3 Floodplains

Floodplains are located along the north and south banks of the Ohio River within the study area (Exhibit 3). The 100-year flood elevation is 498.5 feet. Approximately 168 acres of the 100-year floodplain are on the north side of the river and 12.5 acres of the 100-year floodplain are on the south side of the river.

## 7.4 Threatened and Endangered Species

### 7.4.1 State Listed Species

A preliminary literature search of the Kentucky State Nature Preserves Commission (KYSNPC) lists 32 plant and animal species as state endangered (17), threatened (8), or special concern (7) (Source: website http://www.naturepreserves.ky.gov, 2004). Nine of these species also receive federal protection. Those species not listed but receiving federal protection include two plants, one gastropod, 10 mussels, one insect, two fishes, three amphibians, one reptile, and three breeding birds (Table 7-1).

The Ohio Department of Natural Resources (ODNR) lists 13 plant and animal species as state endangered (5), threatened or potentially threatened (6), or special interest (2) (Source: ODOT North/South Initiative). Three species also receive federal protection.

**Table 7-1: State Listed Threatened and Endangered Species Within the Study Area**

| County, State | Group | Common Name | Scientific Name | State Status |
|---|---|---|---|---|
| Kenton, KY | Plant | Stemless evening-primrose | *Oenothera triloba* | Threatened |
| Hamilton, OH | Plant | Riverbank Paspalum | *Paspalum fluitans* | Potentially Threatened |
| Hamilton, OH | Plant | Maypop | *Passiflora incarnate* | Threatened |
| Kenton, KY | Plant | Mock Orange | *Philadelphus inodorus* | Threatened |
| Hamilton, OH | Plant | Virginia Mallow | *Sida hermaphrodita* | Potentially Threatened |
| Hamilton, OH | Plant | Smooth Buttonweed | *Spermacoce glabra* | Potentially Threatened |
| Kenton, KY | Gastropods | Onyx Rocksnail | *Leptoxis praerosa* | Special Concern |
| Kenton, KY | Mussel | Elktoe | *Alasmidonta marginata* | Threatened |
| Kenton, KY | Mussel | Spectaclecase | *Cumberlandia monodonta* | Endangered |
| Hamilton, OH | Mussel | Butterfly | *Ellipsaria lineolata* | Endangered |
| Hamilton, OH | Mussel | Elephant-ear | *Elliptio crassidens crassidens* | Endangered |
| Kenton, KY | Mussel | Snuffbox | *Epioblasma triquetra* | Endangered |
| Kenton, KY | Mussel | Longsolid | *Fusconaia subrotunda subrotunda* | Special Concern |
| Kenton, KY | Mussel | Pocketbook | *Lampsilis ovata* | Endangered |
| Kenton, KY | Mussel | Creek Heelsplitter | *Lasmigona compressa* | Endangered |
| Hamilton, OH | Mussel | Threehorn Wartyback | *Obliquaria reflexa* | Threatened |

**Table 7-1: State Listed Threatened and Endangered Species Within the Study Area**

| County, State | Group | Common Name | Scientific Name | State Status |
|---|---|---|---|---|
| Kenton, KY | Mussel | Sheepnose | *Plethobasus cyphyus* | Endangered |
| Hamilton, OH | Mussel | Ohio Pigtoe | *Pleurobema cordatum* | Endangered |
| Kenton, KY | Mussel | Pyramid Pigtoe | *Pleurobema rubrum* | Endangered |
| Kenton, KY | Mussel | Rabbitsfoot | *Quadrula cylindrica cylindrica* | Threatened |
| Hamilton, OH | Mussel | Monkeyface | *Quadrula metanevra* | Endangered |
| Kenton, KY | Mussel | Salamander Mussel | *Simpsonaias ambigua* | Threatened |
| Kenton, KY | Insect | Sixbanded longhorn beetle | *Simpsonaias ambigua* | Threatened |
| Hamilton, OH; Kenton, KY | Fishes | Lake Sturgeon | *Acipenser fulvescens* | Endangered |
| Kenton, KY | Fishes | Alligator Gar | *Atractosteus spatula* | Endangered |
| Hamilton, OH | Fishes | Mooneye | *Hiodon tergisus* | Special Interest |
| Hamilton, OH | Fishes | Burbot | *Lota lota* | Special Interest |
| Kenton, KY | Amphibians | Eastern Hellbender | *Cryptobranchus alleganiensis alleganiensis* | Special Concern |
| Kenton, KY | Amphibians | Redback Salamander | *Plethodon cinereus* | Special Concern |
| Kenton, KY | Amphibians | Northern Leopard Frog | *Rana pipiens* | Special Concern |
| Hamilton, OH; Kenton, KY | Reptiles | Kirtland's Snake | *Clonophis kirtlandii* | Threatened |
| Kenton, KY | Bird | Bachman's Sparrow | *Aimophila aestivalis* | Endangered |
| Kenton, KY | Bird | Bewick's Wren | *Thryomanes bewickii* | Special Concern |
| Kenton, KY | Bird | Barn Owl | *Tyto alba* | Special Concern |

### 7.4.2 Federally listed Species

Ten federally endangered species, one federally threatened and one federal candidate species have ranges that include the study area (Table 7-2). Nine of the federally endangered species are mussels whose ranges include the Ohio River and its tributaries in Kentucky. These mussel species have been extirpated from the Ohio study area, and are likely extirpated from the Kentucky study area (KSNPC 2001). The other two federally endangered species whose ranges include the study area are the Indiana bat (*Myotis sodalis*) and running buffalo clover (*Trifolium stoloniferum*). The federally threatened bald eagle (*Haliaeetus leucocephalus*) has wintering sites in Hamilton County.

There are no documented populations of threatened and endangered species or critical habitat within the study area. However, potential habitat characteristics for the Indiana bat, running buffalo clover, and freshwater mussels may exist within the study area. The potential presence of endangered mussel species in the Ohio River will require further specific mussel surveys to determine impacts to any species.

**Table 7-2: Federally Listed Threatened and Endangered Species Within the Study Area**

| County | Group | Common Name | Scientific Name | Status |
|---|---|---|---|---|
| Hamilton Kenton | Mammal | Indiana Bat | *Myotis sodalis* | Endangered^ |
| Hamilton Kenton | Plant | Running Buffalo Clover | *Trifolium Stoloniferum* | Endangered^* |
| Hamilton | Bird | Bald Eagle | *Haliaeetus leucocephalus* | Threatened^ |
| Kenton | Mussel | Purple Catspaw Pearlymussel | *Epioblasma o. obliquata* | Endangered* |
| Kenton | Mussel | Clubshell | *Pleurobema clava* | Endangered* |
| Kenton | Mussel | Fanshell | *Cyprogenia stegaria* | Endangered* |
| Kenton | Mussel | Northern Riffleshell | *Epioblasma torulosa rangiana* | Endangered* |
| Kenton | Mussel | Orange Pimpleback | *Plethobasus cooperianus* | Endangered* |
| Kenton | Mussel | Pink Mucket | *Lampsilis abrupta* | Endangered* |
| Kenton | Mussel | Ring Pink | *Obovaria retusa* | Endangered* |
| Kenton | Mussel | Rough Pigtoe | *Pleurobema plenum* | Endangered* |
| Kenton | Mussel | Sheepnose | *Plethobasus cyphyus* | Candidate |

^ Also listed threatened or endangered by ODNR
* Also listed threatened or endangered by KSNPC

## 7.5 Habitat

No unique terrestrial habitats were observed in the highly urbanized study area. The major terrestrial communities within the study area are small scattered scrub-shrub areas. These scrub-shrub habitats typically occurred in small, fragmented areas behind buildings, between buildings and road areas, or between urban areas and the Ohio River. The woody vegetation in these habitats generally consisted of honeysuckle (*Lonicera* sp.), amur honeysuckle (*Lonicera maackii*), tree-of-heaven (*Ailanthus altissima*), and other disturbance-tolerant species.

Aquatic habitat is limited within the study area to the Ohio River and is designated a warm water habitat by OEPA (OEPA 2002). Hamilton County, Ohio and Kenton County, Kentucky lie within the central lowlands physiographic province of the Ohio River (Source: www.fws.gov/orve/). This basin is the direct result of several glaciations, which covered most of the area depositing soils that are some of the richest agricultural land in the Ohio River watershed. The flat to slightly rolling topography has significantly altered the pre-glacial conditions and in some instances, buried pre-glacial streams that provide groundwater resources today (Source: www.fws.gov/orve/).

# 8.0 GEOTECHNICAL

## 8.1 Topography

The topography in the study area ranges from steep hillsides to level terrain. In Kentucky the topography is generally characterized by a severely to moderately undulating terrain. Northern Kentucky, near the Ohio River, and north of the Ohio River in Ohio the terrain is generally characterized by a more gentle topography.

Beginning at Kyles Lane in Kentucky, existing site grades along the I-71/I-75 corridor generally range between 850 and 900 feet. Northward towards Covington and the Ohio River, the existing topography generally slopes downward to elevation 450 to 500 feet at the river. From the Kyles Lane Interchange to the KY 12th Street Interchange, the topography within the study area is relatively level along existing I-71/I-75, with moderately to steeply sloping hillsides and ridges adjacent to the interstate. From KY 12th Street to the Ohio River, the west side of the study area exhibits similar moderately to steeply sloping hillsides. The eastern side of the corridor is relatively level in comparison to the existing terrain along the western side of the corridor.

The existing grades from the Ohio River northward to the Western Hills Viaduct gradually slope upward from approximately elevation 450 feet adjacent to the Ohio River, to about elevation 550 feet near Western Hills Viaduct. The corridor area is relatively flat beyond the existing highway corridor.

## 8.2 Geology

The study area has been affected by major glaciations occurring during the Pleistocene Epoch. These glacial advances caused profound drainage changes and were responsible for the deposition of a variety of soils lying beneath the Covington/Cincinnati area. *The Brent Spence Bridge Replacement/rehabilitation Project Red Flag Summary Report* (2005) provides a detailed discussion of geotechnical issues as they relate to the project study area.

### 8.2.1 Kentucky Geology

In the Kentucky portion of the study area, soils consist of a gravelly zone topped by granular outwash deposits. Near-surface soils contain alluvial sediments, deposited by the floodwaters of both the Ohio and Licking rivers. Man has also affected soil conditions within the study area by placement of fill, construction of buildings, construction of marina and housing developments, demolition of structures, roadway grading, etc.

In the vicinity of Kyles Lane there are Illinoian age glacial soils, sometimes capped with windblown loessian silts, overlying residual clays provide a soil mantle of varying thickness on top of native bedrock. Near the Ohio River, there are valley basin sediments such as silty clays, sands, gravels, silty sands, and glacial and residual clays underlain by limestone and shale.

Ordovician bedrock underlies the study area and is composed of two major rock units. The Kope Formation is typically found from approximate elevations 510 to 690 feet. This formation is principally shale with relatively thin (four-inch to eight-inch) thick and well-spaced limestone interbeds. The overlying Maysville Formation is found from approximate elevations 690 to 800 feet. It is composed of limestone and shale, at times of equal proportions, but with limestone often predominating, with thicker (eight-inch to 22-inch) and more closely packed beds. The rock beds are highly fossiliferous and calcareous. The limestone distribution within the Maysville Formation often provides a formidable resistance to excavation efforts due to hardness, thickness of layers, and close packing of layers at some elevations.

There are no mapped coal mines within the study area. In this Northern Kentucky region solutioned limestone, or karst, sometimes develops in areas where limestone is the predominant bedrock formation. This region is within an area with limited to moderate potential for karst.

### 8.2.2 Ohio Geology

The study area geology north of the Ohio River generally consists predominantly of a combination of alluvium and outwash soils, with minor amount of lacustrine (lakebed) and glacial till deposits. Based on review of the published Quaternary Geology Map of Ohio (dated 1999), the western portion of the study area from the Ohio River to Western Hills Viaduct consists of recent alluvium and alluvial terraces deposited in present and former floodplains. The alluvial deposits ranged from silty clays, sands, gravels, and silty sands. The alluvium soils typically are encountered between about elevation 460 and 530 feet.

Along the eastern side of the study area, the predominant geology consists of Late Wisconsinian Age outwash soils from the Ohio River to approximately 1.5 miles north of the Ohio River. The outwash materials were deposited by meltwater in front of glacial ice in valley terraces or low plains. The outwash soils are generally granular, consisting predominantly of sands or sands and gravels. The approximate elevation of the outwash deposits range from about elevation 400 to 460 feet.

A zone of lacustrine (lakebed) deposits is generally positioned along the eastern side of the study area from about 1.5 miles north of the Ohio River to the Western Hills Viaduct. The water-deposited Illinoian Age soils are lake-bottom sediments consisting of clays and silts, and are often distinguished by their laminar depositional appearance. Occasionally, the lakebed deposits contain organics.

Approximately 1.5 miles north of the Ohio River along the eastern boundary of the study area there are minor amounts of Illinoian glacial till deposits. Till soils are typically comprised of an unsorted, unstratified conglomeration of silts, clays, sands, and gravels. The till profile often contains intermediate sand/silt seams and/or layers. The outwash and till deposits are often covered by a relatively thin loess layer.

Ordovician Age interlayered shale and limestone bedrock of the Eden Formation underlies the study area. Bedrock is generally encountered at elevations ranging from about 400 to 420 feet, and as high as about elevation 460 feet at the Western Hills Viaduct. Based on review of published and existing subsurface information, the bedrock surface is highly variable, with relatively drastic changes in depth over relatively short distances.

## 8.3 USDA Soil Survey Review

According to the US Department of Agriculture (USDA) Soil Survey for Boone, Campbell, and Kenton County, Kentucky, the soil types within the Kentucky portion of the study area are Urban Land (Ur) along the east side and Eden (EdE2), Faywood (FcD), and Rossmoyne (RsB) series on the west side. Soil types within the study area are shown on Exhibit 4. The urban land (Ur) is disturbed by cuts and fills and is underlain by alluvium and outwash deposits. The Eden (EdE2), Faywood (FcD) series soils are formed of residual material weathered from calcareous shale and limestone and are generally silty clays with slow to moderately slow permeability. The Rossmoyne (RsB) series soils are silty loam and silty clays formed in loess and in glacial till. The permeability is slow in the fragipan. The shrink/swell potential of these soils varies from moderate to high with increasing depths.

According to the USDA Soil Survey for Hamilton County, Ohio, the soils within the Ohio portions of the study area belong to the Pate-Urban land (PhD) and urban land series of the Huntington (Uh), Elkinsville (UgB), Stonelick (Ux), and Martinsville (UmB) complexes. Other soil types within the vicinity of the project limits consist of urban land series of the Rossmoyne (RtB, RtC) complex. Soil types within the study area re shown on Exhibit 4. The Pate soil and Urban land (PhD) are intricately mixed and are located on the colluvial positions on the lower part of the hillsides in Ohio. The Pate soil has very slow permeability and moderate organic content. It has a high shrink-swell potential and is also considered highly corrosive to untreated steel. The Pate soils often make up parks, open space, lawns, and gardens, and are generally unsuited to use as a site for buildings and is subject to slippage.

The Urban land series soils in Ohio, are generally dark brown silty loams with moderate permeability and make up parks, open space, lawns, and gardens. The Elkinsville (UgB) and Martinsville (UmB) series soils have low strength and high frost action susceptibility, and are considered suitable for buildings and recreation areas. However, the Huntington (Uh), and Stonelick (Ux), soils are not generally suited for buildings. Closer to the Ohio River, the Huntington soils have a high water table and frost susceptibility. The Rossmoyne series (Rtb, Rtc) soils are silt to clay loams and are covered by streets, parking lots, buildings and other structures with moderate permeability above the fragipan. These soils are moderately well suited to use as a site for buildings and have high frost action susceptibility. Moreover, these soils are highly corrosive to uncoated steel and concrete.

## 8.4 Seismic Characteristics

Kenton County, Kentucky and Hamilton County, Ohio are located within a relatively “quiet” seismic area with regard to local seismic activity. The seismicity of the area is strongly controlled by the New Madrid fault zone in southeastern Missouri. According to the Ohio Geological Survey map of basement structures in Ohio, which indicates fault lines and tectonic zones, there are no mapped faults in the study area. There are no mapped faults which have experienced surface displacement due to seismic activity during the Holocene Epoch (past 11,000 years) within 100 miles of the project site. The closest mapped fault with such movement is the New Madrid Seismic Zone, which is about 200 miles southwest of the study area.

## 8.5 Landslides

Areas of the Greater Cincinnati/Northern Kentucky region are prone to slope movements and landslides. Numerous landslides have been reported and documented on the Kentucky portion of the study area. The landslides were typically observed to occur along the western side of the study area and near the southern limits from about Kyles Lane to about 1.5 miles north of Kyles Lane. Due to the hilly terrain in these areas, slope instability is common. Landslides typically occurred after heavy rain events or during extended periods of wet weather. The landslides generally occurred above the bedrock within the overburden soils, or along the soil/bedrock interface.

After the original construction of I-71/I-75 in Kentucky (between Kyles Lane and KY 12th Street) the outside northbound lane started to show signs of settlement and cracking. The distress was initial evidence of a landslide. The lane was closed for some time and eventually a large buttress embankment was built to stabilize the slope in this area. In this case, the roadway embankment was constructed on a substantial depth of colluvium, which in turn overlaid a sloping bedrock surface.

Few, if any, landslides have been reported along the eastern side of the corridor (nearer the Ohio River) in Kentucky, and in the entire study area in Ohio. In these relatively flat areas, the greatest potential for landslide or slope instability is adjacent to the Ohio River.

## 8.6 Soil Test Borings

Test borings performed in 1958 for the existing Brent Spence Bridge were reviewed and soil borings taken along the Ohio River banks indicated approximately 45 feet of sandy and clayey fill. The existing fill was underlain by medium stiff silty clay to a depth of about 66 feet below the existing grade. The cohesive alluvium was typically underlain by medium dense to very dense sandy outwash deposits with varying amounts of gravel to about 115 feet below the existing grade. Top of bedrock was determined to be at elevation 380 feet based on casing refusal during the soil borings.

Test borings were also performed within the Ohio River at the bridge location. These borings encountered granular soils with varying consistency and gravel content to the top of the bedrock surface. Bedrock surface was encountered at about 70 to 75 feet below the existing water surface, or at about elevation 370 feet. Rock coring was performed below the depth of auger refusal at the test boring locations. The bedrock consisted of interbedded gray shale and limestone, with the limestone occurring in one to nine-inch thick layers. Limestone comprised approximately 15 to 70 percent of the bedrock profile. Rock cores were generally extended about 10 to 30 feet below the auger refusal depths.

## 8.7 Geotechnical Design and Construction Considerations

The geotechnical aspects that will likely impact design and construction of a new bridge and roadway improvements within the study area are discussed in the following sections.

### 8.7.1 Bridge Structure Foundations

It is anticipated that a bridge structure would need to be supported on deep foundations since bedrock was generally encountered at depths in excess of 100 feet in the area of the existing Brent Spence Bridge. Deep foundations bearing on/in the existing bedrock may include driven steel piles or large diameter drilled shafts. Axial loads, seismic loads, and lateral loads, and constructability would need to be considered in determining if pile groups or large diameter shafts socketed into the underlying shale and limestone bedrock would be the foundation of choice. The deep foundations would need to be designed to provide not only adequate axial support, but also resistance to uplift and lateral forces. Deep foundations would also provide protection from vessel impact loads and scour associated with erodible soils along the Ohio River riverbed.

Support of a new bridge with a deep foundation system would be required regardless of the location that a bridge crosses the Ohio River. End bent support on both the Kentucky and Ohio sides would also likely be supported on deep foundations. Since the general subsurface profile (type of overburden and depth to bedrock) will be similar along the riverbank, construction of the new bridge to optimize geotechnical support capabilities would not play a major role in bridge location selection. A very detailed exploration of overburden soils and bedrock characteristics will determine the appropriate foundation type and its optimal performance.

### 8.7.2 Roadway Considerations

At-grade roadways can generally be constructed on suitable natural soils or new structural fill. It is anticipated that minimal cut/fill will be required if the I-71/I-75 roadway improvements generally follow the current interstate alignment. If the mainline is shifted significantly to the west in Kentucky, deeper cuts, including rock excavation should be anticipated. The Ordovician Age shale and limestone bedrock in the Greater Cincinnati region can generally be excavated with heavy-duty equipment.

Due existing development in the study area, the use of typical embankment fills for roadway construction will likely be limited. Mechanically Stabilized Earth (MSE) walls and/or cut walls may be considered to reduce the roadway impact area. In urban areas, due to space limitations, use of soil nail walls, cantilevered, and tieback walls may also be needed. Due to relatively large lateral loads associated with raised roadways, deep foundations are often required to provide adequate resistance to axial, lateral, and uplift forces.

In Kentucky, the largest impact to realignment of the existing roadway would be the amount of cut (soil and rock) and fill that would be required if the alignment is shifted significantly to the west of its' current location. Significant rock cuts should be anticipated if the alignment crosses through the hilly terrain to the west. Near the Ohio River in Kentucky, and on the Cincinnati side of the river, significant realignment of the I-71/I-75 mainline is limited due to existing interchange/tie-ins. Slight modifications to the alignment to either the west or the east will likely not have a significant impact on roadway construction. The presence of random fill, old structures, and moderately compressible overburden soils in some portions of the study area may warrant the need for ground modification. Various techniques for ground modification and/or improvement can be used and are anticipated.

### 8.7.3 Excavations

Excavations into soil and bedrock should be performed in accordance with applicable US Department of Occupational Safety and Health Organization (OSHA) requirements. Permanent slopes in soil should be 3H:1V or flatter. Steeper slopes can generally be attained in rock formations; however, the local rock formations are highly degradable and prone to erosion and/or raveling of surficial material. Vegetation should be established on soil slopes as soon as possible and rock faces should be protected where required. As a minimum, permanent slopes would need to be evaluated periodically to monitor the integrity of the slope face and look for any destabilizing aspects caused by erosion or movement.

Stability of excavated slopes will be an important consideration. Portions of the corridor may have colluvial soils (especially in the upland areas), which are prone to movement. The presence of groundwater and its impact on cut excavations and overall long-term stability of slopes is also an important consideration. The Ohio Riverbank has a history of shallow sloughing and flood events have an impact on their overall short-term and long-term stability. Rapid drawdown and its impact, especially on the riverbanks and where loess is exposed, is an important stability issue needing detailed investigation and analyses.

Excavation through the underlying unweathered gray shale and limestone bedrock, will involve additional effort. The presence of limestone layers, its thickness, and its distribution will impact the level of difficulty. Proper equipment (heavy-duty) to deal with rock breaking and removal will likely be required. Rock excavation methods may include the use of a large hydraulic trackhoe or dozer with a ripper tooth, hydraulic rock hammers or rock splitters, and/or pneumatic rock drills (air drills) or percussion machines. If deep rock cuts are necessary and/or thick limestone layers are encountered in the bedrock, rock removal by blasting techniques may be required.

# 9.0 SOCIAL ENVIRONMENT

## 9.1 Land Use

The study area follows the existing I-71/I-75 corridor through the cities of Park Hills, Fort Wright, and Covington, Kentucky; and Cincinnati, Ohio. The study area is urban in nature and consists of established residential neighborhoods and commercial properties. The primary land uses within the study area are commercial, industrial, residential, and institutional (Exhibit 5).

### 9.1.1 Zoning - Kentucky

The Kentucky portion of the study area is narrowly defined to the corridor immediately adjacent to I-71/I-75 with slightly larger extensions around the Kyles Lane Interchange. Zoning in the Fort Wright portion of the study area is residential on the southern side of I-71/75 at a density consistent with single family suburban style subdivisions. On the northern side of the interstate the zoning is professional office.

Zoning within the Covington portion of the study area varies. South of KY 5$^{th}$ Street the zoning is mostly residential. Exceptions to that include an area immediately east of I-71/75 and south of KY 5$^{th}$ Street that is zoned Recreation Open Space (ROS), a portion of which is occupied by Goebel Park. This area also has an Historic Preservation (HP) designation meaning it's subject to a Historic Preservation Overlay Zone. In the immediate vicinity of the I-71/75 Interchange with KY 12$^{th}$ Street, there is a concentration of General Commercial Zoning (GC) in the area just east of I-71/I-75 between Pike St and KY 12$^{th}$ Street. In the northern end of the study area closest to the Brent Spence Bridge, the zoning allows for highway commercial uses.

### 9.1.2 Zoning - Ohio

Zoning in the Ohio portion of the study area is primarily a mix of commercial and manufacturing zones. The largest single category is Manufacturing General (MG) which is the most permissive manufacturing zone in the Cincinnati City Zoning Code. This zone applies to almost the entire portion of the study area to the west of I-75. Along the riverfront the zoning is, also a manufacturing zone with special provisions applicable to the riverfront area (RF-M). This zone too is very permissive and neither zone permits residential uses. A small area located to the immediate west of I-75 and north of the OH 6th Street Viaduct is zoned Commercial General, Auto Oriented (CG-A). This zone is broadly permissive regarding allowable development types; however, it does not permit residential uses.

To the east of I-75, at the southern end of the study area, the zoning is Downtown Development (DD). This district specifically governs the downtown area and the central riverfront. This zone is broadly permissive and it includes residential uses though it does preclude most manufacturing activities. Further north, in the West End neighborhood to the east of I-75, zoning is primarily made up of higher density residential districts with smaller neighborhood commercial areas mixed in.

## 9.2 Community Characteristics

There are several established neighborhoods within the study area in both Kentucky and Ohio (Exhibit 6). Many Covington and Cincinnati neighborhoods are cohesive communities with significant history and community infrastructure. There are several residential communities along the interstate corridor in the city of Covington. These include Kenton Hills, Lewisburg, and West Covington located west of I-71/I-75 and Peaselburg, West Side, and Mainstrasse located east of I-71/I-75. In Cincinnati, these neighborhoods include Queensgate, West End, Fairview-Clifton Heights, and Camp Washington. With the exception of the I-71/I-75 Interstate itself and the Ohio River, no physical barriers exist between neighborhoods and the Central Business Districts within Cincinnati and Covington. The following are brief summaries of the neighborhoods within the study area.

**Kenton Hills:** Kenton Hills is located west of I-71/I-75 and has a park-like setting. This neighborhood includes the 700-acre Devou Park. The density of this neighborhood is less than 1,000 persons per square mile. Residents are predominately white and minorities comprise approximately three percent of the population. Median household income is $38,281. Kenton Hills is a residential community known for its beautiful views of downtown Cincinnati.

**Lewisburg:** Lewisburg is located between DeVou Park and I-71/I-75 in the western part of Covington. The density of this neighborhood is less than 1,000 persons per square mile. Residents are predominately white and minorities comprise approximately six percent of the population. Median household income is $36,250. It is a National Register historic district characterized by a mixture of older homes and is a pedestrian scale neighborhood that has retained a unique character. Lewisburg is a residential community known for its beautiful views of downtown Cincinnati.

**West Covington:** West Covington is located between the Ohio River and Devou Park on the westside of I-71/I-75. Residents are predominately white and minorities comprise approximately three percent of the population. Median household income is $38,281. West Covington is a residential community known for its beautiful views of downtown Cincinnati.

**Mainstrasse and West Side:** The Mainstrasse/West Side neighborhoods are adjacent to each other in Covington. The density of these neighborhood ranges from 4,000 to

12,000 people per square mile. Higher densities are found in Mainstrasse and the northern section of West Side. Residents are predominately white and minorities comprise approximately 12 percent of the population. Median household income ranges from $19,884 to $25,618.

The Mainstrasse/West Side neighborhoods are National Register historic districts. Most of the homes were built by 1880 and include architectural styles ranging from Greek Revival to Queen Anne. The German heritage of MainStrasse is reflected in the over 800 buildings which encompass its National Register historic district. The MainStrasse commercial district is tourist-oriented and modeled after German Village in Columbus, Ohio, containing numerous specialty shops and restaurants.

**Peaselburg:** Peaselburg is located on the westside of Covington. Residents are predominately white and minorities comprise approximately 11.5 percent of the population. Median household income is $30,565. This neighborhood has a mixture of race origins and churches of many denominations along with many businesses that include public and parochial schools, parks, grocery stores, corner pubs, the Boys and Girls Club and a variety of businesses.

**Queensgate:** The Queensgate neighborhood is not a typical residential community within the study area. The City of Cincinnati recognizes Queensgate as a ‘neighborhood,’ this designation does not necessarily represent a ‘neighborhood’ in terms of a cohesive, residential community. The southern portion of Queensgate is sparsely populated, with a density less than 1,000 people per square mile. It is heavily dominated by commercial buildings.

**West End:** The West End neighborhood is an urban residential community characterized by a mix of older homes, newer residential developments and multi-family dwellings. This neighborhood includes the Dayton Street, Betts-Longworth, and Laurel Homes National Register historic districts. The density of this neighborhood ranges from less than 1,000 to 20,000 people per square mile. Lower densities are found in the southern section of the West End, which is primarily commercial. Higher densities are found to the north of West Court Street within this neighborhood. The majority of the residents are minority and the median household income is $15,104.

**Fairview and Clifton Heights:** The Fairview and Clifton Heights neighborhoods are located to the north of downtown Cincinnati. This community is a mixture of established neighborhoods, boutiques, restaurants, churches, hospitals, parks recreational facilities and universities. These neighborhoods are densely populated due to the student population. Many of the residences are apartment complexes and multifamily rental housing. Residents are predominately white and minorities comprise approximately 20 percent of the population. Median household income is $53,104.

**Camp Washington:** Camp Washington is located to the north of downtown Cincinnati. This neighborhood contains both manufacturing and residential components. Kahn’s meats and the Andrew Jergens Company are located in Camp Washington. The residential population is 1,506. Residents are predominately white and minorities comprise approximately 30 percent of the population. Median household income is $23,352.

### 9.2.2 Population

Demographic data for the study area were obtained from the US Census Bureau. Census tract data were used to assess population conditions within the study area in both Kentucky and Ohio. There are 22 Census tracts within the study area, which are shown on Exhibit 7. Table 9-1 presents a summary of demographic information by county and city. Tables 9-2 and 9-3 present a summary of demographic data by Census tract.

Table 9-2 illustrates that population has decreased throughout the majority of the study area resulting in a net decrease between 1990 and 2000. Overall, the decline was more than 11 percent or approximately 5,200 persons. The percentage decline is more than the city of Cincinnati (9 percent decline) and Hamilton County (2.4 percent decline). In Kentucky, the city of Covington (0.2 percent increase) and Kenton County (6.6 percent increase) have both seen population growth.

Employment data for the study area are shown in Table 9-3. Within the study area, the largest employment sector is Educational and Health Services and is consistent with the region. The unemployment rate for the cities of Covington and Cincinnati are higher at 6.2 percent and 7.3 percent, respectively. The large majority of the Census tracts in Cincinnati are above these averages, while unemployment in Covington is mixed.

Commuting trends within the study area are shown in Table 9-4. According to the Census data, more than 23 percent of Cincinnati households do not own a car, while Covington is only slightly lower with 22 percent. On average, 35 percent of all households within the study area do not own a car. The majority of employees within the study area use their automobile to travel to their place of work. As shown in Table 9-4, the percent of workers that use public transportation in the study area is higher in Cincinnati than Covington.

**Table 9-1: Demographic Information By City/County (2000)**

| Location | 2000 Population | Percent Population White | Percent Population Minority | Median Age | Number of Households | Median Household Income |
|---|---|---|---|---|---|---|
| **Kentucky** | | | | | | |
| Kenton County | 151,464 | 94 | 6 | 34 | 59,444 | $43,906 |
| Fort Mitchell | 8,089 | 96.9 | 3.1 | 36 | 3,530 | $46,335 |
| Fort Wright | 5,681 | 97.3 | 2.7 | 39 | 2,430 | $52,394 |
| Park Hills | 2,977 | 96.6 | 3.4 | 37 | 1,382 | $42,227 |
| Covington | 43,370 | 87 | 13 | 33 | 18,257 | $30,735 |
| **Ohio** | | | | | | |
| Hamilton County | 845,303 | 72.9 | 27.1 | 35 | 346,790 | $40,964 |
| Cincinnati | 331,285 | 52.5 | 47.5 | 32 | 148,095 | $29,493 |

**Table 9-2: Demographic Information By Census Tract**

| Census Tract | Population 1990 | Population 2000 | Percent Change | Median Age | Number of Households | Median Household Income |
|---|---|---|---|---|---|---|
| **Kentucky** | | | | | | |
| 064800 | 3,485 | 3,364 | -3.47 | 36 | 1,500 | $46,563 |
| 065200 | 3,699 | 4,125 | 11.52 | 42 | 1,795 | $47,586 |
| 064900 | 3,341 | 2,991 | -10.48 | 37 | 1,393 | $41,992 |
| 065100 | 3,985 | 3,594 | -9.81 | 26 | 1,465 | $25,054 |
| 061600 | 1,684 | 1,420 | -15.68 | 32 | 592 | $36,250 |
| 065000 | 4,166 | 4,015 | -3.62 | 33 | 1,608 | $30,565 |
| 060700 | 2,405 | 1,964 | -18.34 | 34 | 901 | $25,618 |
| 060300 | 1,963 | 1,809 | -7.85 | 33 | 886 | $19,884 |
| 063800 | 3,088 | 3,080 | -0.26 | 35 | 1405 | $38,281 |
| 067000 | - | 3,253 | - | 39 | 1,800 | $25,591 |
| **Ohio** | | | | | | |
| 000100 | 13 | 641 | 4830.77 | 26 | 2 | $0.00 |
| 000400 | 763 | 1,114 | 46.00 | 43 | 818 | $12,260 |
| 000600 | 853 | 550 | -35.52 | 41 | 374 | $35,278 |
| 000200 | 1,378 | 1,335 | -3.12 | 32 | 593 | $15,938 |
| 000302 | 2,630 | 963 | -63.38 | 19 | 384 | $7,969 |
| 000800 | 277 | 547 | 97.47 | 31 | 250 | $30,625 |
| 000301 | 2,664 | 1,232 | -53.75 | 21 | 574 | $6,748 |
| 001400 | 641 | 663 | 3.43 | 27 | 252 | $26,964 |
| 001500 | 3,017 | 2,261 | -25.06 | 35 | 1,087 | $7,311 |
| 001600 | 2,312 | 1,712 | -25.95 | 27 | 803 | $8,175 |
| 002800 | 1,763 | 1,506 | -14.58 | 31 | 502 | $23,352 |
| 002700 | 1,658 | 1,685 | 1.63 | 27 | 860 | $30,446 |

**Table 9-3: Study Area Employment**

| Census Tract | Agriculture | Construction | Manufacturing | Wholesale Trade | Retail Trade | Transportation/ Warehousing/ Utilities | Information | Fire/Insurance/Real Estate | Professional/ Scientific/Management/ Administrative/ Waste Management Services | Educational/ Health/ Social Services | Arts/ Entertainment/ Recreation/ Accommodations/Food Services | Other Services | Public Administration | Unemployment |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Kentucky** | | | | | | | | | | | | | | |
| 064800 | 0.00% | 3.18% | 10.54% | 3.68% | 14.05% | 8.40% | 5.10% | 8.07% | 12.84% | 15.70% | 8.34% | 4.06% | 6.04% | 1.46% |
| 065200 | 0.00% | 6.33% | 7.57% | 4.19% | 10.86% | 6.33% | 3.59% | 10.16% | 13.30% | 21.62% | 5.13% | 4.24% | 6.68% | 1.47% |
| 064900 | 0.95% | 4.43% | 10.20% | 3.92% | 9.36% | 6.27% | 2.91% | 11.32% | 11.04% | 20.45% | 9.69% | 6.44% | 3.03% | 1.49% |
| 065100 | 0.22% | 5.11% | 12.31% | 6.62% | 15.19% | 7.27% | 1.94% | 8.50% | 9.00% | 11.66% | 9.79% | 4.54% | 7.85% | 10.33% |
| 061600 | 0.00% | 9.52% | 16.62% | 5.26% | 6.82% | 4.12% | 3.13% | 15.34% | 6.96% | 12.50% | 12.36% | 4.12% | 3.27% | 7.61% |
| 065000 | 0.76% | 9.07% | 17.45% | 4.63% | 11.89% | 6.79% | 1.41% | 6.03% | 4.80% | 19.20% | 10.36% | 4.04% | 3.57% | 7.12% |
| 060700 | 0.66% | 8.93% | 12.35% | 5.13% | 9.69% | 6.93% | 0.66% | 5.32% | 9.21% | 14.06% | 17.57% | 4.56% | 4.94% | 8.27% |
| 060300 | 1.50% | 4.63% | 14.00% | 2.38% | 19.88% | 2.75% | 1.75% | 1.13% | 7.00% | 10.25% | 29.38% | 2.75% | 2.63% | 7.195 |
| 063800 | 0.91% | 6.62% | 12.85% | 4.93% | 12.72% | 7.85% | 4.93% | 8.70% | 7.85% | 10.97% | 9.93% | 3.11% | 8.63% | 2.41% |
| 067000 | 0.48% | 6.06% | 10.74% | 3.10% | 10.05% | 8.81% | 4.75% | 7.50% | 14.59% | 14.52% | 10.46% | 4.20% | 4.75% | 8.27% |
| **Ohio** | | | | | | | | | | | | | | |
| 000100 | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 100.00% | 0.00% |
| 000400 | 0.00% | 6.34% | 5.63% | 2.82% | 3.76% | 10.09% | 3.05% | 11.50% | 23.24% | 14.79% | 8.22% | 5.63% | 4.93% | 18.86% |
| 000600 | 0.00% | 1.53% | 4.86% | 5.37% | 3.32% | 6.65% | 9.72% | 13.81% | 22.51% | 16.62% | 7.16% | 3.07% | 5.37% | 11.34% |
| 000200 | 0.00% | 7.65% | 5.46% | 0.00% | 11.48% | 9.02% | 1.64% | 6.28% | 11.48% | 19.40% | 17.76% | 8.20% | 1.64% | 19.03% |
| 000302 | 0.00% | 0.00% | 23.20% | 0.00% | 18.40% | 0.00% | 16.80% | 5.60% | 5.60% | 12.80% | 6.40% | 6.40% | 4.80% | 38.12% |
| 000800 | 0.00% | 4.18% | 15.97% | 7.98% | 3.42% | 13.69% | 2.66% | 10.27% | 1.52% | 19.39% | 11.41% | 9.51% | 0.00% | 8.68% |
| 000301 | 0.00% | 0.00% | 7.69% | 0.00% | 2.83% | 6.88% | 0.00% | 2.43% | 24.70% | 30.77% | 15.79% | 0.00% | 8.91% | 27.35% |
| 001400 | 0.00% | 6.70% | 12.95% | 0.00% | 9.82% | 4.91% | 0.00% | 3.57% | 14.73% | 26.34% | 11.16% | 6.70% | 3.13% | 11.46% |
| 001500 | 0.00% | 4.62% | 11.04% | 3.82% | 7.63% | 11.65% | 2.81% | 6.22% | 8.84% | 19.68% | 11.65% | 3.41% | 8.63% | 24.77% |
| 001600 | 0.00% | 5.92% | 10.14% | 2.25% | 11.83% | 5.35% | 0.00% | 0.00% | 26.20% | 11.83% | 21.69% | 4.79% | 0.00% | 30.53% |
| 002800 | 0.00% | 18.25% | 10.66% | 3.08% | 15.88% | 2.37% | 0.00% | 1.66% | 6.87% | 13.51% | 18.01% | 2.84% | 6.87% | 13.52% |
| 002700 | 0.00% | 2.10% | 9.19% | 4.54% | 9.41% | 2.33% | 3.88% | 4.21% | 13.73% | 29.01% | 16.28% | 4.21% | 1.11% | 7.57% |

**Table 9-4: Commuting Trends Within The Study Area**

| Census Tract | Total Employed | Car, Truck, Or Van | Drive Alone | Carpool | Public Transportation | Walk | Other Means | Work At Home |
|---|---|---|---|---|---|---|---|---|
| **Kentucky** | | | | | | | | |
| 064800 | 1,786 | 93.67% | 88.58% | 5.10% | 1.85% | 0.95% | 1.29% | 2.24% |
| 065200 | 1,999 | 92.90% | 86.99% | 5.90% | 3.55% | 1.25% | 0.95% | 1.35% |
| 064900 | 1,773 | 87.31% | 75.69% | 11.62% | 4.51% | 1.92% | 0.68% | 5.58% |
| 065100 | 1,346 | 87.52% | 72.07% | 15.45% | 7.13% | 0.97% | 1.26% | 3.12% |
| 061600 | 704 | 90.34% | 64.49% | 25.85% | 5.82% | 0.85% | 2.27% | 0.71% |
| 065000 | 1,684 | 89.67% | 75.83% | 13.84% | 5.52% | 3.03% | 0.53% | 1.25% |
| 060700 | 1,015 | 71.82% | 55.76% | 16.06% | 14.98% | 10.05% | 2.56% | 0.59% |
| 060300 | 778 | 72.11% | 48.20% | 23.91% | 6.68% | 17.10% | 1.80% | 2.31% |
| 063800 | 1,506 | 92.83% | 79.75% | 13.08% | 5.64% | 0.80% | 0.00% | 0.73% |
| 067000 | 1,439 | 77.35% | 67.48% | 9.87% | 12.37% | 7.99% | 0.83% | 1.46% |
| **Ohio** | | | | | | | | |
| 000100 | 12 | 0.00% | 0.00% | 0.00% | 100.00% | 0.00% | 0.00% | 0.00% |
| 000400 | 426 | 40.85% | 31.69% | 9.15% | 16.67% | 36.85% | 0.00% | 5.63% |
| 000600 | 391 | 30.43% | 28.90% | 1.53% | 6.91% | 57.03% | 0.00% | 5.63% |
| 000200 | 366 | 50.55% | 48.63% | 1.91% | 36.89% | 12.57% | 0.00% | 0.00% |
| 000302 | 125 | 63.20% | 63.20% | 0.00% | 10.40% | 20.00% | 0.00% | 6.40% |
| 000800 | 263 | 68.06% | 58.56% | 9.51% | 18.63% | 9.89% | 0.00% | 3.42% |
| 000301 | 233 | 24.89% | 14.16% | 10.73% | 57.08% | 18.03% | 0.00% | 0.00% |
| 001400 | 218 | 57.80% | 35.78% | 22.02% | 38.99% | 0.00% | 0.00% | 3.21% |
| 001500 | 455 | 56.70% | 49.67% | 7.03% | 31.21% | 9.45% | 1.54% | 1.10% |
| 001600 | 341 | 47.51% | 18.77% | 28.74% | 27.86% | 23.17% | 0.00% | 1.47% |
| 002800 | 422 | 83.18% | 53.55% | 29.62% | 3.79% | 12.09% | 0.00% | 0.95% |
| 002700 | 866 | 72.52% | 59.82% | 12.70% | 7.27% | 16.97% | 1.85% | 1.39% |

### 9.2.1 Environmental Justice

Executive Order 12898 (*Federal actions to Address Environmental Justice in Minority Populations and Low Income Populations*, issued February 11, 1994) requires federal agencies to identify and address disproportionately high and adverse health and environmental effects including the interrelated social and economic effects of programs, policies and activities on minority and low income populations. Low income is defined as household income at or below the Department of Health and Human Services poverty guidelines. The 2000 poverty level for an individual is $8,794. Minority is defined as a person who is Black, Hispanic, Asian American, American Indian, or Alaskan Native.

Low-income and minority populations are found within the study area in both Covington and Cincinnati. Table 9-5 and Exhibits 8 and 9 present an overview of minority and low income populations within the study area.

**Table 9-5: Low Income and Minority Populations**

| Census Tract | Total Population 2000 | Minority Population 2000 | Minority Percent of Total Population | Low Income Population 2000 | Low Income Percent of Total Population |
|---|---|---|---|---|---|
| **Kentucky** | | | | | |
| 064800 | 3,364 | 125 | 3.72 | 233 | 6.93 |
| 065200 | 4,125 | 172 | 4.17 | 159 | 3.85 |
| 064900 | 2,991 | 121 | 4.05 | 158 | 5.28 |
| 065100 | 3,594 | 1,031 | 28.69 | 1,242 | 34.56 |
| 061600 | 1,420 | 91 | 6.41 | 279 | 19.65 |
| 065000 | 4,015 | 513 | 12.78 | 626 | 15.59 |
| 060700 | 1,964 | 345 | 17.57 | 420 | 21.38 |
| 060300 | 1,809 | 287 | 15.87 | 798 | 44.11 |
| 063800 | 3,080 | 103 | 3.34 | 244 | 7.92 |
| 067000 | 3,253 | 632 | 19.43 | 521 | 16.02 |
| **Ohio** | | | | | |
| 000100 | 641 | 497 | 77.54 | 32 | 4.99 |
| 000400 | 1,114 | 718 | 64.45 | 472 | 42.37 |
| 000600 | 550 | 167 | 30.36 | 88 | 16.00 |
| 000200 | 1,335 | 1,323 | 99.10 | 540 | 40.45 |
| 000302 | 963 | 919 | 95.43 | 657 | 68.22 |
| 000800 | 547 | 397 | 72.58 | 152 | 27.79 |
| 000301 | 1,232 | 1,229 | 99.76 | 884 | 71.75 |
| 001400 | 663 | 602 | 90.80 | 190 | 28.66 |
| 001500 | 2,261 | 2,196 | 97.13 | 1,268 | 56.08 |
| 001600 | 1,712 | 1,540 | 89.95 | 1,101 | 64.31 |
| 002800 | 1,506 | 470 | 31.21 | 473 | 31.41 |
| 002700 | 1,685 | 489 | 29.02 | 367 | 21.78 |

The Kentucky portion of the study area has moderate levels of low-income and minority populations. In general, the population is predominately white, approximately 85 percent, with a median household income range of $19,000 to $47,000 (Tables 9-1 and 9-2). One Census tract 065100, which includes Peaselburg has the highest minority population in this portion of the study area. Census tracts 065100 (Peaselburg) and

060300 (Mainstrasse) have the highest low income populations in the Kentucky portion of the study area.

The city of Cincinnati has several Census tracts of densely populated minority and low-income areas. The areas east of the existing interstate corridor in Cincinnati are diverse relative to both income and ethnicity. Some Census tracts represent poverty levels as high as 70 percent. These areas are located east of the northern part of the study area. Similarly, some tracts in the northeast part of the study area represent minority levels of 90-100 percent. High minority areas are located immediately adjacent to the existing I-75 corridor in the West End neighborhood of Cincinnati.

Several significant federally assisted Housing and Urban Development (HUD) projects exist in the study area, including the multi-million dollar redevelopment initiative known as HOPE VI located in the West End neighborhood of Cincinnati.

## 9.3 Community Services and Facilities

Community services and facilities within the study area include parks, schools, hospitals, police stations, fire stations, libraries, cemeteries, government buildings, entertainment and religious institutions. These resources are presented and summarized in Table 9-6 and shown on Exhibit 10.

