CAMBRIDGE SYSTEMATICS

I-67 Corridor Feasibility Study

final report

prepared for

I-67 Development Corporation

prepared by

Cambridge Systematics, Inc.

with

Prime Focus LLC

October 2, 2012

www.camsys.com

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Executive Summary

The I-67 Development Corporation (the Corporation) is interested in developing a limited access highway corridor between I-65 in Nashville, Tennessee and I-196 in Western Michigan. While portions of the subject corridor have recently been upgraded, or are under study for possible upgrades, the Corporation is primarily interested in the portion of the corridor between I-65, near Bowling Green, Kentucky and Indianapolis, Indiana.

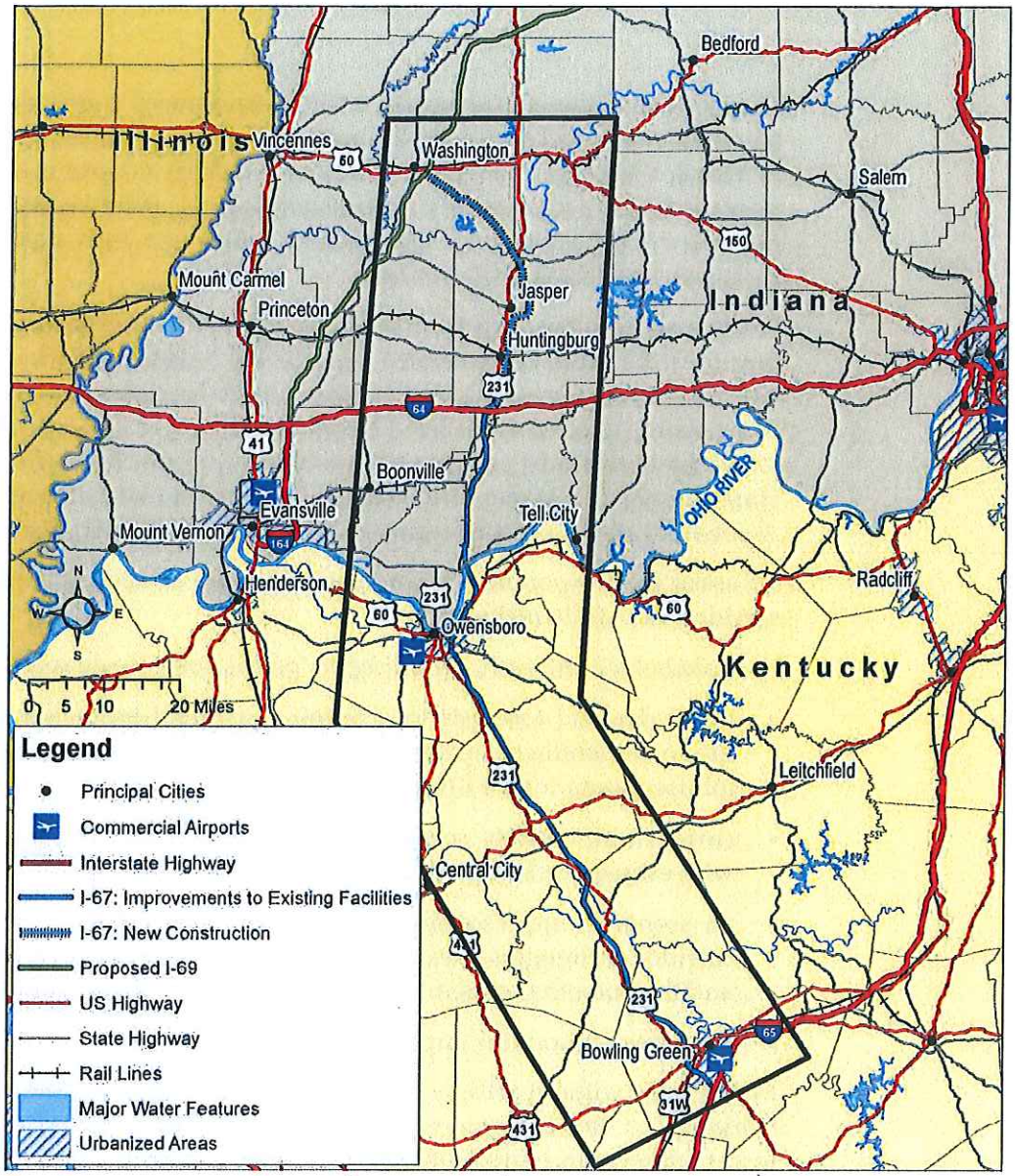
While a specific alignment for the facility has not been determined, for analysis purposes the facility is assumed to follow the Natcher Parkway from Bowling Green to Owensboro, with limited upgrades to Interstate standards; US-231 from Owensboro, across the William H. Natcher Bridge, to I-64, with limited upgrades to Interstate standards; and on completely new right-of-way from I-64, bypassing Huntingburg and Jasper to the east, and tying into I-69 at Washington, Indiana. A potential alignment for the proposed I-67 is shown in Figure E.1.

To assist the Corporation in understanding the business case for the proposed corridor, this study includes:

- stakeholder outreach, including the public and private sector;
- travel demand forecasts to determine potential traffic volumes for I-67 and the corresponding impacts on competing roadways based on both tolled and toll-free scenarios for I-67;
- current traffic safety conditions in the region and the corridor specifically, with estimated changes due to I-67;
- an economic impact analysis consisting of a profile of the economy of the corridor, a strengths, weaknesses, opportunities and threats (SWOT) analysis, and the potential economic impacts of the development of I-67; and
- recommendations for implementation and next steps.

I-67, if built without tolls, is expected to attract anywhere from 16,000 to 30,000 vehicles per day along most of its length in 2035, with the highest volumes toward the central and southern ends of the corridor (Table E.1). It provides some diversion not only from parallel arterials (such as US-231) for trips to, from, and within the corridor, but also diverts some longer-distance traffic from I-65, providing some congestion relief in that corridor. I-67 is not expected to divert traffic from I-69, but rather complement it, by increasing demand on the facility north of Washington, IN.

Figure E.1 Proposed I-67: Potential Alignment



Data Source: National Transportation Atlas Databases 2012.

To estimate the travel efficiencies associated with the highway improvement, the daily changes in vehicle-miles and vehicle-hours traveled from the travel demand model are estimated, annualized and monetized to determine the net benefit or travel efficiency gains in five areas between the build (toll and toll-free) and no-build scenarios: travel time, reliability, vehicle operating costs, safety, and emissions.

To estimate the economic impact of the investments, these travel efficiency gains are mapped to households or industry, depending on the beneficiary. Estimated changes in those classified as "explicit costs" serve as input into the IMPLAN input/output economic model to estimate economic impacts. The output from the IMPLAN model is expressed as changes in employment, output, and value added. These accrue as direct (impacts associated with roadway capacity improvements that are the direct effects of changes in output or production cost, and spending in key economic industries); indirect (increased demand for key input materials by local firms who are the direct suppliers to these "direct" businesses); and induced (changes in household consumption of goods and services from "direct" and "induced" benefactors) impacts.

Through the transportation cost savings experienced by users in the corridor, $2.4 billion is expected in benefits for households and businesses over 20 years, based on the toll-free build scenario. These benefits increase to $3.2 billion for all of southern Indiana and central Kentucky, also for the toll-free build scenario. Tolls provide some revenue but also decrease demand and usage on the facility, and therefore decrease transportation benefits of the facility. $1.1 billion is expected in benefits for households and businesses in the eight-county study area over 20 years when tolls are added, or $1.8 billion across southern Indiana and central Kentucky.

These transportation benefits to households and industry translate into direct economic impacts in the form of increased industry output and additional job creation. These direct impacts, in turn, ripple through the economy in the form of indirect and induced economic impacts. Based on the toll-free build scenario, total increased combined economic output over 20 years due to these impacts from I-67 are expected to reach $1.3 billion in the corridor, with over 10,000 new job-years created. With tolls, $430 million in economic output 3,610 new job-years are expected.

With the highly skilled labor force, available land, productive local industry in the form of manufacturing and power generation, diverse intermodal transportation options, and affordable and available housing, the region would benefit in the form of growth of existing businesses and increased business attraction. Numerous industries have identified supply chains that rely on highway transportation, whose costs would be reduced by improvements in the corridor. Highway access, and particularly Interstate access, is known to be a key factor in business location decisions.

Several next steps are recommended based on typical progression of highway corridor projects as well as issues specific to the study corridor:

- Further analysis of financial feasibility and funding options.
- Consideration of phasing.
- Concurrence to proceed with developing the I-67 Corridor between the States of Indiana and Kentucky.

- NEPA Studies.
- Corridor Preservation.
- Preliminary Design and Final Design.
- Right-of-way Acquisition and Construction.

Table E.1 Summary of I-67 Impacts

	Build Without Toll Scenario	Build With Toll Scenario
I-67 Travel Volumes (Daily)		
KY	24,900 – 32,000	21,200 – 28,500
IN	14,200 – 24,900	9,600 – 22,200
Percent Reduction in (and Number of) Regional Average Annual Crashes		
Fatalities	-0.2% (-2)	-0.1% (-1)
Injuries	-0.5% (-320)	-0.3% (-175)
Property Damage Only	-0.5% (-590)	-0.3% (-340)
Monetized Transportation Benefits, 8-County Study Area (20-Year NPV, Millions US$, 2012)		
Travel Time & Reliability	1,362.9	755.0
Vehicle Operating Cost	-416.4	-404.1
Safety Cost	1,439.2	717.0
Emission Cost	-20.0	-4.7
Total Transportation Benefits	2,365.9	1,063.2
Monetized Transportation Benefits, Entire Model Area (20-Year NPV, Millions US$, 2012)		
Travel Time & Reliability	1,659.6	924.0
Vehicle Operating Cost	-147.9	-23.7
Safety Cost	1,767.6	949.7
Emission Cost	-6.2	-2.7
Total Transportation Benefits	3,272.8	1,847.3
Economic Impacts, 8-County Study Area (20-Year NPV)		
Job-Years	10,830	3,610
GRP (Millions US$)	673.5	230.5
Output (Millions US$)	1,329.5	460.5
Toll Revenue (20-Year NPV, Millions US$, 2012)		
	N/A	43.7