**Table 9-6: Community Facilities Within the Study Area**

| **Kentucky** | | |
|---|---|---|
| **Attraction** | **Location** | **Description** |
| 1. Garden of Hope | 699 Edgecliff Road, Covington | Recreation of the Garden Tomb in Jerusalem |
| **Churches/Religious** | **Location** | **Description** |
| 2. St. John's Catholic Church | 627 Pike Street, Covington | Catholic Church |
| **Nursing Home** | **Location** | **Description** |
| 3. Baptist Life Communities | 800 Highland Avenue, Covington | Nursing Home |
| **Recreation** | **Location** | **Description** |
| 4. Kenney Shields Park | West KY 9th and Philadelphia, Covington | Small neighborhood corner lot with playground equipment - Owned by the city of Covington |
| 5. Neighborhood Pool | West KY 8th and Dalton Avenue, Covington | Neighborhood pool - Owned by the city of Covington |
| 6. Devou Park/Golf Course/Overlook | 1344 Audubon Road, Covington | 700-acre park and golf course - Owned by the city of Covington |
| 7. Goebel Park/Mainstrasse Village District | KY 6th Street Area of Covington | Park area and surrounding retail and restaurants - Owned by city of Covington |
| 8. Neighborhood Park | West KY 11th and Hermes Avenue, Covington | Owned by the city of Covington |
| **School** | **Location** | **Description** |
| 9. Notre Dame Academy | 1699 Hilton Drive, Park Hills | Parochial College Prep High School - 594 female students |
| 10. Prince of Peace Catholic School | 625 Pike Street, Covington | Parochial Grade School – Grades K - 8 |

**Table 9-6: Community Facilities Within the Study Area**

| **Ohio** | | |
|---|---|---|
| **Attraction** | **Location** | **Description** |
| 11. Paul Brown Stadium | One Paul Brown Stadium | Pro Football Facility – Home of NFL Cincinnati Bengals |
| 12. National Underground Railroad Freedom Center | 50 East Freedom Way, Cincinnati | Museum |
| 13. Great American Ball Park | 100 Main Street, Cincinnati | Pro Baseball Facility – Home of MLB Cincinnati Reds |
| 14. US Bank Arena | 100 Broadway, Cincinnati | Multi-purpose facility |
| 15. Cinergy Center | 525 Elm Street, Cincinnati | Convention and Exhibition Facility |
| 16. Cincinnati Fire Museum | 315 West Court Street, Cincinnati | Museum |
| 17. Geier Research and Collections Museum | 760 West OH 5th Street, Cincinnati | Museum |
| 18. Union Terminal * | 1301 Western Avenue, Cincinnati | Omnimax Theatre, Museum Center, Children's Museum, Natural History Museum, Amtrak |
| **Churches/Religious** | **Location** | **Description** |
| 19. York Street United Methodist | 816 York Street, Cincinnati | Methodist Church |
| 20. Plum Street Temple* | 726 Plum Street, Cincinnati | Jewish Temple |
| St. Peter in Chains Cathedral * | 325 West OH 8th Street, Cincinnati | Catholic Church |
| 22. Jarriel Baptist Church | Wesley and Court Street, Cincinnati | Baptist Church |
| **Fire Station** | **Location** | **Description** |
| 23. Fire House - Company 14 | OH 5th and Central, Cincinnati | Fire House |
| 24. Fire House - Company 29, Ladder 29 | 564 West Liberty at Linn Street Cincinnati | Fire House |
| **Government Building** | **Location** | **Description** |
| 25. City Hall * | 801 Plum Street, Cincinnati | Offices of Mayor, City Manager, City Council, etc. |
| 26. Jail - Hamilton County Queensgate Facility | 516 Linn Street, Cincinnati | Correctional Facility |
| **Library** | **Location** | **Description** |
| 27. Public Library of Cincinnati and Hamilton County | 805 Ezzard Charles Drive, Cincinnati | Public Library |
| 28. Lloyd Library and Museum | 917 Plum Street, Cincinnati | Botanical, Medical, Pharmacutical and Scientific books |
| **Utilities** | **Location** | **Description** |
| 29. CGandE Substation | West Pete Rose Way at Mehring Way, Cincinnati | |

**Table 9-6: Community Facilities Within the Study Area**

| **Ohio** | | |
|---|---|---|
| **Public Agency** | **Location** | **Description** |
| 30. Cincinnati Job Corp Center | 1409 Western Avenue, Cincinnati | Training Facility and Dorms |
| **Post Office** | **Location** | **Description** |
| 31. Main Post Office - Dalton Avenue | 1623 Dalton Avenue, Cincinnati | Post Office Facility |
| 32. Post Office Branch | Dalton Avenue and Gest Street, Cincinnati | Post Office Facility-Mid City Carrier Unit |
| **Recreation** | **Location** | |
| 33. Lincoln Park - Union Terminal | Freeman Avenue and Ezzard Charles Drive, Cincinnati | Owned by the city of Cincinnati - Operated by Cincinnati Park Board - Greenspace |
| 34. Park at Derrick Turnbow and Linn Street | 1525 Linn Street, Cincinnati | Behind apartment buildings and a strip shopping center - Owned by the city of Cincinnati |
| 35. Dyer Park | Baymiller Street and Bank Street, Cincinnati | Ball Field, Pool and Playground - Owned by the city of Cincinnati - Operated by Cincinnati Recreation Commission |
| 36. Lincoln Community Center | 1027 Linn Street, Cincinnati | Pool, playground, tennis court, basketball courts -Owned by the city of Cincinnati - Operated by Cincinnati Recreation Commission |
| 37. Queensgate Playground and Ballfields | 707 West Court Street, Cincinnati | Playground and ballfields – Owned by the city of Cincinnati - Operated by Cincinnati Recreation Commission |
| **School** | **Location** | **Description** |
| 38. St. Joseph's Catholic School | 805 Ezzard Charles Drive, Cincinnati | Parochial Elementary School |
| 39. Cincinnati Hamilton County Community Action Agency | 880 West Court Street, Cincinnati | Theodore M. Berry Head Start Program |
| 40. Lafayette Bloom B-O-T Accelerated Middle | 1941 Baymiller Street, Cincinnati | Cincinnati Public School - Grades 6-8 |
| 41. Heberle Elementary | 2015 Freeman Avenue, Cincinnati | Cincinnati Public School - Preschool - 8 |
| **TV/Radio Station** | **Location** | **Description** |
| 42. WXIX - TV | 635 West 7$^{th}$ Street, Cincinnati | Network TV Station |

*Listed on the National Register of Historic Places

## 9.4 Development Trends

### 9.4.1 Kentucky

Portions of three cities, Park Hills, Fort Wright, and Covington, are located within the study area in Kentucky. The Northern Kentucky Area Planning Commission (NKAPC) manages the planning for Kenton County. The NKAPC developed an *Area Wide Comprehensive Plan* (2001) *for* all of Kenton County, which includes Park Hills, Fort

Wright, and Covington. The plan is generalized in nature and with respect to the study area. It reflects the status quo, with no significant changes in land-use foreseen. The site of a former drive-in movie theater located in the northeast quadrant of the Kyles Lane Interchange does have potential for additional development. The plan designates this area for commercial office uses which is consistent with other land uses in the area, and also with the current zoning.

In addition to the *Area Wide Comprehensive Plan*, a variety of more targeted plans relative to the study area exist. Several of these are what are known as Chapter 99 Plans, which refers to Chapter 99 of the Kentucky Revised Statutes (KRS). Chapter 99 Plans are in effect urban renewal plans. Once adopted, they confer on the city the option of using eminent domain to acquire and redevelop property, much as an Urban Renewal Plan does in Ohio. The pertinent plans are listed and briefly discussed below.

- *West Riverfront Development Plan (Updated in 1998)*
  This Chapter 99 plan pertains to the area along Covington's riverfront south of the floodwall and extends east to the Clay Wade Bailey Bridge, south to KY 5$^{th}$ Street, and west to Crescent Avenue. The plan calls for improvements to West KY 4$^{th}$ Street in the area approaching the entrance ramps to I-71/I-75 including the Brent Spence Bridge. With respect to land use, it presumes continuation of the current pattern of highway oriented commercial land uses currently found clustered around the I-75 KY 4$^{th}$ Street/KY 5$^{th}$ Street Interchange. The plan does not identify any substantial change in land use or the acquisition of property for redevelopment. This plan additionally calls for a number of streetscape improvements and improvements for pedestrian circulation within its defined study area.

- *12$^{th}$ Street Corridor Redevelopment Plan (2004)*
  This Chapter 99 plan was completed recently to compliment plans by KYTC to widen and improve KY 12$^{th}$ Street west from I-71/I-75 to the KY 12$^{th}$ Street Bridge over the Licking River to Newport. A small two block portion of this corridor is within the project study area. Any proposed widening may require the acquisition and removal of a number of buildings along KY 12$^{th}$ Street.

  The plan calls for streetscape and pedestrian improvements along the corridor in conjunction with the State's anticipated street widening. A gateway treatment is also planned at the intersection of KY 12$^{th}$ Street and Jillian's Way.

- *St. Elizabeth's Proposal (current year)*
  While no formal plan or proposal currently exists, the city of Covington is currently pursuing negotiations that may result in the construction of a medical facility on now vacant land located adjacent to and east of I-71/I-75 in an area of excess right of way at the base of the "cut in the hill." A proposal has been developed to construct a two lane access road extending south from KY 12$^{th}$ Street paralleling I-71/I-75 to provide access to this site. This access road would intersect with KY 12$^{th}$ Street a short distance east of the southbound exit ramp from I-71/I-75 to KY 12$^{th}$ Street.

- *Bavarian Brewery Redevelopment Plan (1996)*
  This Chapter 99 plan laid the ground work for redevelopment of a site located east of I-71/I-75 between Pike Street and KY 12th Street. This redevelopment has already taken place resulting in the conversion of the former brewery building into Jillian's, an entertainment venue that now occupies a portion of the former brewery structure.

- *Lewisburg Neighborhood Development Plan (1994)*
  This plan pertains to the area included in the Lewisburg Historic District which is located west of I-71/I-75. This plan does not envision any substantial change in this area; it is more oriented towards enhancing historic preservation in the area.

### 9.4.2 Ohio

The most recent citywide land use plan in effect in the city of Cincinnati is the *Cincinnati Coordinated City Plan* completed in 1981, 24 years ago. The *Coordinated City Plan* was generalized in nature, establishing general goals and policies on a city wide basis and identifying particular areas of interest that merited further investigation and study.

Since its completion, the *Coordinated City Plan* has fallen into disuse. The city of Cincinnati is divided into 52 officially designated neighborhoods and it became city policy to develop specific neighborhood plans for particular areas of the city rather than to rely on the city wide plan as the foundation for policy decisions. The *Coordinated City Plan* is no longer considered an official policy guidance document for the city of Cincinnati.

Within the study area all or portions of several officially designated neighborhoods are found. Various plans and studies exist pertaining to each of these areas, some more current than others. The more significant and recent of these are listed below and the significance of each is briefly discussed.

- *The Hamilton County/Cincinnati Central Riverfront Urban Design Master Plan* (2000).
  More commonly known as the *Banks Plan*, this plan defines in detail the type of redevelopment the city of Cincinnati hopes to achieve on its Central Riverfront, particularly in the area located between the new Paul Brown Stadium (football) on the western riverfront and the Great American Ballpark (baseball) on the eastern riverfront. In place for five years, this plan is still considered the official policy of Hamilton County and Cincinnati.

  The *Banks Plan* calls for substantial new mixed use development to be located immediately south of Fort Washington Way (I-71) to be built on top of a series of parking garages yet to be constructed to serve the parking needs of the two stadiums and the downtown area. Also incorporated into this plan was a multimodal transportation facility that has been constructed and which anticipated the future construction of a light rail transportation system in the Cincinnati region.

  The mixture of land uses anticipated in the *Banks Plan* included residential, modest amounts of retail and office and other entertainment venues. To date, the execution of the Banks Plan has been stymied by funding difficulties. Most importantly, financing has yet to be secured for construction of the parking garages upon which other development would be constructed.

The reconstruction of Fort Washington Way and the local street system surrounding it is inherently connected to the redevelopment proposed in the *Banks Plan*.

- *The West End Comprehensive Plan* (2003).
  This plan was developed in 2003 by the West End Community Council. The West End is a largely low income and minority neighborhood that lies primarily to the east of I-75 northwest of downtown Cincinnati. The West End includes a wide variety of land uses, historic buildings and more recent redevelopment. In general, The West End is a residential neighborhood. Currently, two very substantial federally funded Hope VI housing redevelopment projects are being completed. Combined, the Laurel Homes and Lincoln Court projects represent a new investment of $155 million, with over 1,000 new residential units and 130 rehabbed residential units.

  The *West End Comprehensive Plan* identifies several areas where the potential exists for redevelopment. Some of those lie within the study area, in particular along Ezzard Charles Drive and to the west of Linn Street.

- The *Queensgate South Urban Renewal Plan (1995)*
  This plan encompasses all of the riverfront land in the study area located to the west of I-75. The plan identifies several potential redevelopment sites, one of which is located in the study area. This 17.21 acre site is a former junkyard at the corner of Gest Street and Mehring Way, located west and north of Longworth Hall. At the time, it was seen as a potential site for relocating produce businesses being displaced by the construction of Paul Brown Stadium. While that use is now unlikely, redevelopment of the site is in the early stages with environmental cleanup and remediation currently now underway and expected to take several years. The future use is yet to be determined.

  Environmental contamination on the site would probably have made location of a produce business there impractical, however, once cleaned the site is practical for industrial or office redevelopment. A smaller 2.75 acre site at Rose Street and Pete Rose Way was also identified in this study as being under utilized and having redevelopment potential.

  It is worth noting that among the other strategies considered in this plan for promoting redevelopment in the area was to relocate a portion of Mehring Way slightly south and west onto land occupied by inactive rail sidings to facilitate aggregation of a larger redevelopment site.

- The *Queensgate South Industrial Cluster Area Economic and Market Study* (1989)
  This Market Study preceded the above referenced Urban Renewal Plan. Its purpose was to identify in general terms land areas in the Queensgate south area that were underutilized and held redevelopment potential. Its purpose was

also to explore some of the potential land uses that might be practical at that location. This study became the foundation for further action and represents an ongoing city policy to promote land redevelopment for business uses in the riverfront area located to the west of I-75.

- *Cincinnati 2000 Plan Review Committee (1992)*
  Poster update of previous *Cincinnati 2000 Plan,* which set the stage for the Banks Plan. This plan also laid out the expansion of the Cincinnati Convention Center now nearing completion.

- *Cincinnati 2000 Plan (1986)*
  Plan for the Central Business District and Central Riverfront, now replaced by the *Banks Plan*.

- *Cincinnati Riverfront Study (1981)*
  Produced by the Riverfront Advisory Council, encompassed the full riverfront within city boundaries.

# 10.0 CULTURAL RESOURCES

## 10.1 Historic Resources

Historic resources within the study area include individual residential, commercial, institutional, religious, and industrial buildings and districts. Exhibit 11 shows the locations of historic properties and districts within the study area.

### 10.1.1 Kentucky

There are two National Register of Historic Places (NRHP) properties within the study area, the Bavarian Brewing Company and Kenny's Crossing (Table 10-1). Portions of six NRHP districts are also located within the study area (Table 10-2). These districts are located on both the east and west sides of I-75 and are dominated by residential buildings.

### 10.1.2 Ohio

Fifteen individual properties are listed on the NRHP within the study area (Table 10-1). Two properties, Union Terminal and Plum Street Temple are also designated as a National Historic Landmarks. The Court Street Firehouse, Saint Peter-in-Chains Cathedral, Plum Street Temple and Cincinnati City Hall are also listed as local landmarks.

Nine NRHP districts are entirely or partially within the study area (Table 10-2). These nine districts and the Cincinnati Union Terminal are also identified as local historic districts. The districts are comprised of commercial buildings or buildings now undergoing conversion from commercial to residential uses. These districts are concentrated east of I-75 where they encompass large tracts within downtown Cincinnati.

**Table 10-1: NRHP Listed Resources Within the Study Area**

| Property | Address |
|---|---|
| **Kentucky** | |
| Bavarian Brewing Company | 522 West 12th Street |
| Kenny's Crossing | 1001 Highway Avenue |
| **Ohio** | |
| B and O Freight Terminal (Long Worth Hall) | 700 Pete Rose Way |
| Carew Tower | West 5th Street and Fountain Square |
| Lombardy Apartment Building | 318-326 West 4th Street |
| Derby, H.W. Building | 300 West 4th Street |
| Hooper Building | 139-151 West 4th Street |
| St Peter-in-Chains Cathedral | 325 West 8th Street |
| John Church Company Building | 14-16 East Fourth Street |
| Cincinnati City Hall | 801 Plum Street |
| Plum Street Temple | 726 Plum Street |
| Goodall Building | 324 West 9th Street |
| Court Street Firehouse | 311 West Court Street |
| Cincinnati Union Terminal | 1301 Western Avenue |
| Our Lady of Mercy High School | 1409 Western Avenue |
| Ohio National Guard Armory | 1437-1439 Western Avenue |
| Police Station Number 5 | 1024-1026 York Street |

**Table 10-2: Historic Districts Within the Study Area**

| District | NRHP Status | Local Historic District |
|---|---|---|
| **Kentucky** | | |
| Fort Mitchell Heights | Listed | N/A |
| Lewisburg | Listed | N/A |
| East Lewisburg | Eligible | N/A |
| Bavarian Brewing Company | Listed | N/A |
| West Side Neighborhood | Listed | N/A |
| West Side/ Mainstrasse | Listed | N/A |
| **Ohio** | | |
| West Fourth Street | Listed | Yes |
| West Fourth Street Amended | Listed | Yes |
| Ninth Street | Listed | Yes |
| Betts-Longworth | Listed | Yes |
| Laurel Homes | Listed | Yes |
| Dayton Street | Listed | Yes |
| East Fourth Street | Listed | Yes |
| Lytle Park | Listed | Yes |
| Main and Third Street Cluster | Listed | Yes |

## 10.2 Archaeological Resources

There are six recorded archaeological sites within the study area. Five sites are listed in the Ohio Archaeological Inventory (OAI) and one site is listed in Kentucky's OSA files within the study area (Table 10-3).

**Table 10-3: Recorded Archaeological Sites Within the Study Area**

| Site | Description |
|---|---|
| 15Ke122 | Historic Scatter |
| 33Ha1 (Cincinnati Tablet Mound) | Prehistoric Earthen Mound<br>Early Woodland Period |
| 33Ha113 | Prehistoric Mound |
| 33Ha311 (Seventh Street Mound) | Prehistoric Mound<br>Middle Woodland Period |
| 33Ha312 (Richmond Street Mound) | Prehistoric Mound<br>Woodland Period |
| Cincinnati and White Water Canal | Historic Canal<br>Early to Mid-19th Century |

### 10.2.1 Kentucky

There is one recorded archaeological site (15Ke122) within the Kentucky portion of the study area. This site is historic scatter with associated features.

### 10.2.2 Ohio

Five of the archaeological sites recorded within the study area are located in Ohio. Four of the sites are prehistoric and were disturbed in the historic period. The sites are 33Ha1 Cincinnati Tablet Mound, 33Ha113, 33Ha311 Seventh Street Mound, and 33Ha312 Richmond Street Mound. All of the sites yielded lithics, ceramics, floral and faunal remains.

Several historic archaeological sites are known to exist within the Ohio portion of the study area. The most prominent of these is the Cincinnati and White Water Canal. The canal was already abandoned between Cincinnati and Valley Junction, Ohio, when it was purchased in 1863 by the Cincinnati and Indiana Railroad Company. The Cincinnati and Indiana Railroad used the existing canal bed to construct a new rail bed. Today, the canal tow path and bed are just north of Longworth Hall between 2nd and 3rd streets.

Historic maps illustrating the study area show increasingly dense commercial and industrial buildup of the areas northeast of existing I-75 and the Brent Spence Bridge approach lanes between 1815 and 1908. Buildings dating to 1840 still exist in this portion of the study area. Based on excavations conducted elsewhere in the urban core of Cincinnati and along its riverfront, it is likely that building remnants and intact features such as privies, cisterns, and wells remain. During recent construction of Paul Brown Stadium and Fort Washington Way, numerous foundations and shaft features were observed.

# 11.0 HAZARDOUS MATERIALS

Federal and state agencies databases were reviewed to obtain hazardous materials information. A review of the US Environmental Protection Agency (EPA) Envirofacts Data Warehouse information resulted in the identification of 25 records for hazardous waste generators located within the study area. Underground Storage Tank (UST) data was obtained from two sources. The Kentucky Division of Waste Management (KDWM) maintains the UST database for the Commonwealth of Kentucky.

There is a concentration of USTs in Kentucky, adjacent to the southern bridge landing area. One hazardous waste site specifically related to the Brent Spence Bridge is due to a previous painting operation. Sandblasting grit was not properly controlled and resulted in lead contamination in the soil below the bridge in Kentucky. KYTC is currently taking actions to remediate this site.

Data for Ohio USTs were obtained from the Ohio Bureau of Underground Storage Tank Regulations (BUSTR), which is housed in the State Fire Marshal's Office of the Ohio Department of Commerce. The data identified 121 USTs within the study area, 91 in Kentucky and 30 in Ohio. Locations of the hazardous waste generators and USTs are presented on Exhibit 12.

Landfill locations were also researched during the environmental review process. The KDWM website was reviewed for the presence of any current or historically operated landfills in Kenton County. According to the list of Permitted Solid Waste Landfills, there are none present in Kenton County. The OEPA Division of Solid and Infectious Waste Management website was accessed for information pertaining to possible landfills currently or historically operated landfills in the study area. According to several sources on the website, no landfills are located within the Ohio portion of the study area.

# 12.0 AIR QUALITY

In 1990, Congress approved the Clean Air Act Amendments (CAAA) to address the nations growing major air pollution problems. The CAAA established the National Ambient Air Quality Standards for five pollutants: ozone, particulate matter, sulfur dioxide nitrous oxides, and carbon monoxide. The CAAA also explained how the United States Environmental Protection Agency (USEPA) designates non-attainment areas for ozone, carbon monoxide, and fine particulate matter (PM2.5) and how areas are to be classified depending on the severity of the air pollution problem. These pollutants are components of vehicle emissions thus transportation projects are required to conform to meet 8-hour ozone standards.

As of December 2004, USEPA designated Hamilton County, Ohio and Kenton County, Kentucky as non-attainment for fine particulate matter (PM2.5). Additionally, Hamilton County, Ohio and Kenton County, Kentucky are designated eight-hour non-attainment. Plans and programs required to meet new interim conformity requirements of eight-hour ozone standard will to be finalized by June 2007. In June 2005, the one-hour ozone standard was revoked. Air quality analysis is ongoing within Hamilton and Kenton counties to determine how intensive and to what degree the plan and its programs will need to be in order to reach eight-hour attainment (Source: www.oki.org).

# 13.0 REVIEW OF RELATED STUDIES

A number of recently completed study efforts were undertaken within all, or portions of the current study area for the Brent Spence Bridge Rehabilitation/Reconstruction Project. An overview of these studies is presented:

- *North South Transportation Initiative (2004)*
  In 2000, the Ohio-Kentucky-Indiana Regional Council of Governments (OKI) and the Miami Valley Regional Planning Commission (MVRPC) under took a major planning effort, known as the *North South Transportation Initiative* (Initiative), to study the multi-modal transportation system of their regions. The Initiative evaluated the transportation system along a 125-mile stretch of I-75 and the surrounding area spanning from Northern Kentucky, through Cincinnati and Dayton to Piqua, Ohio.

  The result of this process is a preferred program of transportation projects to be considered for inclusion in the long-range planning efforts of the Ohio Department of Transportation (ODOT), Kentucky Transportation Cabinet (KYTC), MVRPC and OKI. Some of the preferred projects from this study are already underway including the Brent Spence Bridge Rehabilitation/Replacement Study (HAM-71/75 0.00/0.22 – KYTC Project Item Number 6-17), Mill Creek Expressway (HAM-75-2.30) and Thru the Valley (HAM-75-10.10) projects.

- *The Feasibility and Constructability Study of the Replacement/Rehabilitation of the Brent Spence Bridge (2005)*
  This study was contracted in 2003 by KYTC and overseen by a Bi-State Management Team that included ODOT, and the Federal Highway Administration (FHWA) offices from both states. The scope of this study included an analysis of restricting trucks on the bridge, analysis of constructing a new crossing near Anderson Ferry, field testing critical truss members to determine fatigue life and developing concepts for five and seven lane Ohio River crossings in the immediate vicinity of the current structure.

  This study recommended a series of potential feasible build alternatives for replacement and/or rehabilitation of the Brent Spence Bridge structure and improvement to its approaches and surrounding transportation system. Neighborhood and environmental impacts, geotechnical reviews and traffic data were all considered in the development of the recommended alternatives.

- *The Mill Creek Expressway Project (current study)*
  ODOT is currently examining transportation options for the improvement of I-75 and its surrounding transportation system north of the Brent Spence Bridge Rehabilitation/Replacement study area.

  The study area for this project includes I-75 interchanges at Hopple Street, I-74, Mitchell Avenue, State Route 562 (The Norwood Lateral) and Towne Street as well as the I-74 interchange at Colerain Avenue.

The Mill Creek Expressway project was initiated to evaluate alternatives that will improve traffic flow, enhance safety and minimize impacts to adjacent property owners and communities within the study area.

- *The Central Area Loop Study (1999)*
  The *Central Area Loop Study* was commissioned by OKI in 1999. The study area included the downtown Central Business Districts for the cities of Cincinnati, Covington and Newport. The purpose of this study was to investigate the feasibility of providing a connection between the three cities and to improve the east/west flow of traffic in the KY 4$^{th}$ and KY 5$^{th}$ street corridor between I-71/I-75 and I-471 in Kentucky.

- *The I-71 Corridor Transportation Study (1997)*
  This was a Major Investment Study for the I-71 Corridor Study, which was commissioned by OKI in 1997. As part of this project, a Technical Memorandum was developed (The I-71/I-75 Brent Spence Bridge Traffic Management Plan). This effort identified a series of recommended existing alternate routes for Brent Spence Bridge traffic.

- *The I-71/I-75 Brent Spence Bridge Scoping Study (1998)*
  In 1998, OKI developed the *I-71/75 Brent Spence Bridge Scoping Study* as part of the larger I-71/I-75 Corridor Transportation Study. This study looked at several conceptual alternatives, including five build and one no-build alternative for the replacement and rehabilitation of the Brent Spence Bridge structure.

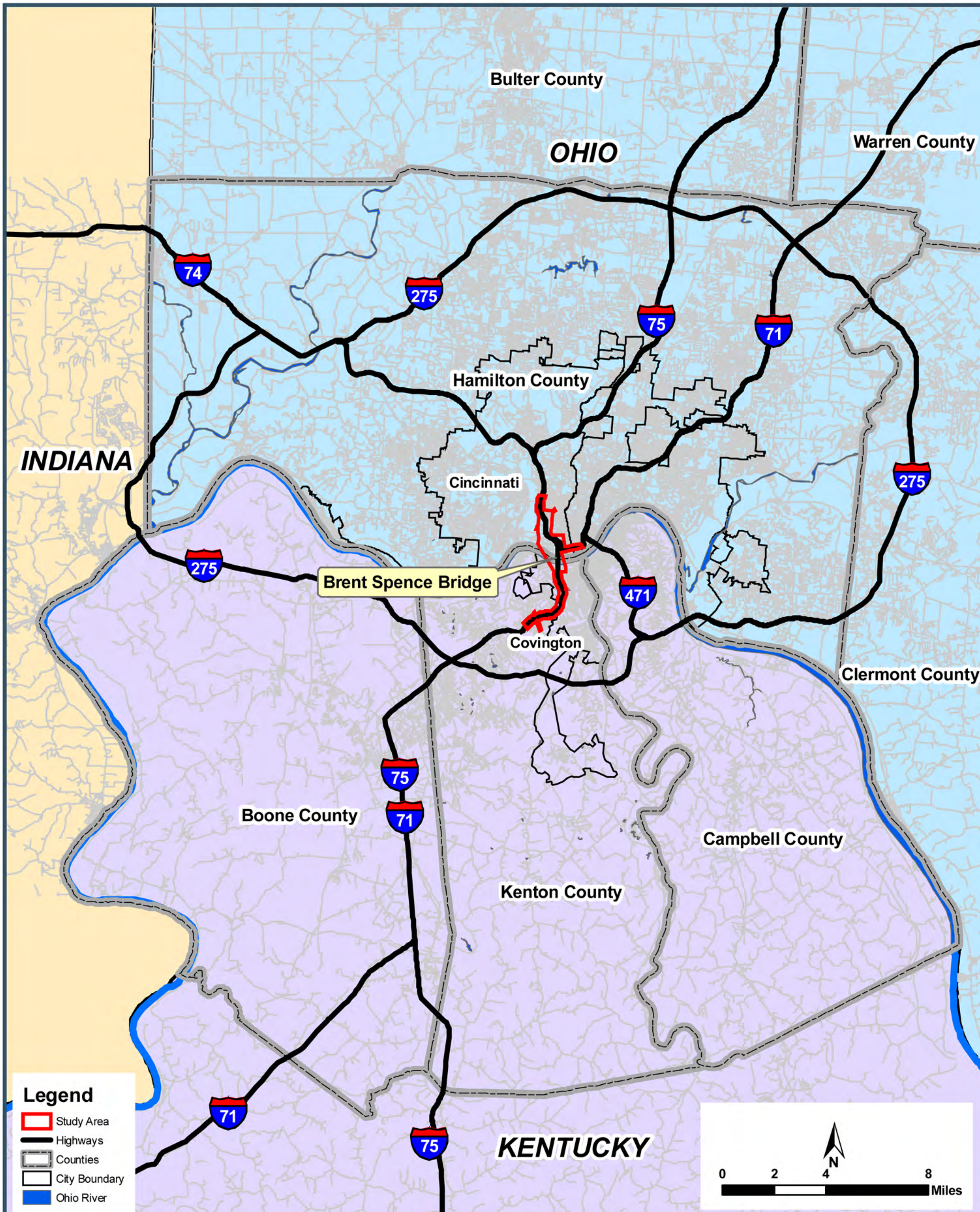
- *MetroMoves Regional Transit Plan/Regional Light Rail Plan (2002)*
  The Regional Light Rail Plan includes several proposed local and commuter passenger corridors within southwestern Ohio and northern Kentucky, including the Brent Spence Bridge Rehabilitation/Replacement study area. Construction of the first operable segment is estimated at approximately $800 million. This plan was completed for $8 million at approximately 30 percent design. It was not completed due to a lack of funding. Exhibits 13 through 15 show the commuter rail, light rail, and streetcar services this plan proposed.

- *OKI 2030 Regional Transportation Plan 2004 Update (2004)*
  The *OKI Regional Transportation Plan* is updated approximately every four years. The latest update was completed in 2004. The plan addresses current and future transportation needs through the year 2030. It was developed in response to FHWA and Clean Air Act requirements to mitigate congestion, address air quality, and other environmental, social and financial issues. It is the outline for the region's transportation projects for the next 25 years.

- *Western Hamilton County Corridor Study (current study)*
  This is a Major Investment Study, which shares a border with the Brent Spence Bridge Rehabilitation/Replacement Study. It includes nearly all of Hamilton County west of I-75, and east of the Indiana border. The study will focus on improving mobility and safety for residents, commuters and freight traffic. The study area is purposefully large and will assess many individual corridors.

- *Uptown Transportation Study (current study)*
  This study is examining transportation infrastructure needs within the Cincinnati neighborhoods of Avondale, Clifton, Clifton Heights, Corryville, East Walnut Hills, Evanston, Fairview/University Heights, Mount Auburn, North Avondale and Walnut Hills. The Uptown area includes the University of Cincinnati, the Cincinnati Zoo and Botanical Garden, USEPA offices and a number of major hospital and medical facilities in the region. A major component of this study is examining access to I-71 and other major roadways within the area.

# Exhibits



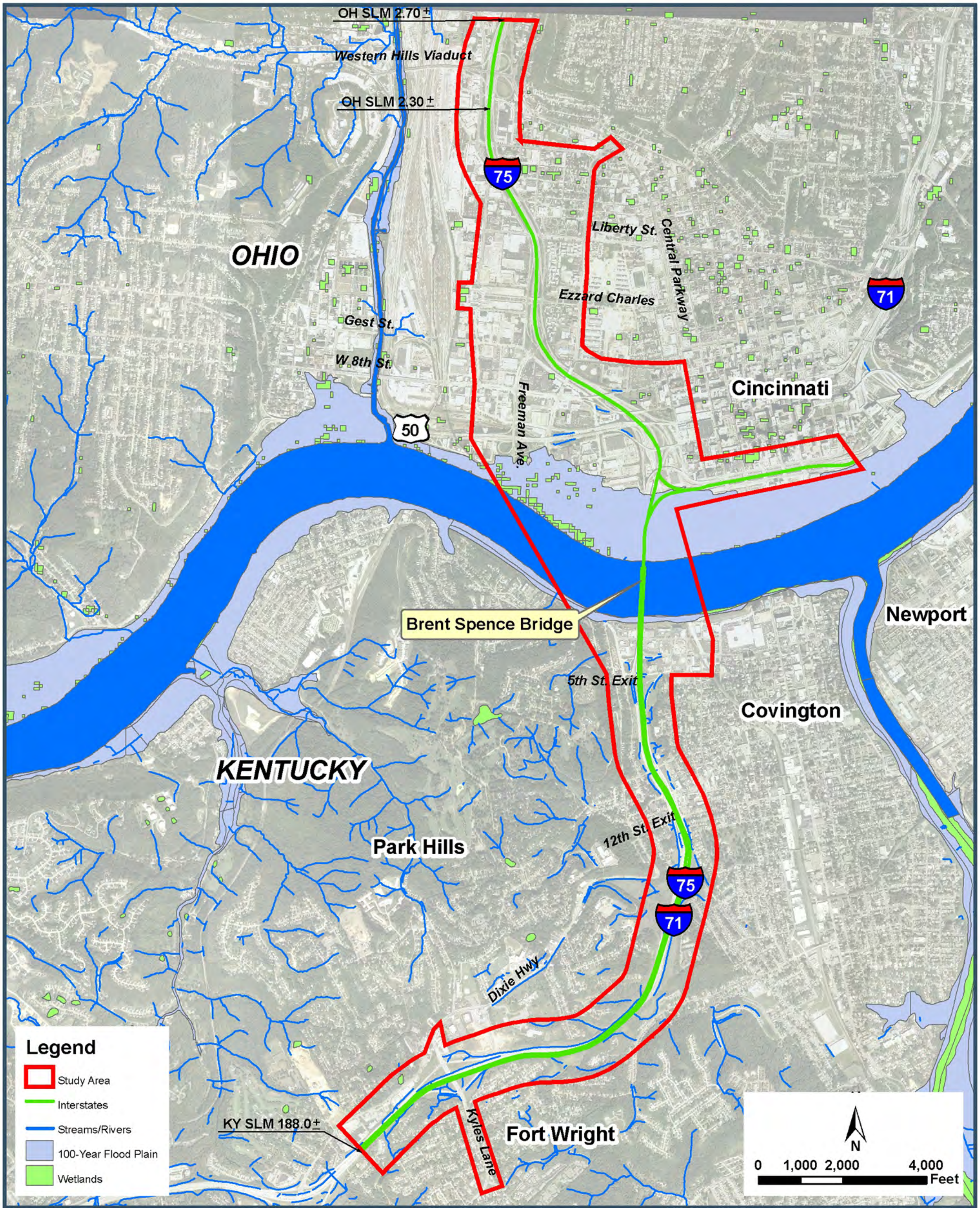

REGIONAL MAP

EXHIBIT 1


EXHIBIT

2

STUDY AREA



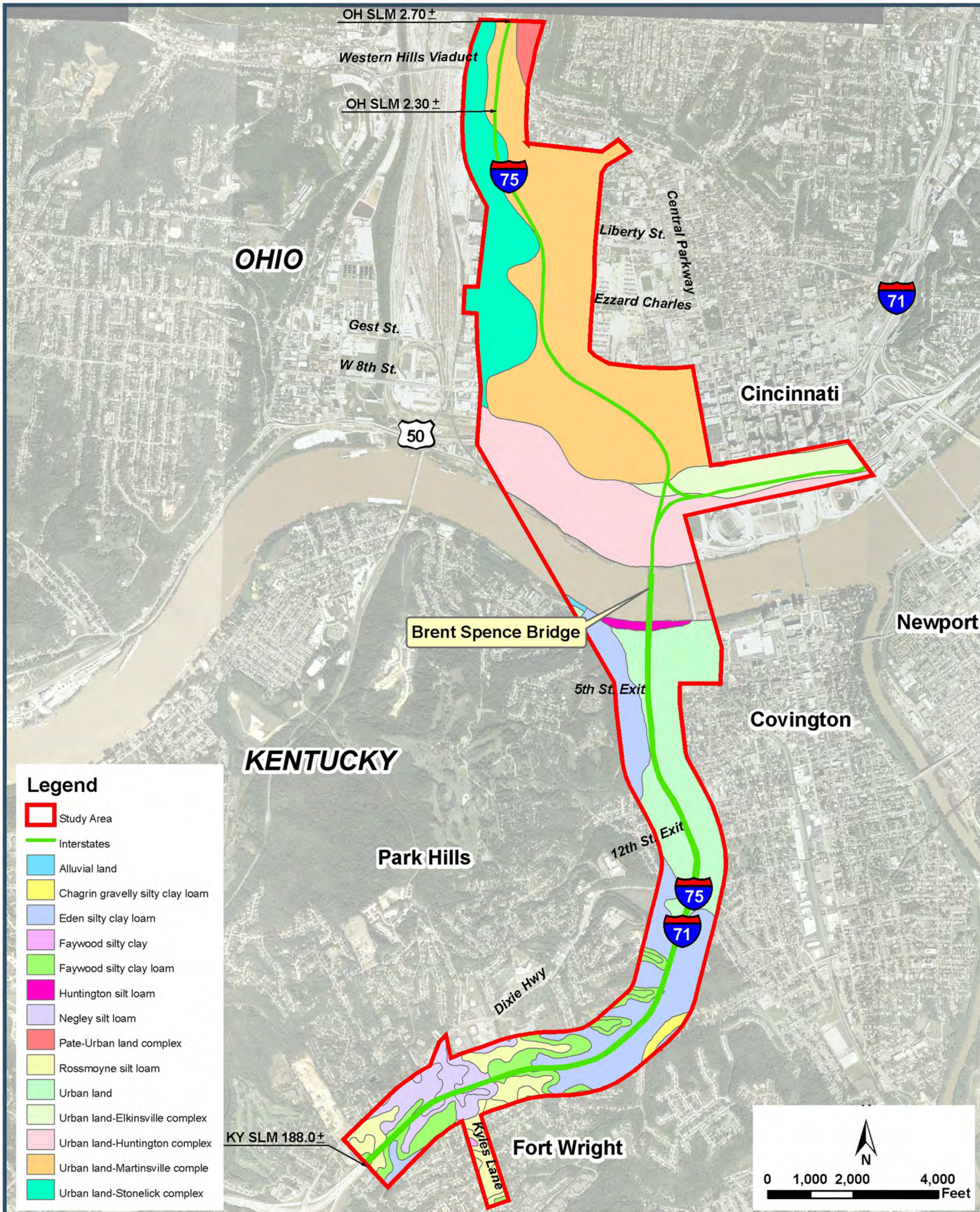

KENTUCKY TRANSPORTATION CABINET

# WETLANDS, STREAMS & 100-YEAR FLOOD PLAIN

EXHIBIT

3

PARSONS BRINCKERHOFF

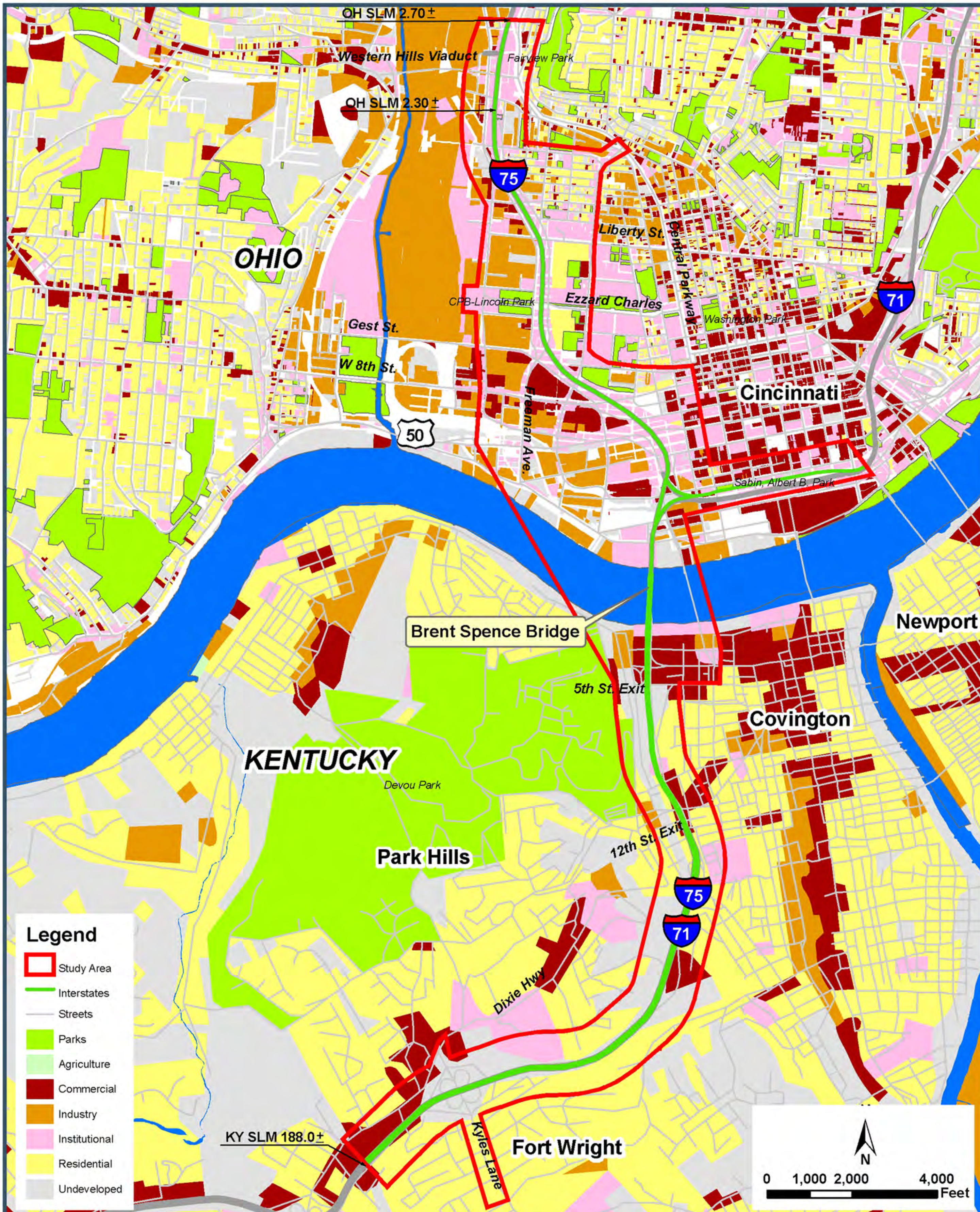



SOILS

EXHIBIT

4

PARSONS BRINCKERHOFF



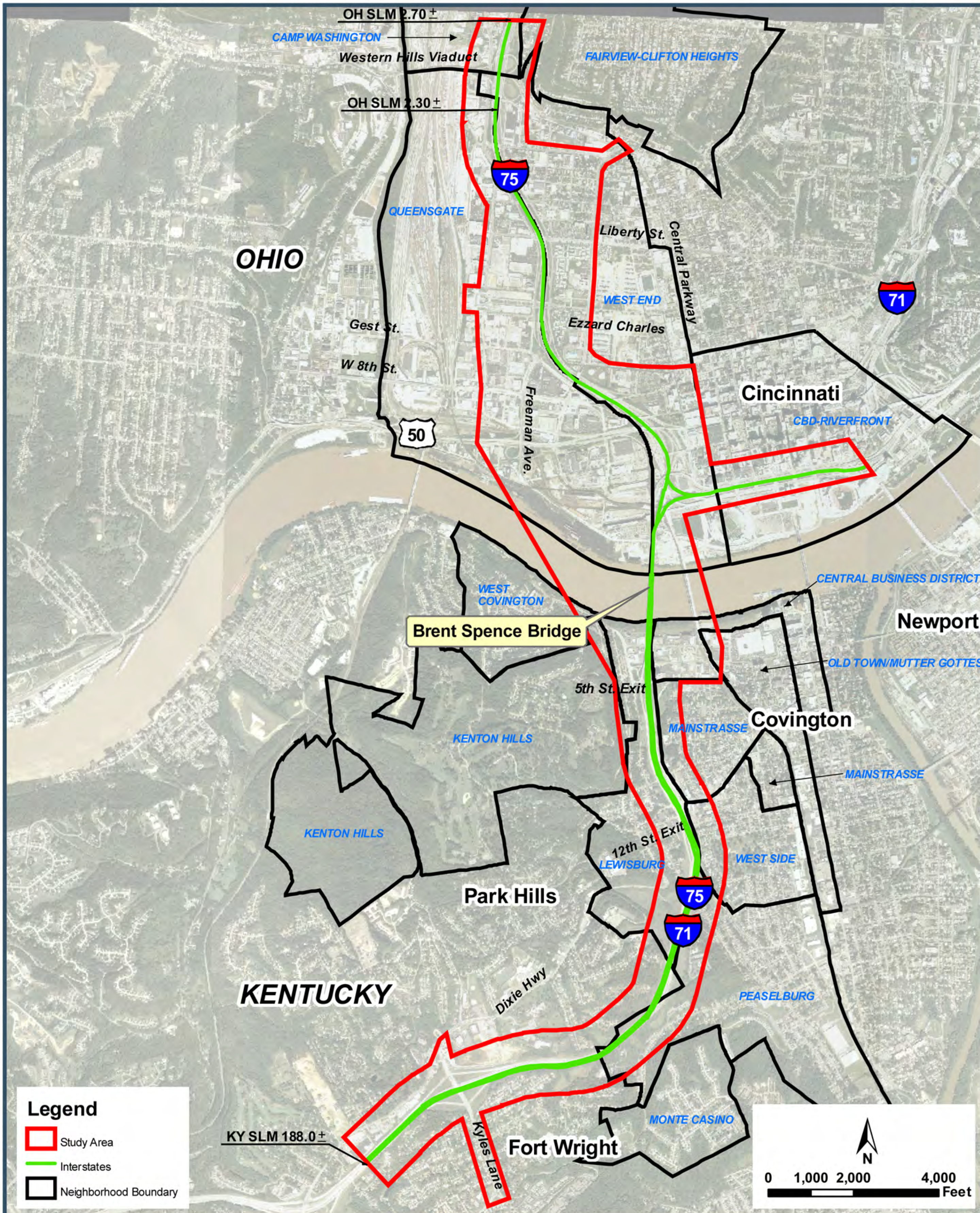

**LAND USE**

EXHIBIT

5

KENTUCKY TRANSPORTATION CABINET

PARSONS BRINCKERHOFF

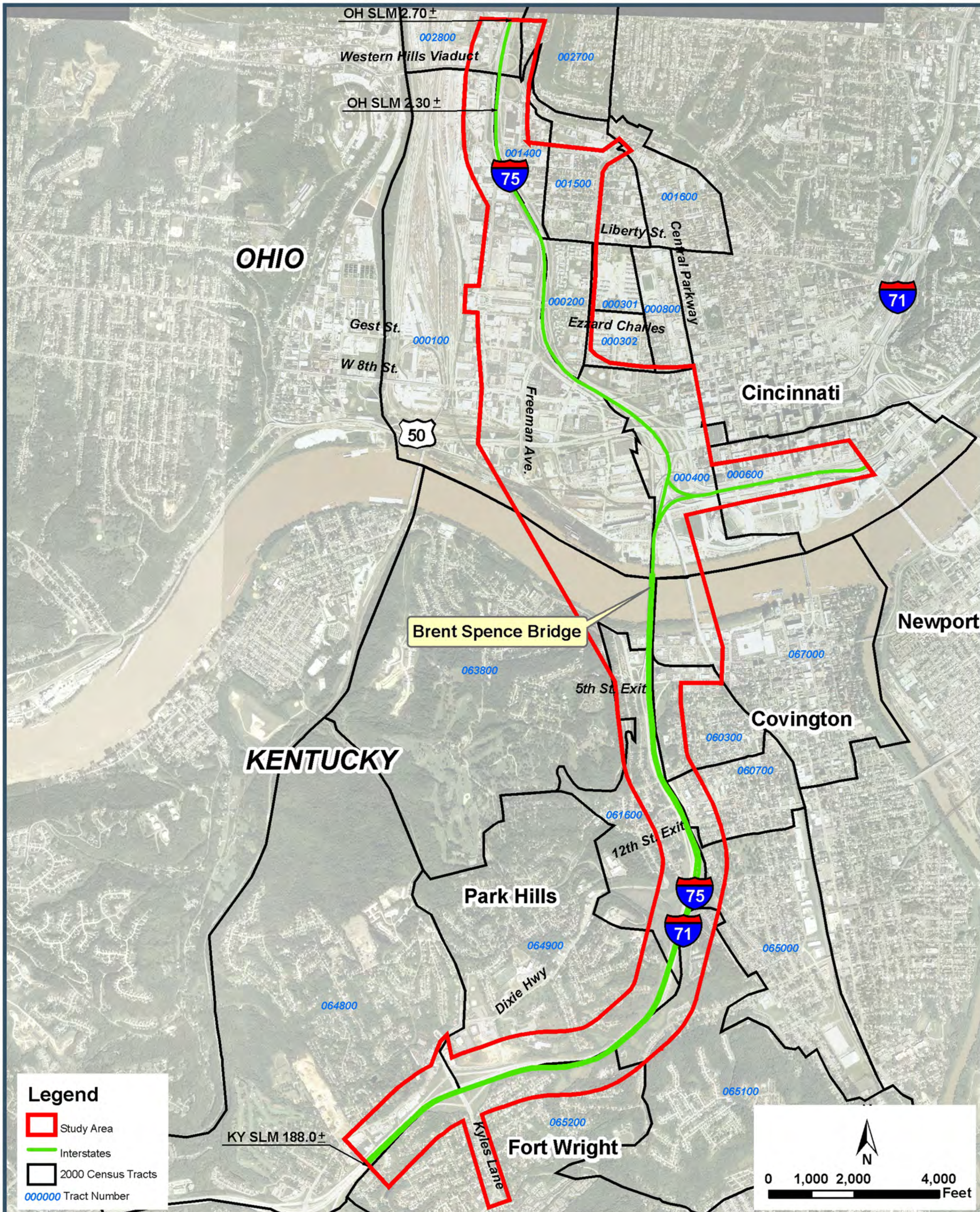



KENTUCKY TRANSPORTATION CABINET

# NEIGHBORHOODS

EXHIBIT 6

PB PARSONS BRINCKERHOFF

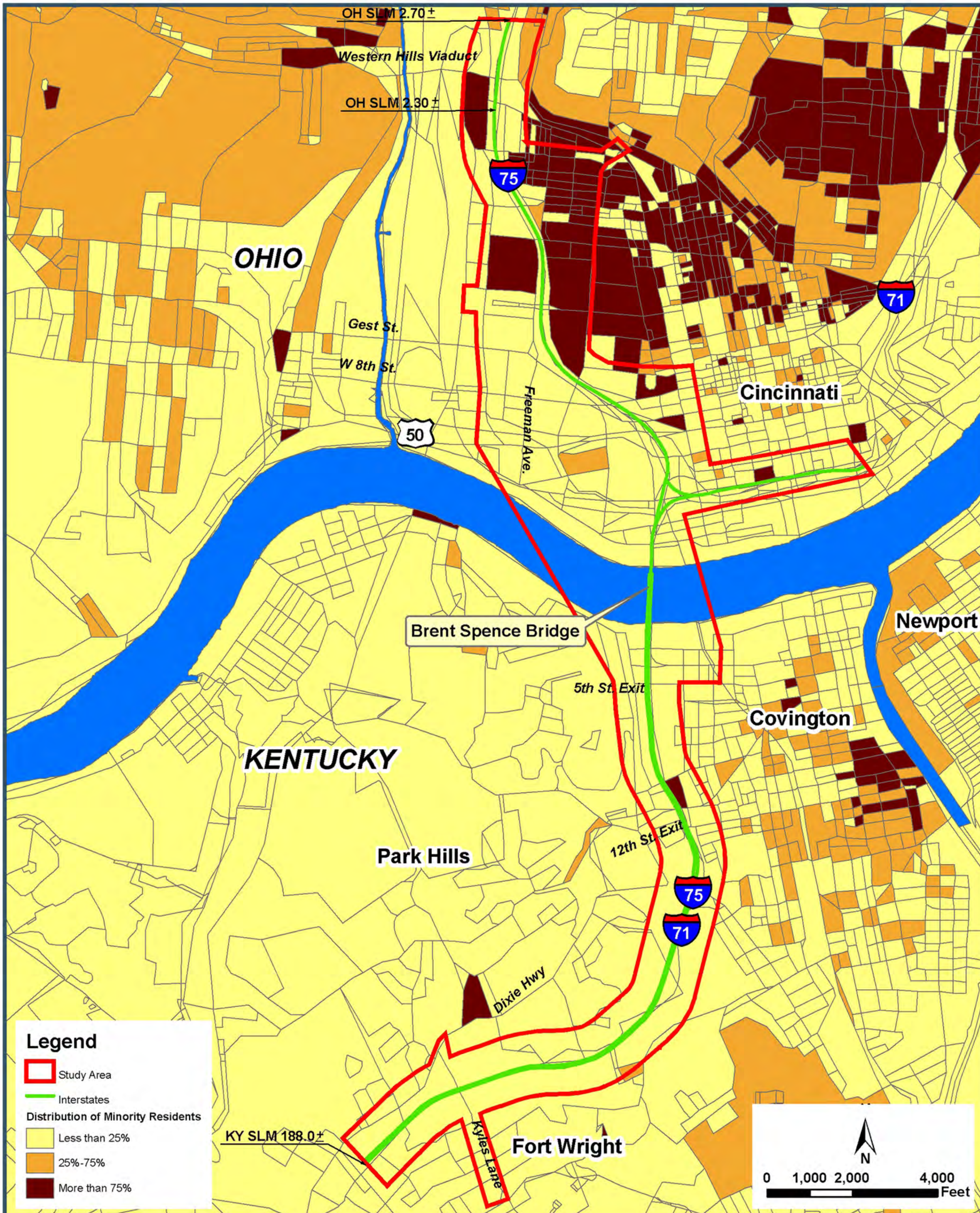



# 2000 CENSUS TRACTS

EXHIBIT

7

PARSONS BRINCKERHOFF



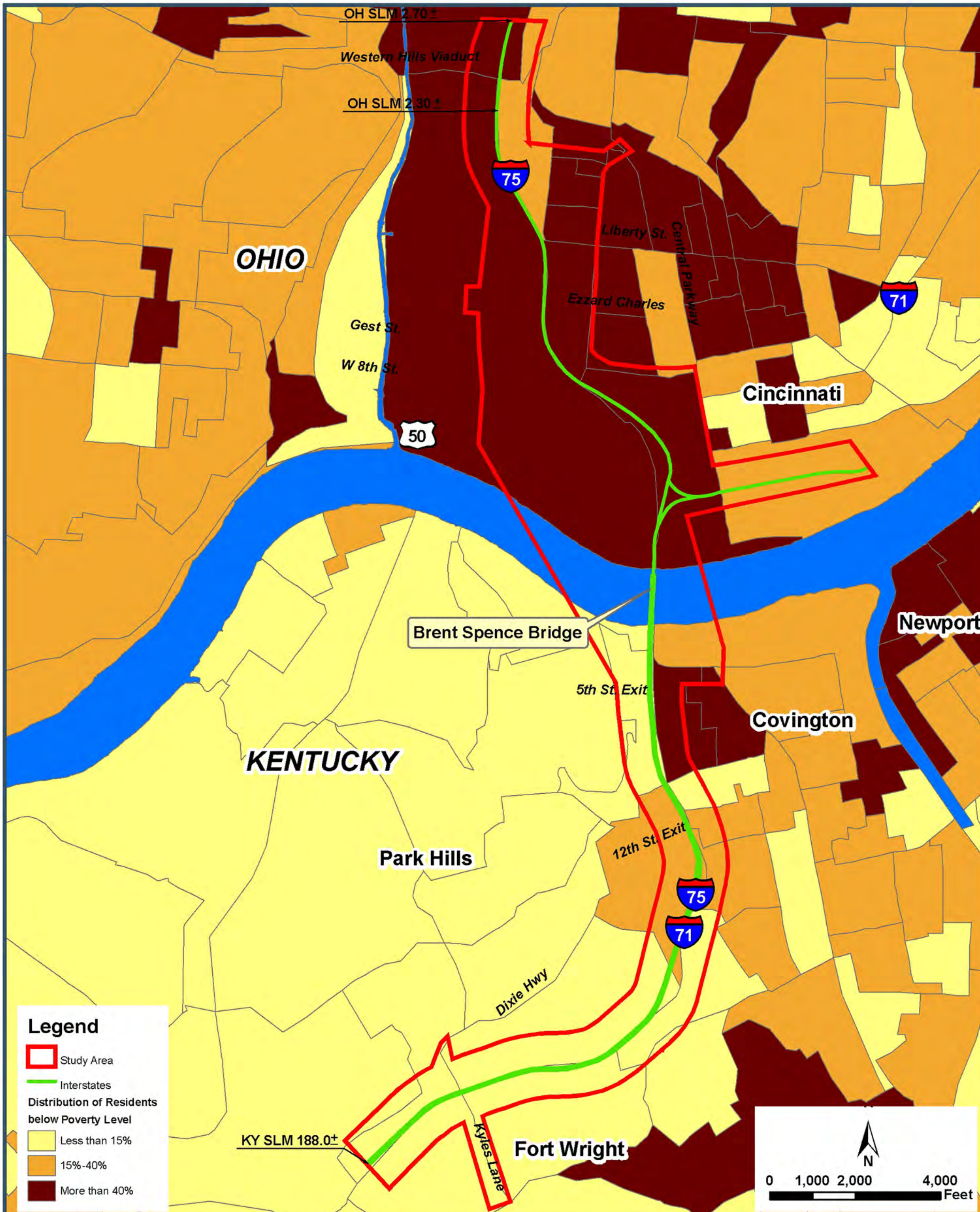

KENTUCKY TRANSPORTATION CABINET

## MINORITY POPULATIONS

EXHIBIT

8

PB PARSONS BRINCKERHOFF




# LOW INCOME POPULATIONS

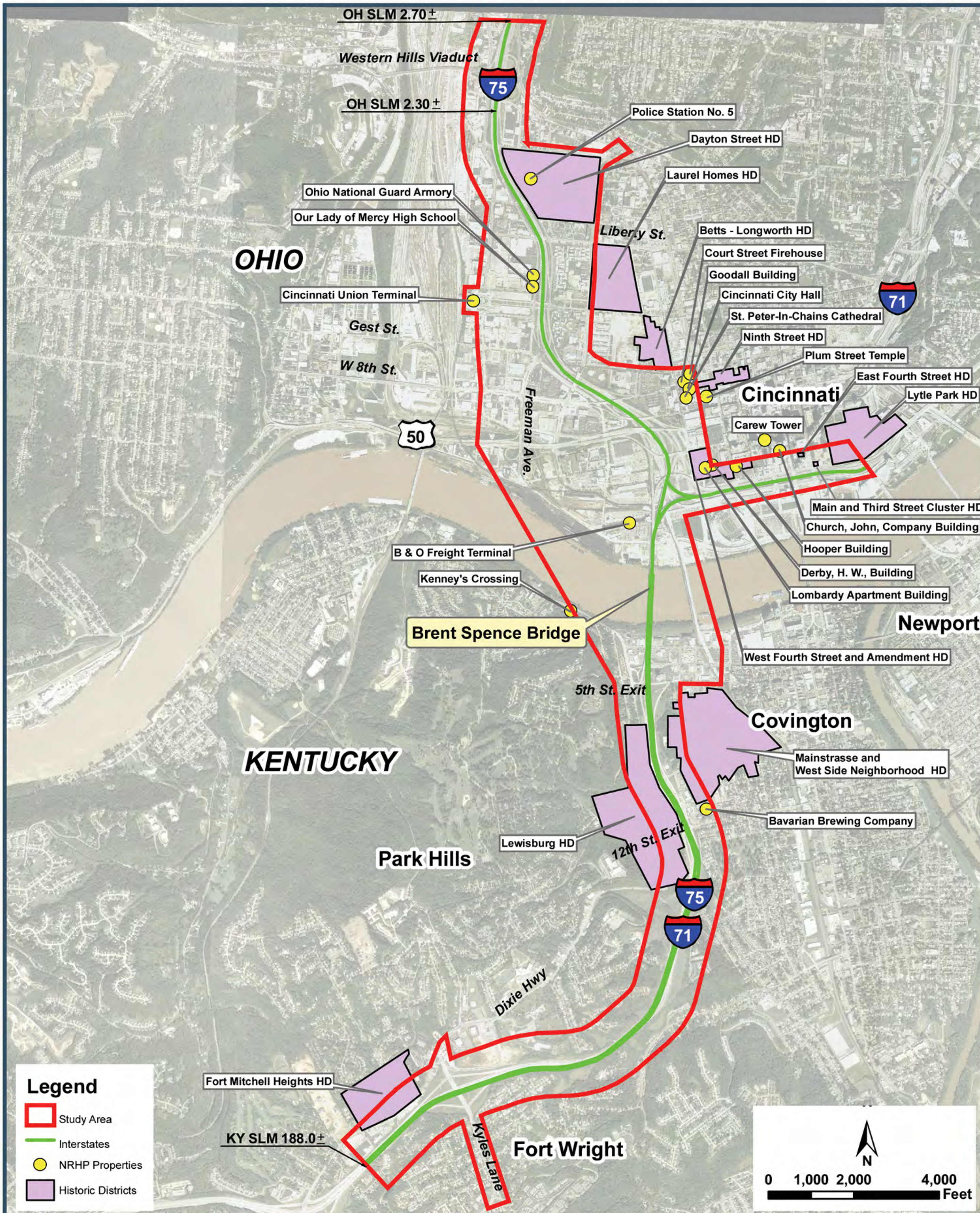
EXHIBIT
9

PARSONS BRINCKERHOFF


# COMMUNITY FACILITIES

EXHIBIT

10




CULTURAL RESOURCES

EXHIBIT

11

PB PARSONS BRINCKERHOFF


HAZARDOUS MATERIALS

EXHIBIT

12

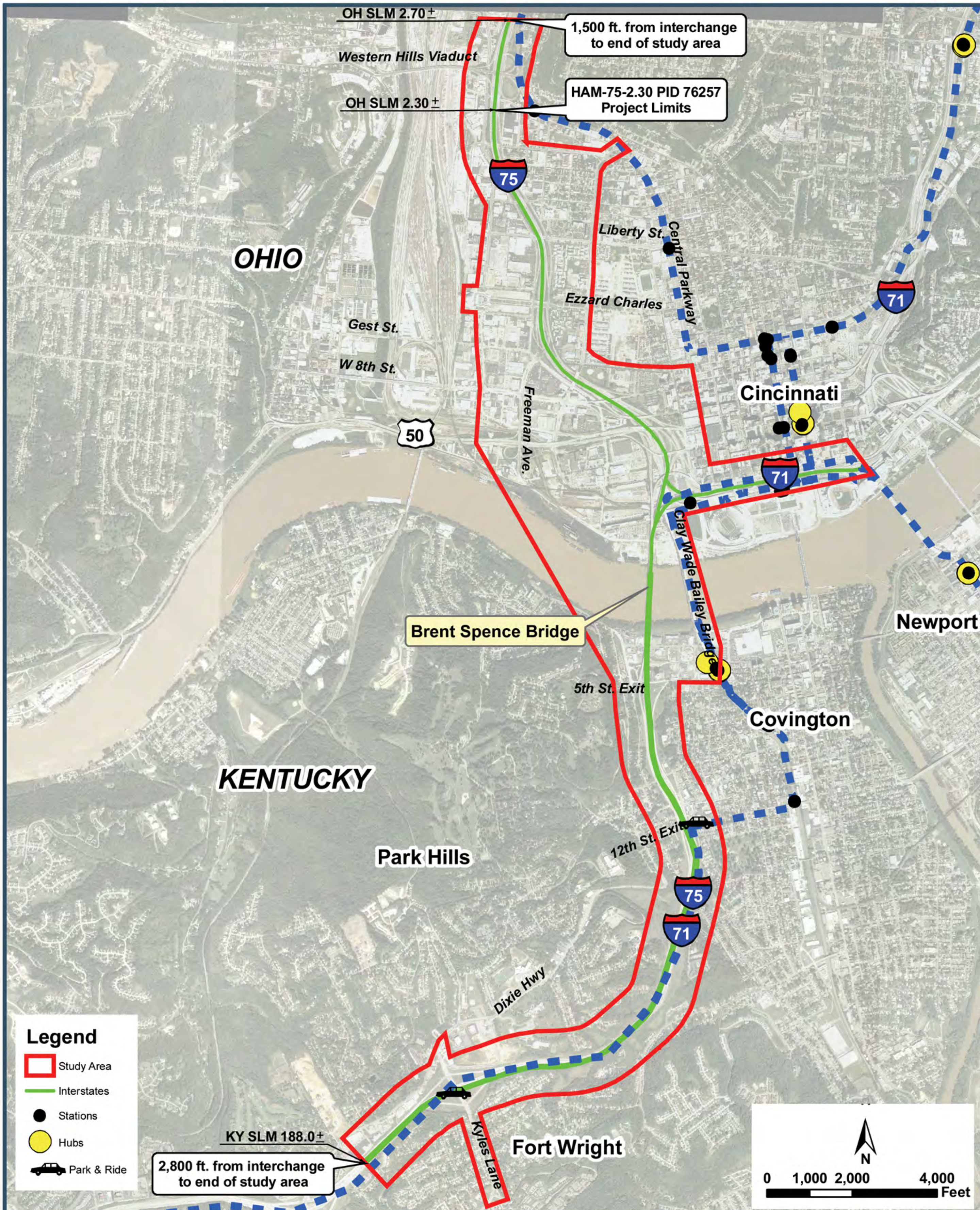
KENTUCKY TRANSPORTATION CABINET

PARSONS BRINCKERHOFF


**CINCINNATI METROMOVES PROPOSED COMMUTER RAIL PLAN**

EXHIBIT

13




# CINCINNATI METROMOVES PROPOSED LIGHT RAIL PLAN

EXHIBIT

14

PARSONS BRINCKERHOFF


# CINCINNATI METROMOVES PROPOSED STREETCAR SERVICE PLAN

EXHIBIT

15

PARSONS BRINCKERHOFF

# Appendix A

# Brent Spence Bridge Project (BSB)
# Review of Existing Geometrics
# Mainline and Ramps, Ohio

Functional Classification (Mainline) - Interstate
Design Speed (Mainline) - 60 Miles Per Hour (MPH)

Notes:
1. Based upon review of the Original Construction, Rehabilitation, and Reconstruction Plans.
2. When a deficient lane / shoulder width is identified, it is assumed that curve widening (when applicable) and bridge width (when applicable) are also deficient.
3. When a deficient horizontal curve is identified, it is assumed that superelevation (when applicable) is also deficient.
4. When a deficient shoulder width is identified, it is assumed that the graded shoulder width is also deficient.
5. Review is based upon design criteria established by the ODOT Location & Design Guidance Manuals.

| Typical Section | | | | |
|---|---|---|---|---|
| **Straight Line Mile** | **Item** | **Location** | **Existing** | **Required** |
| 0.3 | Lane Width (Bridge Width) | I-75 NB Mill Creek Bridge Connector (End of BSB to at-grade) | 11 Feet | 12 Feet |
| 0.2 | Lane Width (Bridge Width) | I-75 SB Mill Creek Bridge Connector (End of BSB to at-grade) | 11 Feet | 12 Feet |
| 0.2 | Lane Width | Directional Ramp NB Mill Creek Expressway One Lane Portion | 12 Feet | 16 Feet |
| 0.5 | Lane Width | Directional Ramp SB Mill Creek Expressway One Lane Portion | 12 Feet | 16 Feet |
| 0.5 | Lane Width | Ramp H - Directional Ramp NB Mill Creek Expressway To WB 6th Steet Expressway | 14 Feet | 16 Feet |
| 1.3 | Lane Width | Ramp J - SB Western Avenue to SB Mill Creek Expressway | 14 Feet | 16 Feet |
| 0.3 | Shoulder Width (Bridge Width) | I-75 NB Mill Creek Bridge Connector (End of BSB to at-grade) | Varies <6 Feet Both Sides | 10 Feet Both Sides |
| 0.2 | Shoulder Width (Bridge Width) | I-75 SB Mill Creek Bridge Connector (End of BSB to at-grade) | Varies <6 Feet Both Sides | 10 Feet Both Sides |

| Typical Section (continued) | | | | |
|---|---|---|---|---|
| **Straight Line Mile** | **Item** | **Location** | **Existing** | **Required** |
| 0.5 | Shoulder Width (Curbed) | Ramp G - 4th Street to NB Mill Creek Expressway | 3 Feet Both Sides | 6 Feet Right<br>3 Feet Left |
| 0.6 | Shoulder Width (Curbed) | Ramp P - Sixth Street to NB Mill Creek Expressway | 3 Feet Both Sides | 10 Feet Right<br>4 Feet Left |
| 0.6 | Shoulder Width (Curbed) | Ramp R - EB 6th Street Expressway To SB Mill Creek Bridge Connector | 6 Feet Right | 10 Feet Right |
| 0.9 - 1.3 | Shoulder Width (Curbed) | Mill Creek Expressway | Median<br>~ 7 Feet | 15 Feet |
| 0.8 | Shoulder Width (Curbed) | Ramp Q - 9th Street Connector To SB Mill Creek Bridge Connector | 6 Feet Right<br>4 Feet Left | 10 Feet Right<br>4 Feet Left |
| 0.8 | Shoulder Width (Curbed) | Ramp B - SB Mill Creek Expressway to EB 7th Street | 3 Feet Right<br>3 Feet Left | 10 Feet Right<br>4 Feet Left |
| 1.3 | Shoulder Width (Curbed) | Ramp F - Gest/Winchell to NB Mill Creek Expressway | 3 Feet Both Sides | 6 Feet Right<br>3 Feet Left |
| 1.3 | Shoulder Width (Curbed) | Ramp H - SB Mill Creek Expressway to Gest Street | 4 Feet Right<br>4 Feet Left | 6 Feet Right<br>3 Feet Left |
| 1.3 | Shoulder Width (Curbed) | Ramp J - SB Western Avenue to SB Mill Creek Expressway | 3 Feet Both Sides | 6 Feet Right<br>3 Feet Left |
| 1.5 | Shoulder Width (Curbed) | Ramp M - NB Winchell Avenue to NB Mill Creek Expressway | 3-4 Feet Right<br>3 Feet Left | 6 Feet Right<br>3 Feet Left |
| 1.6 | Shoulder Width (Curbed) | Ramp N - SB Mill Creek Expressway to SB Western Avenue | 3 Feet Both Sides | 6 Feet Right<br>3 Feet Left |
| 1.6 - 2.3 | Shoulder Width (Paved) | Mill Creek Expressway | Median<br>~ 7 Feet | 15 Feet |
| 2.7 | Shoulder Width (Paved) | Mill Creek Expressway (Bifurcated Area) | Median<br>~ 7 Feet | 15 Feet |
| 2.1 | Shoulder Width (Paved) | Ramp A - SB Mill Creek Expressway to Western Avenue | 3 Feet Both Sides | 6 Feet Right<br>3 Feet Left |

| Typical Section (continued) | | | | |
|---|---|---|---|---|
| **Straight Line Mile** | **Item** | **Location** | **Existing** | **Required** |
| 2.5 | Shoulder Width (Paved) | Ramp C - EB Western Hills Viaduct to NB Mill Creek Expressway | 3 Feet Both Sides | 6 Feet Right<br>3 Feet Left |
| 2.5 | Shoulder Width (Paved) | Ramp D - NB Mill Creek Expressway to WB Western Hills Viaduct | 3 Feet Both Sides | 6 Feet Right<br>3 Feet Left |
| 2.5 | Shoulder Width (Paved) | Ramp F - SB Mill Creek Expressway To WB Western Hills Viaduct | 3 Feet Both Sides | 6 Feet Right<br>3 Feet Left |

| Horizontal Alignment | | | | |
|---|---|---|---|---|
| **Straight Line Mile** | **Item** | **Location** | **Existing** | **Required** |
| 0.5 | Horizontal Curves Radii | I-75 NB Mill Creek Bridge Connector (First Curve on-grade) | R=1146 Feet | R=1349 Feet |
| 0.4 | Horizontal Curves Radii | Directional Ramp EB Distributor Bridge Connector To I-71 | R=654.81 Feet | Directional Ramp Min. V=40 mph R=510 Feet Des. V=50 mph R=850 Feet |
| 0.5 | Horizontal Curves Radii | Directional Ramp FWW / EB DiStreet Bridge Connector | R=754 Feet | Directional Ramp Min. V=40 mph R=510 Feet Des. V=50 mph R=850 Feet |
| 0.4 | Horizontal Curves Radii | Directional Ramp FWW / SB DiStreet Bridge Connector | R=466 Feet | Directional Ramp Min. V=40 mph R=510 Feet Des. V=50 mph R=850 Feet |
| 0.5 | Horizontal Curves Radii | Directional Ramp FWW / SB DiStreet Bridge Connector | R=476 Feet | Directional Ramp Min. V=40 mph R=510 Feet Des. V=50 mph R=850 Feet |
| 0.5 | Horizontal Curves Radii | Ramp J - Directional Ramp I-75 NB to 6th Street WB | R=435.16 Feet | Directional Ramp Min. V=40 mph R=510 Feet Des. V=50 mph R=850 Feet |
| 0.5 | Horizontal Curves Radii | Ramp L - SB Mill Creek Expressway To 6th-5th Street Connector (at 6th-5th Street Connector) | R=100 Feet | V=30 mph R=232 Feet |
| 0.6 | Horizontal Curves Radii | Ramp Q - 9th Street Connector To SB Mill Creek Bridge Connector | R=90 Feet | V=30 mph R=232 Feet |
| 2.5 | Horizontal Curves Radii | Ramp E - EB Western Hills Viaduct to SB Mill Creek Expressway (at Curve Nearest Expressway) | R=~ 229 Feet | Directional Ramp Min. V=40 mph R=488 Feet Pref. V=50 mph R=849 Feet |
| 2.5 | Horizontal Curves Radii | Ramp F - SB Mill Creek Expressway To WB Western Hills Viaduct (at Curve Nearest Expressway) | R=~ 229 Feet | Directional Ramp Min. V=40 mph R=488 Feet Pref. V=50 mph R=849 Feet |

| Horizontal Alignment (continued) | | | | |
|---|---|---|---|---|
| **Straight Line Mile** | **Item** | **Location** | **Existing** | **Required** |
| 0.5 | Horizontal Alignment - Intersection Angle | Ramp G - 4th Street to NB Mill Creek Expressway w/ Central Avenue | ~ 15 Deg. | 70 deg. Max. |
| 0.4 | Ramp Acceleration Length | Ramp R - EB 6th Street Expressway To SB Mill Creek Bridge Connector | ~ 450 Feet | 910 Feet<br>Beg. 30 mph<br>End 60 mph |
| 2.5 | Ramp Acceleration Length | Ramp C - EB Western Hills Viaduct to NB Mill Creek Expressway | ~ 250 Feet | 550 Feet<br>Beg. - 25 mph<br>End. - 50 mph |
| 0.4 | Left-hand Entrances and Exits | Ramp from EB 6th Street Expressway To SB Mill Creek Bridge Connector | Left-hand Entrance | Avoid left-hand entrances in the design of interchanges. L&D Vol.1 503.5.2 |
| 2.5 | Left-hand Entrances and Exits | Ramp to WB Western Hills Viaduct from NB Mill Creek Expressway | Left-hand Exit | Avoid left-hand exit in the design of interchanges. L&D Vol.1 503.5.2 |
| 0.8 | Horizontal Clearance | Mill Creek Expressway at 9th Street Connection (Median Pier) | 5-6 Feet | 10 Feet |
| 1.0 | Horizontal Clearance | Mill Creek Expressway at Linn Street (Median Pier) | 5-6 Feet | 10 Feet |
| 1.2 | Horizontal Clearance | Mill Creek Expressway under Ramp F (Gest Street to Winchell Avenue) (Median Pier) | 5-6 Feet | 10 Feet |
| 1.4 | Horizontal Clearance | Mill Creek Expressway under Ezzard Charles Drive (Median Pier) | 5-6 Feet | 10 Feet |

| Vertical Alignment | | | | |
|---|---|---|---|---|
| **State Line Mile** | **Item** | **Location** | **Existing** | **Required** |
| 0.0 | Vertical Curve Length / SSD | I-75 NB Mill Creek Bridge Connector (at End of BSB) | Length=350 Feet K=70 SSD=330 Feet V=42 mph | V=60 mph Length=680 Feet K=136 SSD=570 Feet |
| 0.3 | Vertical Curve Length / SSD | I-75 NB Mill Creek Bridge Connector (Over R/R) | Length=600 Feet K=97 SSD=429 Feet V=52 mph | V=60 mph Length=936 Feet K=151 SSD=570 Feet |
| 0.0 | Vertical Curve Length / SSD | I-75 SB Mill Creek Bridge Connector (at End of BSB) | Length=350 Feet K=70 SSD=330 Feet V=42 mph | V=60 mph Length=680 Feet K=136 SSD=570 Feet |
| 0.3 | Vertical Curve Length / SSD | I-75 SB Mill Creek Bridge Connector (Over R/R) | Length=500 Feet K=81 SSD=370 Feet V=49 mph | V=60 mph Length=936 Feet K=151 SSD=570 Feet |
| 0.6 | Vertical Curve Length / SSD | I-75 NB Mill Creek Bridge Connector (at 6th Street Connector) | Length=200 Feet K=133 SSD=562 Feet V=57 mph | V=60 mph Length=227 Feet K=151 SSD=570 Feet |
| 0.3 | Vertical Curve Length / SSD | Directional Ramp EB Distributor Bridge Connector To I-71 (Over R/R) | Length=400 Feet K=65 SSD=375 Feet V=45 mph | Directional Ramp Min. Des. Spd.=40 mph Pref. V=50 mph |
| 0.3 | Vertical Curve Length/SSD | Directional Ramp SB Distributor Bridge Connector To I-71 (Over 3rd Street) | Length=300 Feet K=60 SSD=292 Feet V=39 mph | Directional Ramp Min. Des. Spd.=40 mph Pref. V=50 mph |
| 0.4 | Vertical Curve Length / SSD | Directional Ramp FWW / SB DiStreet Bridge Connector | Length=787 Feet K=98 SSD=460 Feet V=52 mph | Directional Ramp Min. Des. Spd.=40 mph Pref. V=50 mph |
| 0.5 | Vertical Curve Length / SSD | Directional Ramp NB Mill Creek Expressway (Under 6th Street Connector) | Length=500 Feet K=82 SSD=374 Feet V=45 mph | Directional Ramp Min. Des. Spd.=40 mph Pref. V=50 mph |

| Vertical Alignment (continued) | | | | |
|---|---|---|---|---|
| **Straight Line Mile** | **Item** | **Location** | **Existing** | **Required** |
| 0.4 | Vertical Curve Length / SSD | Directional Ramp SB Mill Creek Expressway Under SB DiStreet Bridge Connector | Length=450 Feet K=72 SSD=340 Feet V=42 mph | Directional Ramp Min. Des. Spd.=40 mph Pref. V=50 mph |
| 0.5 | Vertical Curve Length / SSD | Ramp H - Directional Ramp NB Mill Creek Expressway To WB 6th Street Expressway Under 6th-5th Street Connector | Length=300 Feet K=39 SSD=212 Feet V=31 mph | Directional Ramp Min. Des. Spd.=40 mph Pref. V=50 mph |
| 0.7 | Vertical Curve Length / SSD | Ramp L - SB Mill Creek Expressway To 6th-5th Street Connector (at Diverge) | Length=150 Feet K=83 SSD=380 Feet V=46 mph | Directional Ramp Min. Des. Spd.=40 mph Pref. V=50 mph |
| 0.8 | Vertical Curve Length / SSD | Ramp P - Sixth Street to NB Mill Creek Expressway (at Merge w/ NB Mill Creek Expressway) | Length=200 Feet K=45 SSD=236 Feet V=33 mph | Ramp Min. Des. Spd.=40 mph Pref. V=50 mph |
| 0.5 | Vertical Curve Length / SSD | Ramp R - EB 6th Street Expressway To SB Mill Creek Bridge Connector Under 6th-5th Street Connection | Length=200 Feet K=42 SSD=221 Feet V=32 mph | Directional Ramp Min. Des. Spd.=40 mph Pref. V=50 mph |
| 0.9 | Vertical Curve Length / SSD | Ramp A - 9th Street to NB Mill Creek Expressway (at Merge with Ramp P) | Length=150 Feet K=48 SSD=247 Feet V=34 mph | Directional Ramp Min. Des. Spd.=40 mph Pref. V=50 mph |
| 0.9 | Vertical Curve Length / SSD | Ramp A - 9th Street to NB Mill Creek Expressway (In Ramp P Merge Area) | Length=50 Feet K=55 SSD=275 Feet V=37 mph | Directional Ramp Min. Des. Spd.=40 mph Pref. V=50 mph |
| 1.1 | Vertical Curve Length / SSD | Ramp A - 9th Street to NB Mill Creek Expressway (At Ramp P Diverge Area) | Length=300 Feet K=38 SSD=207 Feet V=30 mph | Directional Ramp Min. Des. Spd.=40 mph Pref. V=50 mph |
| 1.2 | Vertical Curve Length / SSD | Ramp A - 9th Street to NB Mill Creek Expressway (Just Prior to Ramp G Merge Area) | Length=500 Feet K=54 SSD=341 Feet V=43 mph | Directional Ramp Min. Des. Spd.=40 mph Pref. V=50 mph |

| Vertical Alignment (continued) | | | | |
|---|---|---|---|---|
| **State Line Mile** | **Item** | **Location** | **Existing** | **Required** |
| 1.3 | Vertical Curve Length / SSD | Ramp A - 9th Street to NB Mill Creek Expressway (Just After Ramp G Merge Area) | Length=350 Feet K=44 SSD=232 Feet V=33 mph | Directional Ramp Min. Des. Spd.=40 mph Pref. V=50 mph |
| 1.1 | Vertical Curve Length / SSD | Ramp E - 9th Street WB to NB Mill Creek Expressway (Near Merge) | Length=100 Feet K=92 SSD=407 Feet V=48 mph | Directional Ramp Min. Des. Spd.=40 mph Pref. V=50 mph |
| 0.9 | Vertical Curve Length / SSD | Ramp B - SB Mill Creek Expressway to EB 7th Street (at Diverge) | Length=200 Feet K=50 SSD=258 Feet V=35 mph | Directional Ramp Min. Des. Spd.=40 mph Pref. V=50 mph |
| 1.3 | Vertical Curve Length / SSD | Ramp F - Gest/Winchell to NB Mill Creek Expressway (at Merge) | Length=300 Feet K=54 SSD=271 Feet V=36 mph | Directional Ramp Min. Des. Spd.=40 mph Pref. V=50 mph |
| 1.3 | Vertical Curve Length / SSD | Ramp H - SB Mill Creek Expressway to Gest Street (at Diverge) | Length=200 Feet K=58 SSD=287 Feet V=38 mph | Ramp Min. Des. Spd.=40 mph Pref. V=50 mph |
| 1.2 | Vertical Curve Length / SSD | Ramp J - SB Western Avenue to SB Mill Creek Expressway (at Merge w/ SB Mill Creek Expressway) | Length=200 Feet K=67 SSD=317 Feet V=41 mph | Directional Ramp Min. Des. Spd.=40 mph Pref. V=50 mph |
| 1.3 | Vertical Curve Length / SSD | Ramp J - SB Western Avenue to SB Mill Creek Expressway (Under Ramp H) | Length=400 Feet K=46 SSD=240 Feet V=33 | Directional Ramp Min. Des. Spd.=40 mph Pref. V=50 mph |
| 1.3 | Vertical Curve Length / SSD | Ramp J - SB Western Avenue to SB Mill Creek Expressway (at Western Avenue Diverge) | Length=200 Feet K=51 SSD=333 Feet V=42 mph | Directional Ramp Min. Des. Spd.=40 mph Pref. V=50 mph |
| 1.5 | Vertical Curve Length / SSD | Ramp M - NB Winchell Avenue to NB Mill Creek Expressway (at Diverge from Winchell Avenue) | Length=150 Feet K=46 SSD=316 Feet V=41 mph | Directional Ramp Min. Des. Spd.=40 mph Pref. V=50 mph |

| Vertical Alignment (continued) | | | | |
|---|---|---|---|---|
| **State Line Mile** | **Item** | **Location** | **Existing** | **Required** |
| 1.6 | Vertical Curve Length / SSD | Ramp M - NB Winchell Avenue to NB Mill Creek Expressway (at Merge with NB Mill Creek Expressway) | Length=200 Feet<br>K=58<br>SSD=288 Feet<br>V=38 mph | Directional Ramp<br>Min. Des. Spd.=40 mph<br>Pref. V=50 mph |
| 1.6 | Vertical Curve Length / SSD | Ramp N - SB Mill Creek Expressway to SB Western Avenue (at SB Mill Creek Expressway Diverge) | Length=300 Feet<br>K=50<br>SSD=254 Feet<br>V=35 mph | Directional Ramp<br>Min. Des. Spd.=40 mph<br>Pref. V=50 mph |
| 2.1 | Vertical Curve Length / SSD | Mill Creek Expressway (Just South of Bank Street Overpass) | Length=400 Feet<br>K=100<br>SSD=440 Feet<br>V=51 mph | V=60 mph<br>Length=680 Feet<br>K=136<br>SSD=570 Feet |
| 2.0 | Vertical Curve Length / SSD | Ramp A - SB Mill Creek Expressway to Western Avenue (Near Merge w/ Western Avenue) | Length=200 Feet<br>K=31<br>SSD=181 Feet<br>V=27 mph | Directional Ramp<br>Min. Des. Spd.=40 mph<br>Pref. V=50 mph |
| 2.1 | Vertical Curve Length / SSD | Ramp A - SB Mill Creek Expressway to Western Avenue (Near Diverge w/ Expressway) | Length=200 Feet<br>K=52<br>SSD=335 Feet<br>V=42 mph | Directional Ramp<br>Min. Des. Spd.=40 mph<br>Pref. V=50 mph |
| 2.5 | Vertical Curve Length / SSD | Ramp C - EB Western Hills Viaduct to NB Mill Creek Expressway (at Merge w/ NB Mill Creek Expressway) | Length=150 Feet<br>K=47<br>SSD=241 Feet<br>V=34 mph | Directional Ramp<br>Min. Des. Spd.=40 mph<br>Pref. V=50 mph |
| 2.5 | Vertical Curve Length / SSD | Ramp D - NB Mill Creek Expressway to WB Western Hills Viaduct (at Diverge from NB Mill Creek Expressway) | Length=200 Feet<br>K=38<br>SSD=208 Feet<br>V=30 mph | Directional Ramp<br>Min. Des. Spd.=40 mph<br>Pref. V=50 mph |
| 2.5 | Vertical Curve Length / SSD | Ramp E - EB Western Hills Viaduct to SB Mill Creek Expressway (at Diverge from Viaduct) | Length=200 Feet<br>K=22<br>SSD=139 Feet<br>V=23 mph | Directional Ramp<br>Min. Des. Spd.=40 mph<br>Pref. V=50 mph |

| Vertical Alignment (continued) | | | | |
|---|---|---|---|---|
| **Straight Line Mile** | **Item** | **Location** | **Existing** | **Required** |
| 2.5 | Vertical Curve Length / SSD | Ramp E - EB Western Hills Viaduct to SB Mill Creek Expressway(at Bridge Over Spring Grove) | Length=150 FeetK=42SSD=304 FeetV=39 mph | Directional RampMin. Des. Spd.=40 mphPref. V=50 mph |
| 2.5 | Vertical Curve Length / SSD | Ramp E - EB Western Hills Viaduct to SB Mill Creek Expressway (at Diverge from Viaduct) | Length=150 Feet K=40 SSD=295 Feet V=39 mph | Directional Ramp Min. Des. Spd.=40 mph Pref. V=50 mph |
| 2.6 | Vertical Curve Length / SSD | Ramp F - SB Mill Creek Expressway To WB Western Hills Viaduct (at Diverge from Expressway) | Length=200 Feet K=22 SSD=139 Feet V=23 mph | Directional Ramp Min. Des. Spd.=40 mph Pref. V=50 mph |
| 2.5 | Vertical Curve Length / SSD | Ramp F - SB Mill Creek Expressway To WB Western Hills Viaduct (at Bridge Over Spring Grove) | Length=200 Feet K=67 SSD=317 Feet V=41 mph | Directional Ramp Min. Des. Spd.=40 mph Pref. V=50 mph |
| 2.6 | Vertical Curve Length / SSD | Ramp F - SB Mill Creek Expressway To WB Western Hills Viaduct (at Diverge From Expressway) | Length=80 Feet K=57 SSD=351 Feet V=44 mph | Directional Ramp Min. Des. Spd.=40 mph Pref. V=50 mph |
| 1.3 | Vertical Grades | Mill Creek Expressway (~ Gest Street to Winchell Avenue Overpass to Just North of Ezzard Charles Drive Overpass) | 0.43% - Compounded by Superelevation Transition Near a Sag | 0.50% Min. |

| Vertical Clearance | | | | |
|---|---|---|---|---|
| **State Line Mile** | **Item** | **Location** | **Existing** | **Required** |
| 0.3 | Vertical Clearance | I-75 SB Mill Creek Bridge Connector (R/R Bridge) | 22.0 Feet | 23 Feet Min. |
| 0.4 | Vertical Clearance | I-75 NB Mill Creek Bridge Connector (SB Distributor Bridge Connector Over) | 15.0 Feet | 16.5 Feet Min. |
| 0.4 | Vertical Clearance | I-75 NB Mill Creek Bridge Connector (SB Mill Creek Expressway Under) | 15.0 Feet | 16.5 Feet Min. |
| 0.3 | Vertical Clearance | Directional Ramp EB Distributor Bridge Connector To I-71 Over R/R | 22.0 Feet | 23 Feet Min. |
| 0.6 | Vertical Clearance | EB 6th-5th Street Connector Over NB Mill Creek Expressway | 15.0 Feet | 16.5 Feet |
| 0.5 | Vertical Clearance | WB 6th Street Expressway Over NB Mill Creek Expressway | 15.2 Feet | 16.5 Feet |
| 0.7 | Vertical Clearance | 8th-7th Street Connector Over NB Mill Creek Expressway | 15.2 Feet | 16.5 Feet |
| 0.7 | Vertical Clearance | 8th-7th Street Connector Over SB Mill Creek Expressway | 15.3 Feet | 16.5 Feet |
| 0.5 | Vertical Clearance | Ramp H - Directional Ramp Under 6th-5th Street Connector | 15 Feet | 16.5 Feet |
| 0.5 | Vertical Clearance | Ramp G - 4th Street to NB Mill Creek Expressway Under 6th-5th Street Connection | 15 Feet | 16.5 Feet |
| 0.6 | Vertical Clearance | Ramp L - SB Mill Creek Expressway To 6th-5th Street Connector Under WB 6th Street Expressway | 15.0 Feet | 16.5 Feet |

| Vertical Clearance (continued) | | | | |
|---|---|---|---|---|
| **Straight Line Mile** | **Item** | **Location** | **Existing** | **Required** |
| 0.6 | Vertical Clearance | Ramp Q - EB 6th Street Expressway To SB Mill Creek Bridge ConnectorOver SB Mill Creek Bridge Connector | 15 Feet | 16.5 Feet |
| 0.8 | Vertical Clearance | NB Mill Creek Expressway under 9th Street Connection | 15.3 Feet | 16.5 Feet |
| 1.0 | Vertical Clearance | SB Mill Creek Expressway under Linn Street | 15.2 Feet | 16.5 Feet |
| 1.2 | Vertical Clearance | NB Mill Creek Expressway under Ramp F (Gest Street to Winchell Avenue) | 15.0 Feet | 16.5 Feet |
| 1.4 | Vertical Clearance | Mill Creek Expressway under Ezzard Charles | 15.0 Feet | 16.5 Feet |
| 1.2 | Vertical Clearance | Pedestrian Overpass over Ramp A | 15.0 Feet | 16.5 Feet |
| 0.9 | Vertical Clearance | Ramp B Under 9th Street Connection | 16.1 Feet | 16.5 Feet |
| 1.3 | Vertical Clearance | Ramp H over Ramp J | 15.2 Feet | 16.5 Feet |
| 1.7 | Vertical Clearance | Mill Creek Expressway Over Liberty Street | 15.2 Feet | 16.5 Feet |
| 1.9 | Vertical Clearance | Mill Creek Expressway Over Findlay Street | 15.0 Feet | 16.5 Feet |
| 2.2 | Vertical Clearance | Mill Creek Expressway Over Bank Street | 15.0 Feet | 16.5 Feet |
| 2.4 | Vertical Clearance | NB Mill Creek Expressway Over Harrison Avenue | 15.1 Feet | 16.5 Feet |

| Vertical Clearance (continued) | | | | |
|---|---|---|---|---|
| **Straight Line Mile** | **Item** | **Location** | **Existing** | **Required** |
| 2.5 | Vertical Clearance | Ramp E - EB Western Hills Viaduct to SB Mill Creek Expressway Over Spring Grove Avenue | 15.0 Feet | 16.5 Feet |
| 2.5 | Vertical Clearance | Ramp F - SB Mill Creek Expressway to WB Western Hills Viaduct Over Spring Grove Avenue | 15.0 Feet | 16.5 Feet |
| 2.6 | Vertical Clearance | Ramp D - NB Mill Creek Expressway to WB Western Hills Viaduct Over NB Mill Creek Expressway | 15.0 Feet | 16.5 Feet |

# Brent Spence Bridge Project (BSB)
# Review of Existing Geometrics
# Mainline and Ramps, Kentucky

Functional Classification (Mainline) - Interstate
Design Speed (Mainline) - 60 Mile Per Hour (MPH)

**Notes:**
1. Based upon review of the Original Construction, Rehabilitation, and Reconstruction Plans.
2. When a deficient lane / shoulder width is identified, it is assumed that curve widening (when applicable) and bridge width (when applicable) are also deficient.
3. When a deficient horizontal curve is identified, it is assumed that superelevation (when applicable) is also deficient.
4. When a deficient shoulder width is identified, it is assumed that the clear zone width is also deficient.
5. Review is based upon design criteria established by the KYTC Highway Design Policy.

| Typical Section | | | | |
|---|---|---|---|---|
| **Straight Line Mile** | **Item** | **Location** | **Existing** | **Required** |
| 191.5 | Lane Width | Brent Spence Bridge | 11 Feet | 12 Feet |
| 191.4 | Lane Width | Kentucky Approach Spans | 11 Feet | 12 Feet |
| 191.5 | Shoulder Width | Brent Spence Bridge | 1 Feet on Both Sides | 12 Feet |
| 191.4 | Shoulder Width | Kentucky Approach Spans | NB - 10 Feet Right, 4 Feet Left SB - 4 Feet Both Sides | 12 Feet |
| 191.0 | Shoulder Width | I-75 - 9th Street to Approach Spans | 10 Feet Outside ~8.5 Feet Inside | 12 Feet |
| 191.5 | Bridge Width | Brent Spence Bridge | See Above | See Above |
| 191.5 | Bridge Width | Kentucky Approach Spans | Northbound - 50 Feet +/- Useable Southbound - 52 Feet +/- Useable | NB 3 Lanes=60 Feet Useable SB 4 Lanes=72 Feet Useable |

| Horizontal Alignment | | | | |
|---|---|---|---|---|
| **State Line Mile** | **Item** | **Location** | **Existing** | **Required** |
| 190.8 | Horizontal Curves Lack of Spirals | I-75 Over 9th Street | Super=5.4%<br>No spirals provided | |
| 190.6 | Horizontal Curves Radii | 12th Street Under I-75 | Hard PI w/ Delta ~ 15 degrees<br>No Horizontal Curve | |
| 191.4 | Horizontal Curves Radii | Ramp H - 4th Street To I-75 NB (@ Merge Onto I-75 NB) | R=234 Feet | Directional Ramp<br>Min. R=510 Feet<br>V=40 mph |
| 191.3 | Horizontal Curves Radii | Ramp B1 - SB I-75 to EB 5th Street | R=90 Feet<br>V=15 mph | Directional Ramp<br>Min. R=275 Feet<br>V=30 mph |
| 191.3 | Horizontal Curves Radii | Ramp B2 - SB I-75 to WB 5th Street | R=65 Feet<br>V=15 mph | Directional Ramp<br>Min. R=275 Feet<br>V=30 mph |
| 191.4 | Ramp Acceleration Length | Ramp H - 4th Street To I-75 NB (@ Merge Onto I-75 NB) | ~ 350 Feet | 1020 Feet<br>Beg. 25 mph<br>End 60 mph |
| 191.4 | Ramp Deceleration Length | Ramp B - SB I-75 to 5th Street | ~ 375 Feet | 1550 Feet<br>Beg. 60 mph<br>End 15 mph |
| 189.8 | Horizontal Alignment - General | Undesirable Combination of Horizontal and Vertical Geometry<br>Tight horizontal curvature with maximum superelevation combined with steep downgrade going into a sag | | |

| Vertical Alignment | | | | |
|---|---|---|---|---|
| **Straight Line Mile** | **Item** | **Location** | **Existing** | **Required** |
| 191.2 | Vertical Curve Length / SSD | I-75 at 5th Street Ramp Diverge | Length=750 Feet<br>K=127<br>SSD=539 Feet<br>V=57 mph | V=60 mph<br>Length=802 Feet<br>K=136<br>SSD=570 Feet |
| 191.4 | Vertical Curve Length / SSD | I-75 at Begin Approach Spans | Length=600 Feet<br>K=100<br>SSD=375 Feet<br>V=52 mph | V=60 mph<br>Length=906 Feet<br>K=151<br>SSD=570 Feet |
| 191.3 | Vertical Curve Length / SSD | I-75 Over 4th Street Ramp | Length=350 Feet<br>K=73<br>SSD=342 Feet<br>V=43 mph | V=60 mph<br>Length=653 Feet<br>K=136<br>SSD=570 Feet |
| 188.9 | Vertical Grades | Ramp A - SB I-75 Exit Ramp to Kyle Feets Lane | ~ 6.5% | 5% |
| 188.9 | Vertical Grades | Ramp E - Kyle Feets Lane to NB I-75 | ~ 6.9% | 5% |
| 191.3 | Vertical Grades | Ramp B - SB I-75 to 5th Street | ~ 8.1% | 5% |
| 190.7 | Vertical Clearance | I-75 Over Pike Street | 14.5 Feet | 16.5 Feet |
| 190.8 | Vertical Clearance | I-75 Over 9th Street | 14.5 Feet | 16.5 Feet |
| 190.8 | Vertical Clearance | Ramp Y (NB Pike Street to I-75 NB) Over 9th Street | 14.5 Feet | 16.5 Feet |
| 190.7 | Vertical Clearance | Ramp G (NB I-75 to 5th Street) Over Pike Street | 15.0 Feet | 16.5 Feet |
| 190.6 | Vertical Clearance | I-75 Over 12th Street | 13.4 Feet | 16.5 Feet |

# Appendix B

# Brent Spence Bridge
# Replacement/Rehabilitation Project
# PID No. 75119
# Ham-71/75-o.00/0.22
# KYTC Project Item No. 6-17

## Travel Time Study

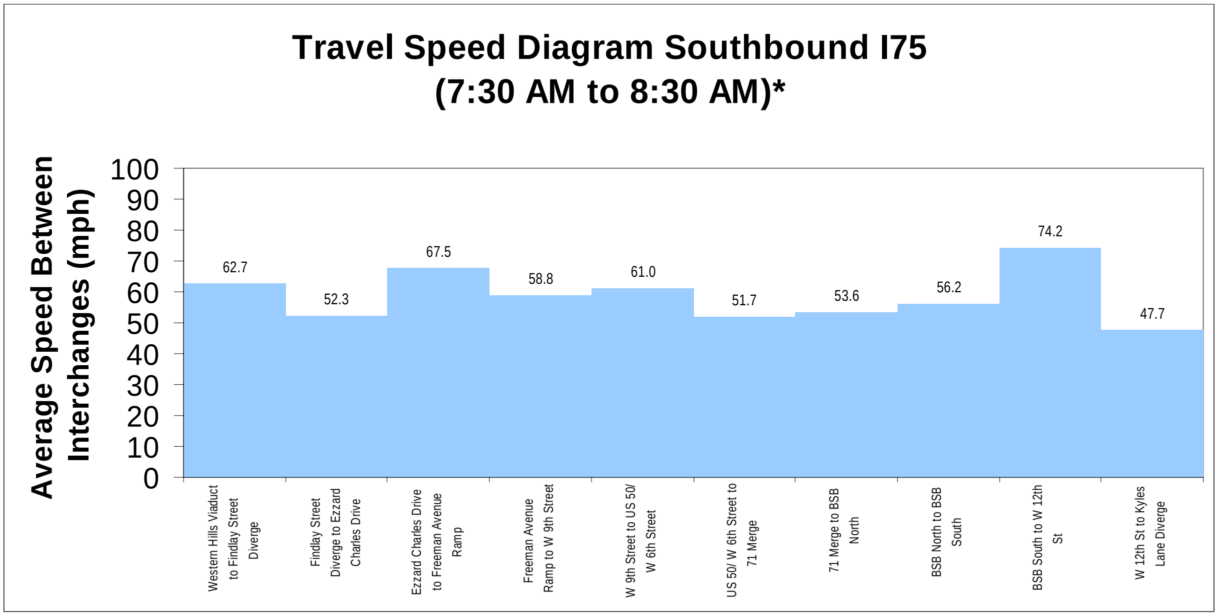
*Methodology*

On December 7 and 8, 2005, a travel time study was completed for the Brent Spence Bridge Project (PID 75119) in Cincinnati, Ohio, and Covington, Kentucky, by TranSystems Corporation. The I-75 corridor between the Kyles Lane interchange at the south end of the project area and the Western Hills Viaduct interchange at the north end of the project area was driven several times during the AM peak hour on both December 7$^{th}$ and December 8$^{th}$ (7:30 – 8:30 AM). It was also driven several times during the PM peak hour on December 7$^{th}$ (4:30 – 5:30 PM). Due to inclement weather, no PM peak hour runs were completed on December 8$^{th}$.