Source: Cambridge Systematics Analysis

1.0 Introduction

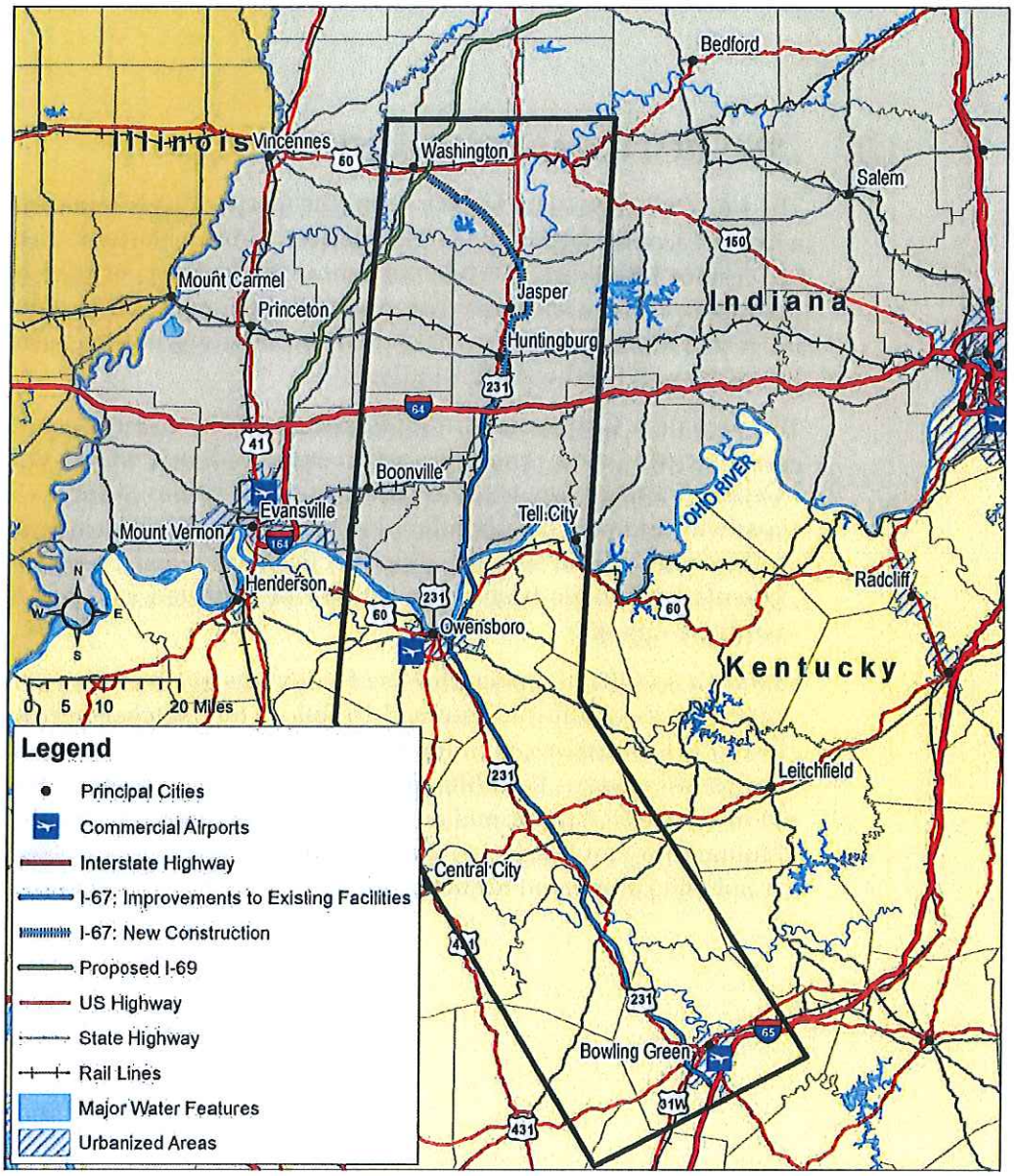
1.1 PROJECT BACKGROUND

The I-67 Development Corporation (the Corporation) is interested in developing a limited access highway corridor between I-65 in Nashville, Tennessee and I-196 in Western Michigan. While portions of the subject corridor have recently been upgraded, or are under study for possible upgrades, the Corporation is primarily interested in the portion of the corridor between I-65, near Bowling Green, Kentucky and Indianapolis, Indiana.

To assist the Corporation in understanding the business case for the proposed corridor, this study provides a two-step approach which includes: 1.) Travel Demand Estimation to determine potential traffic volumes on the upgraded roadway and the corresponding impacts on competing roadways, based on both toll-free and tolled scenarios; and 2.) Economic Impact Analysis to identify the potential economic benefits that might be expected as a result of the proposed roadway upgrade.

While a specific alignment for the facility has not been determined, for analysis purposes the facility is assumed to follow the Natcher Parkway from Bowling Green to Owensboro, with limited upgrades to Interstate standards; US-231 from Owensboro, across the William H. Natcher Bridge, to I-64, with limited upgrades to Interstate standards; and on completely new right-of-way from I-64, bypassing Huntingburg and Jasper to the east, and tying into I-69 at Washington, Indiana. A potential alignment for the proposed I-67 is shown in Figure 1.1.

Figure 1.1 Proposed I-67: Potential Alignment



Data Source: National Transportation Atlas Databases 2012.

1.2 REPORT ORGANIZATION

The remaining sections of this report are organized as follows: Section 2 provides a high level summary of the stakeholder outreach conducted in the region, early in the study process. Section 3 describes the technical methodology used to develop and validate the travel demand model, and presents the

resulting travel demand forecasts. Using these data and local crash information, an analysis of the current safety conditions in the region and the corridor specifically is presented in Section 4. The economic impact analysis in Section 5, which incorporates the information from Sections 2 through 4 in addition to other economic indicators, presents a profile of the economy of the corridor and the potential economic impacts of the development of I-67. The results are summarized in Section 6, with recommendations for implementation and next steps in Section 7.

2.0 Stakeholder Outreach

This section summarizes the results of a series of stakeholder interviews conducted during March and April, 2012 both in person and by phone. The purpose of the interviews was to provide insight into the potential impacts and opportunities of the proposed infrastructure enhancements at both the regional and national levels. These insights help to better target the assessment of the business case for the proposed infrastructure investments.

Key issues raised during the interviews are organized below by key topic. Important overall issues included:

- This region, encompassing south-central Indiana and western Kentucky, has a strong economic base, a dedicated workforce, and low levels of unemployment. The addition of I-67 could help ensure continued economic success for the region.
- One current weakness identified in the area is the lack of a north-south route in the Indiana portion of the study corridor. The current north-south route, US-231, faces congestion and safety issues including narrow lanes, conflicts with local traffic, limited sight distance, and lack of shoulders in some areas.
- Tolling would most likely be an acceptable funding mechanism, with a history of toll roads in Kentucky and businesses that would generally be amenable to tolling given the economic savings that they would receive in return.

Interviewees included:

- Mayor Denny Spinner, City of Huntingburg
- Mayor Ron Payne, City of Owensboro
- Mayor Terry Seitz, City of Jasper
- Mayor Joe Wellman, City of Washington
- Hank Menke, OFS Brands
- John DiDomizio, Morley & Associates
- Ron Arnold, Daviess County (IN) Growth Council
- Debbie Benedek, Greater Owensboro Chamber of Commerce
- Nick Brake, Greater Owensboro Economic Development Corporation
- Mike Braun, Meyer Distribution
- Jim Dinkle, Dubois County Area Development Corporation
- David Holt, Conexus Indiana

- Dan Koch, Holiday World
- Travis McQueen, Dubois County Airport
- Ken Mulzer, Mulzer Stone
- Greg Stoner, MasterBrand Cabinets
- Tom Utter, Lincolnland Economic Development Corporation

2.1 STRONG ECONOMIC BASE

South-central Indiana and Western Kentucky foster a variety of industries. Of the many industries highlighted by the stakeholders, furniture and wood products were generally at the top of the interviewees' lists. Dubois County, Indiana is home to a number of furniture manufacturers including Kimball, OFS, and Masterbrand.

Also mentioned frequently during the interviews were agriculture and food processing industries. Far Best Turkey Farm in Huntingburg, IN, is a major employer and shipper of processed turkey. Far Best has announced a new facility for Vincennes, IN, in Knox County. Perdue Foods also has a turkey processing plant in Washington, IN. In addition, the region has a significant amount of grain processing, particularly along the Ohio River. Owensboro, KY is home to a number of food manufacturing industries. A one-billion dollar nitrogen fertilizer plant has also been proposed in the corridor in either Spencer County or Owensboro. The plant would heavily depend on highway access for delivery of fertilizer products.

The automotive industry also has a presence in the region. Toyota (located west of the study area in Princeton, IN), General Motors in Bowling Green, KY, Jasper Engines and Transmissions, a large corporation that remanufactures drive train components, and an automotive parts supplier in Owensboro, KY are prominent regional employers in this industry.

The United States Navy employs a number of people at the Crane Naval Service Warfare Center. Nearby, a large new office park and employment center called the WestGate Technology Park houses engineering firms that largely support the military. WestGate's first building opened in 2008 and roughly 500 people worked there around the time of the interviews, mainly in the engineering, electronics, and radar sectors.

Mining and energy-related industries are also prevalent in the region. While much of the coal that is mined in southern Indiana is less desirable "soft" coal, the upcoming installation of scrubbers at the AEP coal-based power plant in Spencer County may result in more of the region's coal being used locally. A coal gasification plant, currently being negotiated in Spencer County, would use 3.5 million tons of coal per year, and create 200 permanent - and 1000 construction - jobs. Southern Indiana is also home to a number of limestone quarries.

Several prominent health care facilities are located in the region. Memorial Hospital, located in Jasper, Indiana is currently a major employer. In addition, an extensive medical complex is currently nearing completion on the east side of Owensboro, KY, in close proximity to the US 231 corridor. This $450M complex will also be a major employer for the region.

The area's tourism and hospitality industry is growing, consisting of amusement parks such as Holiday World and Splashin' Safari in Santa Claus, IN, which attract more than 1 million visitors per year and may have as many as 2 million per year by 2020. Upcoming projects include a 60,000 square foot conference and training center near Crane scheduled to open in the fall. In addition, the City of Owensboro currently has a major redevelopment project underway along the riverfront which will include a convention center, two new hotels, a playground, residential developments, Riverpark Center and other planned developments for the future. An International Bluegrass Center is proposed for the former State Office Building in Owensboro.

The region is doing well, despite the ailing global economy. A number of stakeholders highlighted the $12 million Battery Innovation Center, a research facility scheduled to be completed at the end of the year. This could be a great asset to the region. One stakeholder mentioned the possibility of "spinoffs" from this research facility or the possibility of a graduate degree program that could partner with Cummins and Delphi. While the region supports a number of industries, a few stakeholders believe that it could benefit from greater diversity, especially the addition of the warehousing and logistics and tech industries.

The low unemployment in the region (among the lowest in the State of Indiana) was cited by many stakeholders. The fact that despite a major economic downturn, the unemployment rate remains the lowest in the state illustrates the ability of this region to "weather the economic storm" better than other regions. Another fact cited by stakeholders was the region's drawing workers from seven surrounding counties.

The region's strong work ethic was cited by almost all interviewees as one of its greatest strengths. Many referred to the area's history as a farming and woodworking community as one of the reasons this ethic has been carried forward to today. However, while the employment base is strong, the need for a better trained workforce was cited as an area for improvement.

2.2 POPULATION AND EMPLOYMENT GROWTH

Many individual communities and the region as a whole are projecting population growth. One stakeholder noted an increase in retirees in recent years. Others discussed the desire for a larger population of young families. Some referenced the problem of "brain drain", referring to the pattern of young adults leaving the area to advance their education outside the region and not returning. A younger population was seen as advantageous for cultural and economic

development of the region. The need for a better-trained workforce was cited earlier; the critical issue was seen as the need to attract that workforce to the region. Some attractors could be good jobs with generous wages, high quality of life and low cost of living, and access to amenities.