During the AM peak hour, a total of 5 southbound runs and 5 northbound runs were completed, and during the PM peak hour, a total of 2 southbound and 3 northbound runs were completed. During each run, the test vehicle attempted to maintain the average travel speed of the traffic stream. The time (in seconds) between predetermined locations (usually overpasses or diverge points) was recorded during each run. Delays (defined as the vehicle slowing to less than 5 mph) were also recorded, along with any comments about the roadway conditions. Copies of the field data sheets have been maintained in the project files. These data were then analyzed to determine average speed and average delay between the predetermined locations and the cumulative travel time. The results of these analyses can be found in the results section below.

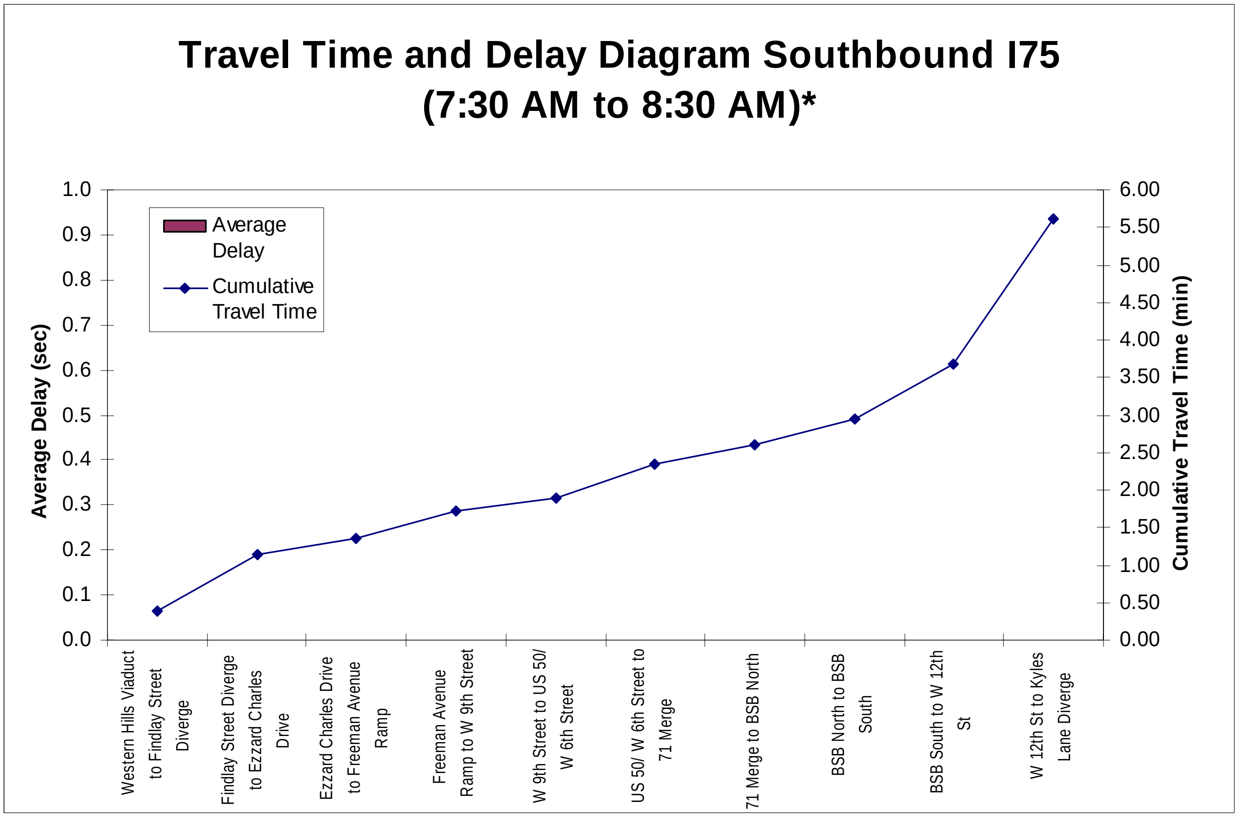
*Results*
The graphs below (Graphs 1 and 2) show the average speed, average delay and cumulative travel time for the southbound AM peak hour runs.

**Graph 1**




*Five runs completed on 12/07/05 & 12/08/05 during the AM Peak

**Graph 2**

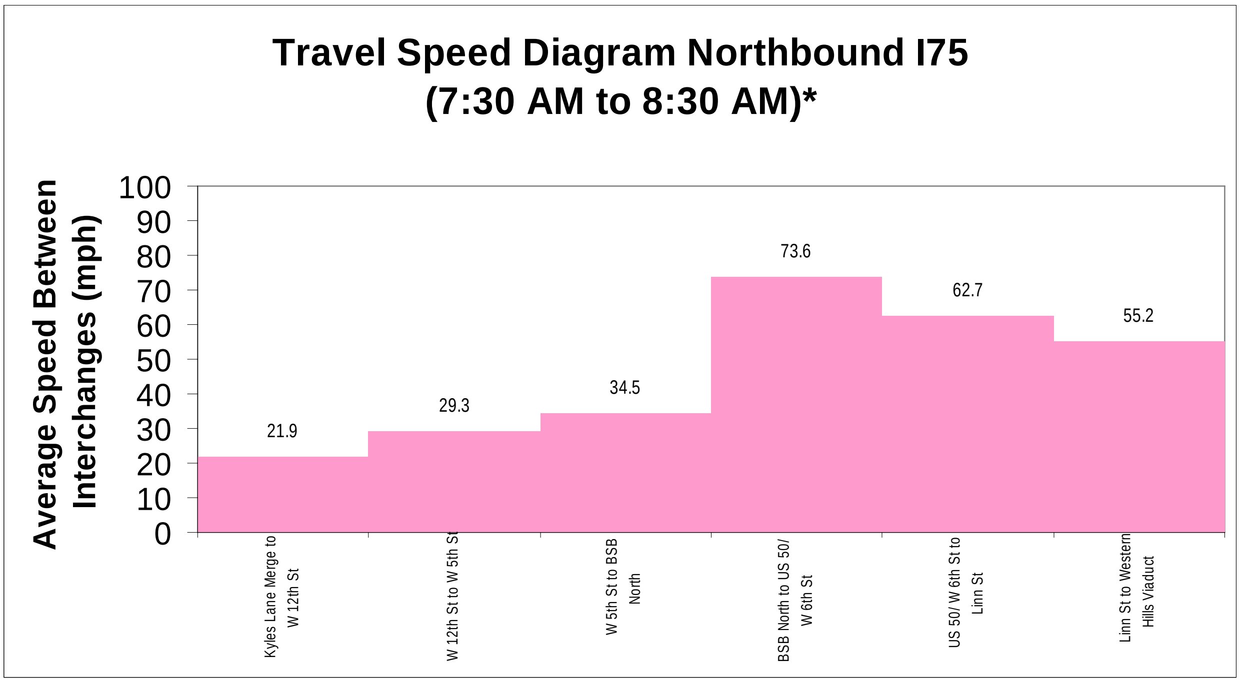



*Five runs completed on 12/07/05 & 12/08/05 during the AM Peak

Graph 1 shows that the average southbound speed during the AM peak is no more than 10 mph below the posted speed limit of 55 mph.  Also, some sections of the corridor were being traversed at speeds somewhat higher than the 55 mph posted speed limit. Graph 2 shows that the test vehicle never went below 5 mph, so no delay was recorded. Additionally, it shows that the cumulative average travel time from Western Hills Viaduct to the Kyles Lane diverge was 5.60 minutes.  This compares to a cumulative travel time of 5.64 minutes assuming a constant speed of 55 mph.

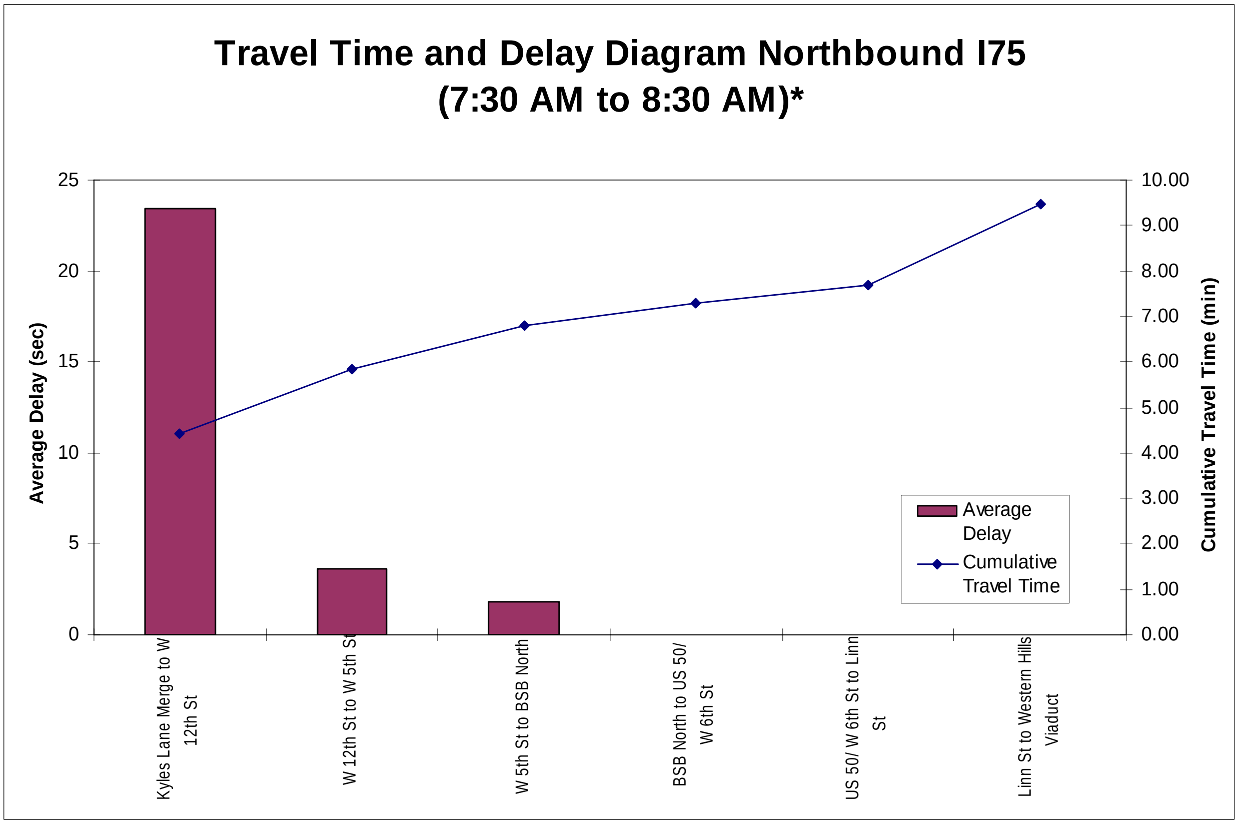
Graphs 3 and 4 depict the average travel speed, delay and cumulative travel time for the northbound runs during the AM peak.

**Graph 3**




* Five runs completed on 12/07/05 & 12/08/05 during the AM Peak

**Graph 4**



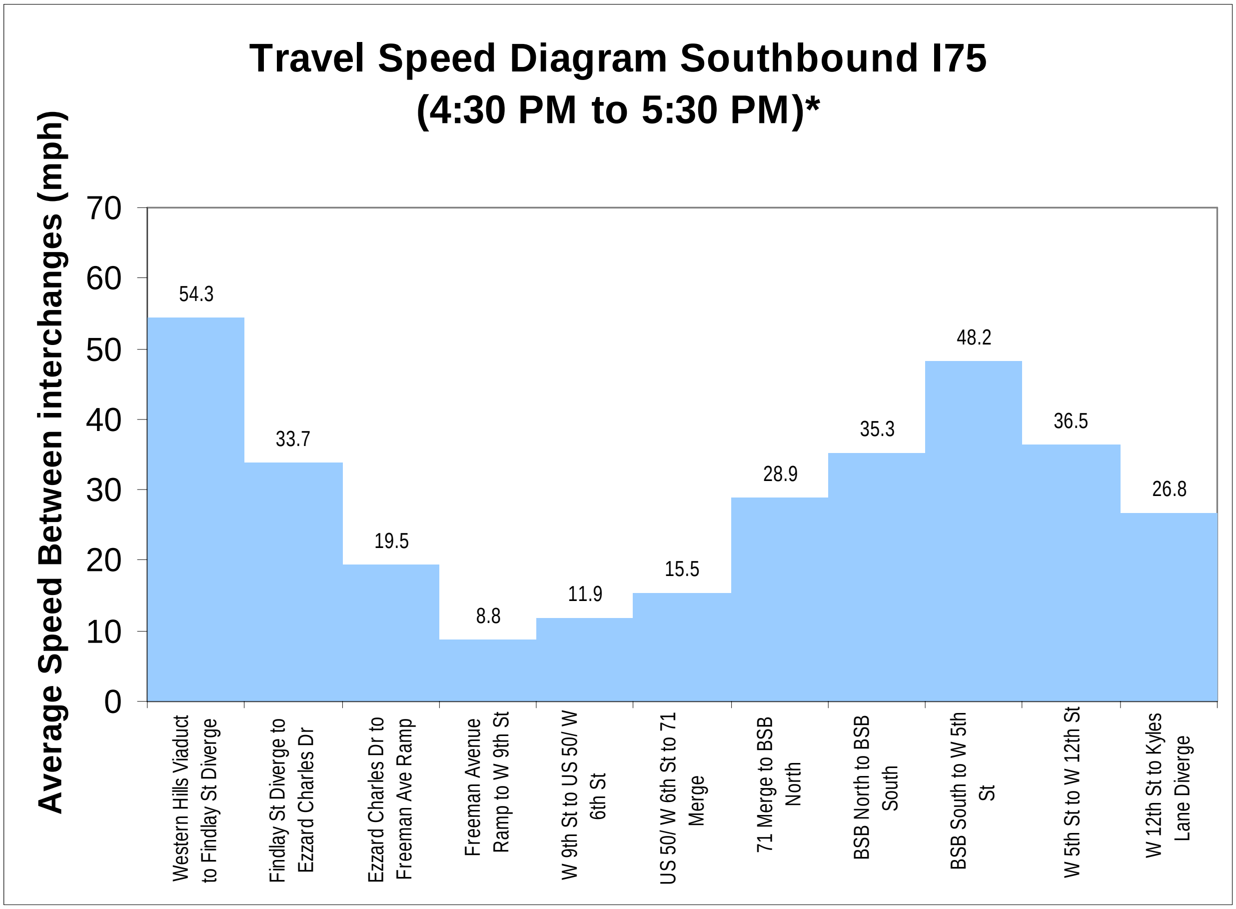

* Five runs completed on 12/07/05 & 12/08/05 during the AM Peak

Graphs 3 and 4 show that the average northbound speed during the AM peak is slow from Kyles Lane in Kentucky to the Brent Spence Bridge; however, the travel speed increases markedly on the Ohio side of the river. Graph 4 shows that delay was also recorded from Kyles Lane to the Brent Spence Bridge. More than 23 seconds of delay, on average, occurred between the Kyles Lane merge and West KY 12th Street. Additionally, it shows that the cumulative average travel time from the Kyles Lane merge to Western Hills Viaduct was 9.47 minutes, almost four minutes greater than the southbound travel time along the same corridor during the AM peak. The cumulative travel time assuming a constant speed of 55 mph was 5.69 minutes, which is also almost four minutes less than the average.

The Cincinnati Central Business District (CBD) lies in the middle of the I-75 corridor. Intuitively, this would indicate that, during the AM peak when commuters are traveling to work, travel speeds might be less traveling northbound from Kyles Lane to just north of Brent Spence Bridge and might then increase in Ohio. It also could indicate that travel speeds might be less traveling southbound from Western Hills Viaduct to the Brent Spence Bridge and then might increase in Kentucky. In the case of the northbound traffic, this appears to be true. However, the southbound traffic seems to travel at high speeds throughout the corridor.

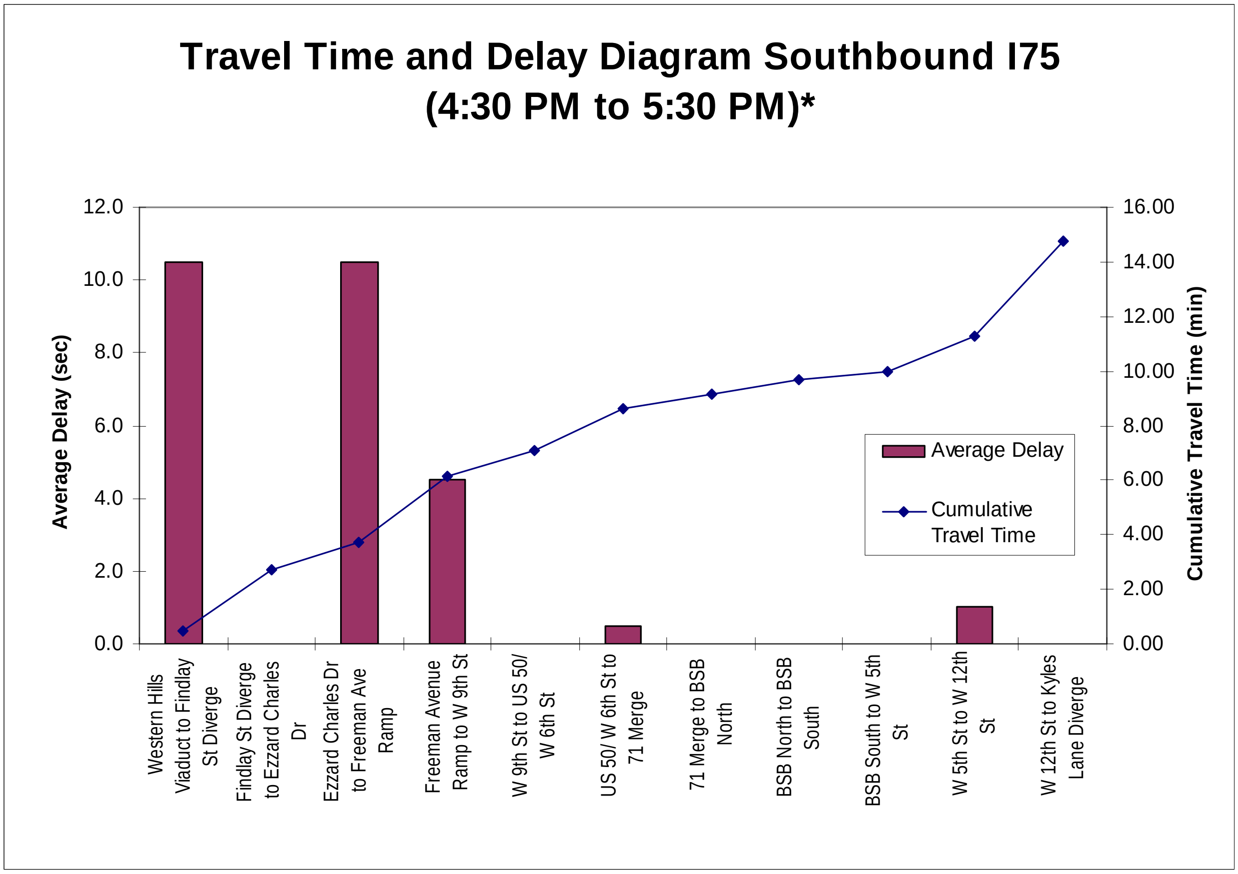
Graphs 5 and 6 depict the average travel speed, delay and cumulative travel time for the southbound runs during the PM peak.

**Graph 5**




* Two runs completed on 12/07/05 during the PM Peak

**Graph 6**

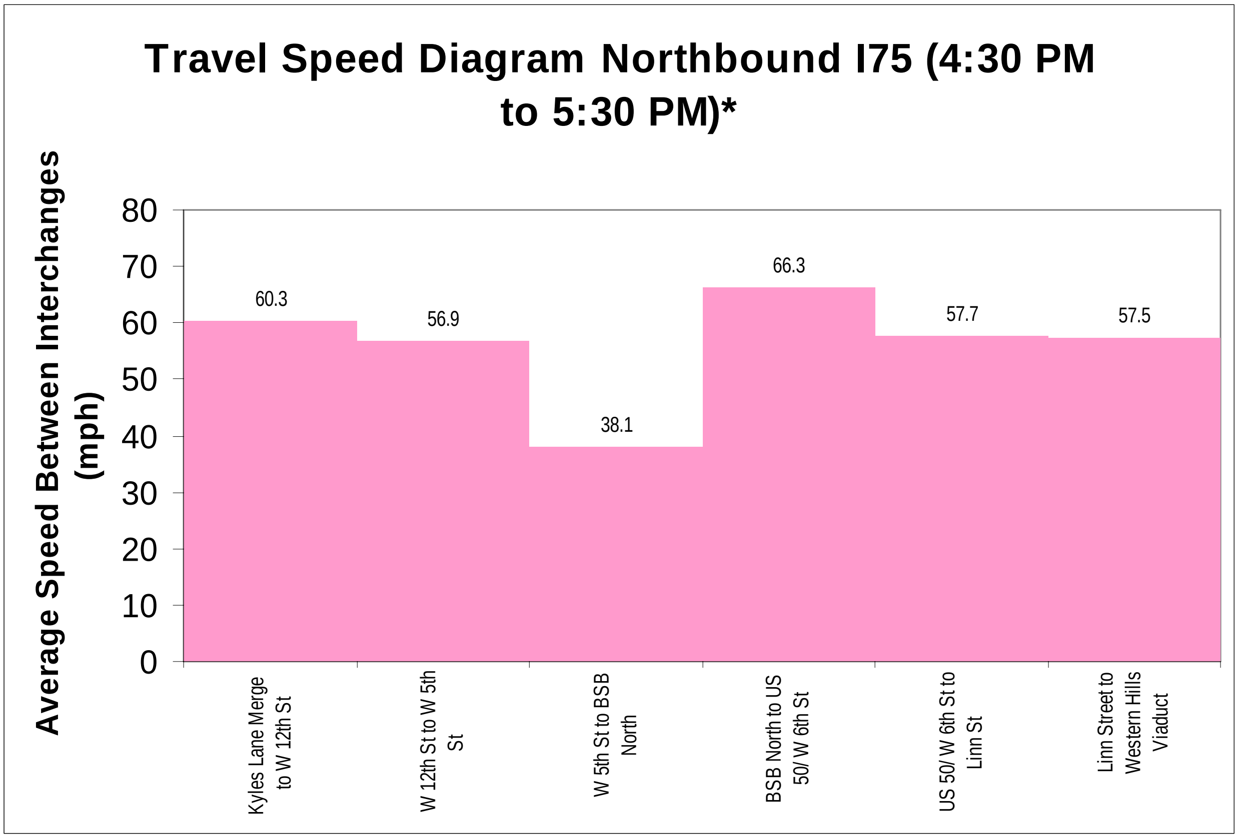



* Two runs completed on 12/07/05 during the PM Peak

Graphs 5 and 6 depict that the average southbound speed during the PM peak is below the posted speed limit along the entire corridor.  It is especially slow between Ezzard Charles Drive and the I-71 merge where the average speeds in this area were below 20 mph.  The second chart shows that delay was also recorded throughout the corridor.  Two sections (Western Hills Viaduct to the Findlay Street Diverge and Ezzard Charles Drive to the Freeman Avenue Ramp) have average delays greater than 10 seconds, which means that the traffic stream was either stopped or moving at speeds below 5 mph for an average duration of 10 seconds.  Additionally, it shows that the cumulative average travel time from Western Hills Viaduct to the Kyles Lane diverge was 14.73 minutes, more than 9 minutes greater than the southbound travel time along the same corridor during the AM peak.  The cumulative travel time assuming a constant speed of 55 mph was 5.64 minutes, which is also more than 9 minutes less than the average.

Graphs 7 and 8 show the average travel speed, delay and cumulative travel time for the northbound runs during the PM peak.

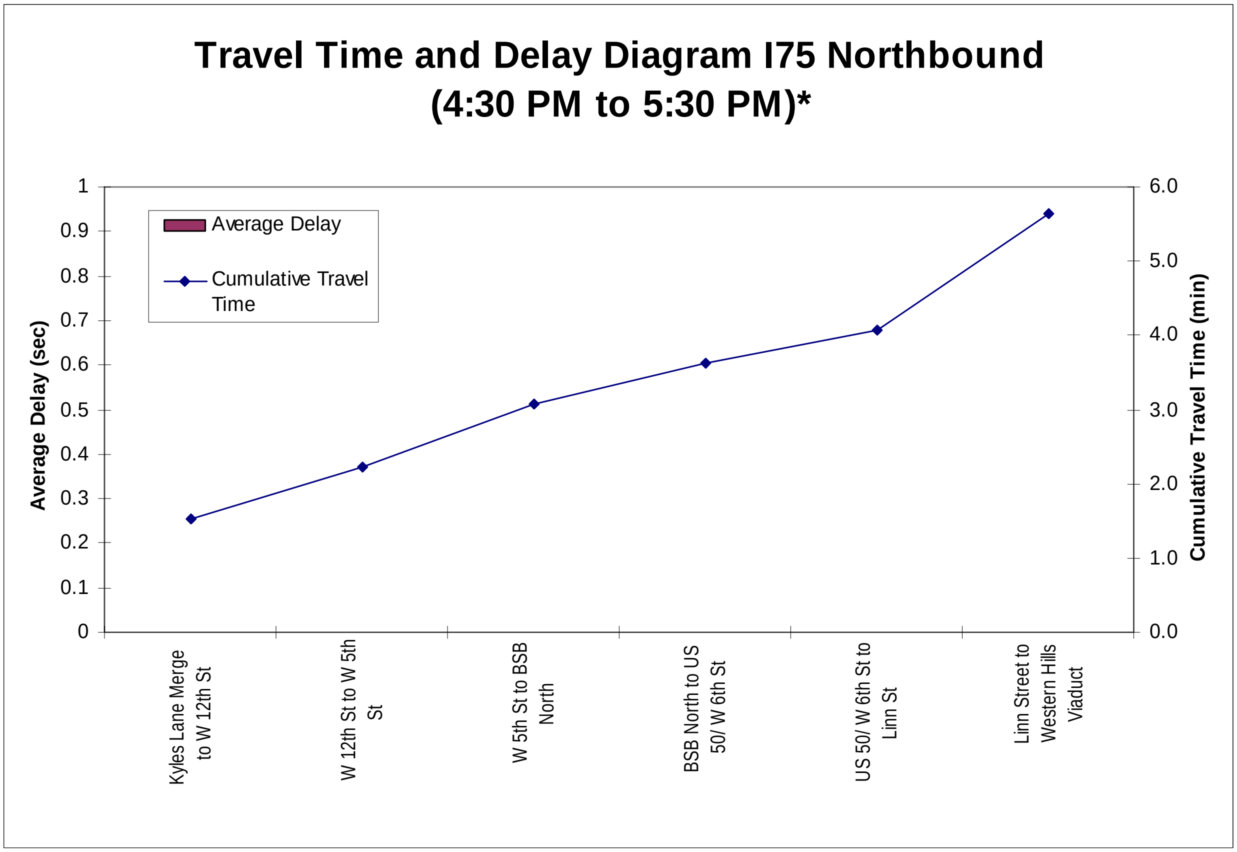
**Graph 7**




- Three runs completed on 12/07/05 during the PM Peak

Graph 7 shows the average northbound speed during the PM peak is above the posted speed limit along the entire corridor except between West KY 5$^{th}$ Street and the Brent Spence Bridge in Kentucky. Graph 8 shows that no delay was recorded during the runs. Additionally, it shows that the cumulative average travel time from the Kyles Lane merge to the Western Hills Viaduct was 5.60 minutes, which is more than 9 minutes less than the travel time in the southbound direction. This compares to a cumulative travel time of 5.69 minutes assuming a constant speed of 55 mph.

**Graph 8**




* Three runs completed on 12/07/05 during the PM Peak

Again, the CBD district lies in the middle of the I-75 corridor. During the PM peak, it would seem that traffic leaving the CBD would be heavier than traffic leaving the CBD due to commuters traveling home. Therefore, traffic traveling southbound from the Brent Spence Bridge to the Kyles Lane exit and traffic traveling northbound from the Brent Spence Bridge to Western Hills Viaduct might travel at lower speeds. However, in both cases, this pattern does not seem to show. The southbound traffic travels at speeds lower than the posted speed limit throughout the corridor and is slowest north of the Brent Spence Bridge. The northbound traffic travels above the posted speed limit throughout most of the corridor, only dropping below the posted speed limit south of the Brent Spence Bridge.

The charts above show that congestion is a problem along the I-75 corridor in the project area. It appears that the congestion is worse in the southbound direction during the PM peak and in the northbound direction during the AM peak. It also appears that the part of the corridor that surrounds the Brent Spence Bridge fares the worst in the travel time study.

# Appendix C

# ODOT/KYTC
# Brent Spence Bridge
# HAM-71/75-0.00/0.22 PID 75119
# KYTC Project Item No. 6-17

Origin-Destination Study

**March 17, 2006**

**Submitted to:**

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# TABLE OF CONTENTS

***Executive Overview*** ........ ***1***
Other Pertinent Travel Pattern Findings ........ 1
Pertinent Travel Time Findings ........ 2
***Overview*** ........ ***3***
***Study Area*** ........ ***3***
***Methodology*** ........ ***5***
***Field Hardware*** ........ ***6***
***Data Processing*** ........ ***6***
Technology ........ 6
Quality Check ........ 7
***Data Tabulation*** ........ ***7***
Capture Rates ........ 7
Sample Rates ........ 8
Summary of Matched License Plates ........ 10
Expansion Factors ........ 12
***Conclusions/Findings*** ........ ***13***
Expected Travel Patterns ........ 13
Summary of Travel Times ........ 15

## List of Figures

Figure 1: Location of Origin-Destination Sites........4
Figure 2: Methodology Followed in this OD Study........5
Figure 3: Sample of a Captured License Plate........7

## List of Tables

Table 1: License Plate Capture Rates for Cars and Trucks. ........ 8
Table 2: Minimum Required Sample Rates. ........ 8
Table 3: Achieved Sample Rates for Cars & Trucks. ........ 9
Table 4: Summary of Matched License Plates for Cars & Trucks. ........ 11
Table 5: Expansion Factors for Cars & Trucks. ........ 12
Table 6: Expected Travel Patterns for Cars & Trucks. ........ 14
Table 7: Average Travel Times (in minutes) for Cars & Trucks. ........ 16

## *Executive Overview*

An Origin Destination (OD) Study was performed to establish travel patterns and travel times of cars and trucks using the Brent Spence Bridge (BSB) during the morning, mid-day, and evening peak periods. Video cameras were used to simultaneously capture and match license plate data for vehicles passing through the northbound and southbound lanes of the I-75/I-71 Brent Spence Bridge, I-75/I-275 interchange in Ohio and the northbound and southbound lanes of the I-471 Daniel Beard Bridge. All data was collected during a typical weekday in early December 2005 to avoid holiday variances in travel patterns. License plate capture rates of the passing traffic for cars and trucks averaged to 68% and 35% respectively. Accepted statistical analysis methods were used to extrapolate the data to arrive at the findings of this study.

The primary purpose of the analysis was to assess the travel patterns between the Brent Spence Bridge and the following two locations:

- I-75/I-275 interchange in Ohio via I-75; and
- I-471 at Daniel Beard Bridge (DBB) via Fort Washington Way.

The study findings indicate:

- During the morning, mid-day, and evening peak periods that were observed, vehicles crossing the Brent Spence Bridge and having origins or destinations at the I-75/I-275 Interchange in Ohio range from 5% to 10% for automobiles and from 45% to 70% for trucks.
- During the morning, mid-day, and evening peak periods that were observed, vehicles crossing the Brent Spence Bridge and using Fort Washington Way and the Daniel Beard Bridge as a bypass traveling through alternative routes in Northern Kentucky ranged from 3% to 7% for automobiles and from 1% to 8% for trucks.
- The remaining vehicles using Brent Spence Bridge have other origins or destinations north of the Ohio River.

## Other Pertinent Travel Pattern Findings

Additional analysis was performed to determine travel patterns for vehicles crossing the Brent Spence Bridge and having origins and destinations at the two other monitored sites which included:

- I-71 Southbound and Northbound at Oak St. Overpass; and
- US-50 Eastbound and West bound from I-71/I-471 at East of I-471.

The study findings indicate that:

- During the morning, mid-day, and evening peak periods, vehicles crossing the Brent Spence Bridge and having origins or destinations at the I-71 at Oak Street Overpass in Ohio range from 20% to 25% for automobiles and from 20% to 30% for trucks.
- During the morning, mid-day, and evening peak periods, vehicles crossing the Brent Spence Bridge and having origins or destinations at the US 50 Ramps to/from I-71/I-75/I-471 in Ohio range from 1% to 5% for automobiles and from 1% to 5% for trucks.

## Pertinent Travel Time Findings

The average travel time for automobiles traveling between the Brent Spence Bridge and I-75 at the Crescentville Overpass during the three peak periods monitored were the longest for all the OD locations studied, ranging from approximately 17 minutes to 23 minutes. The average travel times were similar in both directions and were on the higher end of the range during the morning and evening peak periods. During the mid-day, they were on the lower end of the range. Trucks traveling between the Brent Spence Bridge and I-75 at the Crescentville Overpass had average travel times ranging from approximately 18 to 24 minutes.

Between the Brent Spence Bridge and the Daniel Beard Bridge via Fort Washington Way, the average travel time for automobiles ranged between approximately 5.5 and 8 minutes during the three peak periods monitored. Average travel times for trucks traveling between the Brent Spence Bridge and the Daniel Beard Bridge ramps could not be determined from the count data due to the low number of license plate matches.

The average travel time for automobiles traveling between the Brent Spence Bridge and I-71 at the Oak Street Overpass during the three peak periods ranged between approximately 4.5 and 6 minutes. Trucks traveling between the Brent Spence Bridge and I-71 at the Oak Street Overpass had average travel times ranging from approximately 4.5 to 5.5 minutes.

The average travel time for automobiles traveling between the Brent Spence Bridge and US 50 Ramps during the three peak periods ranged between approximately 3 and 4.5 minutes. The average for travel for automobiles from the Brent Spence Bridge to the US 50 Ramps was approximately 16.5 minutes during the morning peak period. Average travel times for trucks traveling between the Brent Spence Bridge and the US 50 Ramps could not be determined due to the low number of license plate matches.

## Overview

This Origin-Destination (O-D) Study was conducted as part of the Brent Spence Bridge project with two objectives in mind:

1. To determine the travel patterns of vehicles, and
2. To determine the travel times of vehicles.

Each of the objectives was for two different vehicle types – cars and trucks – as well as for three different time periods: 6:00 AM to 10:00 AM; 11:00 AM to 2:00 PM; and 4:00 PM to 7:00 PM.

This report is a summary of the locations included in the study, the processes used in obtaining relevant data, analyses done on the collected data, and results obtained from the study.

## Study Area

Five locations were identified for collecting traffic-related data as part of this O-D study. At each location both directions of traffic flow were included in the data collection process. The locations of the O-D sites are shown in Figure 1 on the following page and are listed below:

- Site 1A: I-75/I-71 Southbound at Brent Spence Bridge (BSB)
- Site 1B: I-75/I-71 Northbound at Brent Spence Bridge (BSB)
- Site 2A: I-471 Southbound at Daniel Beard Bridge (DBB)
- Site 2B: I-471 Northbound at Daniel Beard Bridge (DBB)
- Site 3A: US-50 Eastbound from I-71/I-471 at East of I-471
- Site 3B: US-50 Westbound towards I-71/I-75 at East of I-471
- Site 4A: I-71 Southbound at Oak Street Overpass
- Site 4B: I-71 Northbound at Oak Street Overpass
- Site 5A: I-75 Southbound at Crescentville Road Overpass
- Site 5B: I-75 Northbound at Crescentville Road Overpass

Data was collected simultaneously at each of the sites in the form of traffic volume counts and capture of license plates of all vehicles. Data collection was conducted on Tuesday, December 6, 2005 from 6:00 AM to 7:00 PM.

All analysis was performed to determine two particular situations:

1. Destination of vehicles originating at Site 1B: I-75/I-71 Northbound at Brent Spence Bridge; and
2. Origin of vehicles with Site 1A: I-75/I-71 Southbound at Brent Spence Bridge as their destination in the study area.

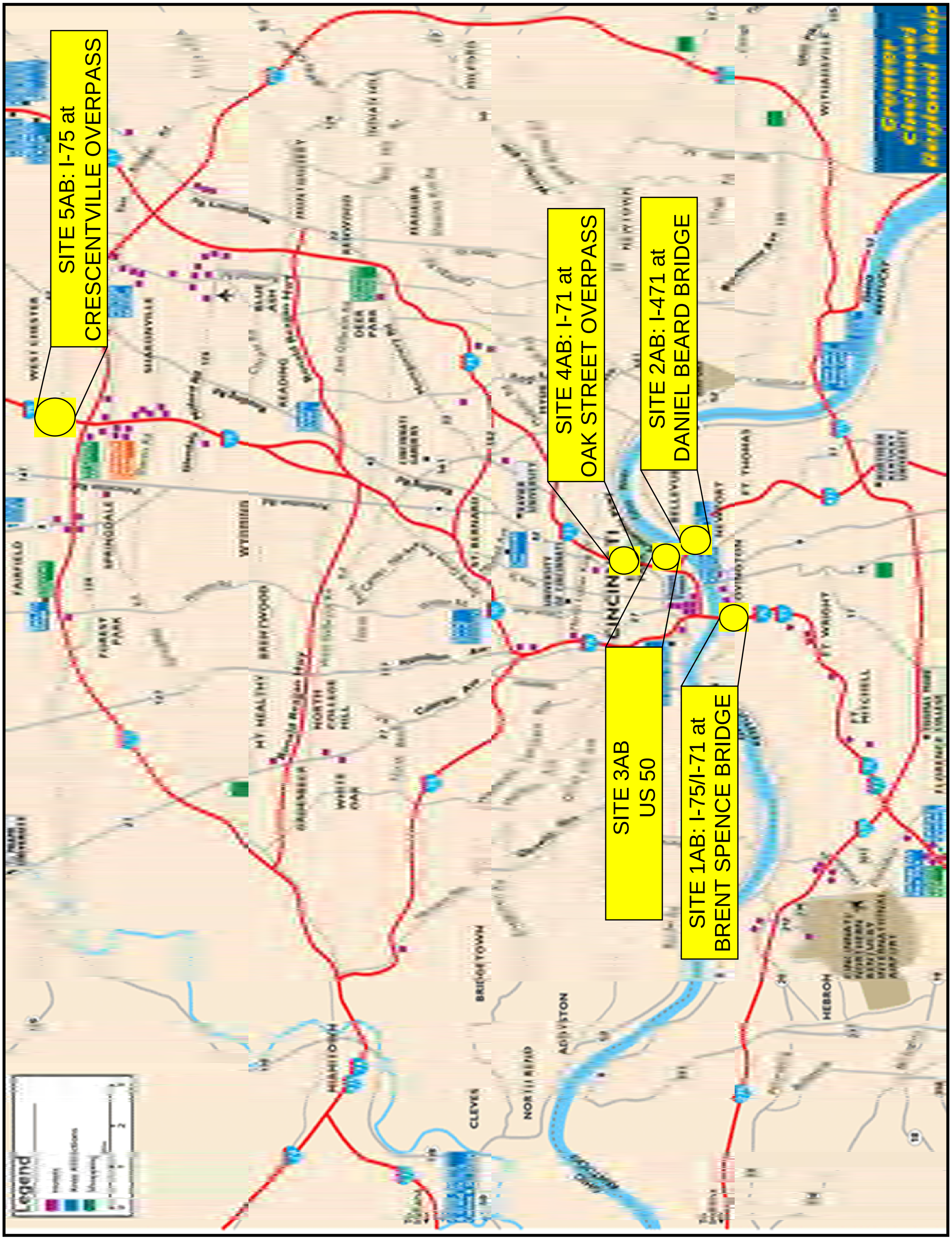



**Figure 1: Location of Origin-Destination Sites.**

## *Methodology*

There are two traditional ways of conducting an OD study. One method is stop vehicles at each OD location site, ask questions of vehicle drivers from an appropriately designed questionnaire, record the driver's responses, and analyze the results to get an estimate of the travel patterns and travel times in the study area. Another method involves handing out survey cards to drivers at each location and relying on them to accurately complete and return the survey cards. In addition to other advantages and disadvantages of such methods, both of these methods can cause a major inconvenience by disrupting traffic flow at survey locations. This is especially true on major freeways during peak hours of traffic.

To overcome the drawbacks of these two traditional methods, a state-of-the-art method was proposed for this current project. Using multiple cameras placed at locations unobtrusive and unknown to drivers, license plates of vehicles were recorded simultaneously at all survey locations. Using modern optical character recognition methods, license plate numbers and time stamps were extracted from the recordings and then used in the analysis. The major steps undertaken in this OD study are shown in Figure 2 and a brief explanation of each step follows.

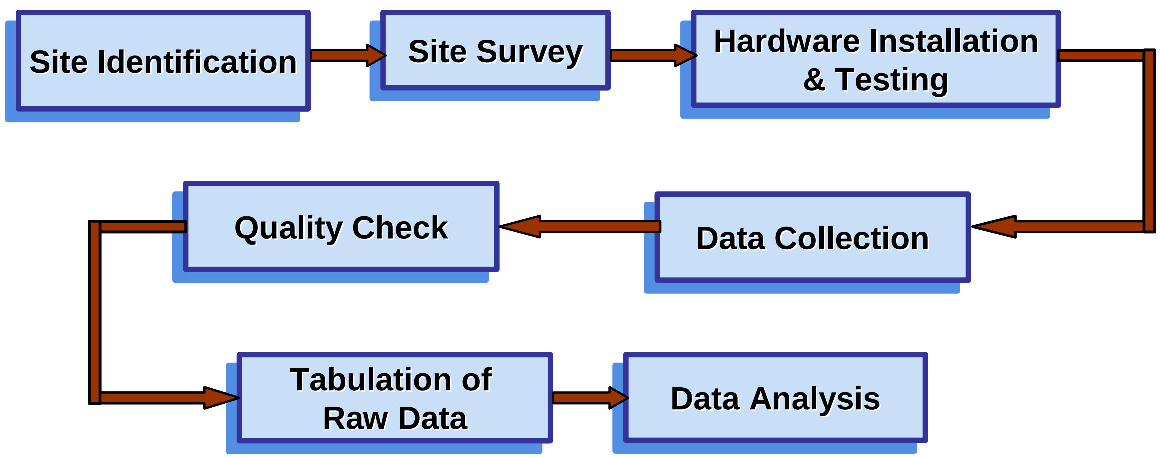



**Figure 2: Methodology Followed in this OD Study.**

- **Site Identification**: The five sites shown in Figure 1 were identified in the scope of services for this project and include BSB as well as four other locations along major freeways in the vicinity.
- **Site Survey**: This step enabled the selection of specific physical locations for mounting cameras and other equipment. In this step suitable gantries or bridges or other existing structures were identified in the vicinity of each site.
- **Hardware Installation & Testing**: Once suitable locations were identified by a site survey, cameras were installed, tested, and calibrated well in advance of the actual survey date.
- **Data Collection**: On the pre-determined survey date (a typical weekday, in this case Tuesday, December 6th, 2005), recording of license plates took place from 6 AM to 7 PM at all locations. Recordings were directly stored at on-site laptop computers. The process was

constantly monitored by survey staff. Along with the video recordings, volume counts were also undertaken simultaneously at every site as a cross check for vehicle type and traffic volumes for comparison with the video-recorded data. During data collection, traffic monitoring was undertaken by ARTIMIS for crashes or other incidents that could adversely impact the travel patterns. It was confirmed with ARTIMIS that there were no incidents during data collection that would have affected the travel patterns in the study area.

- **Quality Check**: The video recordings obtained in the field were subjected to rigorous quality check processes which are further discussed in the following sections of this report.
- **Tabulation of Raw Data**: After the data passes the quality check, it was tabulated in a form that was the most appropriate for this particular study. This tabulation involved the listing of vehicle records, including data such as location, vehicle type, license number, and time.
- **Data Analysis**: Tabulated raw data was then subjected to a matching process across OD pairs at the boundaries of the study area, i.e., matching the license plate number at one location (entry point for a trip) to the same license number at another location (intermediate point or exit point for the trip). This was used to determine both travel patterns and travel times for each of the trips. These methods and results are documented in the following sections of this report.

## Field Hardware

In the days preceding the study, PIPS personnel (acting as a sub-consultant to Wilbur Smith Associates) installed and calibrated the equipment at each of the five sites. PIPS' Automatic License Plate Recognition (ALPR) cameras and processors are designed for use in harsh roadside environments so, once properly configured, can be left in place for extended periods of time without further adjustments. To minimize the effects of cars and trucks which have license plates mounted on their extreme left or right (and to avoid traveling in the center of the lane), two ALPR cameras per lane were allocated to provide 10 feet of coverage within each lane. The cameras were mounted on bridge overpasses and sign gantries to avoid interference with vehicle traffic. Independent verification of PIPS system capture rates and counts were accomplished by recording the actual traffic with day/night CCTV cameras and digital video recorders.

The PIPS system is an infrared-based system. The reason for using infrared (IR) illumination is that most plates, at the time of manufacture, are given a special reflective coating that is highly visible within the IR spectrum. The primary benefit of using an IR lens and IR illumination is that it does not rely on the presence of visible light, nor is it hindered by the presence of other forms of visible light. This allows for accurate image capture under adverse conditions, such as darkness, oncoming headlights, low sunlight, sun glare, rain, and snow.

## Data Processing

### Technology

The IR cameras used in the study had a wavelength of 810 nanometers (nm). This particular wavelength camera was chosen to provide the best illumination for both local (Ohio, Kentucky, and Indiana) and non-local traffic. The system was capable of capturing and processing images with speeds up to 100 miles per hour. PIPS has developed and patented innovative techniques to overcome many of the problems traditionally associated with ALPR systems including:

- Internal triggering;
- A hardware platefinder that ensures high-performance ALPR is maintained for high-speed traffic; and
- The use of 'triple flash' to resolve problems with plate-to-plate variability in reflectance

PIPS Technology's proprietary ALPR platefinder and "optical character recognition" (OCR) engine is one of the highest accuracy ALPR engines on the market today. It is very tolerant of image size and orientation, and capable of reading a large number of varying plate types. As the camera records up to 60 images per second, each with a different amount of illumination, the platefinder locates the license plate within the IR image. The platefinder then analyzes multiple images of the same plate to identify the IR image with the greatest black/white contrast to insure a high degree of accuracy when the OCR translation occurs. The system then uses an OCR engine specifically tuned for Ohio, Kentucky, and Indiana to convert the image into text.


**Figure 3: Sample of a Captured License Plate.**

## Quality Check

Without verification, all data is subjective and hence open to challenge. The following Quality Control Process was implemented by PIPS.

Actual traffic counts were based on using video recordings. This allowed PIPS personnel to perform the counts not at a remote location exposed to poor lighting and bad weather, but in a climate-controlled office, with continuous supervision. As the count was conducted, the counter could slow down or repeat sections when traffic volume was heavy.

With the PIPS-captured license plate information, independent confirmation of the plate number and vehicle class were conducted. All plate images and text derived from the PIPS OCR process were visually verified for license plate accuracy as well as vehicle classification before any travel time calculations were performed.

When calculating the travel time events it was important to minimize any human transcription errors. Visually certain characters (e.g., 0/O/Q, B/8, etc.) can be interpreted incorrectly. These characters were normalized prior to determining travel time matches. As well as requiring an exact match, travel times between any two sites had to occur within one hour.