Among the region's strengths is its low cost of living. However, some stakeholders mentioned that wages are low in the region. There has been some recent positive press about Owensboro, Kentucky. It received the following distinctions: named by *Money Magazine* as one of the top 100 places to live for a small metropolitan area; named by *Forbes* as one of the Top 100 Cities for Business & Careers; and named by *Business Insider* as one of America's next silicon valleys.

In terms of the ability of the region to attract companies and a greater diversity of companies and industries, the notion of the region being "landlocked" was cited by many. The lack of a "north-south" interstate through the region is perceived as a hindrance. It is felt that this sometimes causes employers to overlook the area as a viable location for a corporate headquarters or major center because of this lack of transportation access. While US-231 provides north-south access in the Indiana portion of the study corridor to Indianapolis from points south, the lower speed limit, local traffic and signalized intersections, and the safety and design issues could be perceived as having a negative effect on some businesses.

2.3 TRANSPORTATION INFRASTRUCTURE

The region's strong economic base is supported by good transportation infrastructure; however, there is room for improvement. System highlights include a small airport in Dubois County that caters to corporations. Easy access from corporate headquarters to the small general aviation airport is a major benefit to companies with corporate headquarters in the region. East-west rail lines are also helpful for the movement of goods. While convenient access to rail is important to some businesses, access to Interstate highways is also seen as desirable to many corporations. Additionally, port access along the Ohio River is another strength of the region, particularly to industries such as a stone quarry in the region, for which shipping by barge is the least expensive option.

Stakeholders feel that existing north-south access is insufficient, particularly for companies that rely heavily on efficient goods movement. Concerns about US-231 included congestion and bottlenecks. For businesses that rely on trucks for goods movement, the lower speed limit, congestion through local communities, and narrow roadway design on US-231 cause significant delay. It is much more desirable for a company to have direct access to an Interstate with a 65 mph or 70 mph speed limit. The difference in travel times that could be achieved on an Interstate highway versus a non-Interstate highway could amount to significant cost savings for shippers, companies that rely on freight movement, and workers.

Another important point about this project is its relationship with other transportation projects in the area. This includes the relationship with the proposed I-69 project. These roads were seen by many stakeholders as complementary because I-67 would connect with I-69 and provide a continuous Interstate from south-central Indiana to Indianapolis and beyond. This Interstate would also connect with rail infrastructure and the port along the Ohio River to make this region an intermodal center.

2.4 Freight Movement Challenges and Opportunities

Freight movement is critical to the economy of the study area. The following items were cited as areas in need of improvement:

- US-231 can be congested and has bottlenecks at certain spots, which can be costly to businesses that rely on moving goods quickly between their headquarters and other regions.
- US-231 has a maximum speed limit of 55 mph and 60 mph in Spencer County, with much lower speeds through communities; the difference between 55 mph and 65 or 70 mph is critical in the area of goods movement.
- US-231 also has some safety issues, including narrow lanes, winding and hilly sections, limited sight distance, and the lack of a road shoulder in sections.
- Better connectivity to Indianapolis, Chicago, Nashville, and elsewhere was desired, especially for a number of businesses that serve national and international markets. The proposed I-67 project could help provide this connectivity.

2.5 Benefits and Costs

Most interviewees saw more positive than negative outcomes to the proposed I-67 project. Potential negative outcomes included environmental damage and removal of farmland to make way for the road.

In terms of the economy, most stakeholders cited the addition of I-67 as essential to maintaining and expanding the region's economy; some said that the economy will suffer if this region does not add a north-south Interstate highway in the south-central part of Indiana. A commonly cited theme was that the region must continue to retain and attract businesses.

2.6 Funding Opportunities

In a climate of shrinking budgets, the question of how to fund a major transportation project is an important one. Regarding the idea of tolling as a

means to fund the I-67 project, many stakeholders expect initial pushback, particularly from the local community, but noted that people will eventually begin to accept a new toll road because of the projected economic benefits, as well as the added convenience of the new Interstate. There was general agreement that most industries will support the addition of the I-67 toll road because the expected travel time savings that will be achieved by the trucks moving goods on the new, faster roadway will ultimately result in cost savings.

Familiarity with toll roads and with studies of the corridor in which I-67 would be located are two factors that could make this idea more amenable to stakeholders. Interviewees mentioned that drivers in the region are already familiar with paying tolls on the Natcher Parkway, which runs from Bowling Green to Owensboro, Kentucky, so this proposed toll road would not be an unfamiliar concept. Additionally, reports about improvements in the corridor, in particular the US-231 EIS, have been publicized, so the community is familiar with this topic.

3.0 Travel Demand Forecasts

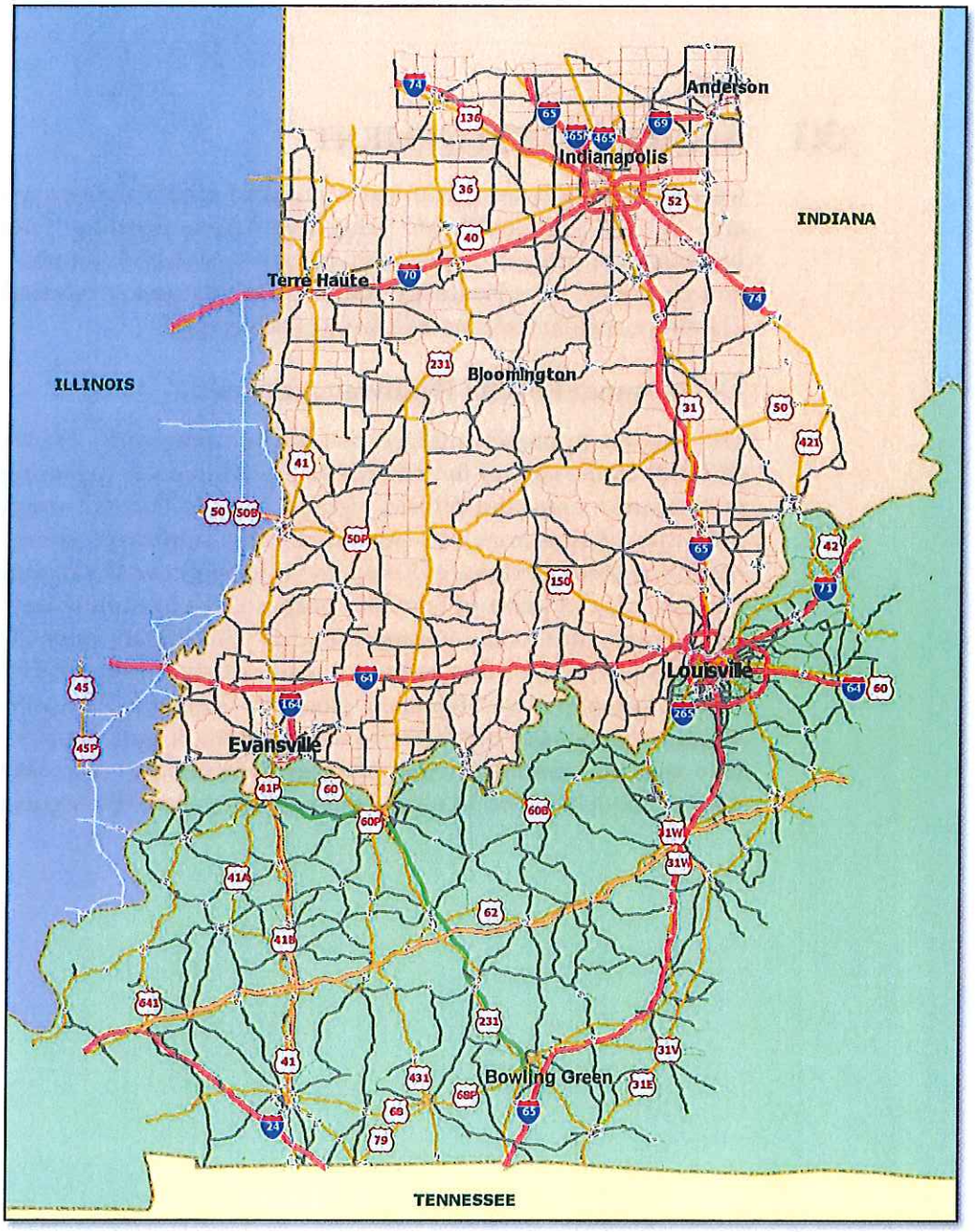
3.1 Model Development

Currently there is no single travel demand model that encompasses the study area for the proposed I-67 alignment from Bowling Green, Kentucky to Indianapolis, Indiana. There are, however, statewide models for both Indiana and Kentucky. The Kentucky statewide model was not available for this study: Therefore, an alternate model plan was developed.

Development of the Highway Network

The revised approach utilizes the Indiana Statewide Travel Demand Model (ISTDM) as the core of the I-67 Model. In addition to capturing the Indiana side of the study area, the ISTDM already includes several counties in Kentucky. From this, the network was expanded to the southwest, south, and southeast in order to include portions of Kentucky as far south as the Tennessee border, as far West as I-24, and east of I-65. The purpose was to capture any traffic that could be diverted due to the existence of I-67. Additional detail was added to the Kentucky portion of the network already existing in the ISTDM model as well. This information was obtained from the Kentucky Transportation Cabinet's website. Sections of the ISTDM network north of Indianapolis were removed as they were not needed for this analysis; their removal increased the efficiency of the I-67 Model. Figure 3.1 shows the final base year 2010 highway network.

Figure 3.1 Study Area Base Highway Network (2010)



Development of Traffic Analysis Zone (TAZ) Layer

Indiana Area

For the Indiana portion of the study area, the ISTDM TAZs were used directly. For the new boundaries where portions of the ISTDM network were removed, new external zones were developed.

Base year 2010 and future year 2035 demographic data contained in the Indiana TAZs include:

- Number of Households and
- Number of Employees by type.[1]

Kentucky Area

For the Kentucky portion of the study area, new TAZs were developed. These were based on census block group geography.

Base year 2010 demographic data was developed from the following sources:

- Household information was based on the 2010 Census data, and
- Employment information was based on the Longitudinal Household-Employer Dynamics (LEHD) origin-destination employment statistics.