# *Data Tabulation*

## Capture Rates

As described in "Field Hardware" above, license plate information of vehicles passing each survey site was captured using video cameras. For various reasons, it is not always possible to identify the license plate identification number of every vehicle. Capture Rate is the percentage of vehicles with license plates identifiable for further analysis. Typically, capture rates are higher for cars and lower for trucks. For example, two of the major reasons are (1) no standard/common location or size for license plate displays on large trucks and (2) unclean or obscure plates. Table 1 summarizes the capture rates for cars and trucks at each location for the three time periods.

**Table 1: License Plate Capture Rates for Cars and Trucks.**

| | | Site 1A - SB BSB | Site 1B - NB BSB | Site 2A - SB DBB | Site 2B - NB DBB | Site 3A - EB US 50 | Site 3B - WB US 50 | Site 4A - SB I-71 | Site 4B - NB I-75 | Site 5A - SB I-75 | Site 5B - NB I-75 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Cars | 06:00 AM - 10:00 AM | 77% | 83% | 76% | 82% | 42% | 70% | 74% | 73% | 81% | 81% |
| | 11:00 AM - 02:00 PM | 46% | 83% | 69% | 62% | 47% | 67% | 74% | 82% | 63% | 70% |
| | 04:00 PM - 07:00 PM | 58% | 85% | 81% | 71% | 34% | 11% | 75% | 79% | 66% | 84% |
| Trucks | 06:00 AM - 10:00 AM | 47% | 52% | 58% | 20% | 50% | 17% | 59% | 76% | 35% | 24% |
| | 11:00 AM - 02:00 PM | 26% | 51% | 59% | 12% | 4% | 0% | 49% | 64% | 34% | 22% |
| | 04:00 PM - 07:00 PM | 31% | 40% | 69% | 17% | 0% | 0% | 40% | 47% | 26% | 24% |

## Sample Rates

For many varied reasons, it is not practical, economical, nor feasible to survey all vehicles at every site in the study area. However, to estimate travel patterns and travel times for the entire population of vehicles, a minimum number of vehicles needs to be sampled for the results to be statistically valid. Table 2 shows minimum sample rates for different daily traffic volume (ADT) ranges. These sample rates are based on a sampling equation for a discrete variable with a proportion of 0.5, confidence interval of 90%, and a 3% margin of error.

**Table 2: Minimum Required Sample Rates.**

| Daily Volume (ADT) | Min. Sample Rate |
|---|---|
| <10000 | 25% |
| 10,000 - 18,000 | 10% |
| 18,000 - 22,000 | 9% |
| 22,000 - 25,000 | 8% |
| 25,000 - 30,000 | 7% |
| 30,000 - 35,000 | 6% |
| 35,000 - 45,000 | 5% |
| 45,000 - 60,000 | 4% |
| 60,000 - 90,000 | 3% |
| >90,000 | 2% |

Source: Gregory Giaimo, P.E., *Guidelines for Conducting Roadside Origin-Destination Surveys* (Ohio Department of Transportation, 2004), 15.

Traffic volume counts conducted along I-75/I-71 in the vicinity of Brent Spence Bridge in October 2005 as part of this study, indicates an ADT in the range of 60,000 to 90,000. Hence, the minimum required sample rate is set at 3% for this study.

Table 3 shows the achieved sample rates for the time periods of interest.

**Table 3: Achieved Sample Rates for Cars & Trucks.**

| 6:00 AM to 10:00 AM | | Destination | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | I-75/I-71 at BSB | | I-471 at DBB | | US-50 to/from I-71/I-471 at East of I-471 | | I-71 at Oak St. Overpass | | I-75 at Crescentville Rd. Overpass | |
| | | Cars | Trucks | Cars | Trucks | Cars | Trucks | Cars | Trucks | Cars | Trucks |
| Origin | I-75/I-71 at BSB | | | 63.22% | 30.49% | 34.98% | 26.09% | 60.26% | 39.87% | 67.15% | 12.50% |
| | I-471 at DBB | 62.75% | 9.45% | | | | | | | | |
| | US-50 to/towards I-71/I-471 at East of I-471 | 53.50% | 7.91% | | | | | | | | |
| | I-71 at Oak St. Overpass | 57.22% | 27.90% | | | | | | | | |
| | I-75 at Crescentville Rd. Overpass | 62.67% | 16.63% | | | | | | | | |

| 11:00 AM to 2:00 PM | | Destination | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | I-75/I-71 at BSB | | I-471 at DBB | | US-50 to/from I-71/I-471 at East of I-471 | | I-71 at Oak St. Overpass | | I-75 at Crescentville Rd. Overpass | |
| | | Cars | Trucks | Cars | Trucks | Cars | Trucks | Cars | Trucks | Cars | Trucks |
| Origin | I-75/I-71 at BSB | | | 57.80% | 30.01% | 39.62% | 2.20% | 68.57% | 32.13% | 58.47% | 10.88% |
| | I-471 at DBB | 28.35% | 3.15% | | | | | | | | |
| | US-50 to/towards I-71/I-471 at East of I-471 | 30.50% | 0.00% | | | | | | | | |
| | I-71 at Oak St. Overpass | 33.91% | 12.53% | | | | | | | | |
| | I-75 at Crescentville Rd. Overpass | 28.77% | 8.73% | | | | | | | | |

| 4:00 PM to 7:00 PM | | Destination | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | I-75/I-71 at BSB | | I-471 at DBB | | US-50 to/from I-71/I-471 at East of I-471 | | I-71 at Oak St. Overpass | | I-75 at Crescentville Rd. Overpass | |
| | | Cars | Trucks | Cars | Trucks | Cars | Trucks | Cars | Trucks | Cars | Trucks |
| Origin | I-75/I-71 at BSB | | | 68.65% | 27.57% | 28.83% | 0.00% | 66.48% | 18.86% | 71.43% | 9.57% |
| | I-471 at DBB | 40.90% | 5.31% | | | | | | | | |
| | US-50 to/towards I-71/I-471 at East of I-471 | 6.47% | 0.00% | | | | | | | | |
| | I-71 at Oak St. Overpass | 43.06% | 12.18% | | | | | | | | |
| | I-75 at Crescentville Rd. Overpass | 37.79% | 8.03% | | | | | | | | |

Indicates OD Pairs relevant to current BSB project.

Indicates that target sample rate of 3% was not achieved due to low volume of trucks recorded at the US 50 site.

Indicates OD Pairs where raw data is available but the anlaysis is not part of current BSB project.

No analysis for OD Pairs where O and D are same.

## Summary of Matched License Plates

License plate matching was conducted to get a distribution of vehicles either originating (Site 1B) or with a destination (Site 1A) at Brent Spence Bridge. In other words, the license plate of a vehicle entering the study area at Site 1B was checked to see if it left the study area at any other location studied (Sites 2A, 3A, 4B and 5B). Similarly, the license plate of a vehicle entering the study area at either of Sites 2B, 3B, 4A and 5A was checked to see if it exited the study area at Site 1A.

Table 4 on the following page shows the summarized results of the license plates that matched. A license plate was considered to be a match only if it was an exact or a 100% match, i.e., partial matches (e.g., if only the last 3, 4 or 5 characters matched, but the others did not) were not counted as a match.

**Table 4: Summary of Matched License Plates for Cars & Trucks.**

| 6:00 AM to 10:00 AM | Destination: I-75/I-71 at BSB | | | | I-471 at DBB | | | | US-50 to/from I-71/I-471 at East of I-471 | | | | I-71 at Oak St. Overpass | | | | I-75 at Crescentville Rd. Overpass | | | | Unknown | | | | Total | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Cars | | Trucks | | Cars | | Trucks | | Cars | | Trucks | | Cars | | Trucks | | Cars | | Trucks | | Cars | | Trucks | | Cars | | Trucks | |
| Origin | # | % | # | % | # | % | # | % | # | % | # | % | # | % | # | % | # | % | # | % | # | % | # | % | # | % | # | % |
| I-75/I-71 at BSB | | | | | 370 | 2.31% | 10 | 1.03% | 60 | 0.37% | 2 | 0.21% | 2,460 | 15.37% | 152 | 15.72% | 658 | 4.11% | 131 | 13.55% | 12,456 | 77.83% | 672 | 69.49% | 16,004 | 100.00% | 967 | 100.00% |
| I-471 at DBB | 352 | 3.95% | 0 | 0.00% | | | | | | | | | | | | | | | | | | | | | | | | |
| US-50 to/towards I-71/I-471 at East of I-471 | 299 | 3.36% | 0 | 0.00% | | | | | | | | | | | | | | | | | | | | | | | | |
| I-71 at Oak St. Overpass | 1,420 | 15.94% | 103 | 13.14% | | | | | | | | | | | | | | | | | | | | | | | | |
| I-75 at Crescentville Rd. Overpass | 772 | 8.66% | 121 | 15.43% | | | | | | | | | | | | | | | | | | | | | | | | |
| Unknown | 6,068 | 68.10% | 560 | 71.43% | | | | | | | | | | | | | | | | | | | | | | | | |
| Total | 8,911 | 100.00% | 784 | 100.00% | | | | | | | | | | | | | | | | | | | | | | | | |

| 11:00 AM to 2:00 PM | Destination: I-75/I-71 at BSB | | | | I-471 at DBB | | | | US-50 to/from I-71/I-471 at East of I-471 | | | | I-71 at Oak St. Overpass | | | | I-75 at Crescentville Rd. Overpass | | | | Unknown | | | | Total | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Cars | | Trucks | | Cars | | Trucks | | Cars | | Trucks | | Cars | | Trucks | | Cars | | Trucks | | Cars | | Trucks | | Cars | | Trucks | |
| Origin | # | % | # | % | # | % | # | % | # | % | # | % | # | % | # | % | # | % | # | % | # | % | # | % | # | % | # | % |
| I-75/I-71 at BSB | | | | | 370 | 4.76% | 6 | 0.55% | 146 | 1.88% | 1 | 0.09% | 1,322 | 17.01% | 182 | 16.68% | 430 | 5.53% | 144 | 13.20% | 5,502 | 70.81% | 758 | 69.48% | 7,770 | 100.00% | 1,091 | 100.00% |
| I-471 at DBB | 130 | 3.15% | 1 | 0.15% | | | | | | | | | | | | | | | | | | | | | | | | |
| US-50 to/towards I-71/I-471 at East of I-471 | 104 | 2.52% | 0 | 0.00% | | | | | | | | | | | | | | | | | | | | | | | | |
| I-71 at Oak St. Overpass | 585 | 14.20% | 54 | 8.31% | | | | | | | | | | | | | | | | | | | | | | | | |
| I-75 at Crescentville Rd. Overpass | 271 | 6.58% | 100 | 15.38% | | | | | | | | | | | | | | | | | | | | | | | | |
| Unknown | 3,031 | 73.55% | 495 | 76.15% | | | | | | | | | | | | | | | | | | | | | | | | |
| Total | 4,121 | 100.00% | 650 | 100.00% | | | | | | | | | | | | | | | | | | | | | | | | |

| 4:00 PM to 7:00 PM | Destination: I-75/I-71 at BSB | | | | I-471 at DBB | | | | US-50 to/from I-71/I-471 at East of I-471 | | | | I-71 at Oak St. Overpass | | | | I-75 at Crescentville Rd. Overpass | | | | Unknown | | | | Total | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Cars | | Trucks | | Cars | | Trucks | | Cars | | Trucks | | Cars | | Trucks | | Cars | | Trucks | | Cars | | Trucks | | Cars | | Trucks | |
| Origin | # | % | # | % | # | % | # | % | # | % | # | % | # | % | # | % | # | % | # | % | # | % | # | % | # | % | # | % |
| I-75/I-71 at BSB | | | | | 530 | 5.36% | 3 | 0.48% | 171 | 1.73% | 1 | 0.16% | 1,683 | 17.01% | 91 | 14.49% | 560 | 5.66% | 101 | 16.08% | 6,953 | 70.25% | 432 | 68.79% | 9,897 | 100.00% | 628 | 100.00% |
| I-471 at DBB | 205 | 2.32% | 0 | 0.00% | | | | | | | | | | | | | | | | | | | | | | | | |
| US-50 to/towards I-71/I-471 at East of I-471 | 37 | 0.42% | 0 | 0.00% | | | | | | | | | | | | | | | | | | | | | | | | |
| I-71 at Oak St. Overpass | 1,755 | 19.83% | 49 | 7.97% | | | | | | | | | | | | | | | | | | | | | | | | |
| I-75 at Crescentville Rd. Overpass | 290 | 3.28% | 79 | 12.85% | | | | | | | | | | | | | | | | | | | | | | | | |
| Unknown | 6,562 | 74.16% | 487 | 79.19% | | | | | | | | | | | | | | | | | | | | | | | | |
| Total | 8,849 | 100.00% | 615 | 100.00% | | | | | | | | | | | | | | | | | | | | | | | | |

Indicates OD Pairs relevant to current BSB project.
Indicates OD Pairs where raw data is available but the anlaysis is not part of current BSB project.
No analysis for OD Pairs where O and D are same.

## Expansion Factors

Since the Capture Rates for cars and trucks are different at each site, an expansion factor was computed by factoring in the capture rates at both the origin and destination. Because the site at Brent Spence Bridge (site 1) is of primary concern in this study, expansion factors were computed for two cases – the first with Site 1 as the origin and all other sites as the destination; and the second with Site 1 as the destination and all other sites as the origin. These factors were computed separately for each of the three time periods for both cars and trucks. Table 5 shows the expansion factors thus obtained.

**Table 5: Expansion Factors for Cars & Trucks.**

| 6:00 AM to 10:00 AM | | Destination | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | I-75/I-71 at BSB | | I-471 at DBB | | US-50 to/from I-71/I-471 at East of I-471 | | I-71 at Oak St. Overpass | | I-75 at Crescentville Rd. Overpass | |
| | | Cars | Trucks | Cars | Trucks | Cars | Trucks | Cars | Trucks | Cars | Trucks |
| Origin | I-75/I-71 at BSB | | | 1.58 | 3.28 | 2.86 | 3.83 | 1.66 | 2.51 | 1.49 | 8.00 |
| | I-471 at DBB | 1.59 | 10.58 | | | | | | | | |
| | US-50 to/towards I-71/I-471 at East of I-471 | 1.87 | 12.64 | | | | | | | | |
| | I-71 at Oak St. Overpass | 1.75 | 3.58 | | | | | | | | |
| | I-75 at Crescentville Rd. Overpass | 1.60 | 6.01 | | | | | | | | |

| 11:00 AM to 2:00 PM | | Destination | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | I-75/I-71 at BSB | | I-471 at DBB | | US-50 to/from I-71/I-471 at East of I-471 | | I-71 at Oak St. Overpass | | I-75 at Crescentville Rd. Overpass | |
| | | Cars | Trucks | Cars | Trucks | Cars | Trucks | Cars | Trucks | Cars | Trucks |
| Origin | I-75/I-71 at BSB | | | 1.73 | 3.33 | 2.52 | 45.52 | 1.46 | 3.11 | 1.71 | 9.19 |
| | I-471 at DBB | 3.53 | 31.72 | | | | | | | | |
| | US-50 to/towards I-71/I-471 at East of I-471 | 3.28 | 0.00 | | | | | | | | |
| | I-71 at Oak St. Overpass | 2.95 | 7.98 | | | | | | | | |
| | I-75 at Crescentville Rd. Overpass | 3.48 | 11.46 | | | | | | | | |

| 4:00 PM to 7:00 PM | | Destination | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | I-75/I-71 at BSB | | I-471 at DBB | | US-50 to/from I-71/I-471 at East of I-471 | | I-71 at Oak St. Overpass | | I-75 at Crescentville Rd. Overpass | |
| | | Cars | Trucks | Cars | Trucks | Cars | Trucks | Cars | Trucks | Cars | Trucks |
| Origin | I-75/I-71 at BSB | | | 1.46 | 3.63 | 3.47 | 0.00 | 1.50 | 5.30 | 1.40 | 10.45 |
| | I-471 at DBB | 2.45 | 18.85 | | | | | | | | |
| | US-50 to/towards I-71/I-471 at East of I-471 | 15.47 | 0.00 | | | | | | | | |
| | I-71 at Oak St. Overpass | 2.32 | 8.21 | | | | | | | | |
| | I-75 at Crescentville Rd. Overpass | 2.65 | 12.46 | | | | | | | | |

Indicates OD Pairs relevant to current BSB project.

Indicates OD Pairs where raw data is available but the anlaysis is not part of current BSB project.

No analysis for OD Pairs where O and D are same.

## *Conclusions/Findings*

### Expected Travel Patterns

Using the expansion factors (Table 5) with the summary of matched license plates (Table 4), expected travel patterns of vehicles using the Brent Spence Bridge were derived. These travel distribution patterns are shown in Table 6. All percentages shown in the Tables represent traffic observed at the Brent Spence Bridge location. A summary of the findings are presented below:

***Northbound traffic through BSB***

- During the morning, mid-day, and evening peak periods 3% to 7% of the automobiles and 1% to 2% of the trucks crossing the Brent Spence Bridge, and traveling northbound, were then observed traveling along I-471 at the Daniel Beard Bridge (DBB).
- During the morning, mid-day, and evening peak periods 1% to 5% of the automobiles and 1% to 2% of the trucks crossing the Brent Spence Bridge, and traveling northbound, were then observed traveling along the US 50 ramps east of DBB.
- During the morning, mid-day, and evening peak periods 21% to 22% of the automobiles and 21% to 31% of the trucks crossing the Brent Spence Bridge, and traveling northbound, were then observed traveling along I-71 at the Oak Street overpass.
- During the morning, mid-day, and evening peak periods 5% to 8% of the automobiles and 57% to 67% of the trucks crossing the Brent Spence Bridge, and traveling northbound, were then observed traveling along I-75 at the Crescentville overpass.

During the morning, mid-day, and evening peak periods the remaining automobiles, ranging from 58% to 70%; and the remaining trucks, ranging from 1% to 20%; crossing the Brent Spence Bridge are expected to be going to other unknown locations.

***Southbound traffic through BSB***

- During the morning, mid-day, and evening peak periods 3% to 5% of the automobiles and 1% to 2% of the trucks crossing the Brent Spence Bridge, and traveling southbound, were previously observed traveling along I-471 at Daniel Beard Bridge (DBB).
- During the morning, mid-day, and evening peak periods 4% to 5% of the automobiles and 1% of the trucks crossing the Brent Spence Bridge, and traveling southbound, were previously observed traveling along US 50 ramps east of DBB.
- During the morning, mid-day, and evening peak periods 19% to 27% of the automobiles and 17% to 22% of the trucks crossing the Brent Spence Bridge, and traveling southbound, were previously observed traveling along I-71 at the Oak Street overpass.
- During the morning, mid-day, and evening peak periods 5% to 10% of the automobiles and 44% to 49% of the trucks crossing the Brent Spence Bridge, and traveling southbound, were previously observed traveling along I-75 at Crescentville overpass.

During the morning, mid-day, and evening peak periods the remaining automobiles, ranging from 58% to 69%; and the remaining trucks, ranging from 26% to 37%; crossing the Brent Spence Bridge are expected to be coming from other unknown locations.

**Table 6: Expected Travel Patterns for Cars & Trucks.**

**6:00 AM to 10:00 AM**

| Origin | I-75/I-71 at BSB | | | | I-471 at DBB | | | | US-50 to/from I-71/I-471 at East of I-471 | | | | I-71 at Oak St. Overpass | | | | I-75 at Crescentville Rd. Overpass | | | | Unknown | | | | Total | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Cars | | Trucks | | Cars | | Trucks | | Cars | | Trucks | | Cars | | Trucks | | Cars | | Trucks | | Cars | | Trucks | | Cars | | Trucks | |
| | # | % | # | % | # | % | # | % | # | % | # | % | # | % | # | % | # | % | # | % | # | % | # | % | # | % | # | % |
| I-75/I-71 at BSB | | | | | 585 | 3.03% | 33 | 1.78% | 172 | 0.89% | 8 | 0.43% | 4,082 | 21.13% | 381 | 20.56% | 980 | 5.07% | 1,048 | 56.56% | 13,499 | 69.88% | 383 | 20.67% | 19,318 | 100.00% | 1,853 | 100.00% |
| I-471 at DBB | 561 | 4.84% | 0 | 0.00% | | | | | | | | | | | | | | | | | | | | | | | | |
| US-50 to/towards I-71/I-471 at East of I-471 | 559 | 4.83% | 0 | 0.00% | | | | | | | | | | | | | | | | | | | | | | | | |
| I-71 at Oak St. Overpass | 2,482 | 21.43% | 369 | 22.34% | | | | | | | | | | | | | | | | | | | | | | | | |
| I-75 at Crescentville Rd. Overpass | 1,232 | 10.64% | 728 | 44.07% | | | | | | | | | | | | | | | | | | | | | | | | |
| Unknown | 6,749 | 58.27% | 555 | 33.60% | | | | | | | | | | | | | | | | | | | | | | | | |
| Total | 11,583 | 100.00% | 1,652 | 100.00% | | | | | | | | | | | | | | | | | | | | | | | | |

**11:00 AM to 2:00 PM**

| Origin | I-75/I-71 at BSB | | | | I-471 at DBB | | | | US-50 to/from I-71/I-471 at East of I-471 | | | | I-71 at Oak St. Overpass | | | | I-75 at Crescentville Rd. Overpass | | | | Unknown | | | | Total | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Cars | | Trucks | | Cars | | Trucks | | Cars | | Trucks | | Cars | | Trucks | | Cars | | Trucks | | Cars | | Trucks | | Cars | | Trucks | |
| | # | % | # | % | # | % | # | % | # | % | # | % | # | % | # | % | # | % | # | % | # | % | # | % | # | % | # | % |
| I-75/I-71 at BSB | | | | | 640 | 6.87% | 20 | 0.93% | 369 | 3.96% | 46 | 2.13% | 1,928 | 20.70% | 566 | 26.22% | 735 | 7.89% | 1,323 | 61.28% | 5,641 | 60.57% | 204 | 9.45% | 9,313 | 100.00% | 2,159 | 100.00% |
| I-471 at DBB | 459 | 5.07% | 32 | 1.26% | | | | | | | | | | | | | | | | | | | | | | | | |
| US-50 to/towards I-71/I-471 at East of I-471 | 341 | 3.77% | 0 | 0.00% | | | | | | | | | | | | | | | | | | | | | | | | |
| I-71 at Oak St. Overpass | 1,725 | 19.05% | 431 | 17.03% | | | | | | | | | | | | | | | | | | | | | | | | |
| I-75 at Crescentville Rd. Overpass | 942 | 10.40% | 1,146 | 45.28% | | | | | | | | | | | | | | | | | | | | | | | | |
| Unknown | 5,587 | 61.71% | 922 | 36.43% | | | | | | | | | | | | | | | | | | | | | | | | |
| Total | 9,054 | 100.00% | 2,531 | 100.00% | | | | | | | | | | | | | | | | | | | | | | | | |

**4:00 PM to 7:00 PM**

| Origin | I-75/I-71 at BSB | | | | I-471 at DBB | | | | US-50 to/from I-71/I-471 at East of I-471 | | | | I-71 at Oak St. Overpass | | | | I-75 at Crescentville Rd. Overpass | | | | Unknown | | | | Total | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Cars | | Trucks | | Cars | | Trucks | | Cars | | Trucks | | Cars | | Trucks | | Cars | | Trucks | | Cars | | Trucks | | Cars | | Trucks | |
| | # | % | # | % | # | % | # | % | # | % | # | % | # | % | # | % | # | % | # | % | # | % | # | % | # | % | # | % |
| I-75/I-71 at BSB | | | | | 772 | 6.60% | 11 | 0.70% | 593 | 5.07% | 0 | 0.00% | 2,532 | 21.64% | 482 | 30.76% | 784 | 6.70% | 1,055 | 67.33% | 7,020 | 59.99% | 19 | 1.21% | 11,701 | 100.00% | 1,567 | 100.00% |
| I-471 at DBB | 501 | 3.26% | 0 | 0.00% | | | | | | | | | | | | | | | | | | | | | | | | |
| US-50 to/towards I-71/I-471 at East of I-471 | 572 | 3.73% | 0 | 0.00% | | | | | | | | | | | | | | | | | | | | | | | | |
| I-71 at Oak St. Overpass | 4,075 | 26.55% | 402 | 19.98% | | | | | | | | | | | | | | | | | | | | | | | | |
| I-75 at Crescentville Rd. Overpass | 767 | 5.00% | 984 | 48.91% | | | | | | | | | | | | | | | | | | | | | | | | |
| Unknown | 9,434 | 61.46% | 626 | 31.11% | | | | | | | | | | | | | | | | | | | | | | | | |
| Total | 15,349 | 100.00% | 2,012 | 100.00% | | | | | | | | | | | | | | | | | | | | | | | | |

Indicates OD Pairs relevant to current BSB project.
Indicates that target sample rate of 3% was not achieved due to low volume of trucks recorded at the US 50 site.
Indicates OD Pairs where raw data is available but the anlaysis is not part of current BSB project.
No analysis for OD Pairs where O and D are same.



Wilbur Smith Associates

## Summary of Travel Times

Using the video recordings, the travel time of the vehicle was tracked and recorded for every matched license plate between an O-D pair (data shown in Tables 5 thorough 8). For each O-D pair, the travel times were tabulated by vehicle type (car or truck) and by time period. Table 7 on the following page provides a summary of this data.

The average travel time for cars traveling between the Brent Spence Bridge and I-75 at the Crescentville Overpass were the longest amongst all OD pairs studied and ranged from 17 minutes to 23 minutes. The average travel times were similar in both directions and were on the higher end of the range during the morning and evening peak periods, while during the mid-day, they were on the lower end of the range.

Average travel time for cars traveling between the Brent Spence Bridge and I-71 at Oak Street overpass ranged between 4.25 and 5.57 minutes. Between the Brent Spence Bridge and the Daniel Beard Bridge, the average travel time for a car ranged between 5.30 and 8.25 minutes.

Although the average travel time for cars traveling between the Brent Spence Bridge and the US 50 Ramps ranged between 2.92 and 4.43 minutes, the average travel time from the Brent Spence Bridge to the US 50 Ramps during the morning peak period was 16.62 minutes.

Trucks traveling between during the morning peak period and I-71 at Oak Street overpass had average travel times ranging from 4.45 to 5.58 minutes, while trucks traveling between during the morning peak period and I-75 at Crescentville Overpass had average travel times ranging from 18.18 to 23.75 minutes. Due to low volumes of trucks and/or low number of license plate matches, average travel time of trucks traveling between the Brent Spence Bridge and the Daniel Beard Bridge, and between the Brent Spence Bridge and the US 50 Ramps, provided unrealistic results and could not be considered representative.

**Table 7: Average Travel Times (in minutes) for Cars & Trucks.**

| 6:00 AM to 10:00 AM | | Destination | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | I-75/I-71 at BSB | | I-471 at DBB | | US-50 to/from I-71/I-471 at East of I-471 | | I-71 at Oak St. Overpass | | I-75 at Crescentville Rd. Overpass | |
| | | Cars | Trucks | Cars | Trucks | Cars | Trucks | Cars | Trucks | Cars | Trucks |
| Origin | I-75/I-71 at BSB | | | 6.27 | 3.07 | 16.62 | 13.78 | 4.65 | 4.62 | 20.93 | 22.38 |
| | I-471 at DBB | 7.43 | - | | | | | | | | |
| | US-50 to/towards I-71/I-471 at East of I-471 | 2.92 | - | | | | | | | | |
| | I-71 at Oak St. Overpass | 4.25 | 4.67 | | | | | | | | |
| | I-75 at Crescentville Rd. Overpass | 22.12 | 23.72 | | | | | | | | |

| 11:00 AM to 2:00 PM | | Destination | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | I-75/I-71 at BSB | | I-471 at DBB | | US-50 to/from I-71/I-471 at East of I-471 | | I-71 at Oak St. Overpass | | I-75 at Crescentville Rd. Overpass | |
| | | Cars | Trucks | Cars | Trucks | Cars | Trucks | Cars | Trucks | Cars | Trucks |
| Origin | I-75/I-71 at BSB | | | 7.00 | 10.92 | 3.40 | 2.73 | 4.88 | 5.23 | 18.08 | 18.15 |
| | I-471 at DBB | 8.25 | 3.97 | | | | | | | | |
| | US-50 to/towards I-71/I-471 at East of I-471 | 2.93 | - | | | | | | | | |
| | I-71 at Oak St. Overpass | 4.80 | 4.45 | | | | | | | | |
| | I-75 at Crescentville Rd. Overpass | 17.23 | 18.18 | | | | | | | | |

| 4:00 PM to 7:00 PM | | Destination | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | I-75/I-71 at BSB | | I-471 at DBB | | US-50 to/from I-71/I-471 at East of I-471 | | I-71 at Oak St. Overpass | | I-75 at Crescentville Rd. Overpass | |
| | | Cars | Trucks | Cars | Trucks | Cars | Trucks | Cars | Trucks | Cars | Trucks |
| Origin | I-75/I-71 at BSB | | | 5.30 | 10.17 | 3.03 | 2.40 | 4.83 | 4.72 | 23.55 | 23.75 |
| | I-471 at DBB | 6.10 | - | | | | | | | | |
| | US-50 to/towards I-71/I-471 at East of I-471 | 4.43 | - | | | | | | | | |
| | I-71 at Oak St. Overpass | 5.57 | 5.58 | | | | | | | | |
| | I-75 at Crescentville Rd. Overpass | 22.12 | 23.13 | | | | | | | | |

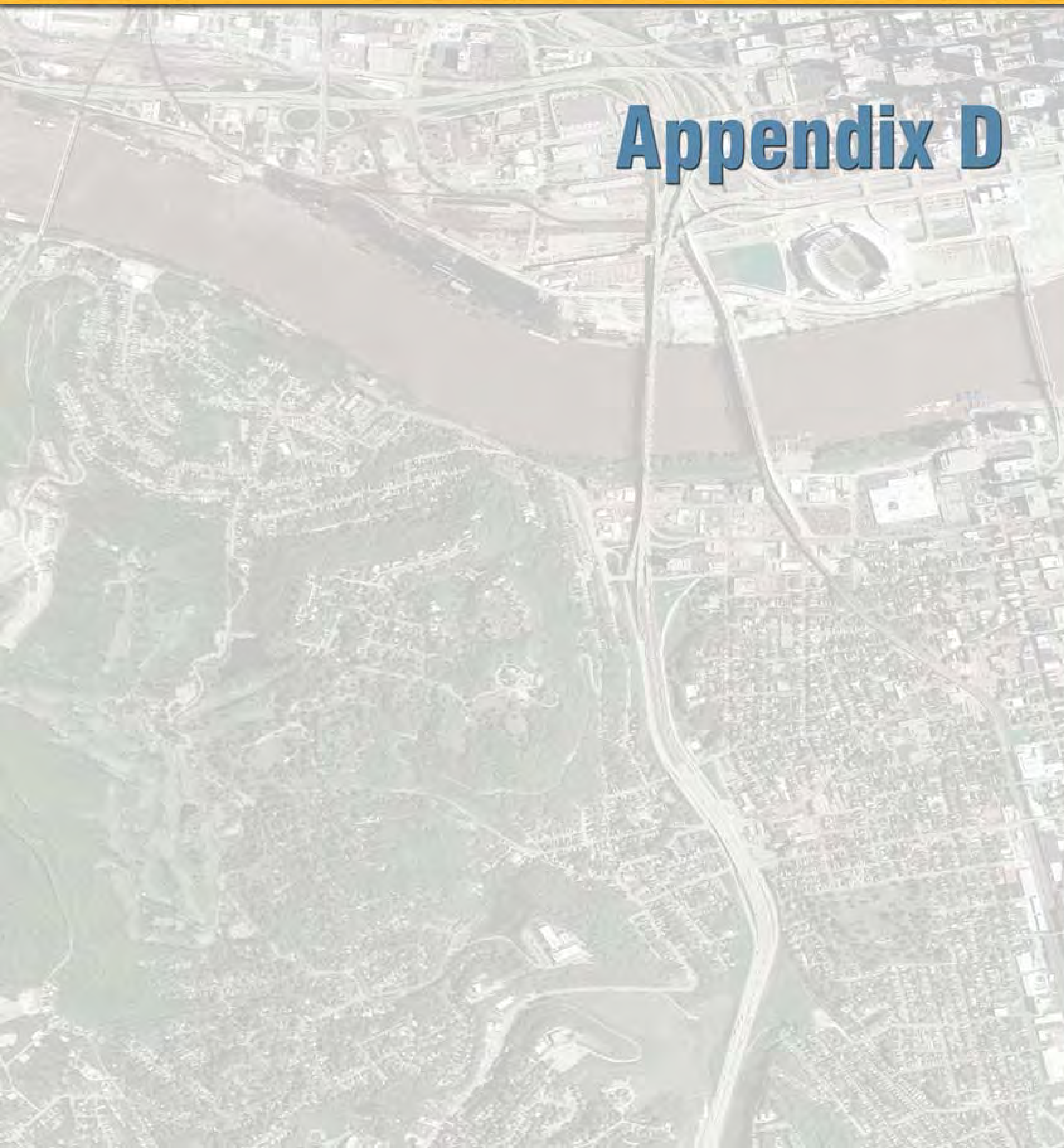
Indicates OD Pairs relevant to current BSB project.

Indicates a sample with less than 8 matched vehicles, not considered a representative sample

Indicates OD Pairs where raw data is available but the anlaysis is not part of current BSB project.

No analysis for OD Pairs where O and D are same.

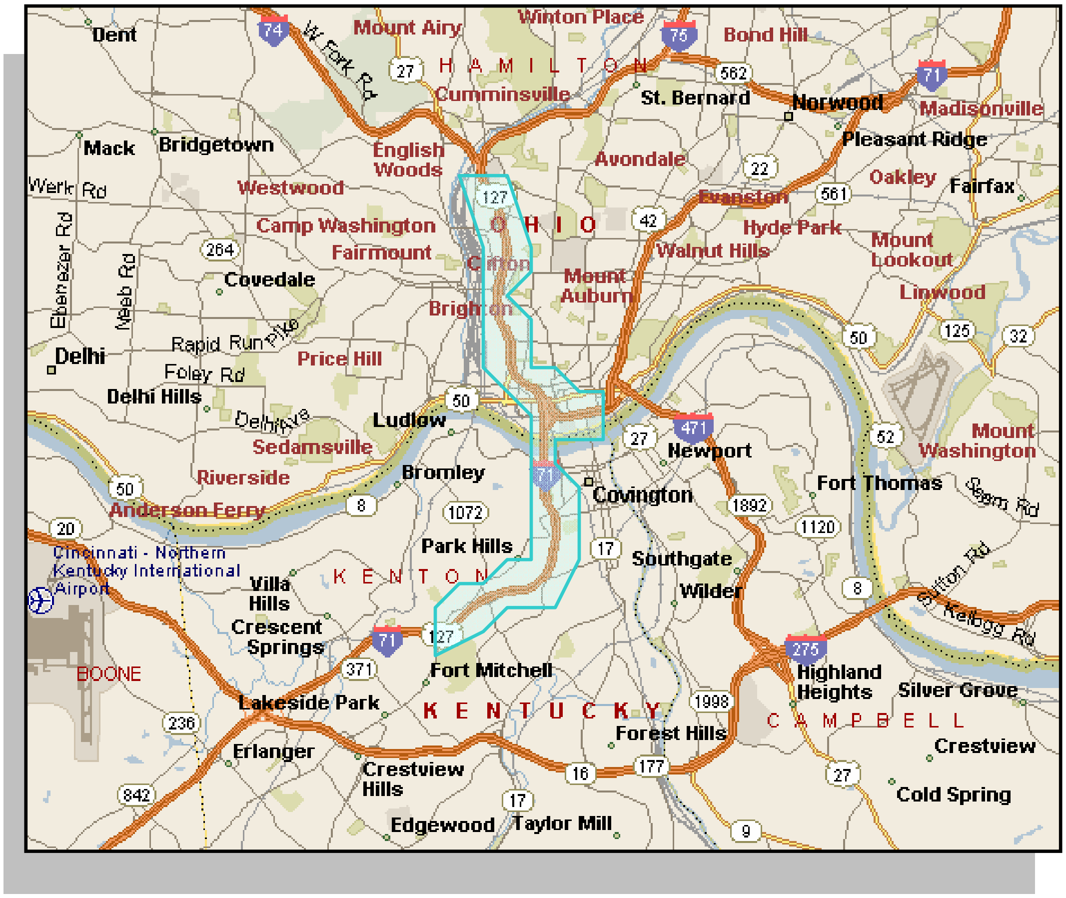
# Appendix D



# Safety Study

**HAMILTON COUNTY, OH: IR-71 / 75**
**ODOT DISTRICT 8**

**KENTON COUNTY, KY: IR-71 / 75**
**KYTC DISTRICT 6**




COMPLETED BY:

TRANSYSTEMS CORPORATION

IN ASSOCIATION WITH:

PB PARSONS BRINCKERHOFF

COMPLETION DATE:
January 9, 2006

## Crash Analyses

An analysis of available data was conducted for collisions within the project study area. These analyses are presented separately for Ohio and Kentucky due to the differences in available data for each state. The Ohio analysis includes the I-75 and I-71 corridors within the project area located in Ohio. The Kentucky analysis includes the portion of the I-75 corridor project area in Kentucky.

Methodology. Collisions were plotted, by year on aerial photography of the study area utilizing GIS shapefiles. A single dot represents each accident, color-coded based on accident type. Where details could be determined from the available data, the dot representing a crash was placed in the correlating lane and location as designated by the corresponding crash report. Where the exact location could not be determined, collisions were plotted near the recorded mile marker.

The plots for the I-75 corridor in Ohio can be found in Attachment A plots for the I-71 corridor in Ohio in Attachment B and I-75 in Kentucky corridor plots can be found in Attachment C.

Along with maps, graphs were also developed to show trends along the corridor at various mile-points and aid in correlation of accident types to geometric and operational deficiencies. Four different graphs were made for each section displaying road condition, type, severity and time as they relate to crash location. The three sets of graphs include the I-75 corridor located in Ohio from SLM 0.00 to SLM 2.90, the I-71 corridor in Ohio from SLM 0.30 to SLM 0.90, and the I-75 corridor located in Kentucky from SLM 187.70 to 191.80. These graphs may be found in Attachment D.

***Ohio***

The portion of I-75 corridor under study has been documented as a congested freeway with a history of high accident frequency. The sections of this corridor, along with the sections of I-71 on the High Crash Location Identification System (HCLIS), are shown in Table 1 below. This system is used to identify high hazard locations throughout the state. Many sections located in the study area show up on this list. Overall, four sections on I-75 and three sections on I-71 appear on the list. Three sections on I-75 in the study area rank in the top one hundred on the HCLIS list.

| | Table 1: Highway Safety Program Listings in Study Area | | | |
|---|---|---|---|---|
| | Begin Mile | End Mile | Location Type | HCLIS Rank |
| I-75 Corridor Segments and Interchanges | 0.00 | 0.49 | Section | 22 |
| | 0.50 | 0.99 | Section | 28 |
| | 1.00 | 2.90 | Section | 36 |
| | 3.04 | 4.14 | Section | 170 |
| I-71 Corridor Segments and Interchanges | 0.00 | 0.29 | Section | 96 |
| | 0.30 | 0.59 | Section | 559 |
| | 0.60 | 1.10 | Section | 53 |

Source: ODOT Office of Roadway Safety and Mobility High Crash Location Identification System

Safety Hot Spots were also identified using Data from the Office of Roadway Safety and Mobility. The Hot Spot locations are based on the total number of accidents over a three year period in an area regardless of traffic volume and other factors. Ohio roadways are divided into two-mile segments, and the number of crashes is compared to a given rate to establish if a hot spot exists. The entire study corridor is included as a Safety Hot Spot. Table 2 below lists the Safety Hot Spots in the study area.

| | Table 2: Safety Hot Spots | | | | |
|---|---|---|---|---|---|
| | Begin Mile | End Mile | # of Crashes | # Fatal | # of Injuries |
| I-75 Corridor Segments | 0.22 | 2.22 | 1005 | 4 | 239 |
| | 2.22 | 4.22 | 802 | 2 | 205 |
| I-71 Corridor Segments | 0.00 | 2.00 | 721 | 2 | 162 |

Source: ODOT Office of Roadway Safety and Mobility Safety Hot Spot List, 2001-2003

Two sections of I-75 within the study area and a section of I-71 are among the most congested in the state. Congested areas were identified using data from the Office of Roadway Safety and Mobility. According to the office, congested areas are determined by calculating a roadway's volume to capacity ratio; roadways with a ratio greater than one are considered congested. The section of I-71 from SLM 0.48 to 0.50 is ranked third, from SLM 1.15 to 1.34 is ranked fourth and one of the I-75 sections from SLM 0.71 to 0.90 is ranked second. Table 3 below displays the congested areas within the study area.

| | Table 3: Congested Sections | | |
|---|---|---|---|
| | **Begin Mile** | **End Mile** | **Rank** |
| I-75 Corridor Segments | 0.71 | 0.90 | 2 |
| | 1.35 | 17.47 | 31 |
| I-71 Corridor Segments | 0.00 | 0.22 | 62 |
| | 0.48 | 0.50 | 3 |
| | 1.15 | 1.34 | 4 |

Source: ODOT Office of Roadway Safety and Mobility Congestion List

*Crash Data Analyses.* Crash reports from ODPS were analyzed to determine crash rates throughout the study area and to provide support for observations made throughout the study corridor. Along I-75 within the study area, 1049 accidents were logged between the years 2001 and 2003 and 150 accidents were logged on I-71 in the study area during this same time period. The crash data in Appendices A and B show each accident for I-75 and I-71 respectively and includes severity, location, time of day, road condition, and accident type.

Along I-75, the crash severity rate ([fatality accidents + injury accidents] / total accidents) is 0.233. Of the 1049 total crashes, 504 of the accidents (48%) were attributed to rear-end type crashes; while another 256 (25.3%) were attributed to sideswipes. Approximately 67.8% of the crashes occurred during daylight, and about 69.4% occurred on dry pavement, suggesting that road and light conditions may not be large factors in influencing accidents since the majority of them occurred during favorable situations.

Along I-71, the crash severity rate is 0.188. Of the accidents on I-71 37.3% of them were rear-ends, 16.7% were sideswipe and 14.7% were fixed object crashes. Around 58% of the crashes that occurred along I-71 occurred on dry pavement, and approximately 54.7% occurred during daylight hours, suggesting that road and light conditions may not be large factors in influencing accidents since the majority of them took place during favorable situations.

Crash rates (accidents / million vehicle miles traveled) were also determined for segments along the two corridors in the study area. Each corridor was broken down into smaller segments and, based on 2002 Average Daily Traffic, (ADT) crash rates were calculated for each segment and compared to the statewide average. Crash rates for each corridor were calculated with an ADT that used a weighted average of the ADTs throughout the corridors. These crash rates are shown in Table 3.

The overall crash rates for all segments along both Northbound and Southbound I-75 were higher than the average crash rates for similar facilities in Ohio. The worst segment has a crash rate more than six times greater than the statewide average. Overall, the corridor has a crash rate of 3.54 acc/mvmt, which is more than two times greater than the statewide average rate of 1.338 acc/mvmt.

Along I-71, the crash rates for all of the segments are greater than the statewide average rates. The worst segment has a crash rate more than nineteen times the statewide average. The overall crash rate for the corridor is 5.26 accidents / million vehicle miles traveled (acc/mvmt), which is nearly four times the statewide average rate of 1.338 acc/mvmt. Table 3 shows crash rates for each segment.

**Table 3: Crash Rates**

| | Begin Mile | End Mile | Crash Rate |
|---|---|---|---|
| I-75 Corridor Segments | 0.00 | 0.22 | 4.27 |
| | 0.22 | 0.41 | 5.90 |
| | 0.41 | 0.50 | 7.95 |
| | 0.50 | 0.63 | 8.30 |
| | 0.63 | 0.71 | 4.96 |
| | 0.71 | 0.86 | 2.42 |
| | 0.86 | 1.25 | 3.51 |
| | 1.25 | 1.43 | 3.10 |
| | 1.43 | 1.91 | 2.94 |
| | 1.91 | 2.52 | 2.55 |
| | 2.52 | 2.90 | 1.98 |
| I-71 Corridor Segments | 0.22 | 0.27 | 25.66 |
| | 0.27 | 0.48 | 6.27 |
| | 0.48 | 0.50 | 11.95 |
| | 0.50 | 0.90 | 1.85 |

*Crash Data Observations.* After reviewing the crash reports from ODPS and plotting the accidents in GIS, several observations were made about the corridors in the study area.

*I-75 Northbound Observations*

- There is a high concentration of rear-end accidents at SLM 0.10 right before the I-71/I-75 interchange.
- There is a high concentration of rear-end accidents at SLM 1.90 near the Findlay Street bridge.
- There is a high concentration of sideswipe accidents at SLM 0.20 near the I-71/I-75 interchange.
- High concentrations of sideswipe crashes were observed at SLM 1.00 near the 9th Street entrance ramp.
- High concentrations of sideswipe crashes were observed at SLM 1.20 near the Gest Street entrance ramp.
- There is a high concentration of wet road conditions and fixed object accidents at SLM 1.30 on a curve near the ramp bridges for Gest Street
- There is a high concentration of wet road conditions and fixed object accidents at SLM 1.70 on a curve near the entrance ramp from Ezzard Charles.

*I-75 Southbound Observations*

- Approximately 56% of the accidents that occurred on I-75 happened in the southbound lanes.
- There is a high concentration of rear-end accidents at SLM 0.10 where I-71 and I-75 merge together.
- There is a high concentration of rear-end accidents at SLM 1.00 near the 9th Street exit ramp.
- There is a high concentration of wet road condition and rear-end accidents at SLM 1.50 near the Ezzard Charles exit.
- There is a high concentration of rear-end accidents at SLM 1.80 near the Western Hills Viaduct exit.
- There is a high concentration of fixed object accidents at SLM 1.40 near the exit for Ezzard Charles.
- There is a high concentration of sideswipe accidents on southbound I-75 at SLM 0.10 and 0.20 near the I-71/I-75 interchange.
- There is a high concentration of sideswipe accidents near SLM 2.70 near the Western Hills Viaduct exit ramps.

*I-71 Northbound Observations*

- Approximately 57% of the accidents on I-71 were northbound.
- A high concentration of sideswipe crashes were observed near SLM 0.50, the area includes traffic exiting too the 2nd Street and entrance traffic merging from US 50 EB.
- A high concentration of rear-end and sideswipe accidents were observed near SLM 0.80 between the Race Street and Vine Street bridges.

*I-71 Southbound Observations*

- A high concentration of fixed object crashes were observed near SLM 0.50 this area has merging traffic from 3rd Street and exit ramps to US 50 NB.
- There are high concentrations of rear-end accidents between SLM 0.70 and 0.80 between Elm Street and Vine Street.

***Kentucky***

*Crash Data Analyses.* Traffic Crash data was collected from KYTC Division of Traffic Operations Traffic Safety Data Service for the study area, including I-71/75 from SLM 187.70 near the Dixie Highway, US 25, exit to SLM 191.77 at the Kentucky/Ohio border. The data includes a summary of crashes in the study area occurring between 2001 and 2003. All crashes were analyzed by the study team any inaccurate or missing data were corrected.

The accidents were plotted by year utilizing GIS shapefiles overlying aerial photography of the project corridor. A single dot represents each accident, and each dot is color-coded based on accident type. Observations based on the crash data may be found in the *Crash Rate Observation* Section of this report. These plots for the I-71/75 corridor can be found in Attachment C.

Crash reports from KYTC were analyzed to determine crash rates throughout the study area and to provide support for observations. Along the I-71/75 corridor within the study area, 676 accidents were logged between the years 2001 and 2003. The crash data in Attachment C shows each accident for I-71/75 and includes severity, location, date, time of day, weather condition, light condition, road condition, and accident type.

Along I-71/75, the crash severity rate ([fatality accidents + injury accidents] / total accidents) is 0.1953. Of the 676 total crashes, 349 of the accidents (51.6%) were attributed to rear-end type crashes; while another 219 (32.4%) were attributed to sideswipes. Approximately 67.3% of the crashes occurred during daylight, and about 74.3% occurred on dry pavement, suggesting that road and light conditions may not be large factors in influencing accidents since the majority of them took place during favorable situations.

Crash rates (accidents / million vehicle miles traveled) were also determined by the KYTC Division of Traffic Operations Traffic Safety Data Service. The overall crash rate for the corridor was found to be 130.363 acc/100mvmt. When compared to the average crash rates in Kentucky as found in Table 4 of the Kentucky Transportation Center College of Engineering "Analysis of Traffic Crash Data in Kentucky (2000-2004)" report, see Attachment E, the project area has a crash rate nearly 1.33 times higher than the average of 93 for the years 2000-2003 for similar types of roadway for 100 million vehicle miles traveled.

The Critical Rate Factor also calculated by the KYTC Division of Traffic Operations Traffic Safety Data Service for this corridor was found to be 1.304, nearly 7.67 times higher than the average of 0.17 in Kentucky for similar roadway types as compared to Table B-10 from the Kentucky Transportation Center College of Engineering "Analysis of Traffic Crash Data in Kentucky (2000-2004)" report, see Attachment E.