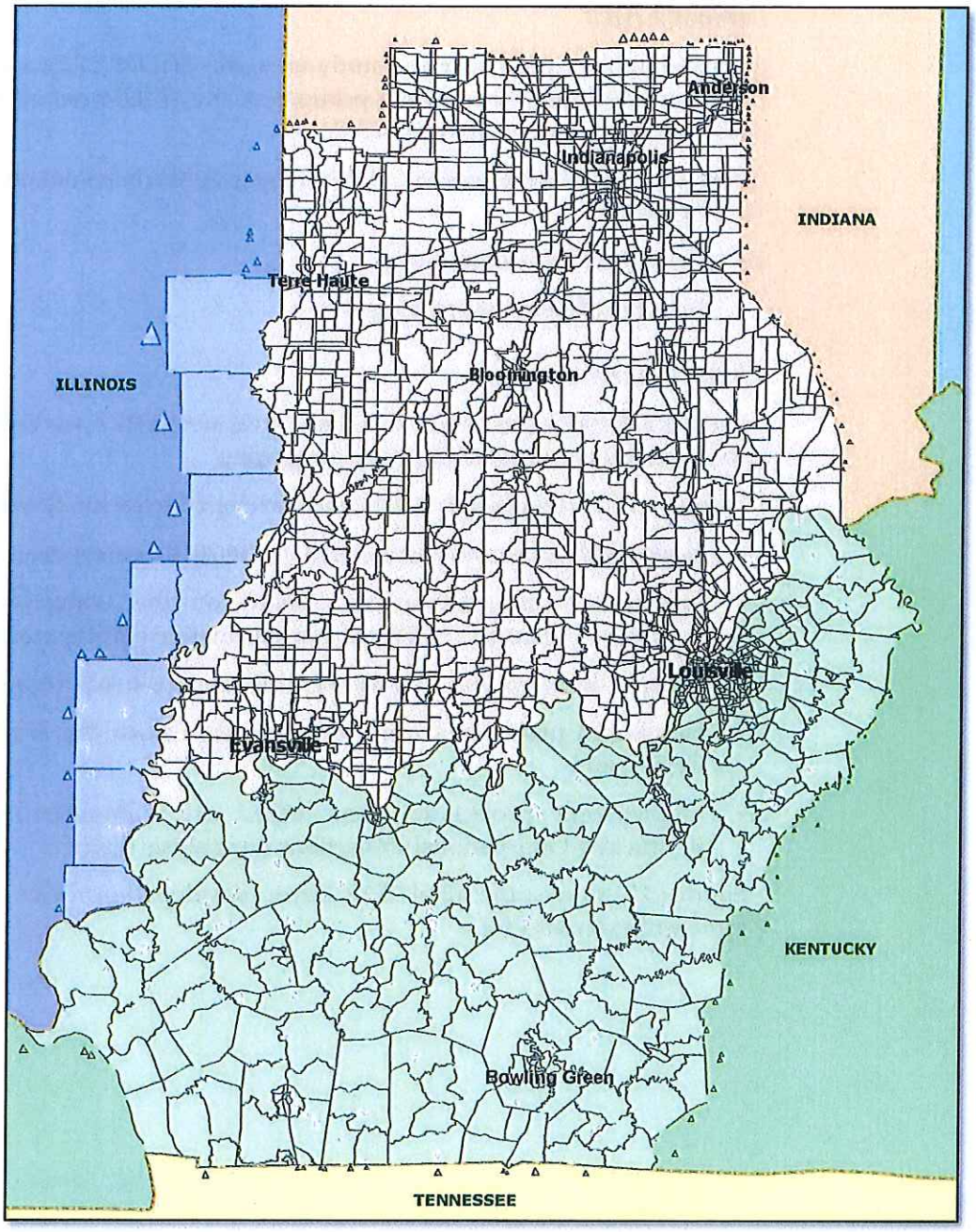
Future year demographic data was obtained from the following sources:

- Household projections were based on data from the Kentucky State Data Center, and
- Employment projections were based on information from Workforce Kentucky's Occupational Projections by analysis district.

Figure 3.2 shows the final TAZ layer developed for this study. Triangles represent external TAZs.

[1] Indiana Statewide Travel Demand Model Upgrade; Indiana Department of Transportation, March 2005

Figure 3.2 Study Area TAZ Layer



Development of Base Year Trip Table

Freight Trucks

Base year freight truck origin-destination (O-D) trips were developed from the Freight Analysis Framework (FAF) national model. County to county trips were assigned to the national model and trips into, out of, within and through the I-67 study area were retained. These trips constitute the base year I-67 Model trip tables for freight trucks.

Autos

Since there is no model that covers the entire study area from which a trip table could be used to develop the base year auto flows, the approach that was taken involved bringing together O-D information from different sources and adjusting it based on observed traffic flow data. The general process is described below and is outlined in Figure 3.3:

1. **Develop base year auto "seed" trip table.** The first priority was to develop a "seed" trip table, or first iteration of the trip table, that expresses the trip patterns correctly. To the extent possible, O-D information from the ISTDM was used. For the O-D pairs within the study area that did not have an ISTDM equivalent, trip patterns from the Corridor 18 model, from the Corridor 18 Feasibility Study, were used.
2. **Normalize auto trip tables.** Trip-ends (the number of trip origins or destinations at a particular zone) were adjusted based on trip generation models borrowed from the ISTDM.
3. **Calibrate auto trip tables.** Origin Destination Matrix Estimation (ODME) techniques were then used to refine these trip tables in order to better match the observed traffic count data.

Non-Freight Trucks

The process to develop non-freight truck trips is nearly identical to that for the autos. The difference lies in the development of the initial seed trip table which was developed by combining the O-D patterns from the FAF truck trip tables and the initial "seed" auto trip tables described above:

1. **Develop base year non-freight truck "seed" trip table.** O-D information from the initial "seed" auto trip tables and the FAF truck trip tables were combined to create this first iteration of the non-freight truck trip tables.
2. **Normalize non-freight truck trip tables.** Trip-ends (the number of trip origins or destinations at a particular zone) were adjusted based on trip generation models borrowed from the ISTDM.

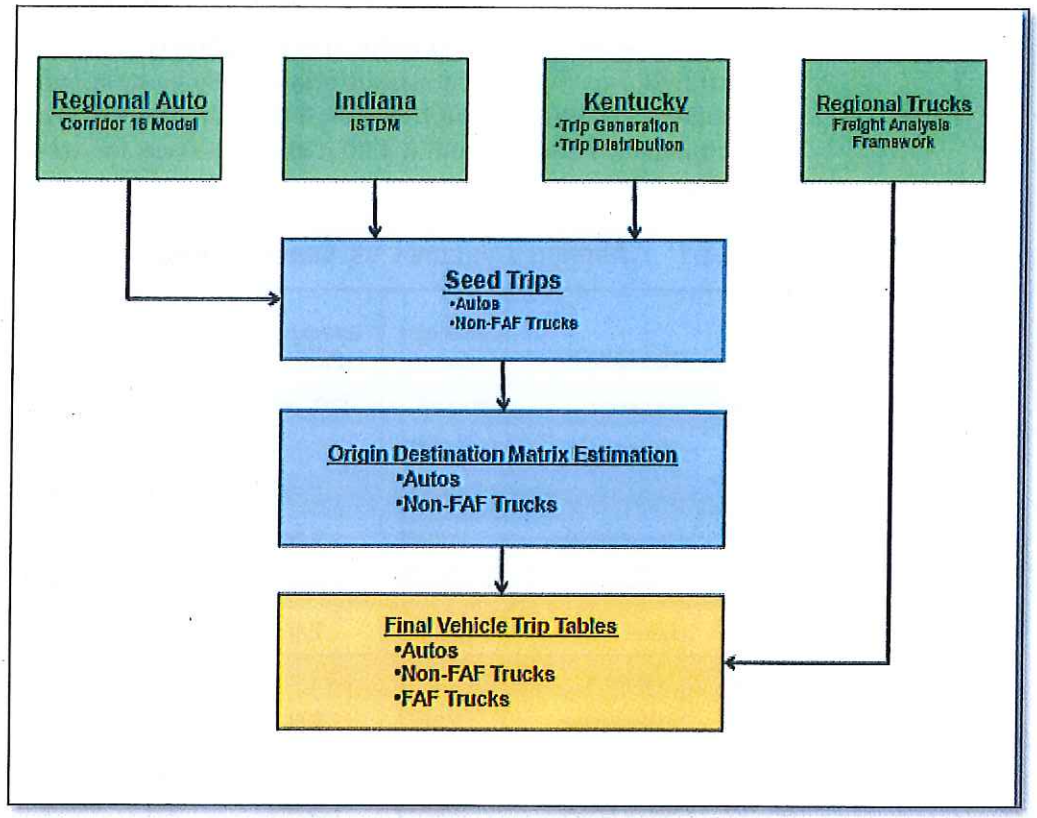
3. **Calibrate non-freight truck trip tables.** ODME techniques were then used to refine these trip tables in order to better match the observed traffic count data.

Base Year Trip Table Calibration

The ODME procedure within TransCAD, a travel demand forecasting software package, was used to iterate between the traffic assignment and matrix estimation stages; the main objective is to refine the initial O-D vehicle matrices from the seed trip tables to better match the observed data. The procedure is based on the Maximum Likelihood technique, which attempts to estimate a trip table that maximizes the probability of all input datasets.

The input datasets include an initial estimate of the O-D matrices as described above and Automatic Traffic Recorder (ATR) data. The procedure is Multimodal and Multi-Class (MMA), and the MMA O-D Matrix Estimator is based on TransCAD's MMA assignment procedure. The MMA assignment routine is a generalized cost assignment that assigns trips by individual mode or user class to the network simultaneously. Each mode or class can have different congestion impacts, different volume delay function parameters, different values of time, and different sets of excluded facilities and types of tolls. The advantage of using the MMA Assignment for ODME is that rather than producing just one overall trip O-D matrix, the MMA ODME can generate estimated trip matrices for each mode or class.

Figure 3.3 Trip Table Development Process



The determination as to which vehicle trip tables to estimate using ODME was based on the study objectives and the availability of the count data. A successful implementation of the multimodal approach requires multimodal count data. A review of the count data revealed that the classification scheme that yielded the most data points was broken into two groups: truck and non-truck. The non-truck group included all vehicle types not classified as a truck in the counts. As the truck group does not distinguish between freight and non-freight based trucks, the approach was to develop count targets for non-freight trucks by first assigning the FAF freight trucks and then calculating the non-freight targets by subtracting the assigned freight trucks from the overall truck counts. Then the MMA ODME procedure consisted of preloading the freight trucks and performing the ODME for the auto and non-freight trucks.

O-D Validation Criteria

There currently is no consensus on criteria for determining when an O-D table produces traffic flows that are considered validated. For this study, common measures of travel demand assignment validation as recognized by FHWA were used to compare the assigned volumes to observed traffic counts. These include

the percent deviation between the counts and assigned volumes, the percent Root Mean Square Error (%RMSE) of these deviations, and screenline analysis.

Table 3.1 compares estimated traffic flows to observed counts for the entire study area stratified by functional classification. This comparison indicates how well the model is replicating traffic flows on the different types of roadways. Overall the estimated flows are within 1% of the observed counts with a %RMSE less than 15%.

Table 3.1 Assigned Volumes vs. Counts - Stratified by Functional Class

Functional Classification		Average Count	Average Flow	No. of Counts	% Dev	FHWA Standard	% RMSE
Rural	Freeways	34,548	34,247	47	-0.9%	+/- 7%	5.1%
	Expressways	7,658	7,740	551	1.1%	+/- 7%	9.7%
	Major Arterials	5,629	5,683	661	1.0%	+/- 10%	13.4%
	Minor Arterials	2,788	2,803	1,868	0.5%	+/- 15%	14.1%
	Collectors	1,814	1,847	69	1.8%	+/- 25%	15.0%
	Local	2,193	2,166	8	-1.2%	N/A	9.8%
Urban	Freeways	71,277	71,145	54	-0.2%	+/- 7%	7.3%
	Expressways	22,877	22,696	29	-0.8%	+/- 7%	5.3%
	Major Arterials	17,520	17,158	631	-2.1%	+/- 10%	9.1%
	Minor Arterials	9,611	9,303	354	-3.2%	+/- 15%	8.9%
	Collectors	6,347	6,129	103	-3.4%	+/- 25%	13.2%
	Local	1,631	1,724	1	5.7%	N/A	5.7%
	Other	7,247	7,284	49	0.5%	N/A	34.5%
Total		7,886	7,824	4,425	-0.8%	N/A	13.3%

Table 3.2 compares estimated traffic flows to observed counts for the entire study area, stratified by volume group. This indicates how well the model replicates observed counts with regard to the level of traffic on the facility. Generally, it is desirable for the higher volume roadways to match more closely than the lower volume roadways as they carry the majority of traffic. Table 3.2 shows that as the average roadway volumes increase, the percent deviation and percent RMSE generally improve.