*Crash Data Observations.* After reviewing the crash reports from KYTC and plotting the accidents in GIS, several observations were made about the corridor in the study area.

*I-71/75 Northbound Observations*

- Approximately 56.4% of the accidents that occurred on I-71/75 happened in the northbound lanes.
- There is a high concentration of single vehicle crashes near SLM 189.70 on a curve.
- There are a high concentration of rear-end accidents at SLM 188.8 and 188.90 north of the Kyle's Lane exit.

- There is a high concentration of rear-end accidents at SLM 191.00 near the $12^{th}$ Street/Pike Street exit.
- There is a high concentration of rear-end accidents at SLM 191.20 near the $5^{th}$ Street exit.

*I-71/75 Southbound Observations*

- There is a high concentration of rear-end accidents near the southbound $12^{th}$ Street/Pike Street exit ramp.
- There is a high concentration of rear-end accidents near the $5^{th}$ Street exit ramp from I-71/75 southbound.
- There is a high concentration of sideswipe accidents near the $5^{th}$ Street exit ramp southbound.

# Attachment A

I-75 Ohio GIS Plots


# Figure A-1
## Brent Spence Bridge Project
## Accident Analysis
## 2001 HAM I-75 Accidents

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Feet


KENTUCKY TRANSPORTATION CABINET

STATE OF OHIO DEPARTMENT OF TRANSPORTATION

# Figure A-2
# Brent Spence Bridge Project
# Accident Analysis
# 2001 HAM I-75 Accidents

PB 100 YEARS

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# Figure A-3
# Brent Spence Bridge Project
# Accident Analysis
# 2001 HAM I-75 Accidents

KENTUCKY TRANSPORTATION CABINET

STATE OF OHIO DEPARTMENT OF TRANSPORTATION

PB 100 YEARS

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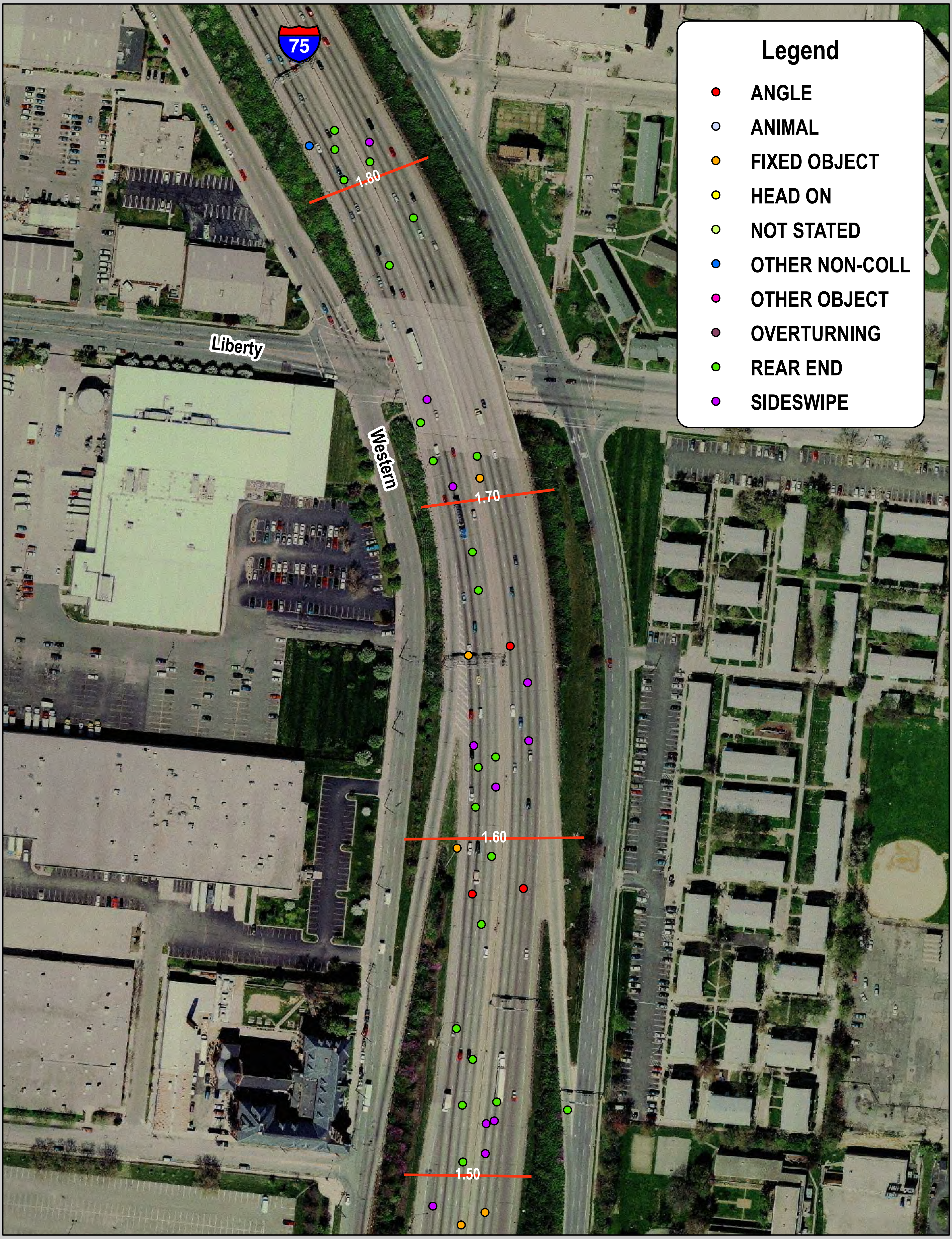


**Figure A-4**
**Brent Spence Bridge Project**
**Accident Analysis**
**2001 HAM I-75 Accidents**


# Figure A-5
## Brent Spence Bridge Project
## Accident Analysis
## 2001 HAM I-75 Accidents

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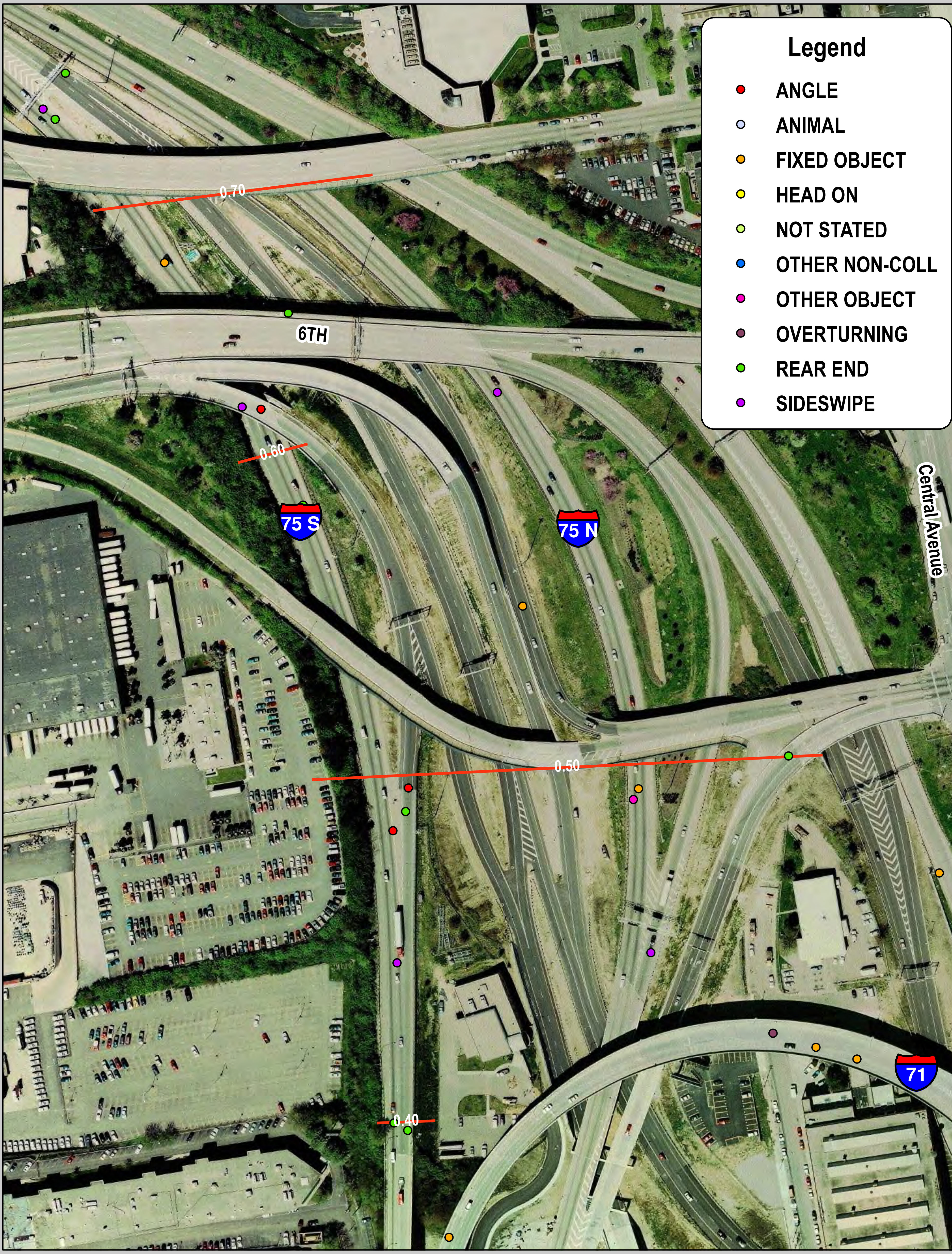
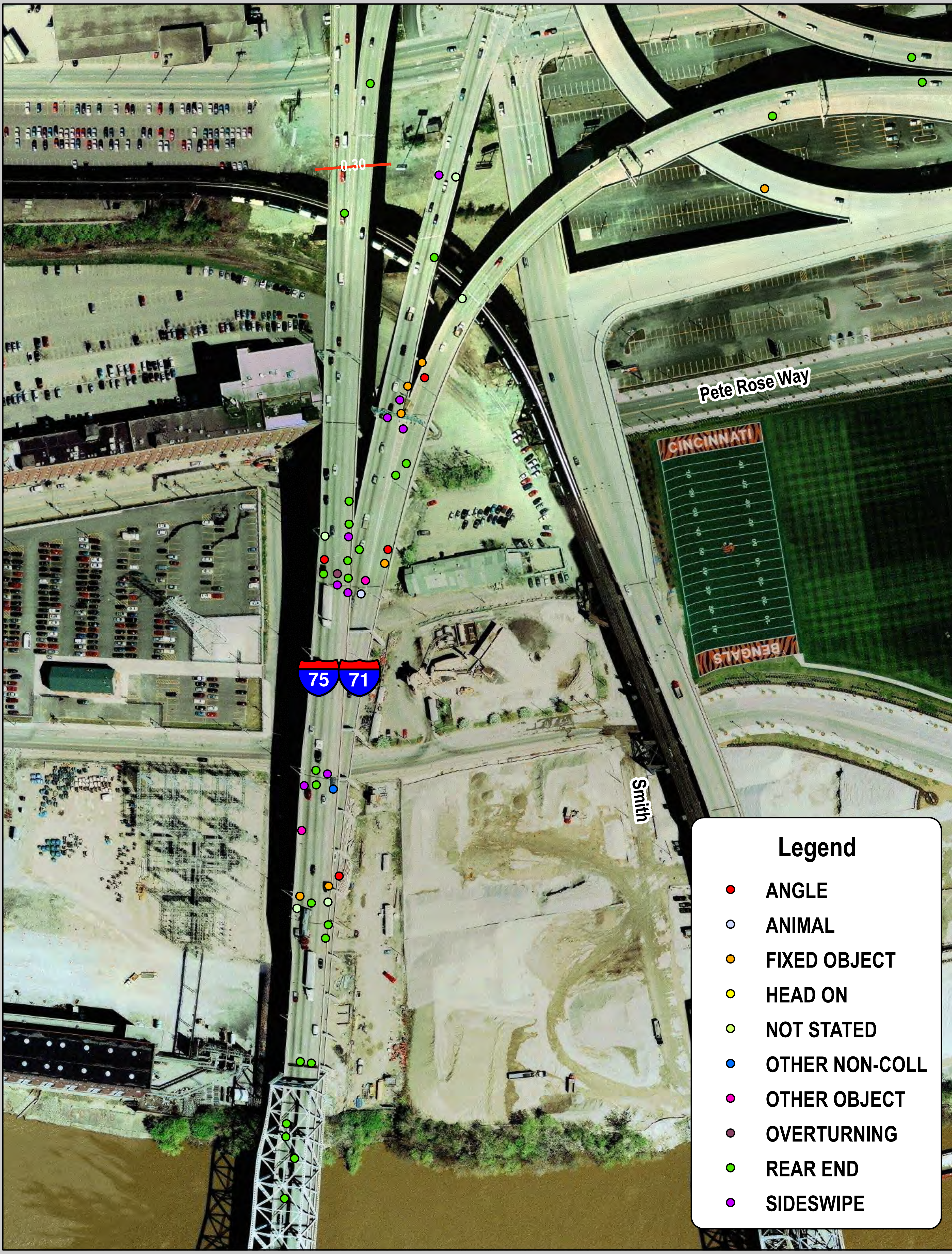
# Figure A-6
## Brent Spence Bridge Project
## Accident Analysis
## 2001 HAM I-75 Accidents




# Figure A-7
# Brent Spence Bridge Project
# Accident Analysis
# 2001 HAM I-75 Accidents




# Figure A-8
## Brent Spence Bridge Project
## Accident Analysis
## 2001 HAM I-75 Accidents

KENTUCKY TRANSPORTATION CABINET

STATE OF OHIO DEPARTMENT OF TRANSPORTATION

PB 100 YEARS

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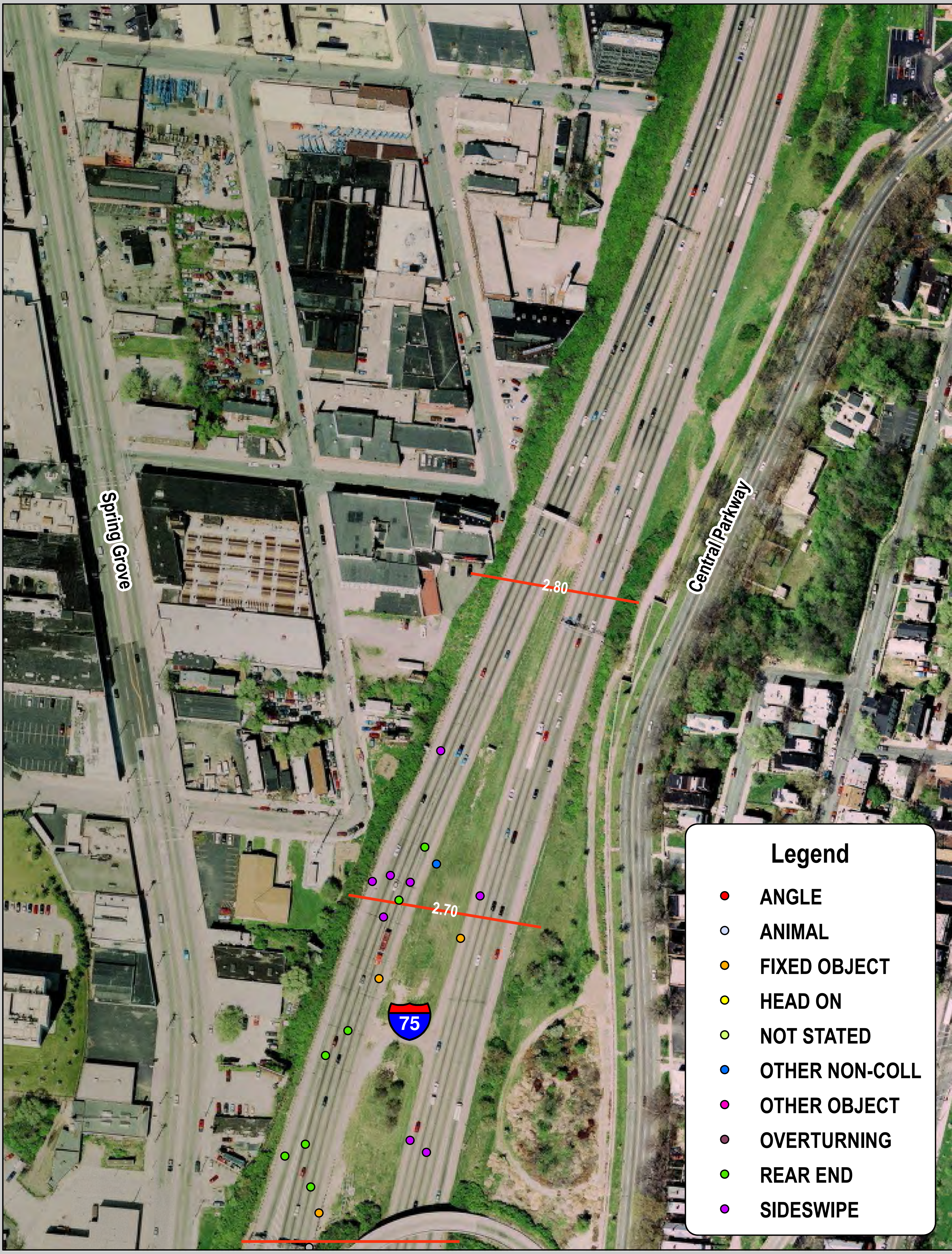


# Figure A-9
## Brent Spence Bridge Project
## Accident Analysis
## 2002 HAM I-75 Accidents

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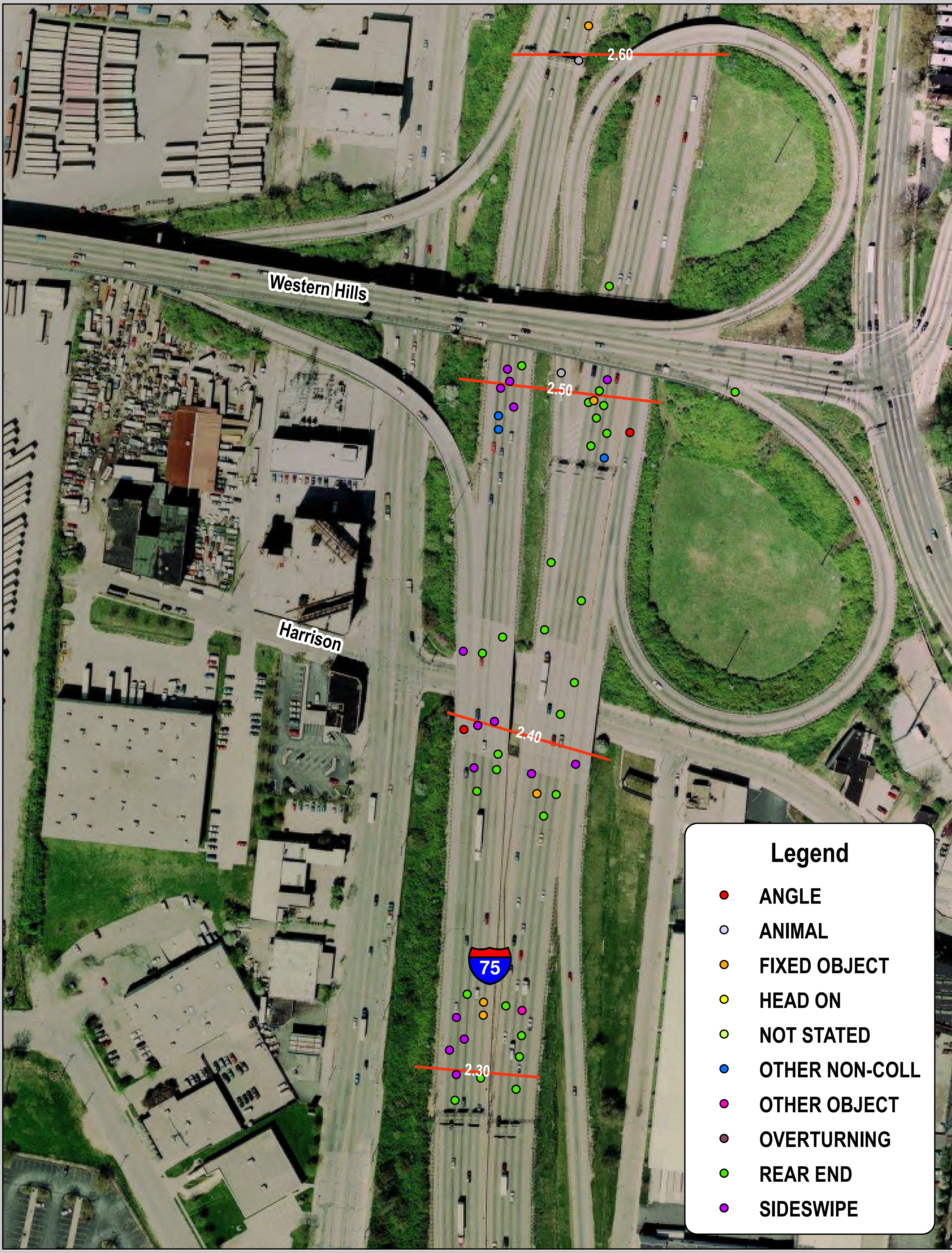


# Figure A-10
# Brent Spence Bridge Project
# Accident Analysis
# 2002 HAM I-75 Accidents

KENTUCKY TRANSPORTATION CABINET

STATE OF OHIO DEPARTMENT OF TRANSPORTATION

PB 100 YEARS

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**Figure A-11**
**Brent Spence Bridge Project**
**Accident Analysis**
**2002 HAM I-75 Accidents**

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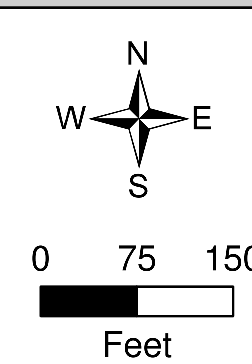
# Figure A-12
# Brent Spence Bridge Project
# Accident Analysis
# 2002 HAM I-75 Accidents




# Figure A-13
## Brent Spence Bridge Project
## Accident Analysis
## 2002 HAM I-75 Accidents

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# Figure A-14
## Brent Spence Bridge Project
## Accident Analysis
## 2002 HAM I-75 Accidents

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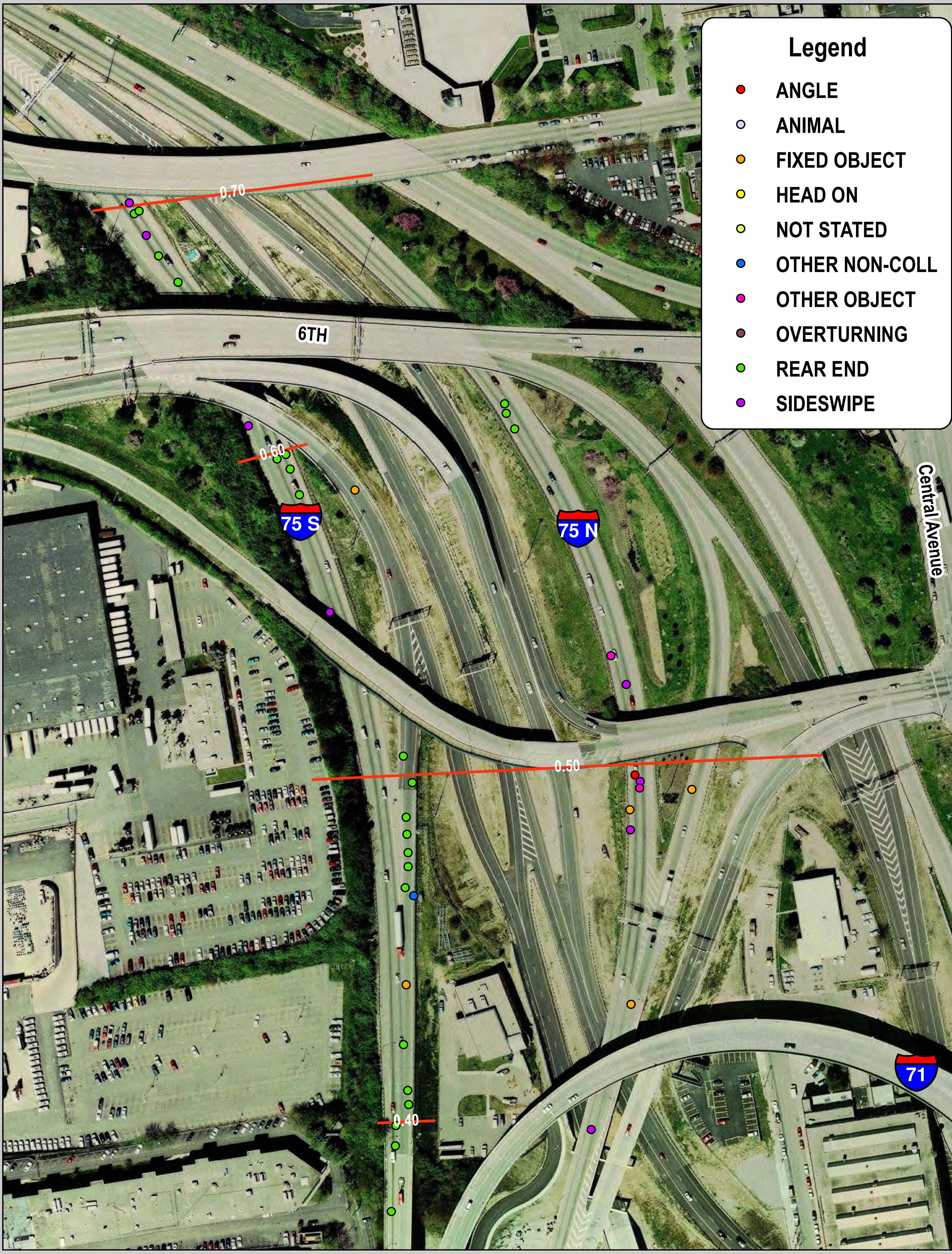
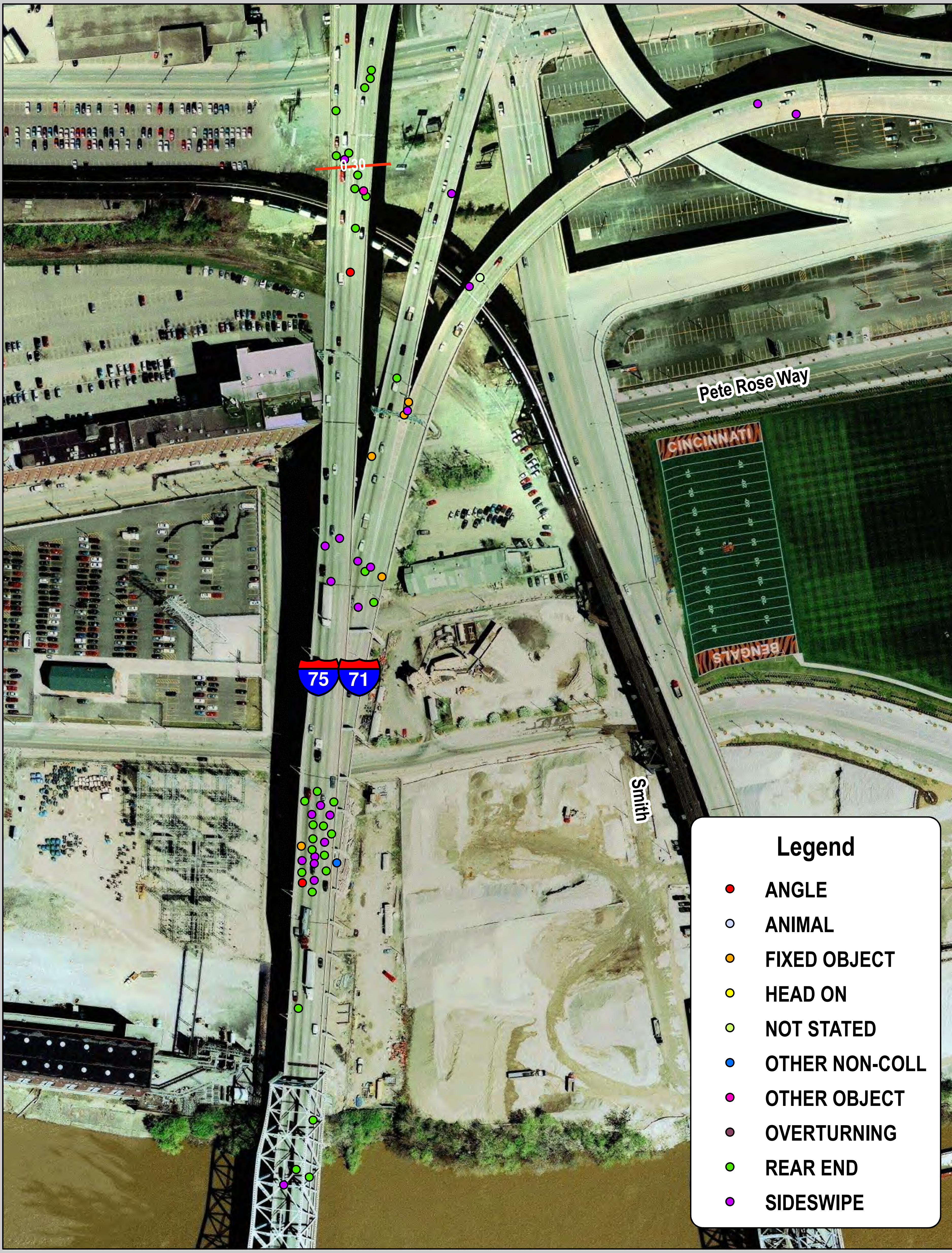



# Figure A-15
# Brent Spence Bridge Project
# Accident Analysis
# 2002 HAM I-75 Accidents




# Figure A-16
## Brent Spence Bridge Project
## Accident Analysis
## 2002 HAM I-75 Accidents

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# Figure A-17
## Brent Spence Bridge Project
## Accident Analysis
## 2003 HAM I-75 Accidents


# Figure A-18
## Brent Spence Bridge Project
## Accident Analysis
## 2003 HAM I-75 Accidents

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# Figure A-19
# Brent Spence Bridge Project
# Accident Analysis
# 2003 HAM I-75 Accidents

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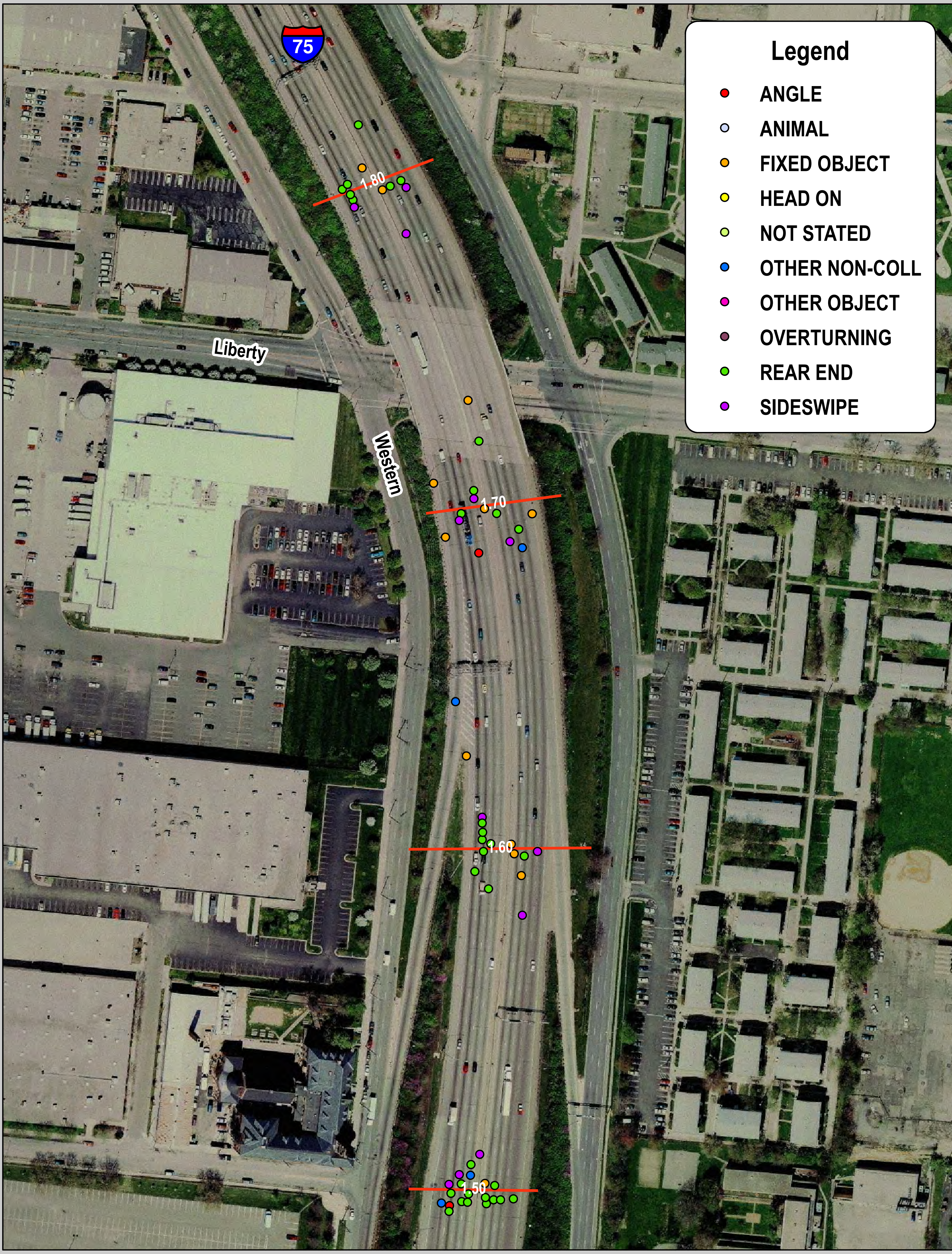


# Figure A-20
## Brent Spence Bridge Project
## Accident Analysis
## 2003 HAM I-75 Accidents


# Figure A-21
## Brent Spence Bridge Project
## Accident Analysis
## 2003 HAM I-75 Accidents

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# Figure A-22
## Brent Spence Bridge Project
## Accident Analysis
## 2003 HAM I-75 Accidents

KENTUCKY TRANSPORTATION CABINET

STATE OF OHIO DEPARTMENT OF TRANSPORTATION

PB 100 YEARS

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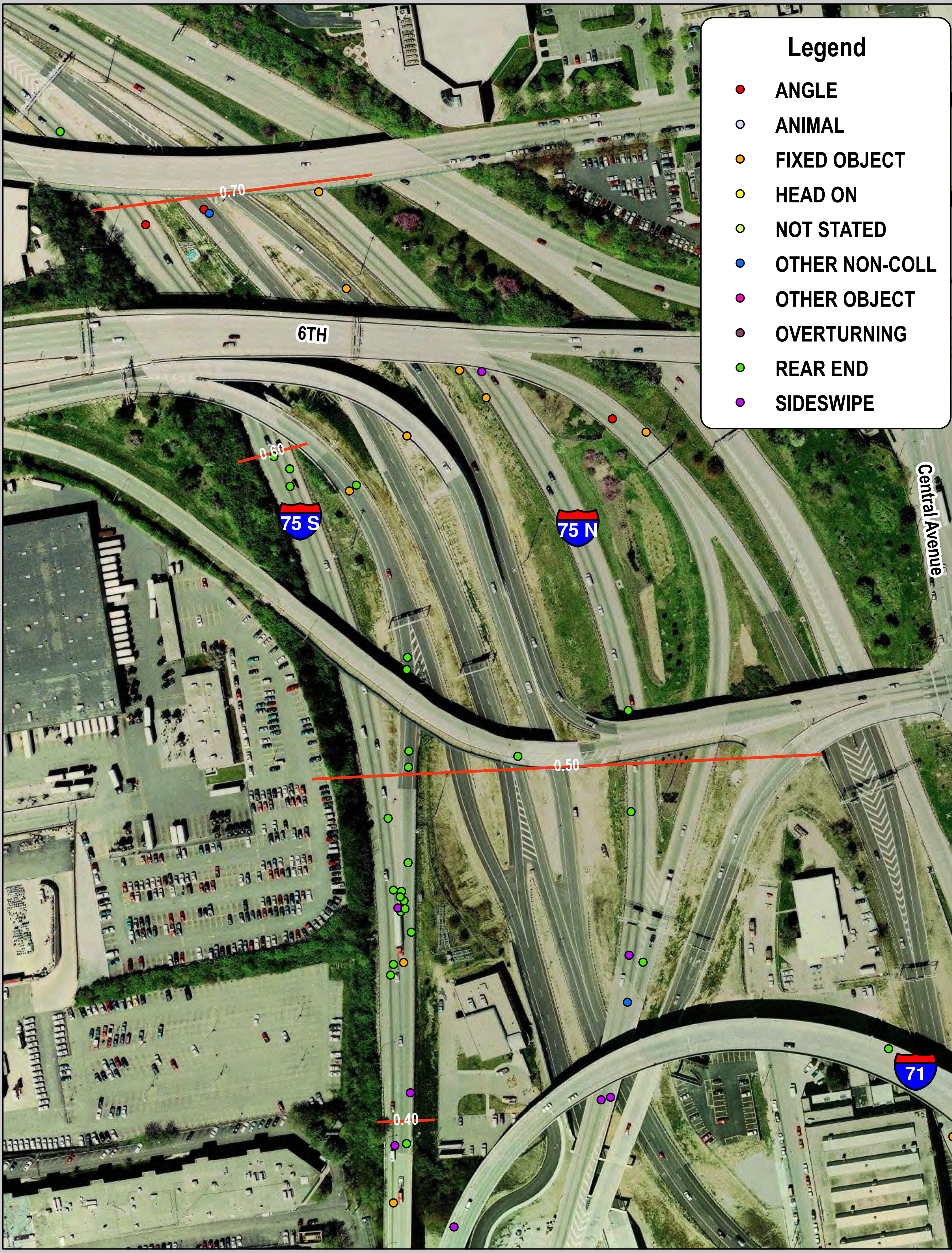


# Figure A-23
# Brent Spence Bridge Project
# Accident Analysis
# 2003 HAM I-75 Accidents

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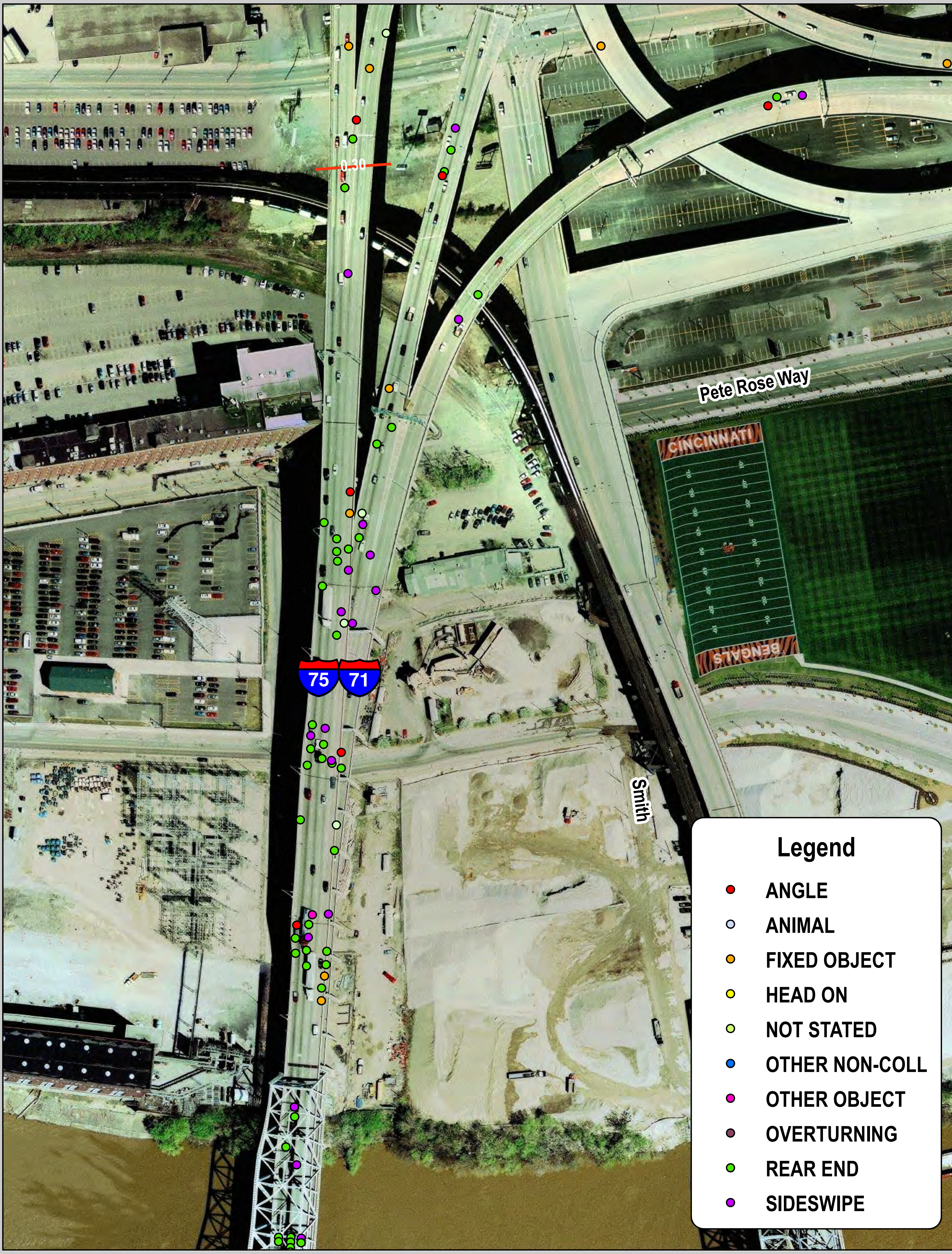


# Figure A-24
## Brent Spence Bridge Project
## Accident Analysis
## 2003 HAM I-75 Accidents

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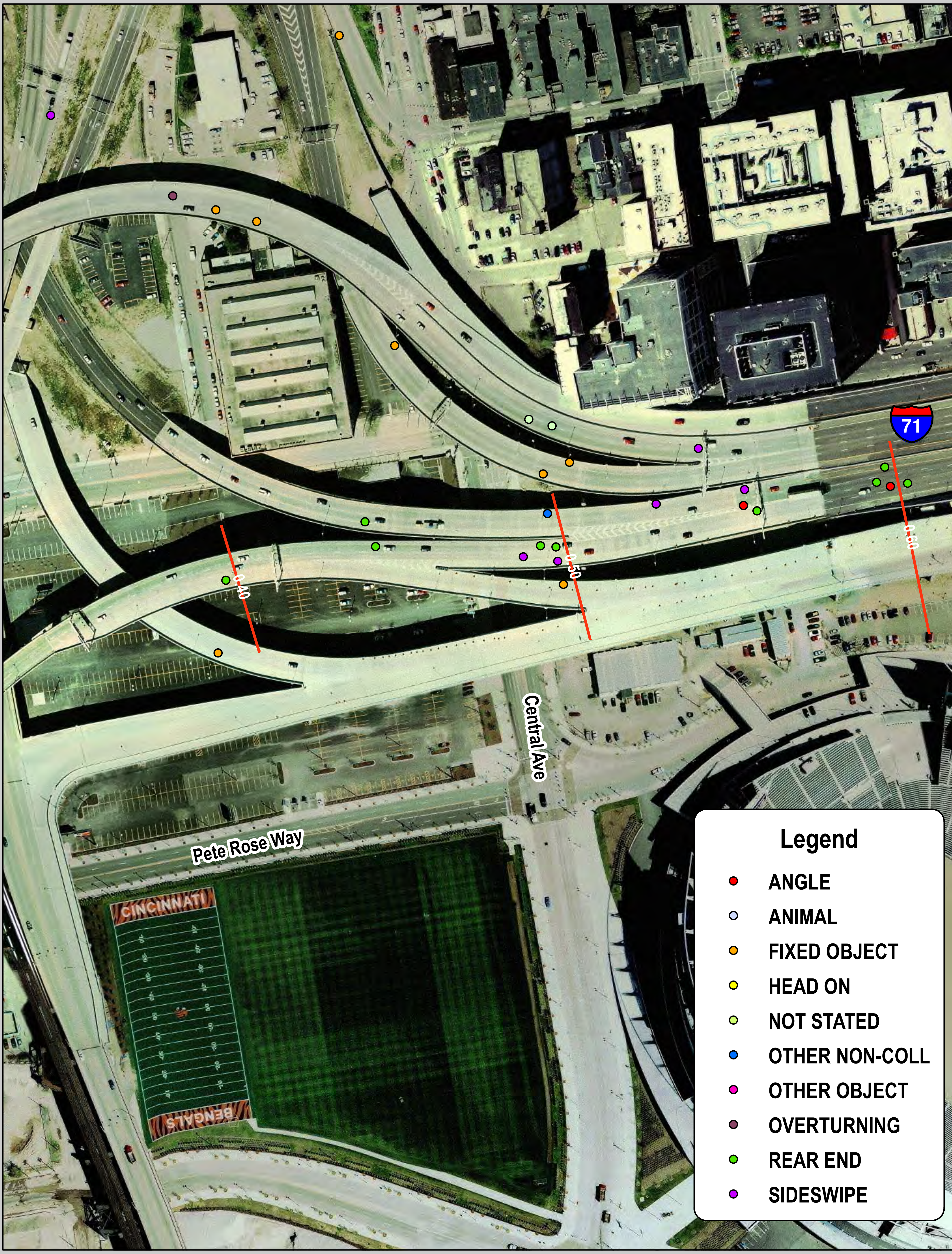
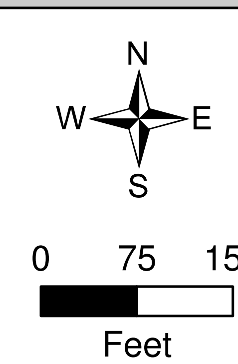
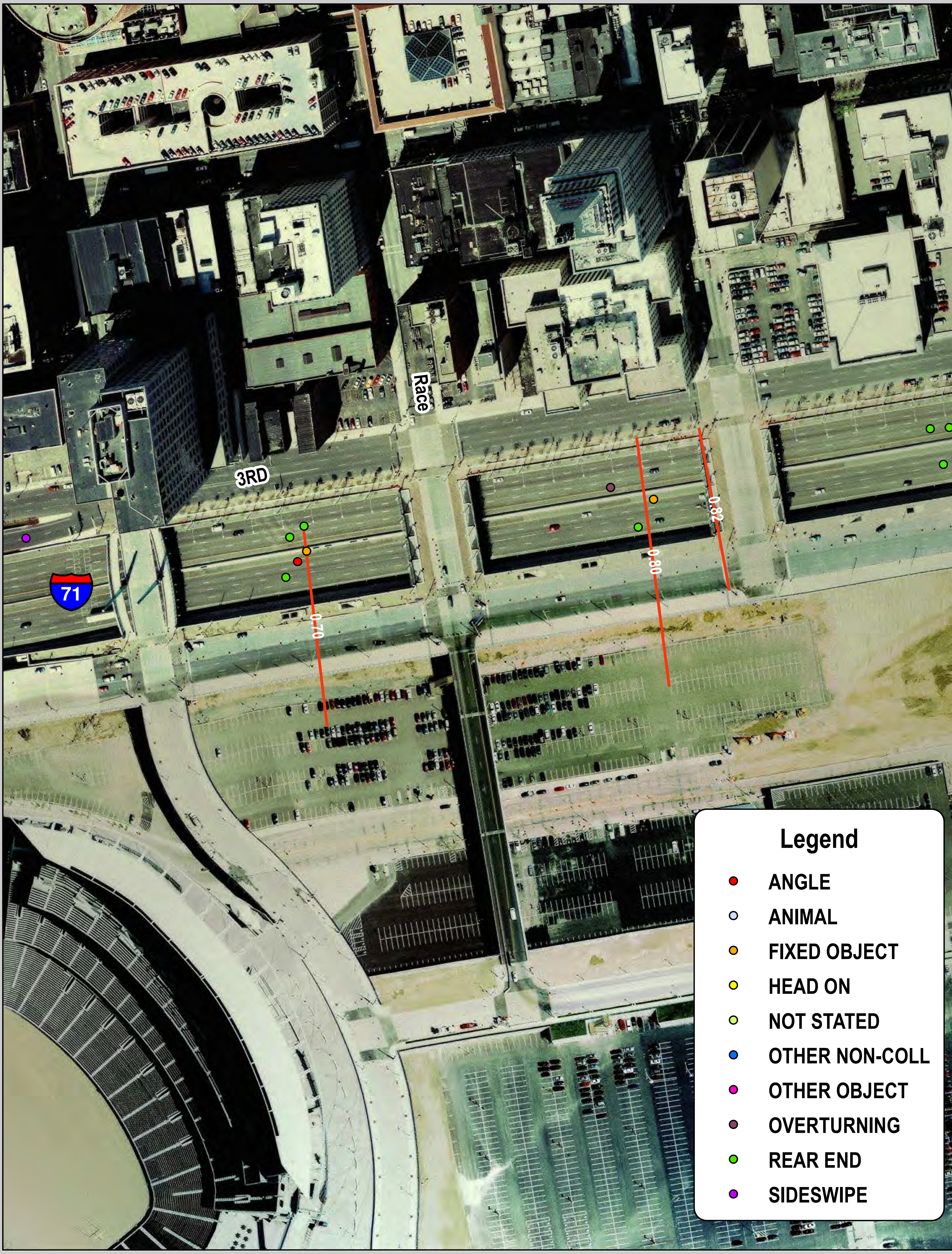
# Attachment B