Two screenlines were developed to get a sense of how well the model matches the observed data with regard to regional O-D patterns. One measures the traffic crossing the Ohio River to capture north/south movements, and the other measures traffic traveling east/west or west to east across Kentucky to capture any changes in route choice related to the project. Figure 3.4 shows the location of the screenlines. Base year traffic forecasts were compared to observed count

data and appear in Table 3.3 below. Traffic estimates across both screenlines are within 2% of the observed daily traffic.

Table 3.2 Assigned Volumes vs. Counts - Stratified by Volume Group

Volume Group	Average Count	Average Flow	No. of Counts	% Dev	% RMSE
0-1,000	596	632	474	6.0%	24.9%
1,000-2,500	1,708	1,768	924	3.5%	18.7%
2,500-5,000	3,690	3,720	1,087	0.8%	13.8%
5,000-10,000	7,103	7,051	924	-0.7%	10.4%
10,000-25,000	15,122	14,779	759	-2.3%	8.9%
25,000-50,000	33,870	33,669	209	-0.6%	6.8%
>50,000	81,303	80,729	48	-0.7%	6.9%
Grand Total	**7,886**	**7,824**	**4,425**	**-0.8%**	**13.3%**

Figure 3.4 Screenline Locations

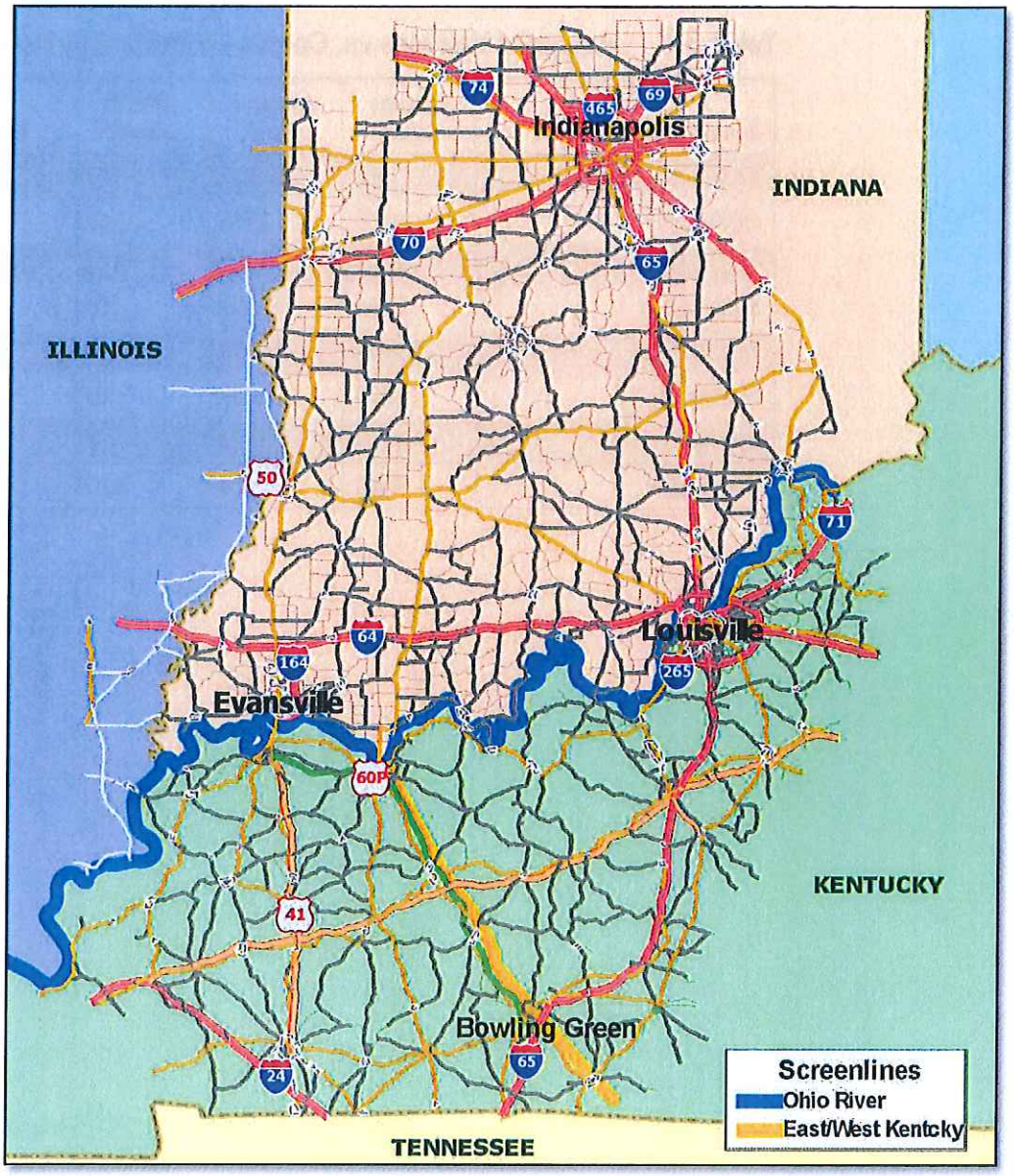


Table 3.3 Modeled Traffic Volumes vs. Observed Traffic Counts - Screenlines

Screenlines	Average Observed Counts	Average Modeled Volumes	No. of Counts	% Devation	% RMSE
Ohio River	31,044	31,328	10	0.9%	5.9%
East/West Kentucky	11,121	10,921	13	-1.8%	21.0%

3.2 FORECASTING APPROACH

Future year growth for auto, non-freight truck, and freight truck trips was estimated for each TAZ individually. This was accomplished by applying trip generation rates from the ISTDM to the base and future year demographic data for each TAZ to generate total trip ends (trips originating or terminating in a TAZ). Growth factors were then developed from the ratio of future year trip ends to base year trip ends. These growth factors were applied using a Fratar process to the validated base year trip table to produce future year trips. A Fratar process is standard means of using growth factors to extrapolate a trip table to a future year. The future year trips were then assigned to the future year networks for the following scenarios:

- **Year 2035 No Build.** All committed roadway projects for Indiana and Kentucky were added to the existing base year network. Network assumptions included:
  - Network improvements consistent with INDOT's Existing Plus Committed (E+C) scenario, as reviewed by INDOT.
  - System upgrades and improvements consistent with the Kentucky Transportation Cabinet's Six Year Highway Plan.
- **Year 2035 Build (No I-67 Toll).** Implementation of I-67 between Bowling Green, KY and Washington, IN as described in Section 1. The model reflects new construction for I-67 along a corridor from I-64 and US-231 to I-69 at Washington, IN, and minor improvements throughout the rest of the existing corridor.
- **Year 2035 Build (I-67 Toll).** New sections of I-67 from north of I-64 and US-231 to I-69 in Washington, IN, were tolled using:
  - Distance based tolls, derived from averages of existing toll rates on the Indiana Toll Road and most recent rates on Kentucky's previously tolled facilities (adjusted for inflation), of:
    - » $0.03 per mile for autos
    - » $0.05 per mile for non-freight trucks
    - » $0.15 per mile for freight trucks
  - Value of time (VOT) parameters developed for the Illiana Expressway Feasibility Study:
    - » Autos at $15.02 per hour[2]

[2] The Illiana study stratified auto value of time among work and non-work trips. The value used for this study is for autos only and is a weighted average of the work and non-work values.

» Non-freight trucks at $26.74 per hour

» Freight trucks at $31.12 per hour

The toll rates used in the analysis are not recommended toll rates, and a complete analysis of traffic and financial impacts under various toll scenarios was not performed. The purpose of the toll scenario is to generally test the sensitivity of traffic to a moderate toll rate, and estimate potential revenues.

3.3 MODEL RESULTS

System-Wide

Tables 3.4 through 3.5 compare system-wide statistics for the model area related to the assignment of base and future year trips to the network. The first table compares vehicle miles travelled (VMT) and the second reports vehicle hours traveled (VHT), both by functional classification of roadway and area type (urban or rural). These statistics represent the roadway links contained within the model network, and not every local roadway actually in the model area is contained within the model. These measures together describe the performance of the different scenarios with respect to one another. These comparisons show:

- Average speeds are highest in the base year as there is less traffic than in future years:
  - VMT is estimated to increase by 34% in 25 years; and
  - VHT is estimated to increase by 37%.
- Overall VMT is highest for the build alternative without tolls as traffic shifts to I-67, sometimes driving longer distances in order to reduce total travel time.
- Overall VHT is lowest for the build alternative without tolls, and therefore average speeds (calculated as VMT/VHT) increase slightly in this alternative as traffic shifts away from more congested routes to the new, uncongested facility.
- Adding tolls shifts some of the traffic away from the new facility as compared to the build alternative without tolls, resulting in slightly lower VMT, slightly higher VHT and slightly lower resulting speeds system-wide.

Table 3.4 System-Wide Vehicle Miles Traveled

FC		2010 Base	2035 NB	2035 Build	2035 Build (Tolled)
Rural	Freeways	20,573,673	31,641,973	31,641,292	31,598,754
	Expressways	14,965,066	20,365,350	21,263,876	20,889,711
	Major Arterials	10,567,848	14,435,571	14,287,449	14,395,061
	Minor Arterials	17,059,377	24,097,977	23,706,776	23,784,713
	Collectors	1,007,971	1,562,748	1,558,346	1,560,996
	Local	47,702	61,302	61,892	61,803
Urban	Freeways	24,750,181	31,653,189	31,553,221	31,587,101
	Expressways	1,917,087	2,428,351	2,376,262	2,346,705
	Major Arterials	20,027,889	25,275,423	25,292,034	25,318,105
	Minor Arterials	8,732,542	10,970,154	11,005,814	11,000,644
	Collectors	1,644,855	2,295,914	2,278,653	2,291,233
	Local	6,985	9,406	9,415	9,405
	All	121,301,177	164,832,665	165,070,330	164,879,536

Table 3.5 System-Wide Vehicle Hours Traveled

FC		2010 Base	2035 NB	2035 Build	2035 Build (Tolled)
Rural	Freeways	300,909	481,573	479,323	480,424
	Expressways	262,723	354,130	364,571	359,570
	Major Arterials	203,847	288,997	286,027	288,481
	Minor Arterials	351,417	513,801	505,802	507,215
	Collectors	23,401	39,246	39,286	39,175
	Local	1,033	1,341	1,356	1,354
Urban	Freeways	444,001	594,472	590,033	592,207
	Expressways	33,076	41,748	40,939	40,591
	Major Arterials	523,601	694,084	691,796	694,276
	Minor Arterials	257,383	348,127	349,921	349,283
	Collectors	49,787	72,574	71,712	72,290
	Local	222	332	332	331
	All	2,451,400	3,431,072	3,421,742	3,425,844

Screenlines

A comparison of traffic at the screenlines can show how regional traffic diverts in response to the availability of new capacity. Tables 3.6 and 3.7 show the traffic at each of the roadways that are part of the two screenlines developed for this study.

The Ohio River screenline captures how traffic routes itself across the river:

- Overall, traffic crossing the Ohio River is estimated to increase by about 30% from 2010 to 2035.
- With the opening of I-69, traffic shifts from US-41 to I-69; 2010 base year flows on US-41 drop from about 43,000 to about 39,000 and traffic on the new I-69 bridge is estimated to be about 13,000.
- Similarly, with the opening of the Eastside Bridge in Louisville, traffic shifts to the new bridge away from the I-65 bridge; 2010 flows on I-65 drop from about 136,000 in 2010 to about 106,000 in 2035 and traffic on the new Eastside Bridge is estimated to be about 66,000.
- In the build alternative without tolls, regional traffic is estimated to shift slightly from the I-65 corridor to the new I-67 corridor; traffic on bridges in Louisville drops slightly and traffic on the US-231 (I-67 in the build scenario) bridge increases slightly.
- The addition of tolls to the I-67 facility shifts some of the traffic back from the I-67 corridor to the I-65 corridor; US-231 bridge traffic flows are slightly lower with a tolled I-67 than without tolls; the Louisville bridges in general have slightly higher volumes; and I-69 remains the same.

Table 3.6 Ohio River Screenline

Route	2010 Traffic Count	2010 Base Volume	2035 No Build	2035 Build	2035 Build (Tolled)
IL-1/KY-91	1,800	1,900	2,000	2,000	2,000
US-41	44,000	42,900	38,900	38,900	38,900
I-69	N/A	N/A	13,300	12,900	12,900
IN-161/J.R. Miller Blvd.	7,300	7,600	6,700	6,600	6,600
US-231 (I-67)	5,900	6,900	20,800	24,900	22,200
IN-237/KY-69	8,900	9,400	8,500	8,400	8,500
IN-135/KY-79	5,300	5,400	8,600	8,000	8,600
I-64	79,000	83,300	107,800	107,300	107,200
Clark Memorial Bridge	15,900	13,000	23,500	22,600	23,400
I-65	134,000	135,600	105,600	103,800	104,600
New Eastside Bridge	N/A	N/A	66,100	65,800	66,600
US-421	8,300	8,400	6,000	6,000	6,000
Total	310,400	314,400	407,800	407,200	407,500

The Kentucky east/west screenline captures traffic that travels eastward and westward between the two main north-south corridors between which diversion of longer trips could occur: I-65 and I-67. The comparison of traffic on the roadways that are part of this screenline show:

- Traffic increases on US-231 (I-67 in the build scenario) near Owensboro under the two build alternatives from about 27,000 in the no build to about 31,200 without tolls on I-67 and about 28,500 with tolls on I-67.
- Traffic on I-65 near Bowling Green is estimated to decrease slightly under the two build scenarios from about 93,900 in the no build to about 91,500 without tolls on I-67 and about 93,200 with tolls on I-67 as regional traffic shifts away from the I-65 corridor to the new I-67 corridor.

Table 3.7 Kentucky East/West Screenline

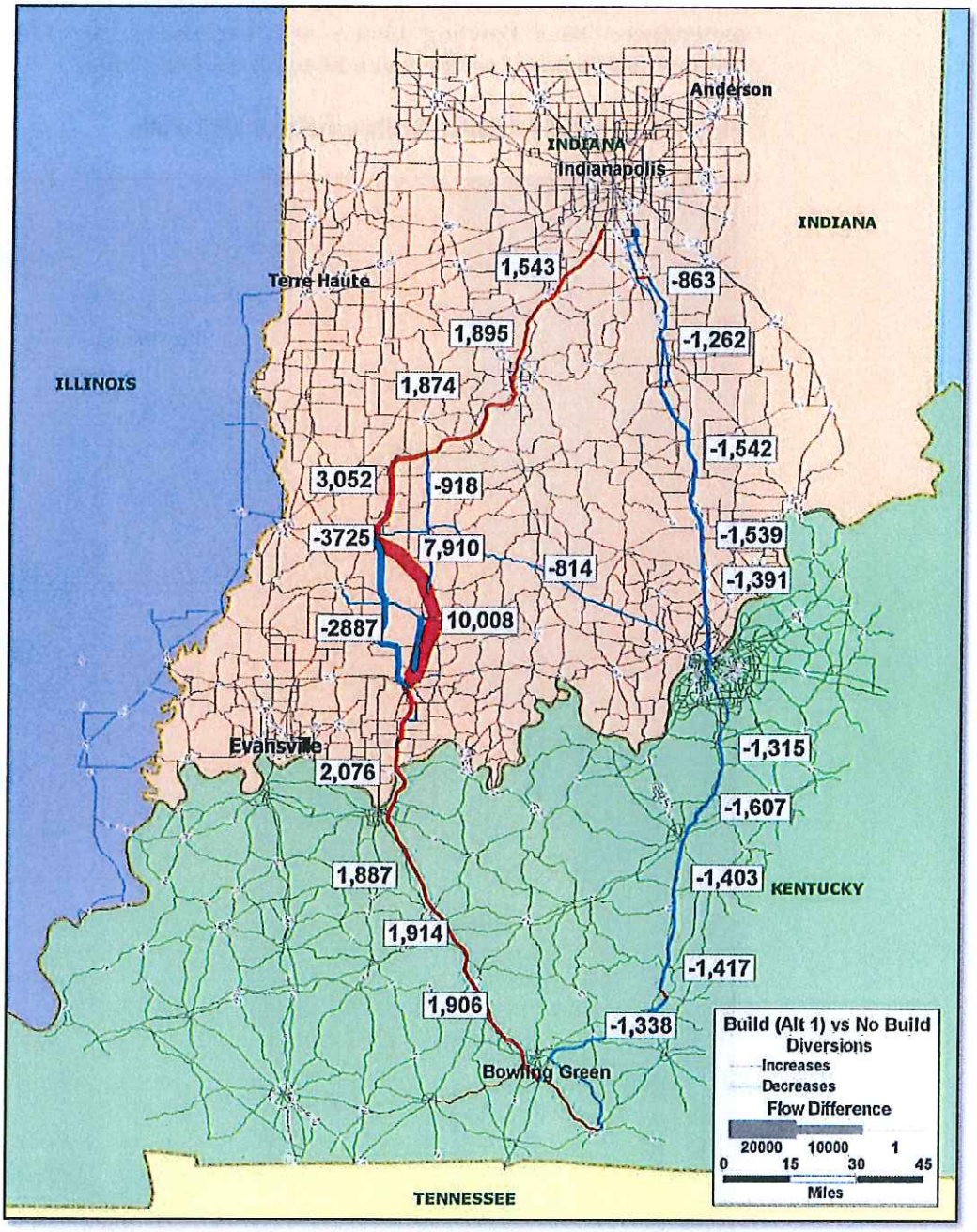
Route	2010 Traffic Count	2010 Base Volume	2035 No Build	2035 Build	2035 Build (Tolled)
US-60	30,600	23,200	8,700	8,800	8,700
New US 231 (I-67)	N/A	N/A	27,000	31,200	28,500
Leitchfield Road	18,700	18,400	20,100	20,100	20,100
KY-69	5,200	4,800	5,400	5,400	5,400
US-62	2,600	2,700	3,100	3,100	3,100
Wendall Ford Pkwy	7,200	9,700	15,900	15,800	15,800
KY-79	3,000	3,900	7,200	6,300	7,000
KY-70	2,200	2,800	3,800	3,800	3,800
KY-185	2,600	2,200	4,000	4,000	4,000
US-68	18,200	19,300	18,600	18,600	18,600
I-65	47,300	45,500	93,900	91,500	93,200
KY-101	1,000	2,300	5,300	5,000	5,000
US-31E	4,600	5,100	10,400	10,400	10,400
KY-98	1,400	2,100	3,600	3,600	3,600
Total	144,600	142,000	227,000	227,600	227,300

Traffic Diversions

The tables above indicate that with the addition of capacity to the I-67 corridor under the build alternatives, some regional traffic can be expected to divert away from the I-65 corridor. They also indicate that the addition of tolls tempers the regional demand for the new I-67 corridor and some of the traffic can be expected to shift back to the I-65 corridor. To illustrate these dynamics, difference plots were developed that compare one-way traffic volumes between scenarios.

Figure 3.5 shows how traffic shifts to other routes under the build scenario without tolls from the no build scenario condition. In addition to regional shifts from I-65 to I-67, locally traffic diverts to the new I-67 facility away from existing US-231 and from other local roads parallel to the new facility in Indiana.