I-71 Ohio GIS Plots




# Figure B-1
## Brent Spence Bridge Project
## Accident Analysis
## 2001 HAM I-71 Accidents






# Figure B-2
## Brent Spence Bridge Project
## Accident Analysis
## 2001 HAM I-71 Accidents

KENTUCKY TRANSPORTATION CABINET

STATE OF OHIO DEPARTMENT OF TRANSPORTATION

PB 100 YEARS

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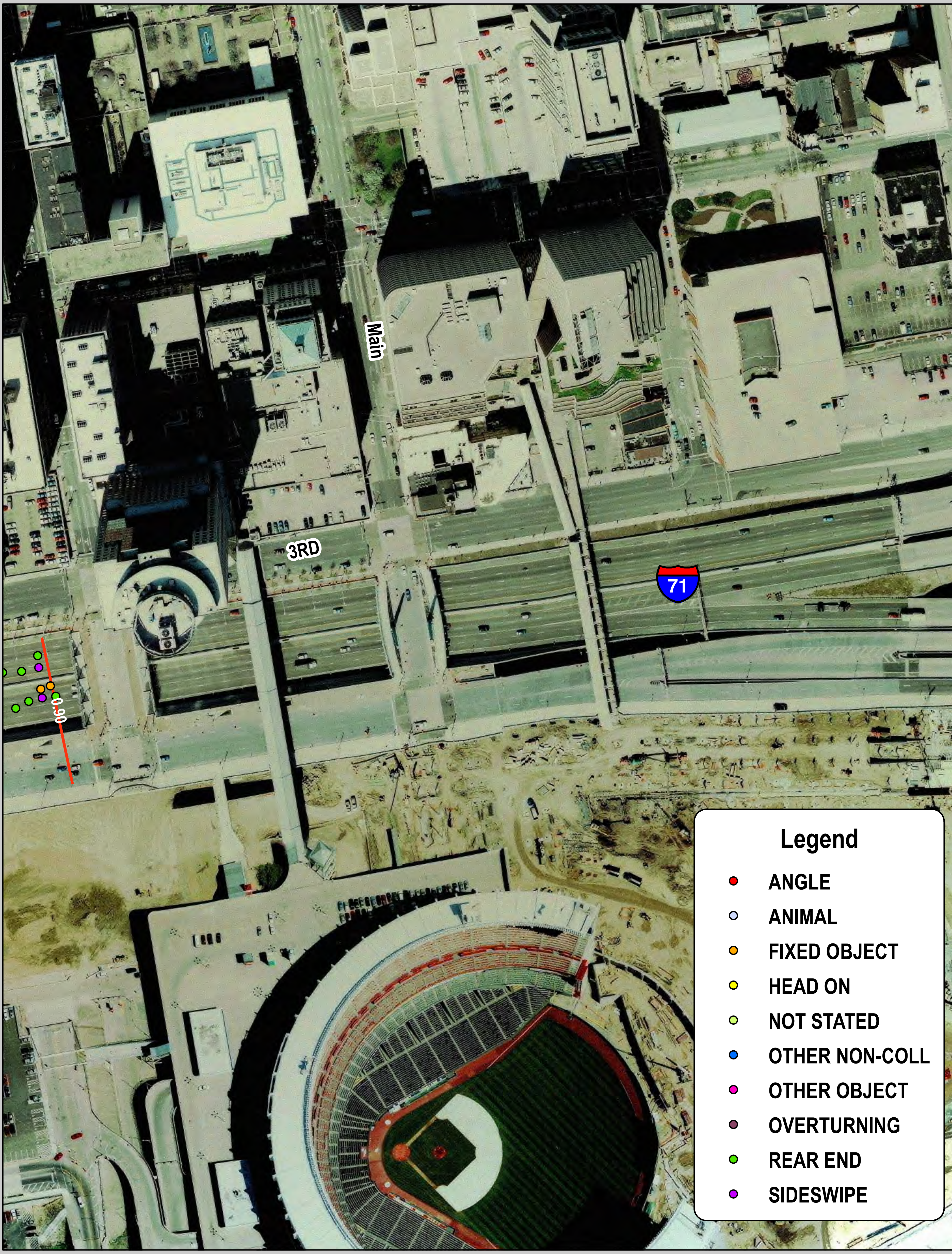


# Figure B-3
## Brent Spence Bridge Project
## Accident Analysis
## 2001 HAM I-71 Accidents

KENTUCKY TRANSPORTATION CABINET

STATE OF OHIO DEPARTMENT OF TRANSPORTATION

PB 100 YEARS

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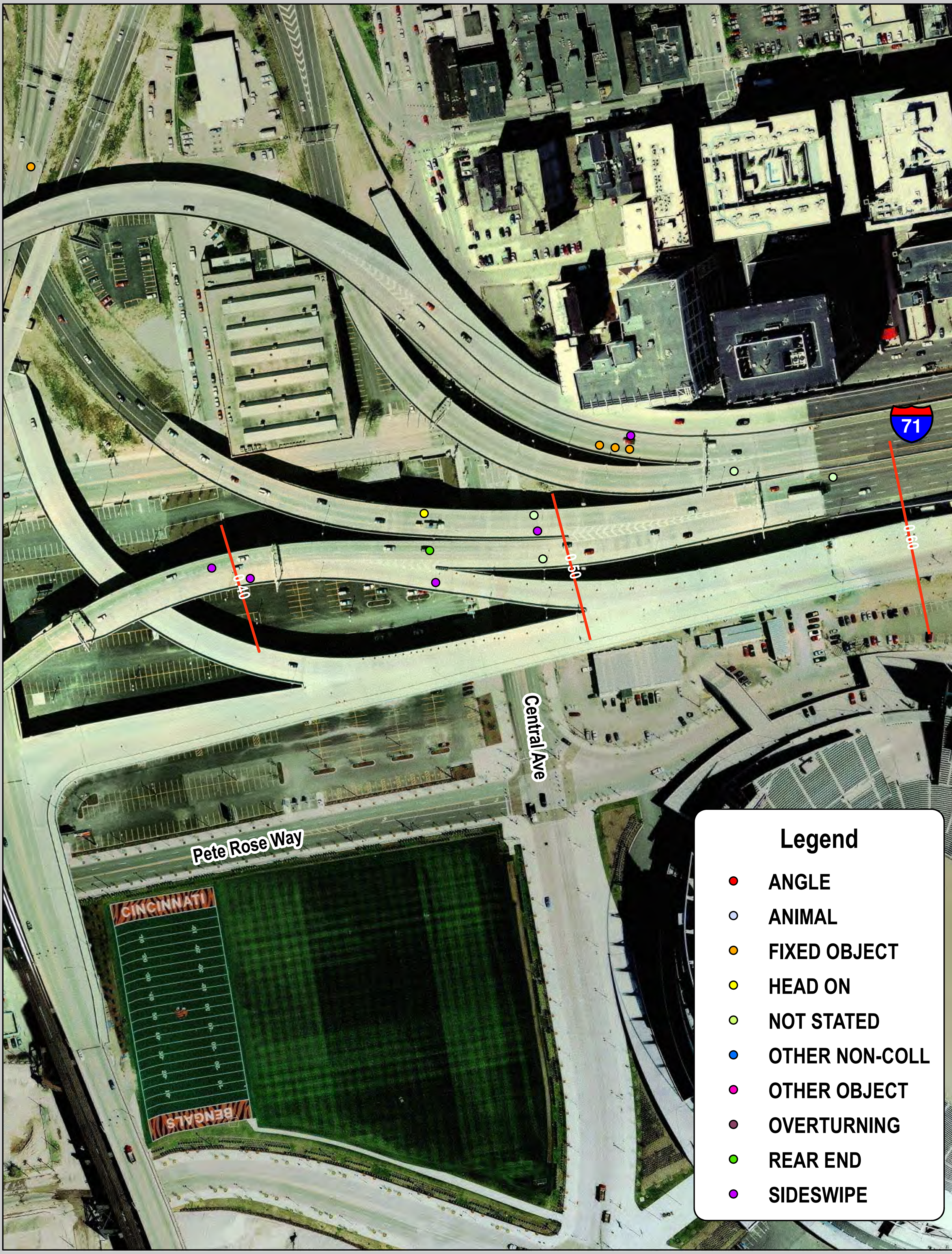


# Figure B-4
## Brent Spence Bridge Project
## Accident Analysis
## 2002 HAM I-71 Accidents

KENTUCKY TRANSPORTATION CABINET

STATE OF OHIO DEPARTMENT OF TRANSPORTATION

PB 100 YEARS

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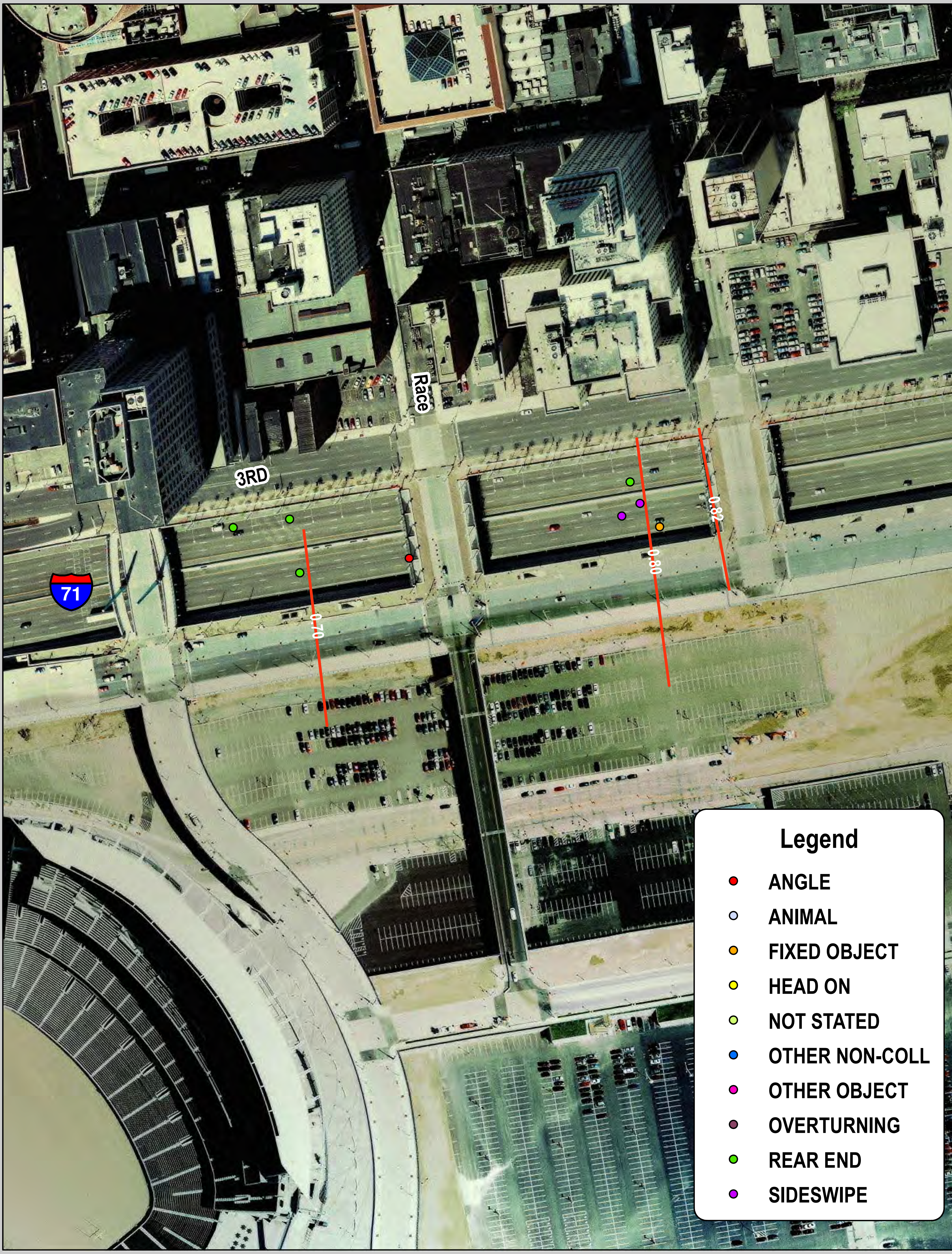


**Figure B-5**
**Brent Spence Bridge Project**
**Accident Analysis**
**2002 HAM I-71 Accidents**

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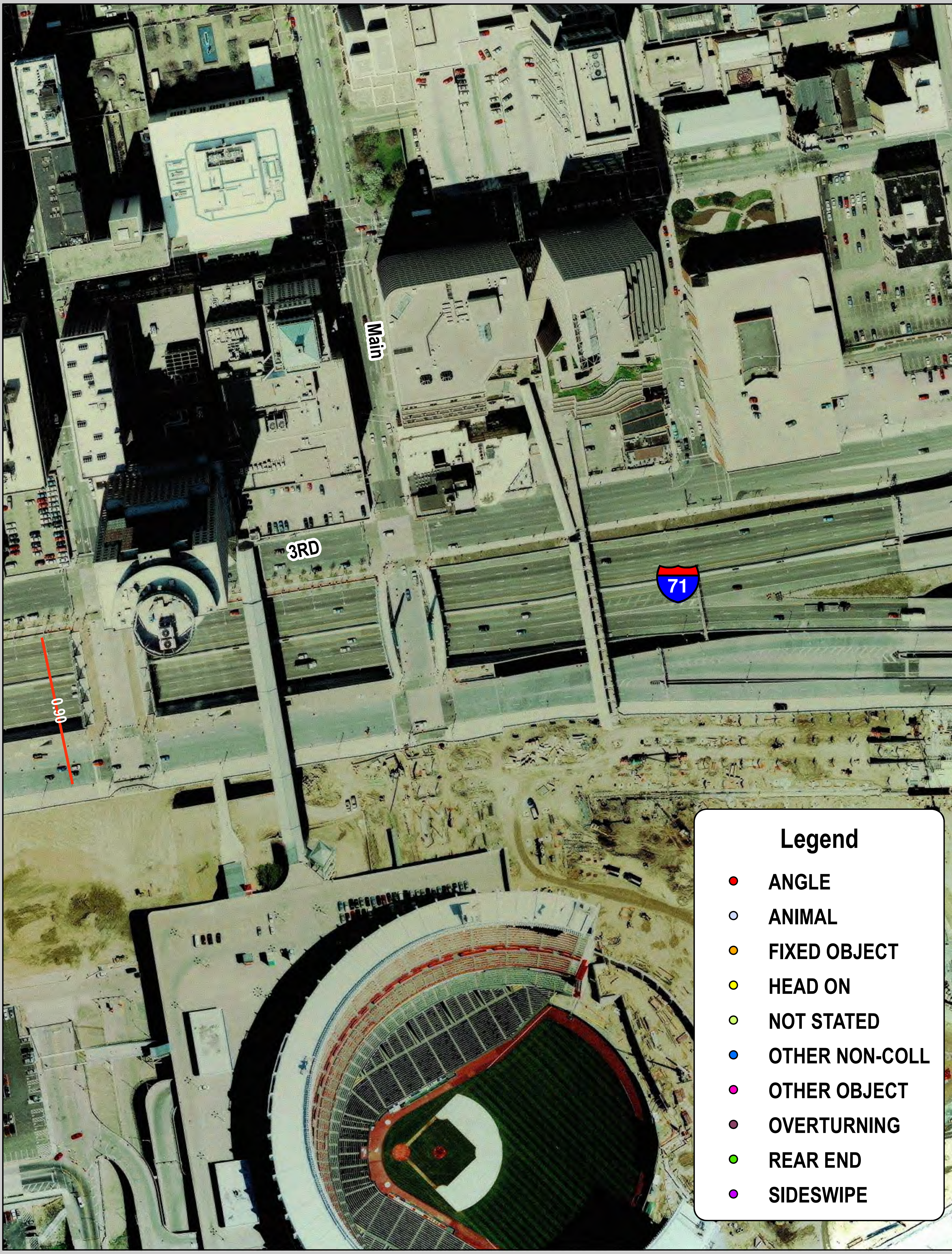


# Figure B-6
## Brent Spence Bridge Project
## Accident Analysis
## 2002 HAM I-71 Accidents

KENTUCKY TRANSPORTATION CABINET

STATE OF OHIO DEPARTMENT OF TRANSPORTATION

PB 100 YEARS

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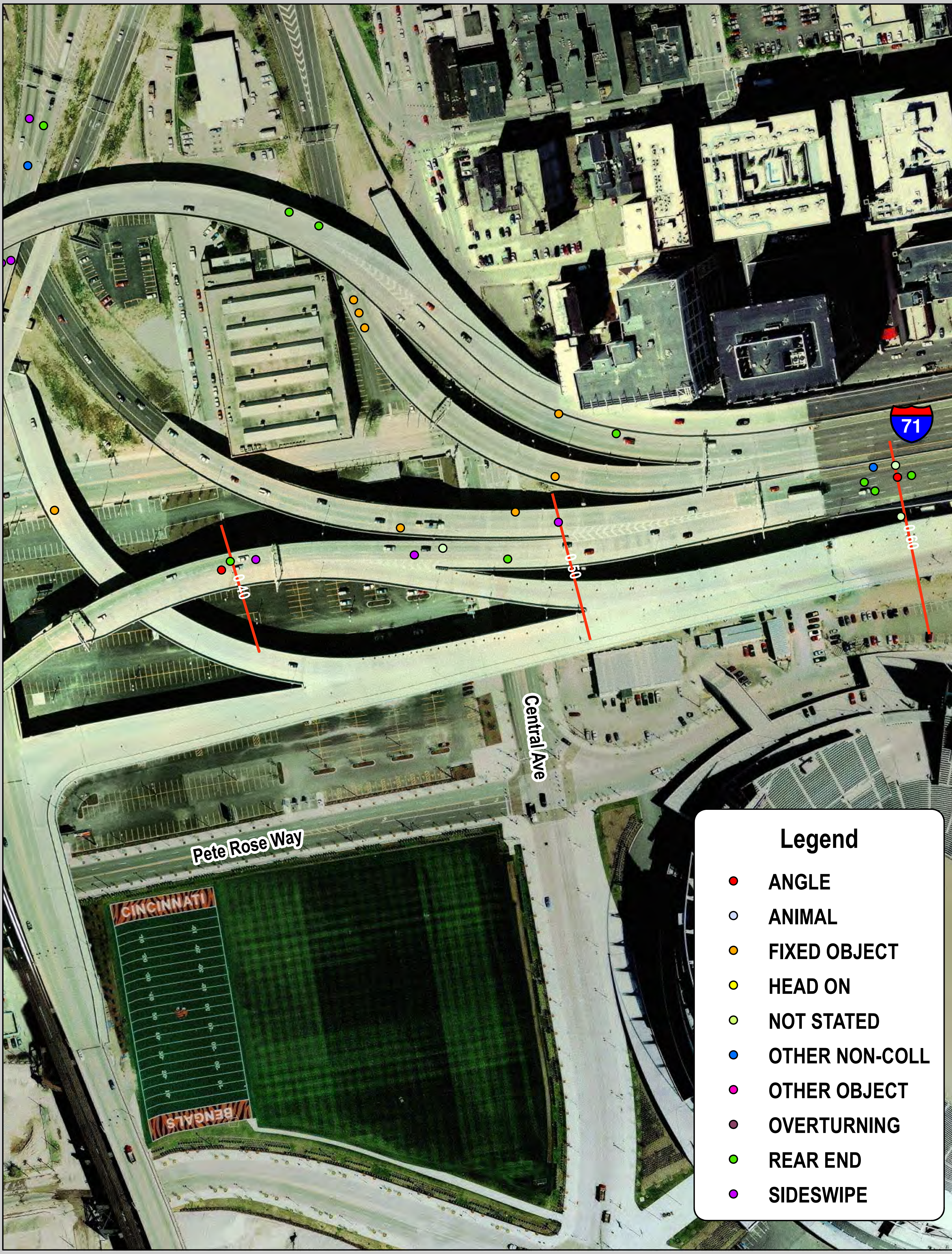
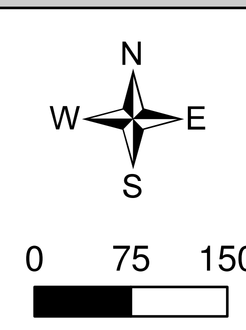



**Figure B-7**
**Brent Spence Bridge Project**
**Accident Analysis**
**2003 HAM I-71 Accidents**



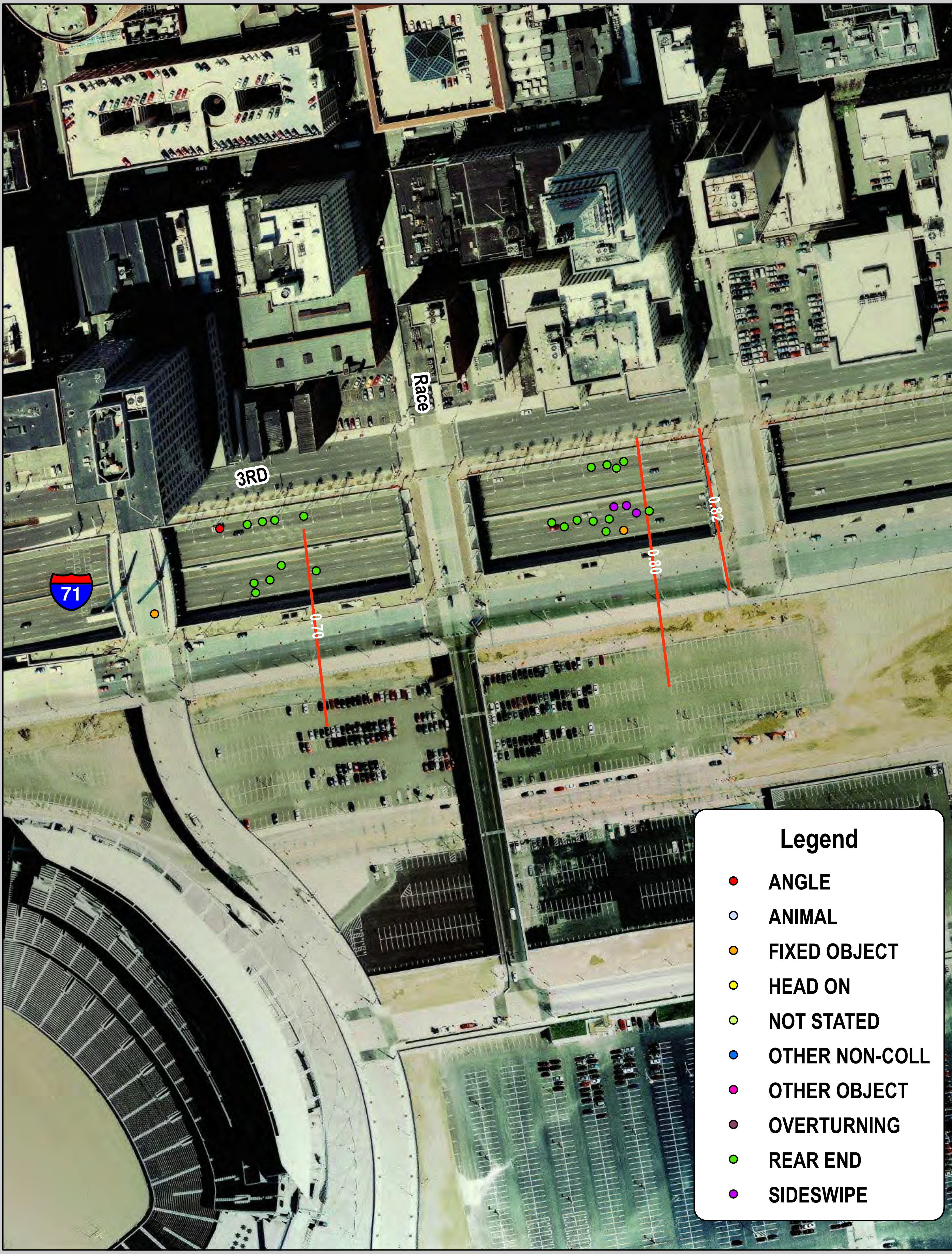
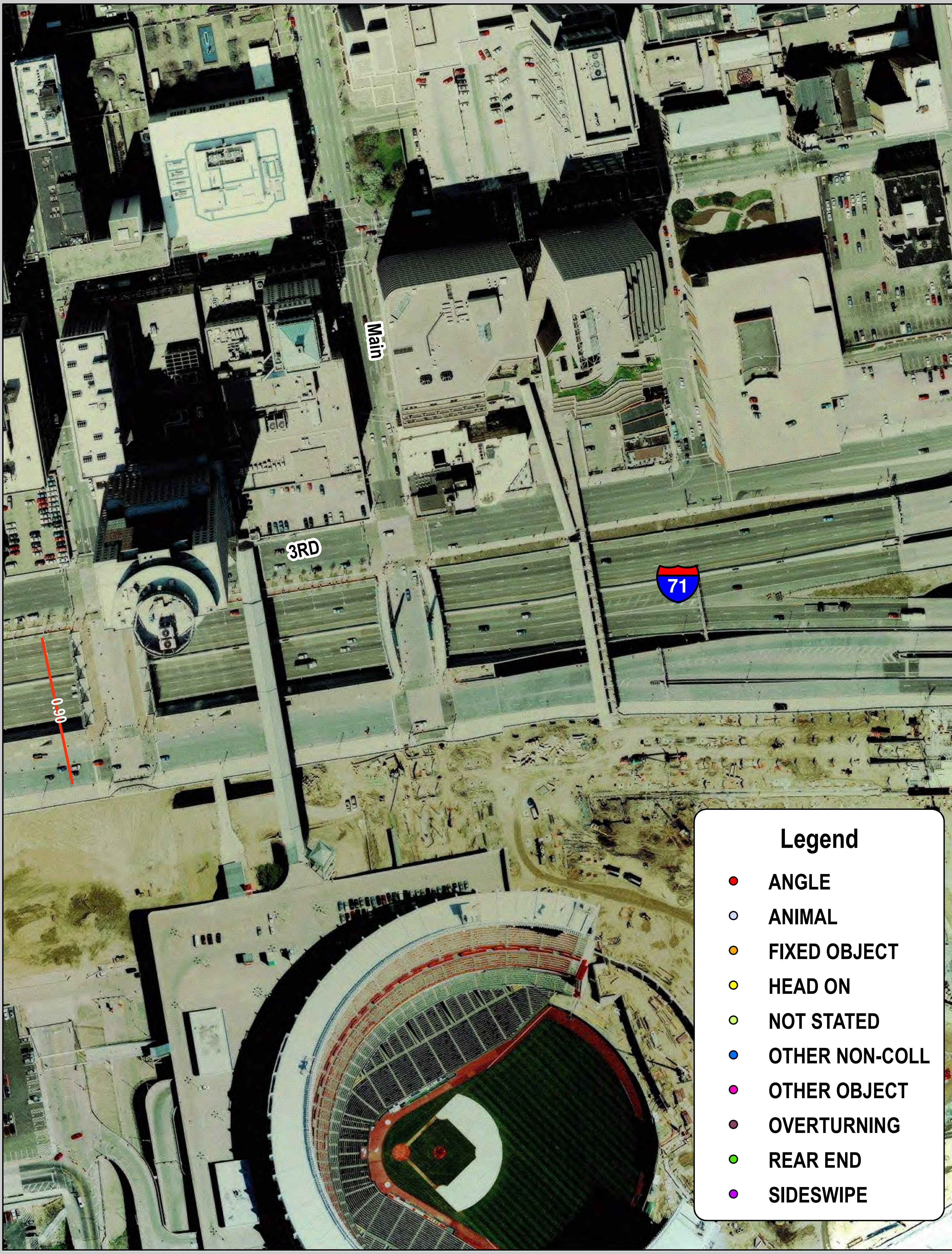



Figure B-8
Brent Spence Bridge Project
Accident Analysis
2003 HAM I-71 Accidents




# Figure B-9
# Brent Spence Bridge Project
# Accident Analysis
# 2003 HAM I-71 Accidents

KENTUCKY TRANSPORTATION CABINET

STATE OF OHIO DEPARTMENT OF TRANSPORTATION

# Attachment C

I-71/75 Kentucky GIS Plots


**Figure C-1**
**Brent Spence Bridge Project**
**Accident Analysis**
**2001 KY I-75 Accidents**


# Figure C-2
# Brent Spence Bridge Project
# Accident Analysis
# 2001 KY I-75 Accidents

KENTUCKY TRANSPORTATION CABINET

STATE OF OHIO DEPARTMENT OF TRANSPORTATION

PB 100 YEARS

N
W E
S

0 75 150
Feet


# Figure C-3
## Brent Spence Bridge Project
## Accident Analysis
## 2001 KY I-75 Accidents

N
W E
S
0 75 150
Feet


# Figure C-4
## Brent Spence Bridge Project
## Accident Analysis
## 2001 KY I-75 Accidents

KENTUCKY TRANSPORTATION CABINET

STATE OF OHIO DEPARTMENT OF TRANSPORTATION

N
W E
S
0 75 150
Feet


**Figure C-5**
**Brent Spence Bridge Project**
**Accident Analysis**
**2001 KY I-75 Accidents**


**Figure C-6**
**Brent Spence Bridge Project**
**Accident Analysis**
**2001 KY I-75 Accidents**

KENTUCKY TRANSPORTATION CABINET

STATE OF OHIO DEPARTMENT OF TRANSPORTATION

N
W E
S

0 75 150
Feet


**Figure C-7**
**Brent Spence Bridge Project**
**Accident Analysis**
**2001 KY I-75 Accidents**

N
W E
S

0 75 150
Feet


# Figure C-8
## Brent Spence Bridge Project
## Accident Analysis
## 2001 KY I-75 Accidents

N
W E
S
0 75 150
Feet


**Figure C-9**
**Brent Spence Bridge Project**
**Accident Analysis**
**2001 KY I-75 Accidents**

KENTUCKY TRANSPORTATION CABINET

STATE OF OHIO DEPARTMENT OF TRANSPORTATION

N
W E
S

0 75 150
Feet


# Figure C-10
## Brent Spence Bridge Project
## Accident Analysis
## 2001 KY I-75 Accidents

N
W E
S
0 75 150
Feet


# Figure C-11
## Brent Spence Bridge Project
## Accident Analysis
## 2001 KY I-75 Accidents

KENTUCKY TRANSPORTATION CABINET

STATE OF OHIO DEPARTMENT OF TRANSPORTATION

N
W E
S

0 75 150

Feet


Figure C-12
Brent Spence Bridge Project
Accident Analysis
2001 KY I-75 Accidents

N
W E
S
0 75 150
Feet

KENTUCKY TRANSPORTATION CABINET
STATE OF OHIO DEPARTMENT OF TRANSPORTATION
PB 100 YEARS


# Figure C-13
## Brent Spence Bridge Project
## Accident Analysis
## 2002 KY I-75 Accidents

N
W E
S

0 75 150
Feet


# Figure C-14
## Brent Spence Bridge Project
## Accident Analysis
## 2002 KY I-75 Accidents

N
W E
S

0 75 150
Feet

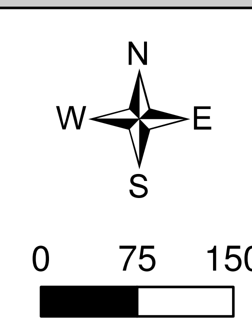

# Figure C-15
## Brent Spence Bridge Project
## Accident Analysis
## 2002 KY I-75 Accidents


# Figure C-16
# Brent Spence Bridge Project
# Accident Analysis
# 2002 KY I-75 Accidents

KENTUCKY TRANSPORTATION CABINET

STATE OF OHIO DEPARTMENT OF TRANSPORTATION

PB 100 YEARS




# Figure C-17
## Brent Spence Bridge Project
## Accident Analysis
## 2002 KY I-75 Accidents

KENTUCKY TRANSPORTATION CABINET

STATE OF OHIO DEPARTMENT OF TRANSPORTATION

100 YEARS

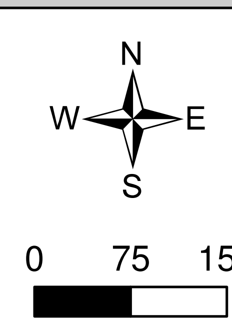

# Figure C-18
# Brent Spence Bridge Project
# Accident Analysis
# 2002 KY I-75 Accidents

KENTUCKY TRANSPORTATION CABINET

N
W E
S

0 75 150
Feet


# Figure C-19
## Brent Spence Bridge Project
## Accident Analysis
## 2002 KY I-75 Accidents




# Figure C-20
## Brent Spence Bridge Project
## Accident Analysis
## 2002 KY I-75 Accidents

KENTUCKY TRANSPORTATION CABINET

STATE OF OHIO DEPARTMENT OF TRANSPORTATION

PB 100 YEARS

N
W E
S

0 75 150
Feet


# Figure C-21
# Brent Spence Bridge Project
# Accident Analysis
# 2002 KY I-75 Accidents

KENTUCKY TRANSPORTATION CABINET

STATE OF OHIO DEPARTMENT OF TRANSPORTATION

PB 100 YEARS®

N
W E
S

0 75 150

Feet


# Figure C-22
## Brent Spence Bridge Project
## Accident Analysis
## 2002 KY I-75 Accidents

N
W E
S
0 75 150
Feet


# Figure C-23
## Brent Spence Bridge Project
## Accident Analysis
## 2002 KY I-75 Accidents

N
W E
S
0 75 150
Feet


**Figure C-24**
**Brent Spence Bridge Project**
**Accident Analysis**
**2002 KY I-75 Accidents**

KENTUCKY TRANSPORTATION CABINET

STATE OF OHIO DEPARTMENT OF TRANSPORTATION

PB 100 YEARS

N
W E
S

0 75 150
Feet


# Figure C-25
# Brent Spence Bridge Project
# Accident Analysis
# 2003 KY I-75 Accidents

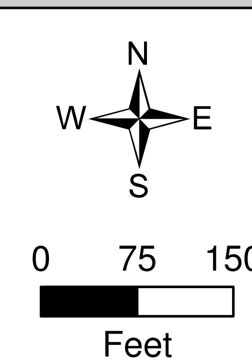
N
W E
S
0 75 150
Feet


# Figure C-26
## Brent Spence Bridge Project
## Accident Analysis
## 2003 KY I-75 Accidents

KENTUCKY TRANSPORTATION CABINET

STATE OF OHIO DEPARTMENT OF TRANSPORTATION

PB 100 YEARS




# Figure C-27
## Brent Spence Bridge Project
## Accident Analysis
## 2003 KY I-75 Accidents

KENTUCKY TRANSPORTATION CABINET

STATE OF OHIO DEPARTMENT OF TRANSPORTATION

N
W E
S

0 75 150
Feet


# Figure C-28
# Brent Spence Bridge Project
# Accident Analysis
# 2003 KY I-75 Accidents


# Figure C-29
## Brent Spence Bridge Project
## Accident Analysis
## 2003 KY I-75 Accidents

KENTUCKY TRANSPORTATION CABINET

STATE OF OHIO DEPARTMENT OF TRANSPORTATION

PB 100 YEARS

N
W E
S

0 75 150

Feet


# Figure C-30
## Brent Spence Bridge Project
## Accident Analysis
## 2003 KY I-75 Accidents

N
W
E
S
0 75 150
Feet


# Figure C-31
## Brent Spence Bridge Project
## Accident Analysis
## 2003 KY I-75 Accidents

N
W E
S
0 75 150
Feet


# Figure C-32
## Brent Spence Bridge Project
## Accident Analysis
## 2003 KY I-75 Accidents


# Figure C-33
## Brent Spence Bridge Project
## Accident Analysis
## 2003 KY I-75 Accidents

KENTUCKY TRANSPORTATION CABINET

STATE OF OHIO DEPARTMENT OF TRANSPORTATION

PB 100 YEARS

N
W E
S

0 75 150
Feet


# Figure C-34
## Brent Spence Bridge Project
## Accident Analysis
## 2003 KY I-75 Accidents

KENTUCKY TRANSPORTATION CABINET

STATE OF OHIO DEPARTMENT OF TRANSPORTATION

PB 100 YEARS

N
W E
S

0 75 150
Feet


# Figure C-35
## Brent Spence Bridge Project
## Accident Analysis
## 2003 KY I-75 Accidents

N
W E
S

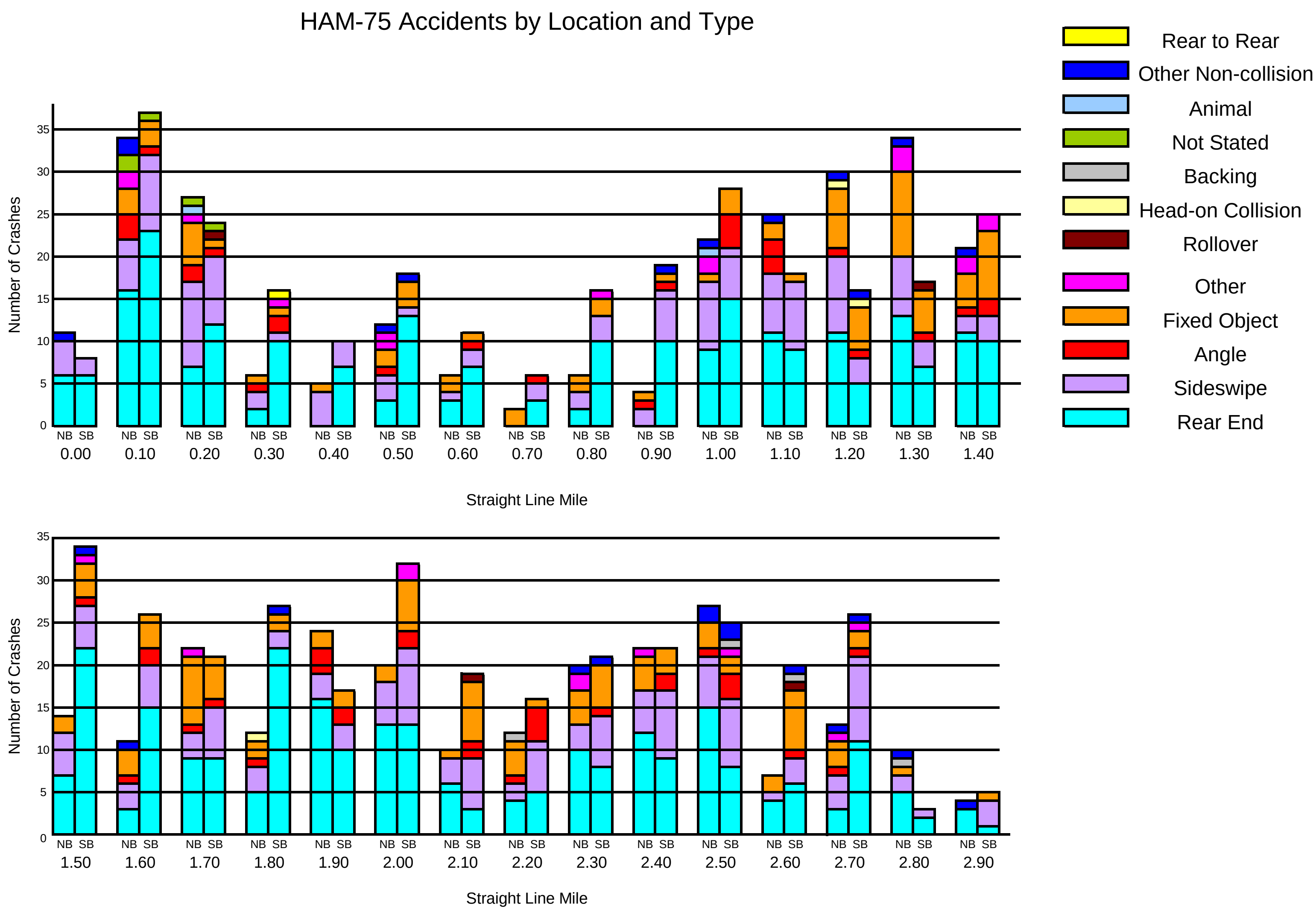
0 75 150
Feet


**Figure C-36**
**Brent Spence Bridge Project**
**Accident Analysis**
**2003 KY I-75 Accidents**

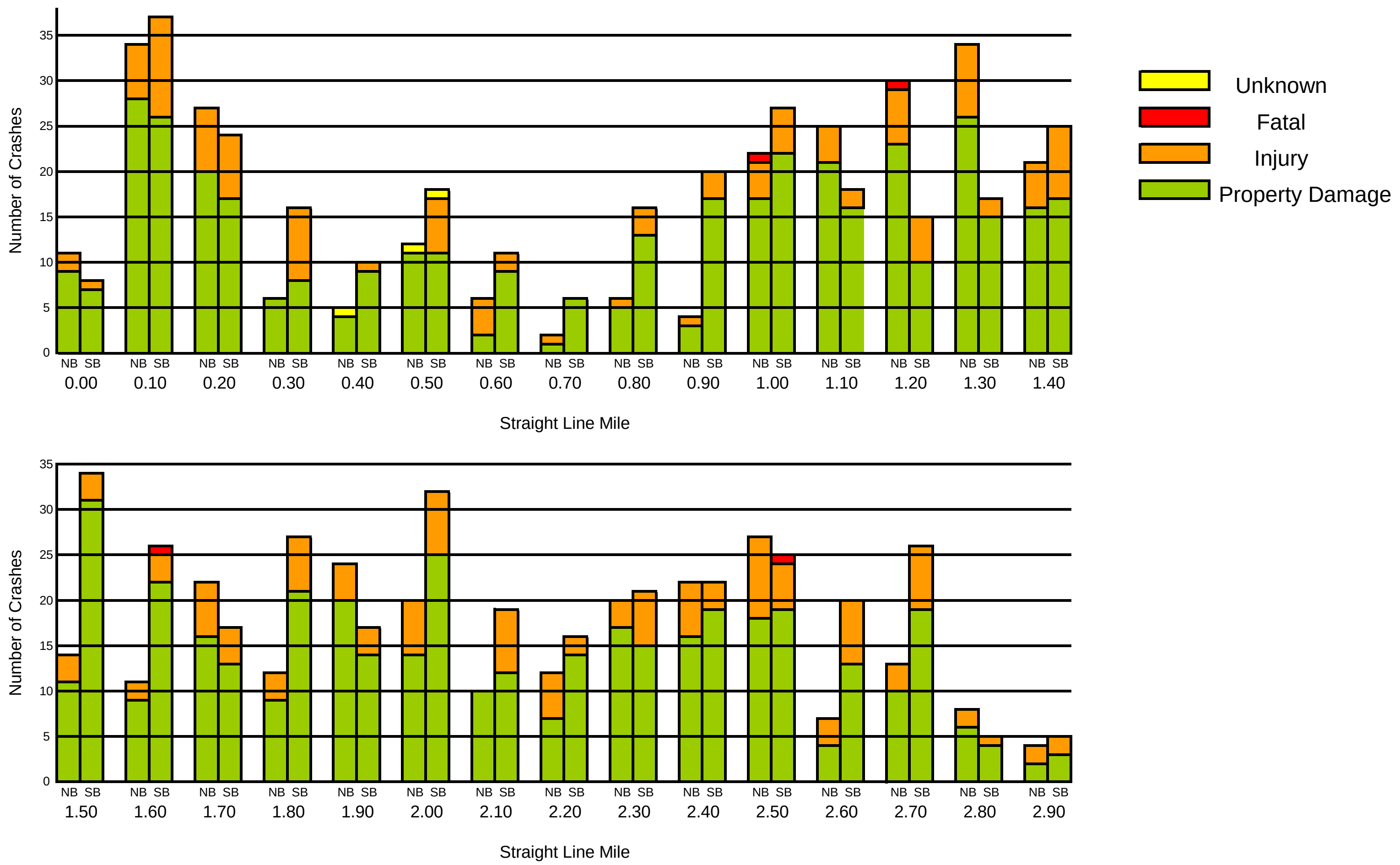
KENTUCKY TRANSPORTATION CABINET

# Attachment D

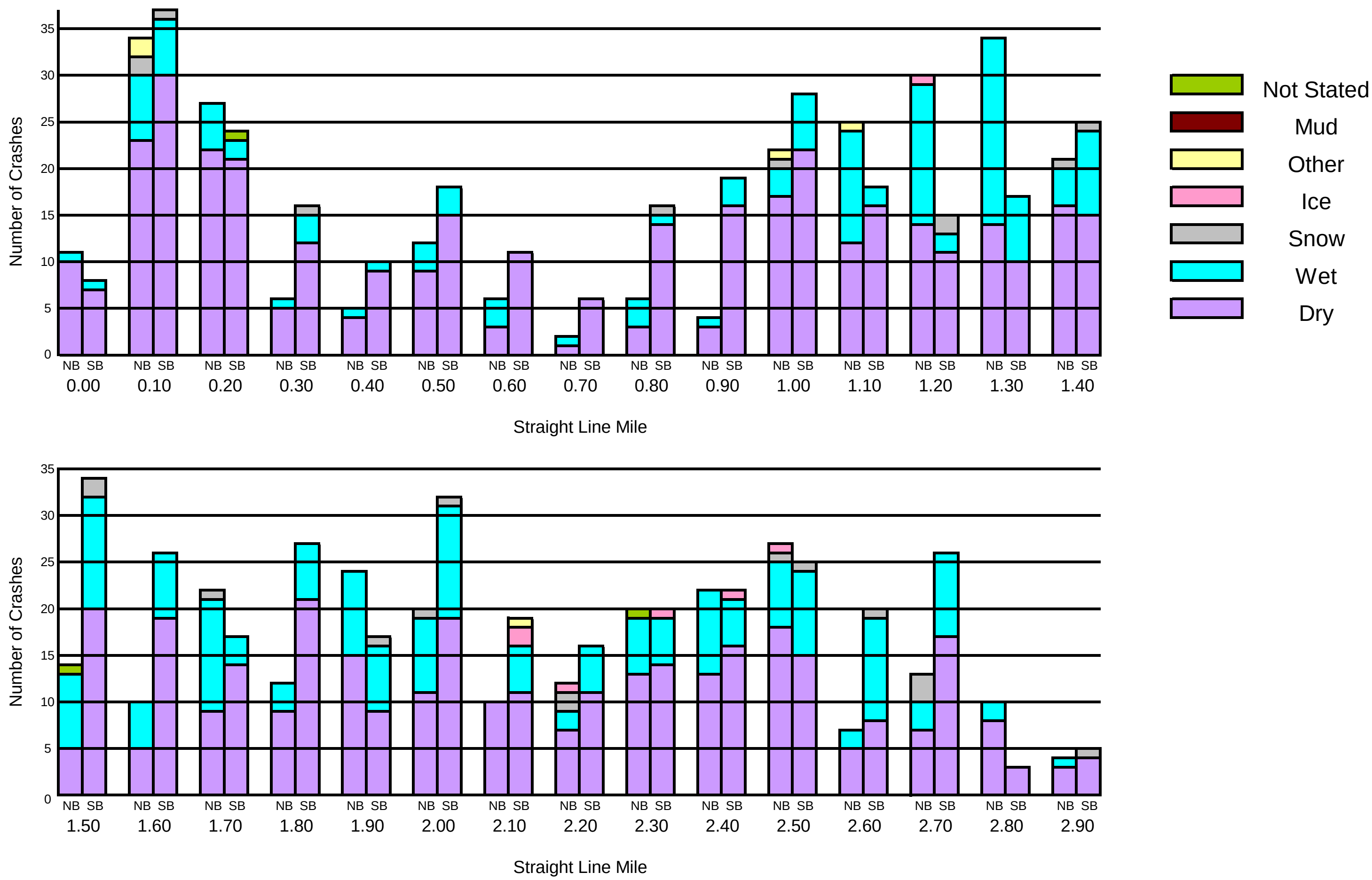
Graphs

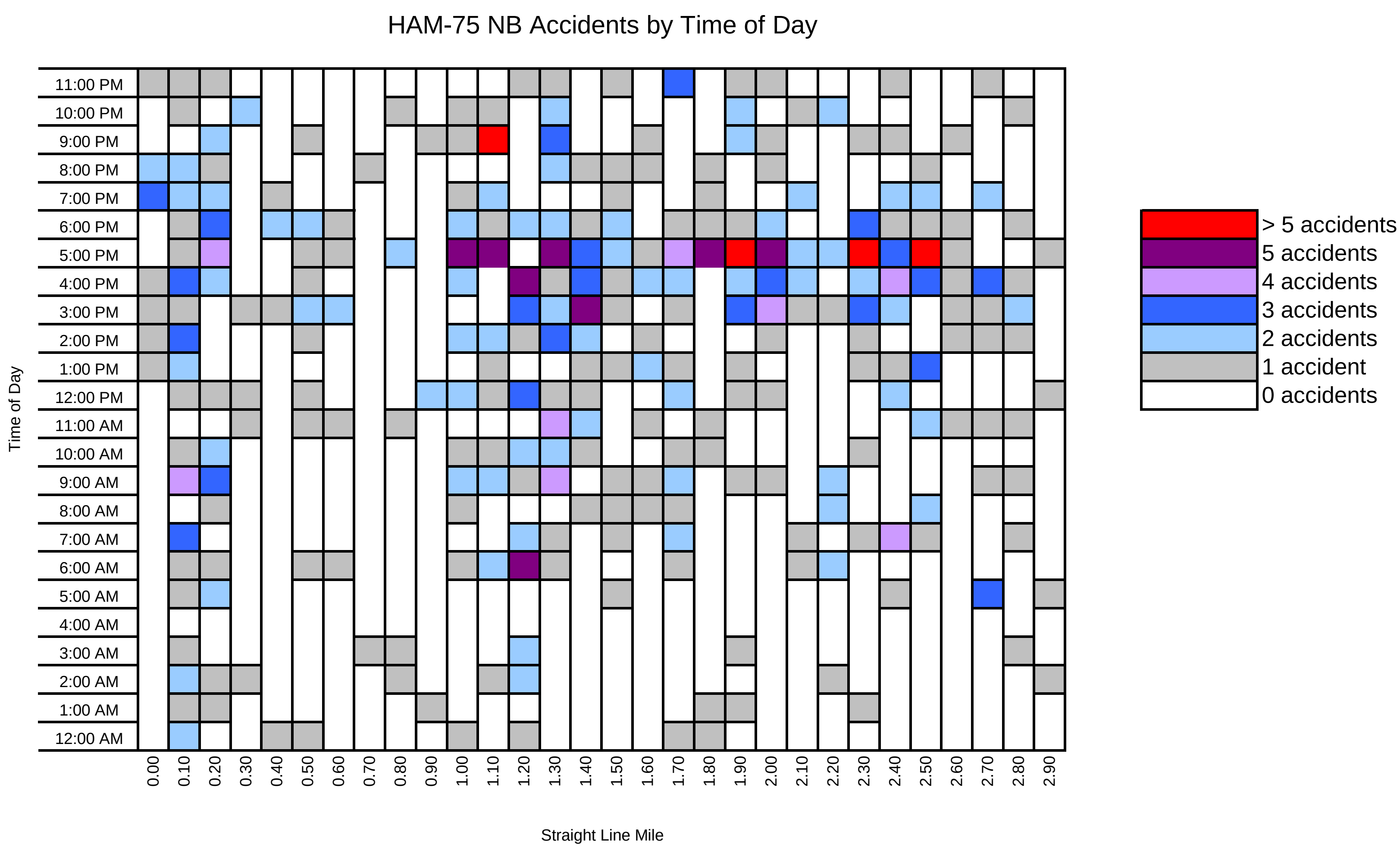

HAM-75 Accidents by Location and Type
Rear to Rear
Other Non-collision
Animal
Not Stated
Backing
Head-on Collision
Rollover
Other
Fixed Object
Angle
Sideswipe
Rear End
Number of Crashes
0
5
10
15
20
25
30
35
NB SB
0.00
0.10
0.20
0.30
0.40
0.50
0.60
0.70
0.80
0.90
1.00
1.10
1.20
1.30
1.40
Straight Line Mile
Number of Crashes
1.50
1.60
1.70
1.80
1.90
2.00
2.10
2.20
2.30
2.40
2.50
2.60
2.70
2.80
2.90
Straight Line Mile

HAM-75 Accidents by Location and Severity



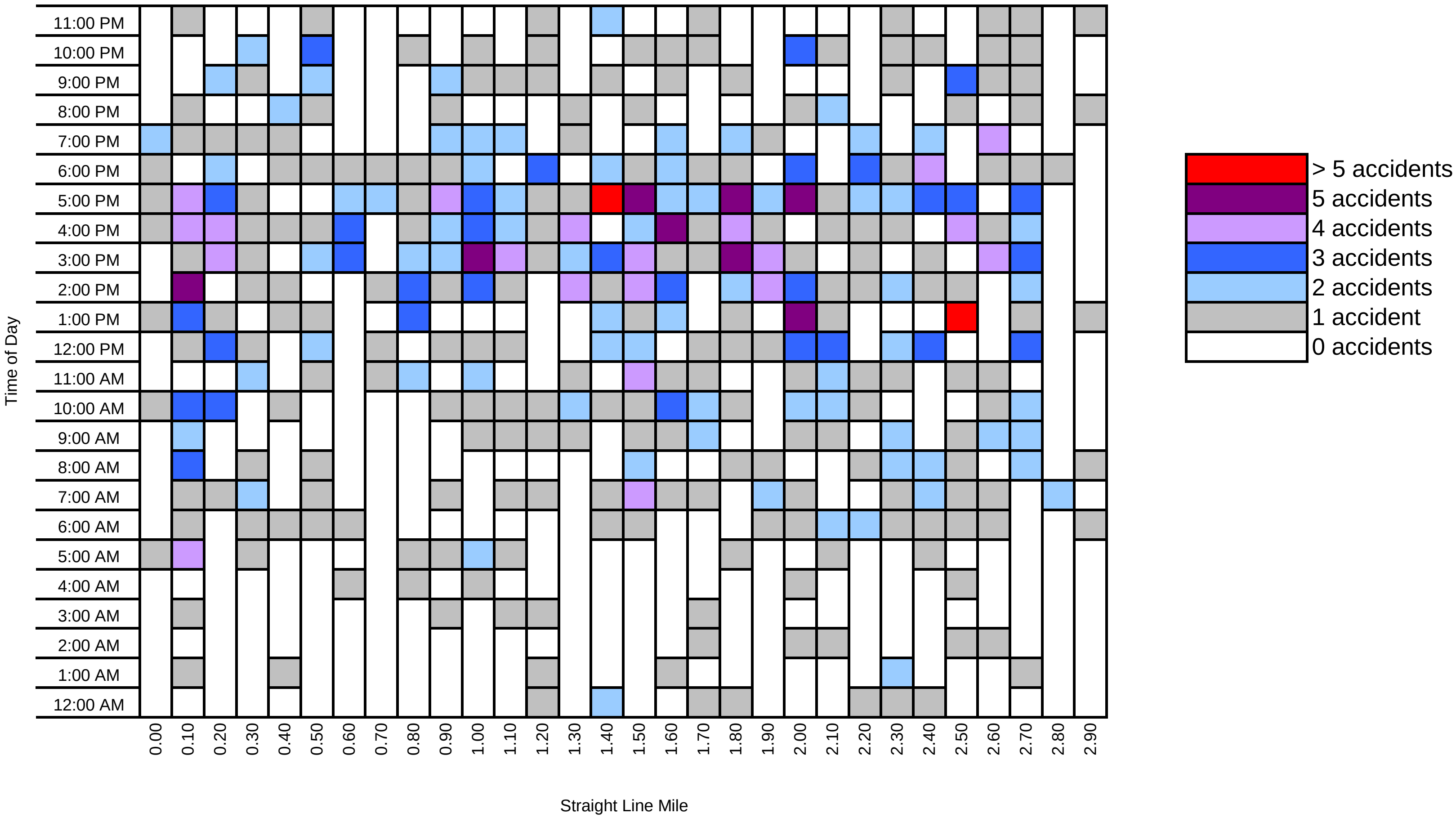
HAM-75 Accidents by Location and Road Condition



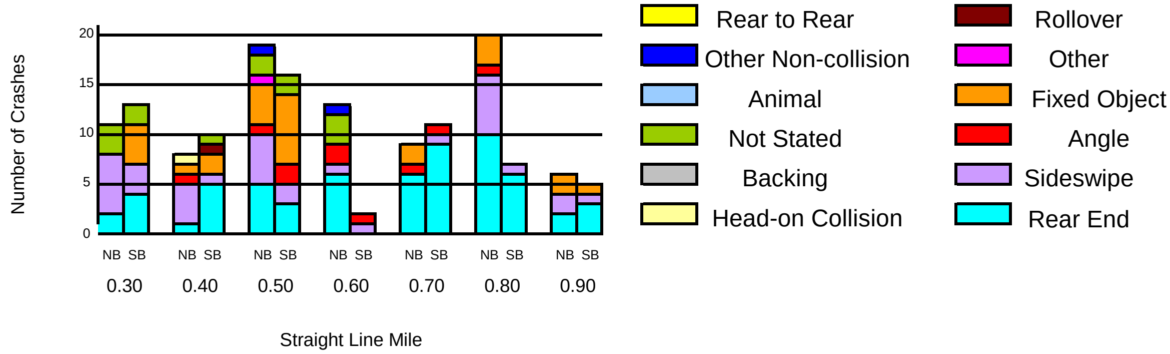


HAM-75 NB Accidents by Time of Day
Time of Day
11:00 PM
10:00 PM
9:00 PM
8:00 PM
7:00 PM
6:00 PM
5:00 PM
4:00 PM
3:00 PM
2:00 PM
1:00 PM
12:00 PM
11:00 AM
10:00 AM
9:00 AM
8:00 AM
7:00 AM
6:00 AM
5:00 AM
4:00 AM
3:00 AM
2:00 AM
1:00 AM
12:00 AM
0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.80 0.90 1.00 1.10 1.20 1.30 1.40 1.50 1.60 1.70 1.80 1.90 2.00 2.10 2.20 2.30 2.40 2.50 2.60 2.70 2.80 2.90
Straight Line Mile
> 5 accidents
5 accidents
4 accidents
3 accidents
2 accidents
1 accident
0 accidents

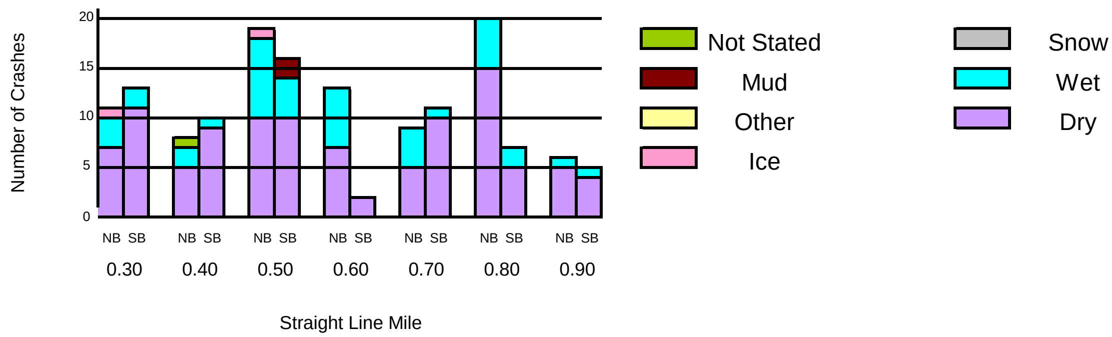
HAM-75 SB Accidents by Time of Day



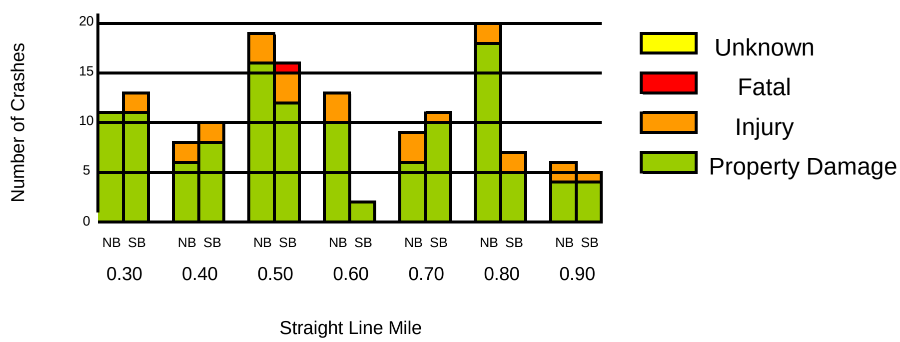
HAM-71 Accidents by Location and Type



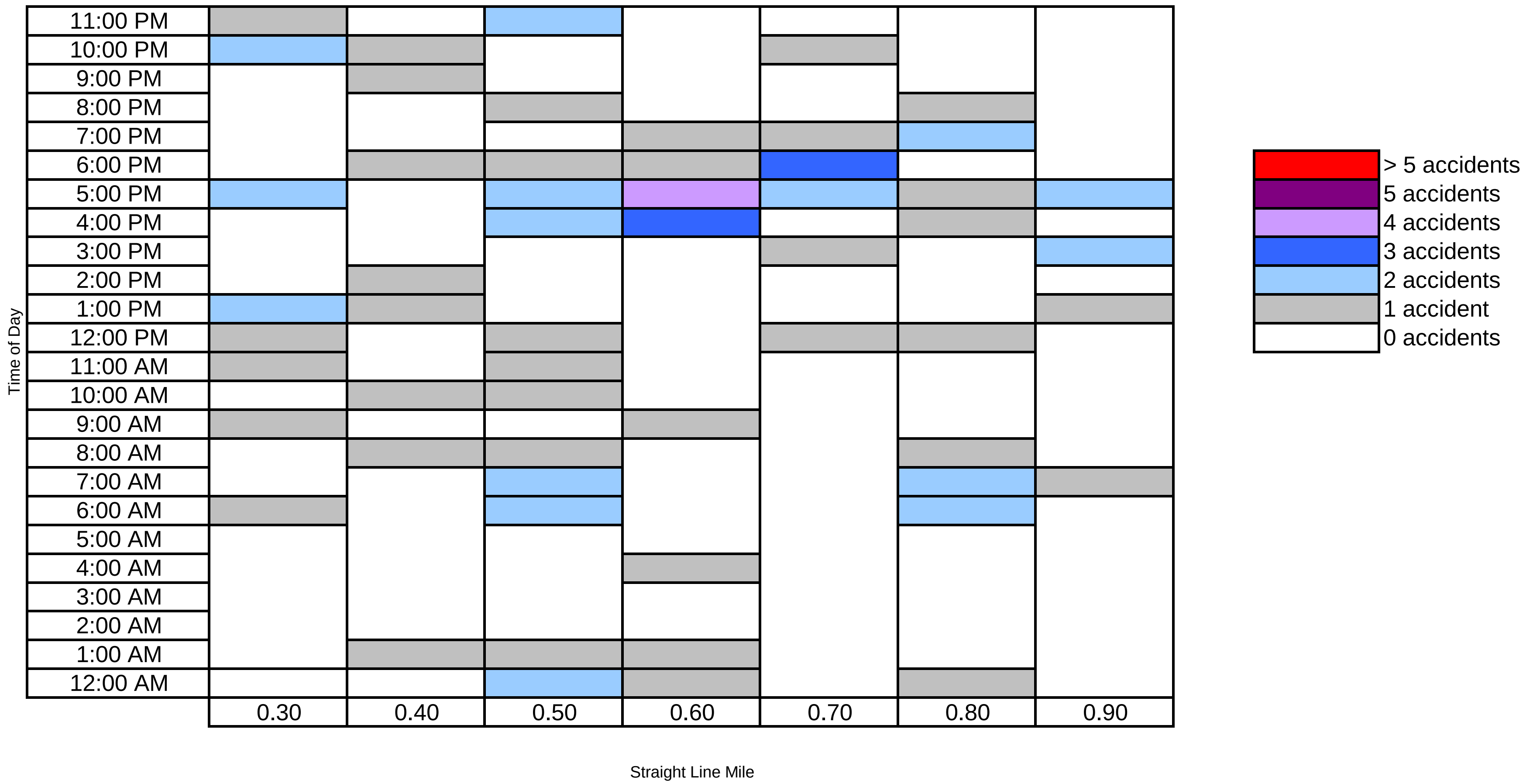

HAM-71 Accidents by Location and Road Condition



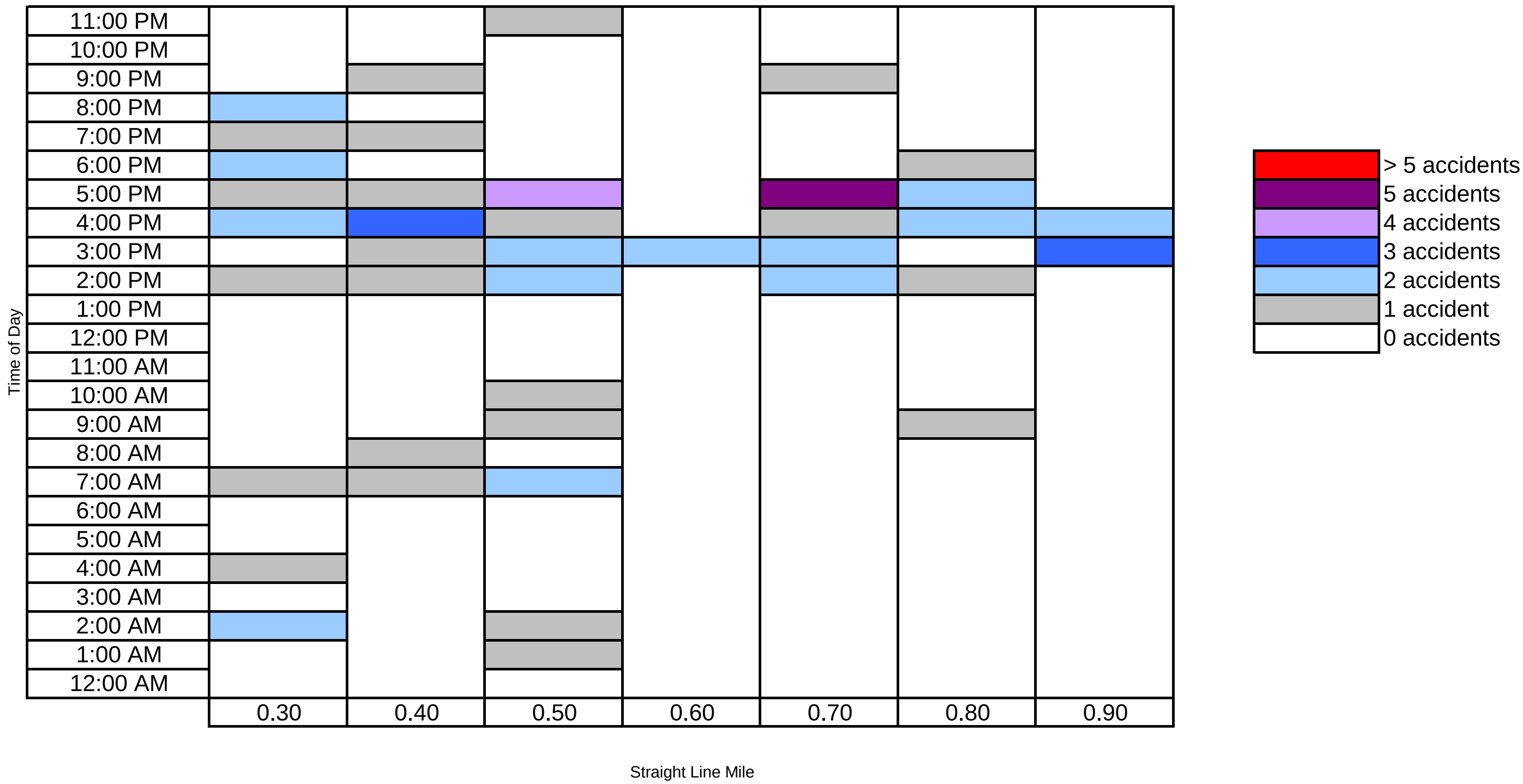

HAM-71 Accidents by Location and Severity



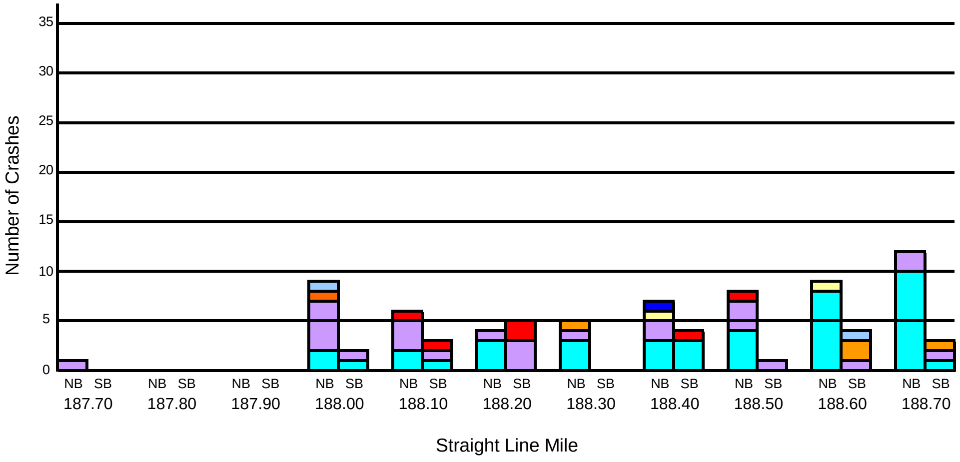
HAM-71 NB Accidents by Time of Day

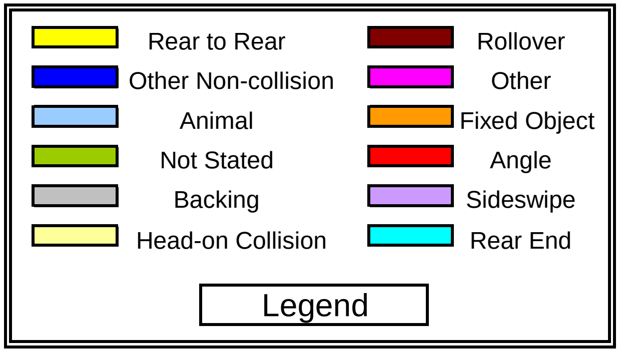


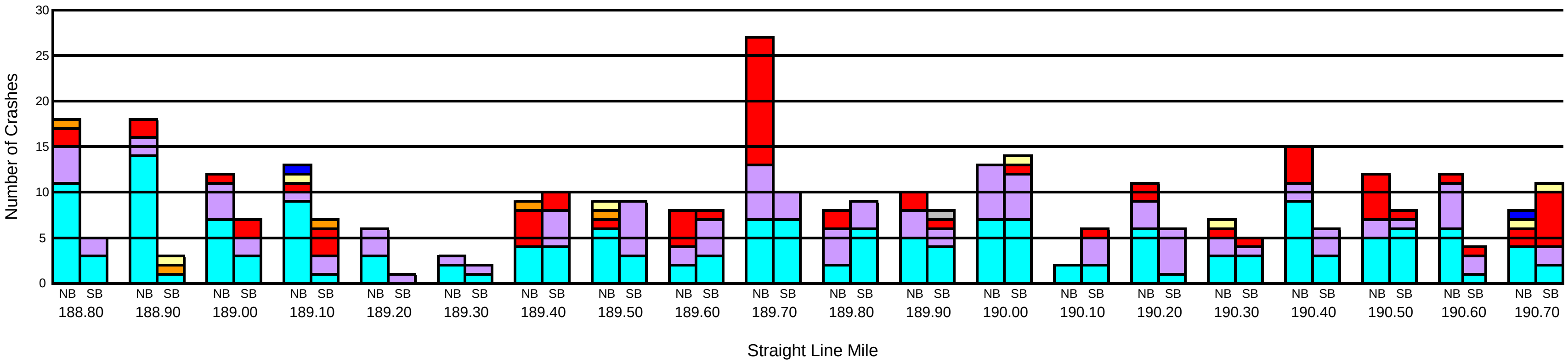
HAM-71 SB Accidents by Time of Day



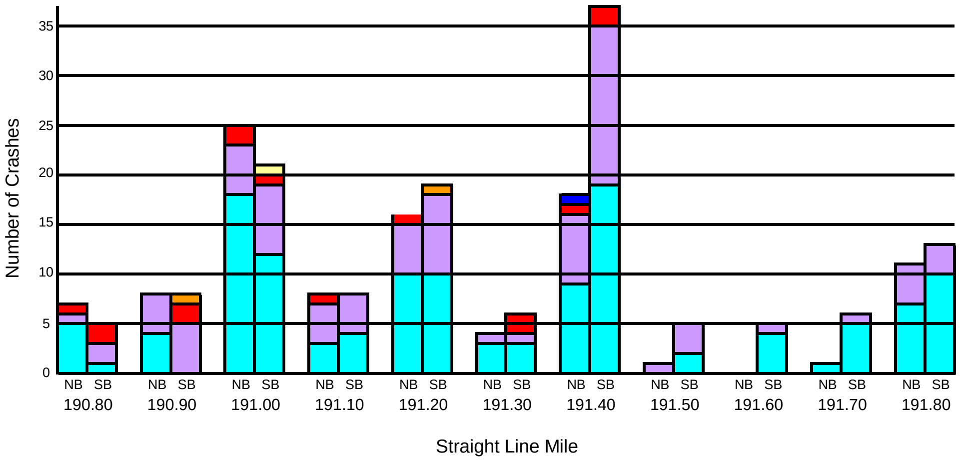
# KY-75 Accidents by Location and Type

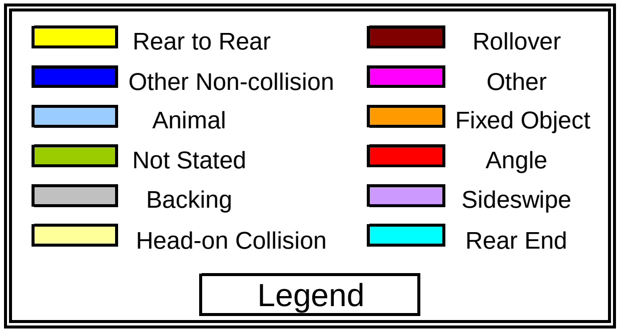


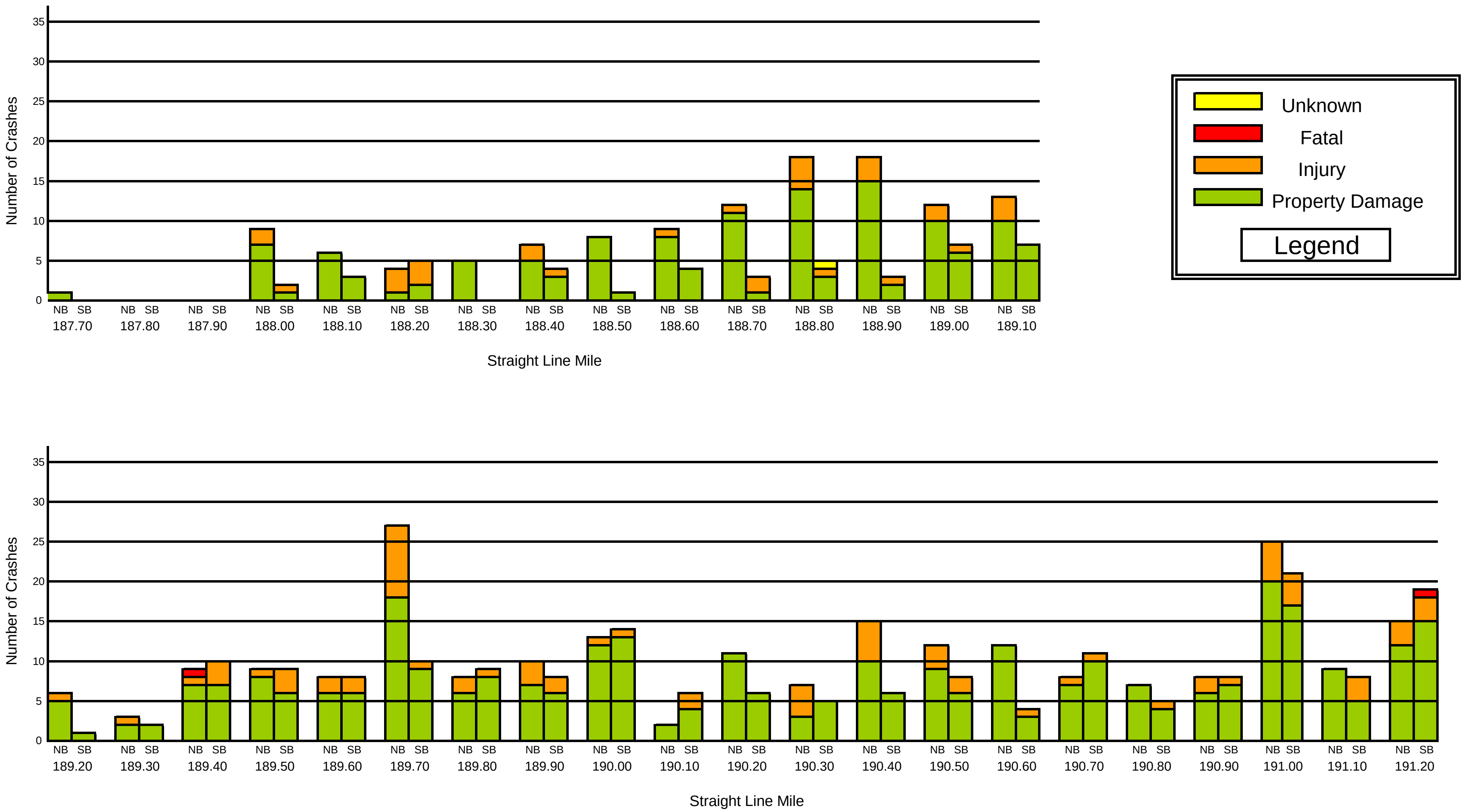



KY-75 Accidents by Location and Type Continued

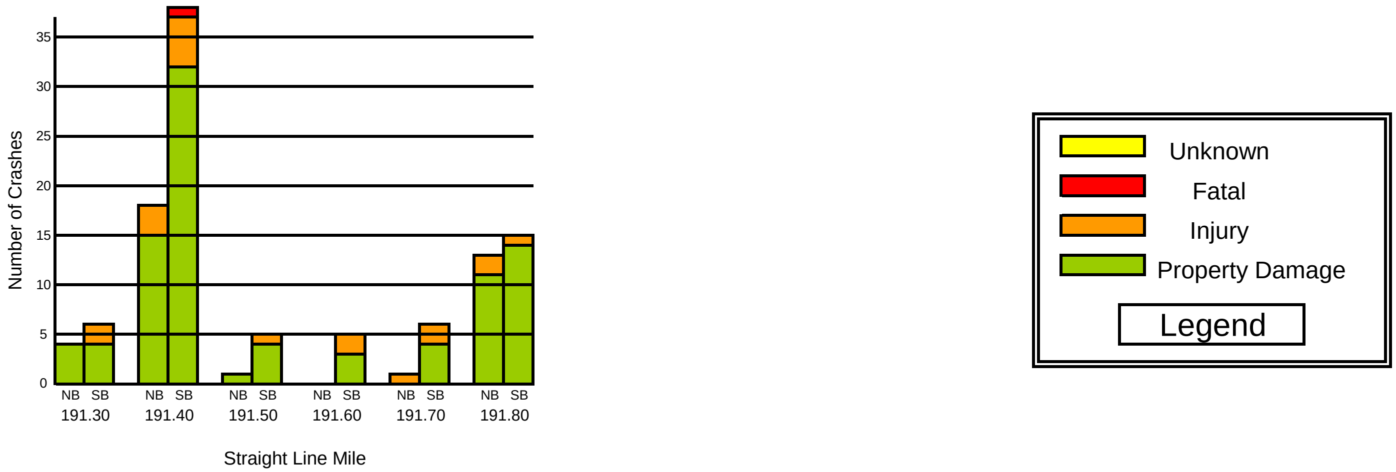


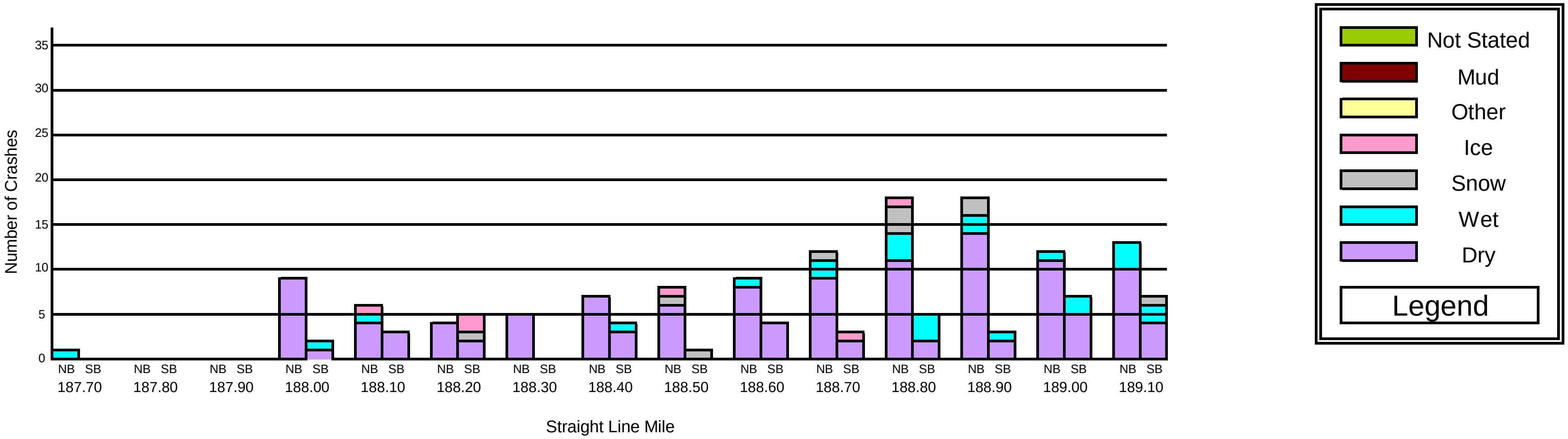
KY-75 Accidents by Location and Severity

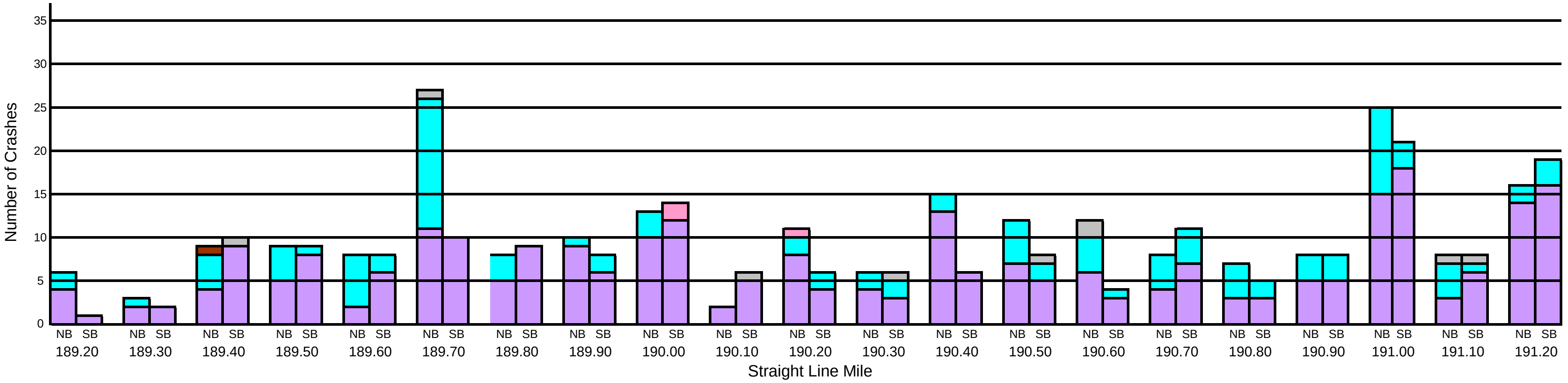


KY-75 Accidents by Location and Severity Continued

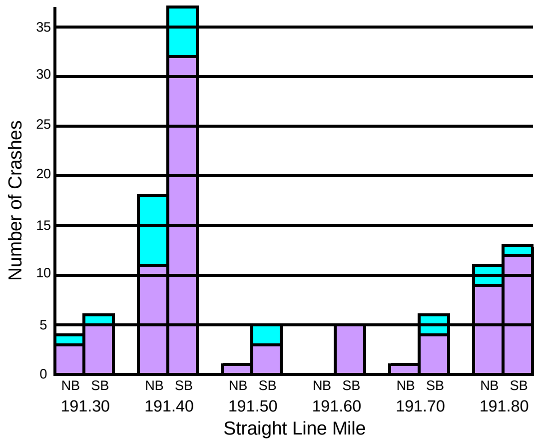


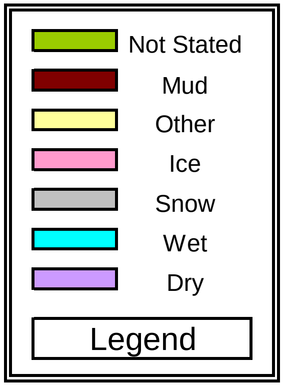
KY-75Accidents by Location and Road Condition



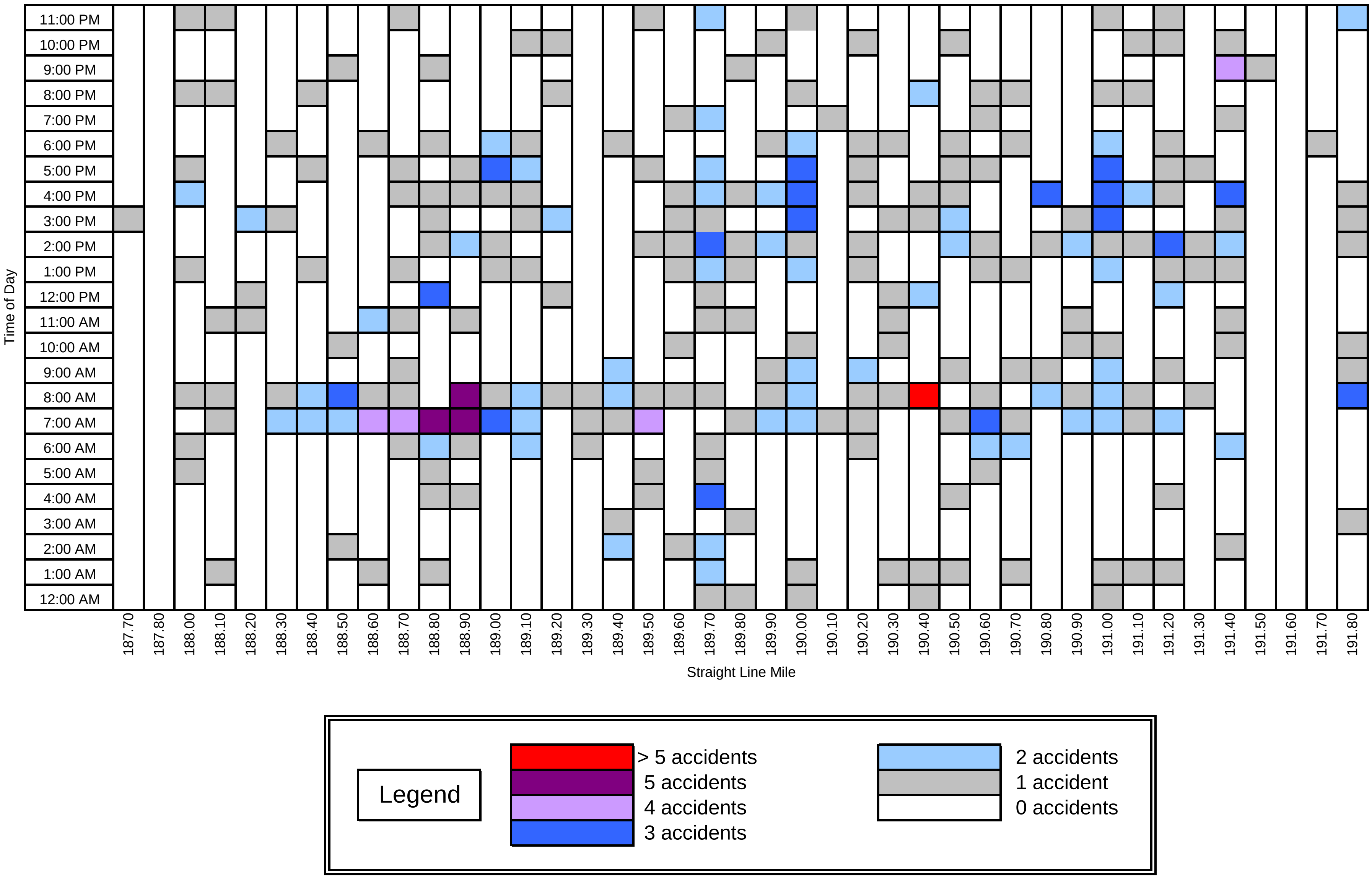



KY-75Accidents by Location and Road Condition Continued

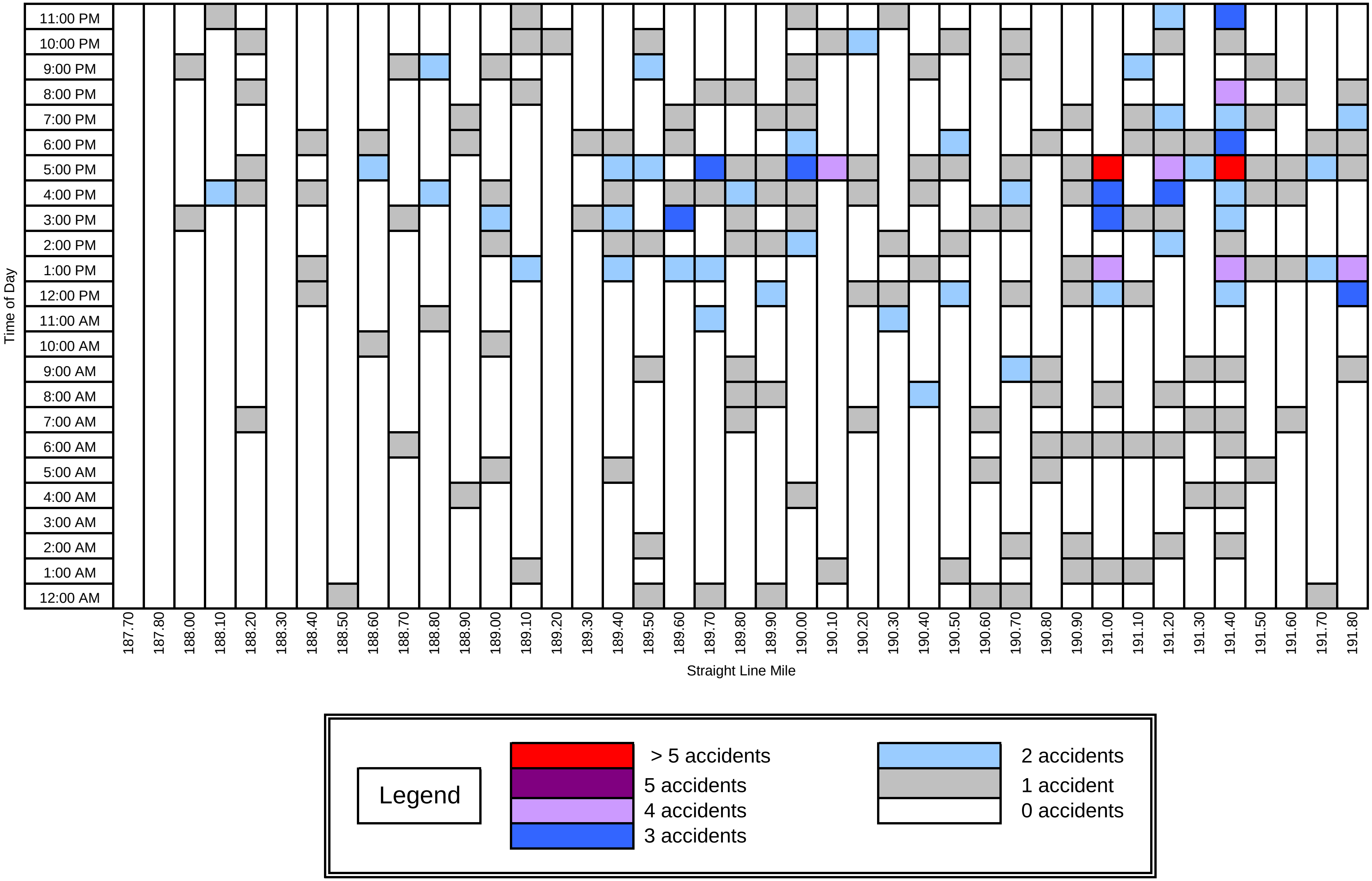


# KY-75 NB Accidents by Time of Day



KY-75 SB Accidents by Time of Day



# Attachment E

Tables

TABLE 3. STATEWIDE URBAN CRASH RATES BY HIGHWAY TYPE CLASSIFICATION (2000-2004)

| HIGHWAY TYPE | TOTAL MILEAGE* | AADT | CRASH RATES (CRASHES PER 100 MVM) ALL | INJURY | FATAL |
|---|---|---|---|---|---|
| Two-Lane | 2,183 | 6,580 | 273 | 64 | 0.9 |
| Three-Lane | 33 | 11,370 | 492 | 86 | 1.3 |
| Four-Lane Divided (Non-Interstate or Parkway) | 394 | 24,200 | 281 | 67 | 0.9 |
| Four-Lane Undivided | 289 | 19,630 | 458 | 101 | 1.2 |
| Interstate | 251 | 66,410 | 93 | 20 | 0.4 |
| Parkway | 47 | 12,260 | 108 | 22 | 0.9 |
| All ** | 3,227 | 14,920 | 239 | 54 | 0.8 |

* Average for the five years.

** Includes small number of one-, five-, and six-lane highways.

TABLE 4. COMPARISON OF 2000 - 2004 CRASH RATES BY RURAL AND URBAN HIGHWAY TYPE CLASSIFICATION

| LOCATION | HIGHWAY TYPE | 2000 | 2001 | 2002 | 2003 | 2000-2003 Average | 2004 | Percent Change* |
|---|---|---|---|---|---|---|---|---|
| Rural | One-Lane | 285 | 324 | 259 | 228 | 274 | 321 | 17.3 |
| | Two-Lane | 255 | 248 | 247 | 238 | 247 | 231 | -6.5 |
| | Three-Lane | 142 | 142 | 193 | 163 | 160 | 75 | -53.1 |
| | Four-Lane Divided (Non-Interstate or Parkway) | 124 | 130 | 128 | 119 | 125 | 111 | -11.2 |
| | Four-Lane Undivided | 341 | 270 | 256 | 232 | 275 | 200 | -27.2 |
| | Interstate | 51 | 48 | 50 | 56 | 51 | 56 | 10.1 |
| | Parkway | 61 | 64 | 63 | 70 | 65 | 66 | 2.1 |
| | All | 177 | 173 | 172 | 168 | 173 | 160 | -7.6 |
| Urban | Two-Lane | 333 | 268 | 268 | 263 | 283 | 242 | -14.6 |
| | Three-Lane | 547 | 449 | 475 | 476 | 487 | 502 | 3.0 |
| | Four-Lane Divided | 323 | 247 | 293 | 287 | 288 | 256 | -11.1 |
| | Four-Lane Undivided | 546 | 434 | 486 | 447 | 478 | 387 | -19.0 |
| | Interstate | 98 | 91 | 88 | 93 | 93 | 94 | 2.0 |
| | Parkway | 98 | 115 | 110 | 112 | 109 | 105 | -3.2 |
| | All | 278 | 226 | 240 | 233 | 244 | 219 | -10.2 |

* Percent change from 2000 through 2003 to 2004.

*Source: Kentucky Transportation Center College of Engineering "Analysis of Traffic Crash Data in Kentucky (2000-2004)" report.

TABLE B-9. CRITICAL CRASH RATES FOR 0.1 MILE "SPOTS" ON URBAN TWO-LANE AND THREE-LANE HIGHWAYS (THREE-YEAR PERIOD)(2002-2004)

| AADT | CRITICAL CRASH RATE (C/MV) BY HIGHWAY TYPE | |
|---|---|---|
| | TWO-LANE | THREE-LANE |
| 500 | 2.95 | 3.81 |
| 1,000 | 1.97 | 2.64 |
| 2,500 | 1.24 | 1.74 |
| 5,000 | 0.91 | 1.33 |
| 7,500 | 0.78 | 1.16 |
| 10,000 | 0.70 | 1.06 |
| 15,000 | 0.61 | 0.95 |
| 20,000 | 0.56 | 0.88 |
| 30,000 | 0.50 | 0.81 |
| 40,000 | 0.47 | 0.76 |

TABLE B-10. CRITICAL CRASH RATES FOR 0.1 MILE "SPOTS" ON URBAN FOUR-LANE HIGHWAYS, INTERSTATES, AND PARKWAYS (THREE-YEAR PERIOD)(2002-2004)

| AADT | CRITICAL CRASH RATE (C/MV) BY HIGHWAY TYPE | | | |
|---|---|---|---|---|
| | FOUR-LANE DIVIDED (NON-INTERSTATE AND PARKWAY) | FOUR-LANE UNDIVIDED | INTERSTATE | PARKWAY |
| 1,000 | 2.04 | 2.53 | 1.29 | 1.38 |
| 5,000 | 0.95 | 1.26 | 0.51 | 0.57 |
| 10,000 | 0.74 | 1.00 | 0.37 | 0.41 |
| 15,000 | 0.65 | 0.89 | 0.31 | 0.35 |
| 20,000 | 0.59 | 0.83 | 0.28 | 0.32 |
| 30,000 | 0.53 | 0.75 | 0.24 | 0.27 |
| 40,000 | 0.50 | 0.71 | 0.22 | 0.25 |
| 50,000 | 0.47 | 0.68 | 0.20 | 0.23 |
| 60,000 | 0.46 | 0.66 | 0.19 | 0.22 |
| 70,000 | 0.44 | 0.64 | 0.18 | 0.21 |
| 80,000 | 0.43 | 0.63 | 0.18 | 0.21 |
| 90,000 | 0.42 | 0.62 | 0.17 | 0.20 |
| 100,000 | 0.41 | 0.61 | 0.17 | 0.20 |

*Source: Kentucky Transportation Center College of Engineering "Analysis of Traffic Crash Data in Kentucky (2000-2004)" report.