Figure 3.5 Traffic Diversions – I-67 Build Without Tolls vs. No Build

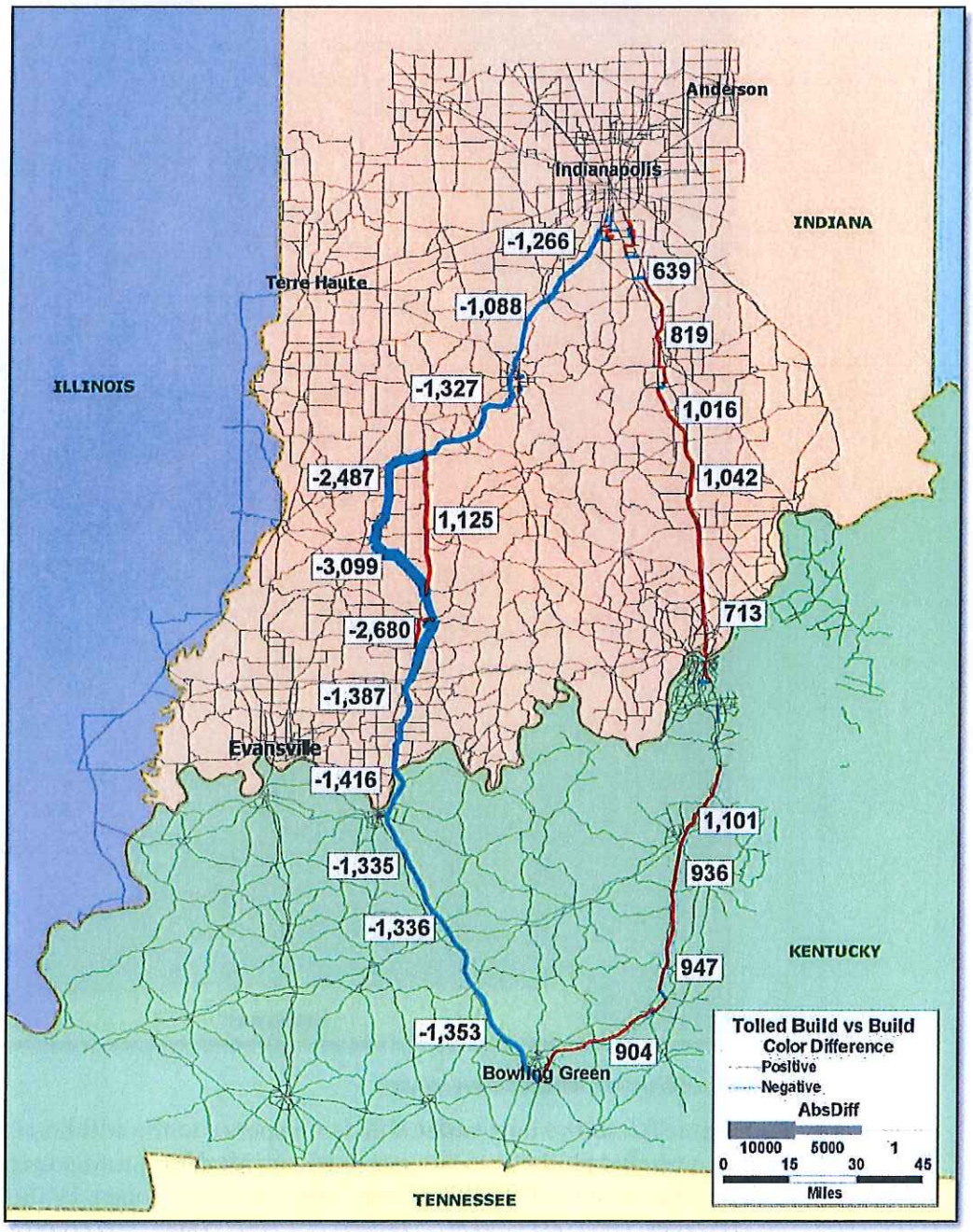


Note: Differences reflect one-way volumes

Figure 3.6 shows how traffic shifts in response to the addition of tolls. Regionally, some traffic shifts from the new I-67 corridor back to the existing I-65 corridor. Locally, some traffic shifts away from the new tolled facility back to parallel arterials such as US-231. Figure 3.7 and Table 3.8 show changes in traffic volumes across different scenarios for selected locations throughout the model

region. Finally, Table 3.9 shows the complete ranges in traffic volumes projected across I-67 in both Indiana and Kentucky. In Kentucky, the highest volumes are experienced near Bowling Green and Owensboro. In Indiana, the highest volumes are experienced between I-64 and the Ohio River.

Figure 3.6 Build without Tolls vs. Build with Tolls



Note: Differences reflect one-way volumes

Figure 3.7 Traffic Flows at Selected Locations

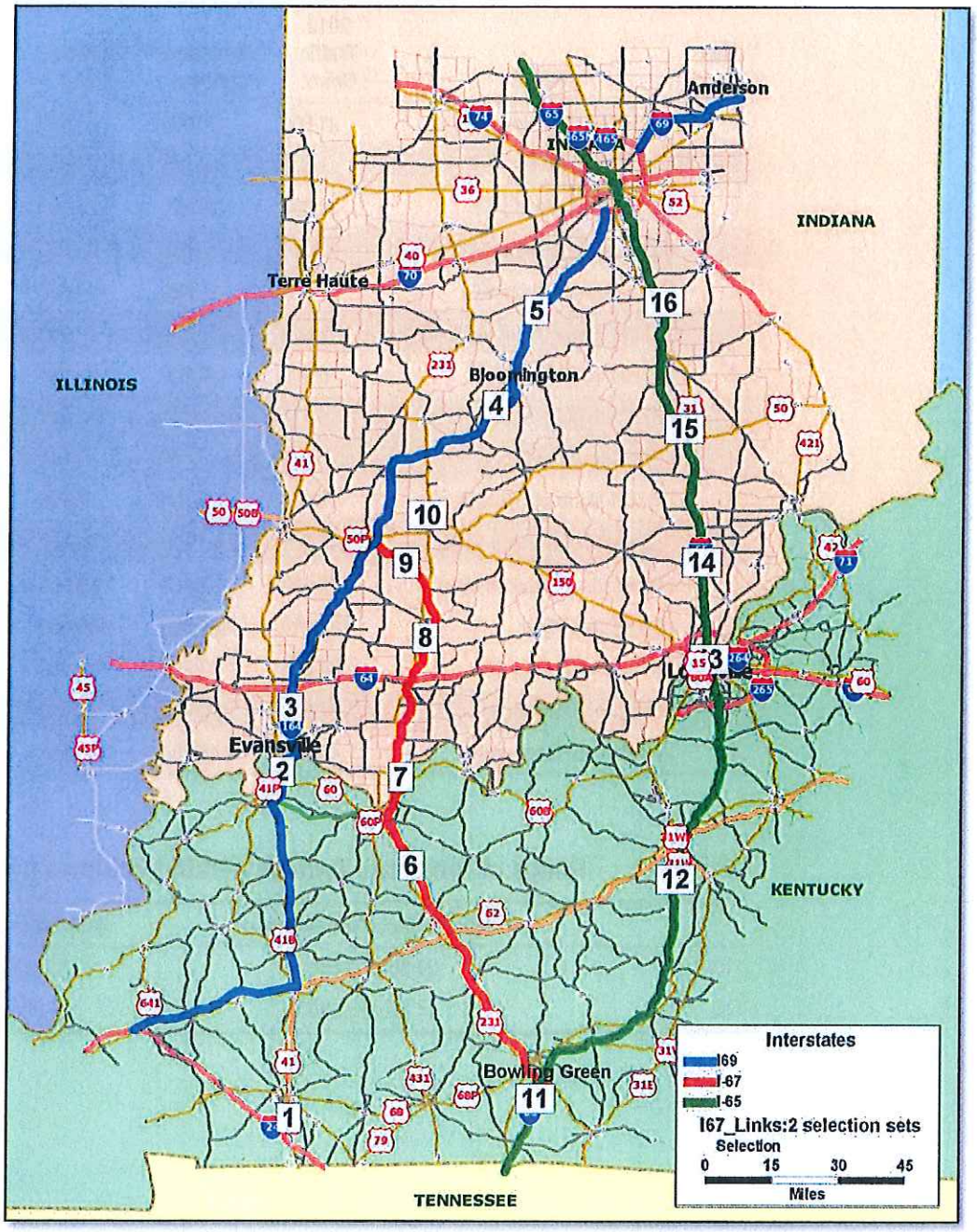


Table 3.8 Traffic Flows at Selected Locations

Map #	Route	2010 Traffic Count	2010 Base Volume	2035 No Build	2035 Build	2035 Build (Tolled)
1	US-41 South of Hopkinsville	21,800	20,000	47,500	47,500	47,500
2	I-69 @ Ohio River	N/A	N/A	13,300	12,900	12,900
3	I-69/I-164 South of I-64	20,300	20,200	25,200	24,800	24,800
4	I-69 South of Bloomington	N/A	N/A	21,700	25,500	22,800
5	I-69 South of Martinsville	N/A	N/A	41,600	44,700	42,500
6	Natcher Pkwy South of US-231	9,800	9,200	20,100	23,900	21,200
7	US-231 @ Ohio River	5,900	6,900	20,100	24,900	22,200
8	I-67 North of SR 64	N/A	N/A	N/A	20,000	14,700
9	I-67 Connector to I-69	N/A	N/A	N/A	15,800	9,600
10	US-231 North of Loogootee	5,400	5,700	7,200	5,300	7,600
11	I-65 South of Bowling Green	41,700	41,200	88,400	88,700	88,700
12	I-65 South of Elizabethtown	35,300	35,900	59,500	56,600	58,500
13	I-65 @ Ohio River	134,000	135,600	105,600	103,800	104,600
14	I-65 North of Henryville	36,600	37,600	44,100	41,100	43,100
15	I-65 North of Seymour	31,900	31,600	44,100	41,100	43,100
16	I-65 North of Edinburgh	45,500	46,200	58,500	56,500	58,000

Table 3.9 Range of Projected Two-Way Traffic Volumes on I-67 (Year 2035)

	Build Without Toll Scenario	Build With Toll Scenario
KY	24,900 – 32,000	21,200 – 28,500
IN	14,200 – 24,900	9,600 – 22,200

4.0 Safety Analysis

4.1 INTRODUCTION

Traffic safety is a key component to consider in the development of a new highway. Roadway safety is typically measured by the number of crashes on a roadway, including crashes that result in fatalities, injuries or only property damage. These categories are also used in economic analysis by assigning average monetary values to the events, and estimating total costs. Significant reductions in the number and severity of crashes improves personal well-being overall, reducing costs to individuals that can result in benefits to different sectors of the economy.

Roadway safety is affected by a wide range of events, including weather, roadway condition, driver education programs and law enforcement activities, to name a few. A number of factors affected by the development of a new roadway can affect roadway safety, including the amount of traffic, roadway design and traffic congestion.

Motor vehicle crashes are the leading cause of death for people aged 5 to 44, and remain a top cause of death in all age groups.[3] Nationally, traffic fatalities and fatality rates declined from 2006 to 2010, and initial estimates from 2011 showed a continuing of this trend[4]. Research by the National Highway Traffic Safety Administration (NHTSA) indicated that declines stemmed from fewer crashes involving young drivers, fewer crashes at night and on weekends, and drops in crashes in rural areas[5]. In addition, the research also indicated that an estimated 2.24 million people were injured nationwide in over 1.54 million injury-only crashes in 2010, approximately the same as the previous year.[6] As shown in Table 4.1 below, of the three-year average number of crashes, less than one percent of all crashes result in fatalities, over one quarter result in injuries, and nearly three quarters result in property damage only (PDO). For large trucks the fatal and

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[3] US Department of Health and Human Services, Center for Disease Control. Web-based Injury Statistics Query and Reporting System. Available at http://www.cdc.gov/injury/wisqars. Accessed March 15, 2012.

[4] National Highway Traffic Safety Administration (2011) *Traffic Safety Facts: Crash Stats Early Estimate of Motor Vehicle Traffic Fatalities for the First Three Quarters of 2011.*

[5] Ibid.

[6] National Highway Traffic Safety Administration (2012) 2010 Motor Vehicle Crashes: Overview.

PDO share of crashes increases while the share of injury crashes drops to approximately 18 percent.

Table 4.1 Average Annual Crashes in the United States by Crash Severity (2007-2009)

	Crashes				Share of all Crashes		
Crash Severity	Fatal	Injury	PDO	Total	Fatal	Injury	PDO
All Vehicles	34,135	1,619,333	4,126,000	5,779,468	0.6%	28.0%	71.4%
Large Trucks	3,648	62,333	282,000	348,000	1.0%	17.9%	81.0%

Source: NHTSA Traffic Safety Facts 2010.

Normalizing the number of total crashes by national vehicle miles traveled yields an overall crash rate for the nation, for all roadway types, which can serve as a general comparison to local crash conditions. Average crash rates per 100 million VMT (by severity) for the period of 2007-2009 are summarized below in Table 4.2.

Table 4.2 Average Crash Rates in the United States by Crash Severity (2007-2009)

	Crash Rate per 100 Million VMT by Severity Type			
Crash Severity	Fatal	Injury	PDO	All Severity Types
All Vehicles	1.1	54.2	138.1	193.5
Large Trucks	1.2	20.7	93.7	115.6

Note: Crash rate calculated using mode-specific VMT.

Source: National Highway Traffic Safety Administration (2011) Traffic Safety Facts 2010, Federal Motor Carrier Safety Administration (2011) Commercial Motor Vehicle Facts.

Table 4.3 shows the total number of crashes by type in Indiana and Kentucky, also for the period of 2007-2009. During this period, there were more average annual crashes in Indiana than Kentucky, although Kentucky had a higher share of crashes resulting in at least one fatality.

Table 4.4 shows the 2007 to 2009 average annual crash rates per 100 million VMT by severity in Indiana and Kentucky.

Table 4.3 Average Annual Crashes in Indiana and Kentucky by Vehicle Type and by Crash Severity (2007-2009)

	Crashes				Share of all Crashes		
Crash Severity	Fatal	Injury	PDO	Total	Fatal	Injury	PDO
All Vehicles							
Indiana	719	35,395	163,924	200,037	0.4%	17.7%	81.9%
Kentucky	762	25,528	98,484	124,773	0.6%	20.5%	78.9%
Heavy Trucks							
Indiana	111	1,168	11,123	12,402	0.9%	9.4%	89.7%
Kentucky	102	1,463	7,055	8,620	1.2%	17.0%	81.8%

Source: Indiana Crash Facts (2010), Kentucky Traffic Collision Facts (2007-2009).

The study area for the I-67 safety analysis included roadways in both Indiana and Kentucky representing the approximate proposed route for I-67 (Figure 4.1). In Indiana, the analysis included US-231 from the Kentucky state line in Spencer County, to US-36 in Putnam County. The study area in Kentucky included the William H. Natcher Parkway from Bowling Green in Warren County, to US-60 near Owensboro in Daviess County. The Natcher Parkway is a four-lane controlled-access highway with a landscaped median dividing the directional traffic. In Indiana US-231 includes both four-lane and two-lane segments.

Table 4.4 Average Crash Rates in Indiana and Kentucky by Vehicle Type and by Severity (2007-2009)

	Crash Rate per 100 Million VMT			
Crash Severity	Fatal	Injury	PDO	All Severity Types
All Vehicles				
Indiana	1.0	50.4	233.4	248.8
Kentucky	1.6	53.8	207.6	263.0
Heavy Trucks				
Indiana	1.1	11.5	109.9	122.6
Kentucky	1.9	27.3	131.6	160.8

Note: Kentucky statewide average annual heavy truck VMT was estimated by applying the 2009-2010 average of heavy truck traffic shares of total roadway volumes, available from FHWA. Earlier heavy truck statistics and estimated heavy truck VMT was not available for this report.

Source: Indiana Criminal Justice Institute (2010) Indiana Crash Facts, Indiana DOT, Kentucky State Police (2007-2009) Kentucky Traffic Collision Facts, Kentucky DOT, Federal Highway Administration.

Figure 4.1 I-67 Safety Study Area

Source: ESRI 2010 (Basemap), Cambridge Systematics

4.2 CRASH ANALYSIS

Safety data from Indiana and Kentucky show similar, steady reductions in traffic fatalities over the past five years. Indiana and Kentucky ranked 35th and 36th, highest, respectively, in the number of fatalities in 2010 for all states. The two

states ranked 31st and 7th highest, respectively, in the highest number of fatalities per 100 million VMT.[7]

All data in this section were derived from databases maintained by each State Police Department (Indiana for US-231 and Kentucky for Natcher Parkway). The data below represent the average of years 2009 to 2011. Vehicle miles traveled data was derived from vehicle roadway volume databases and maps maintained by the Departments of Transportation in each state. Average annual daily trips were converted to annual vehicle miles traveled assuming 365 days to each year.

Total crashes on the study area roadways averaged just over 1,000 between 2009 and 2011, with 12 fatal crashes, and approximately 250 crashes resulting in at least one injury. Table 4.5, below, shows the higher number of crashes on US-231 in Indiana, compared to the relatively shorter Natcher Parkway in Kentucky. The study area roadways are similar in the distribution of crashes involving fatalities, injuries, and property damage only (PDO), with just over one percent of crashes resulting in a fatality, approximately one quarter resulting in injury, and three quarters PDO. Approximately ten percent of total crashes in the US-231 study area, and fifteen percent of crashes on the Natcher Parkway involved at least one heavy truck. Crashes resulting in fatalities accounted for approximately six percent and three percent of all truck-related crashes, respectively. The overall share of heavy truck crashes in the study area involving a fatality was nearly five times that for all vehicle types. Injury crashes also account for a greater share of heavy truck crash types; both of these statistics are indicative of the greater crash severity associated with large truck crashes on state highways and arterial roadways.

As shown in Table 4.6 below, normalizing the crash results by vehicle miles traveled (VMT) also shows similar crash rates on each roadway of the study area. Fatal crash rates for all vehicles on the Natcher Parkway and US-231 averaged 1.8 per 100 million VMT. Fatal crashes involving trucks have a higher rate on US-231 in Indiana than on the Natcher Parkway in Kentucky, with the fatal crash rate averaging approximately 9.4 per 100 million (truck) VMT on US-231, and 3.1 per 100 million (truck) VMT on the Natcher Parkway.

[7] National Highway Traffic Safety Administration (2011) *State Motor Vehicle Fatalities, 2010.*

Table 4.5 Average Annual Crashes by Severity (2009-2011)

Facility	Crashes by severity				Share of Total Crashes		
	Fatal	Injury	PDO	Total	Fatal	Injury	PDO
All Vehicles							
US-231	9	205	612	826	1.1%	24.8%	74.0%
Natcher Pkwy	3	50	175	228	1.3%	21.9%	76.8%
All	12	256	788	1,054	1.1%	24.2%	74.6%
Crashes Involving Heavy Truck(s)							
US-231	5	23	56	84	6.0%	27.4%	66.7%
Natcher Pkwy	1	13	22	36	2.8%	36.1%	61.1%
All	6	36	78	120	5.0%	30.0%	65.0%

Source: Kentucky State Police, Indiana State Police.

Compared to national and state level crash data, rates in the study area are higher than – nearly double – national and state level crash rates. The state and national data includes all roadway types, however, including Interstates and other large roadways that typically have lower crash rates than two to four lane arterial roadways analyzed as part of the current study area.

Table 4.6 Average Crash Rates for Study Area Roadways by Severity Type (2009-2011)

Facility	Crash Rate per 100 Million VMT			
	Fatal	Injury	PDO	All Severity Types
All Vehicles				
US-231	2.2	51.0	152.2	205.6
Natcher Pkwy	1.2	19.3	67.6	88.0
All	1.8	38.6	119.0	159.4
Involving Heavy Truck(s)				
US-231	9.4	43.4	105.7	158.6
Natcher Pkwy	3.1	39.8	67.4	110.3
All	7.0	42.1	91.1	140.2

Note: Crash rates involving heavy trucks based on heavy truck VMT based on historical shares of single- and combination unit truck VMT as a share of total VMT for arterial roadways (FHWA). Indiana VMT for 2011 was estimated based on the average annual growth rate of statewide arterial VMT 2008-2010.

Source: Kentucky State Police, Kentucky Department of Transportation, Indiana State Police, Indiana Department of Transportation, FHWA Highway Statistics Series.

Crash data for study area roadways by time period illustrates the incidence of crashes at different levels of roadway activity. Crashes in the AM peak period (7 a.m to 9 a.m.) averaged 97 incidents annually, or just over nine percent of all crashes. The PM peak period (4 p.m. to 6 p.m.) averaged a higher number of crashes, at 152, or 14.4 percent of all crashes. The remaining, or off-peak periods accounted for the remaining 76 percent of all crashes. Crash rates by time period for study area roadways are summarized in Table 4.7. The results reflect the greater amount of travel that occurs in the PM peak period, compared to the AM peak period, and is typically also related to the increased roadway safety risks associated with reduced daylight.

Table 4.7 Average Annual Crashes by Time Period on Study Area Roadways (2006-2010)

Facility	Average Annual Crashes by Time Period			Percent all crashes		
	AM Peak	PM Peak	Off Peak	AM Peak	PM Peak	Off Peak
Natcher Pkwy	19	27	183	8.2%	11.8%	80.0%
US-231	78	125	624	9.5%	15.1%	75.5%
All	97	152	807	9.2%	14.4%	76.4%

Sources: Kentucky State Police, Indiana State Police.

Stakeholders have identified several driving factors related to safety in the corridor, particularly along 2-lane sections of US-231 north of I-64:

- Narrow shoulder widths;
- Slow moving vehicles (farm equipment and Amish buggies), with limited passing zones and often impatient drivers;
- Winding, hilly terrain;
- Limited sight distance at numerous access points; and
- Large numbers of heavy trucks.

4.3 EXPECTED FUTURE CRASH RATES

The process to estimate changes in total crashes in the future with the development of I-67 begins with the use of the travel demand model to forecast future travel. The build scenarios lead to greater travel in the model study area, measured as VMT (a table of VMT by scenario and functional classification is shown in Section 3.4). However, the addition of tolls leads to less of an increase in overall travel than the build without toll scenario, as drivers respond to the added out-of-pocket cost with fewer trips.

Table 3.4 in Section 3.4 also illustrates changes in where people drive due to tolls. This is evident on rural and urban Interstates, where VMT is proportionally

lower in the build with toll scenario than without tolls. Travel on urban collectors and rural arterials is greater in the build with toll scenario than in the build without toll scenario, reflecting the shift to smaller roadways without tolls.

The amount of travel by roadway type is an important safety consideration. Crash rates have been shown to vary by facility type and roadway traffic volumes. This safety analysis reflects that research by applying crash rates that are unique to the roadway type (e.g. Interstate, major arterial, etc.) and traffic volume. The crash rates used in this analysis are derived from the Highway Economic Requirements Model (HERS), which is a national highway asset management tool used by state departments of transportation. In general, the rates and severity of crashes are greater on the smaller and more highly traveled roadways. This is due to the design of these roadways; expressways tend to have good lines of sight, wide shoulders, and limited access with all traffic moving in the same direction, while minor arterials have a number of hazards such as turning lanes and shoulder obstructions, that are associated with higher crash rates, on average.

Crashes on the entire network in each future modeling scenario are expected to decrease from the future no-build scenario. Total crashes in build without toll scenario are estimated to be lower by approximately 0.5 percent, and approximately 0.3 percent in build with toll scenario. The severity of crashes is expected to decrease approximately the same order of magnitude in the two alternative scenarios. Table 4.8 presents a comparison of predicted future crashes by severity and future forecasting scenario. Most of these safety improvements are expected to occur in the 8-county study area itself. For example, in the build without toll scenario, both reduced fatalities, about 290 reduced injuries, and about 450 reduced PDO crashes are expected along the corridor, per year, as a result of I-67.

Table 4.8 Forecasted Change in Regional Average Annual Crashes by Severity (Percent Difference from No-Build Scenario)

Future Scenario	Fatal	Injury	PDO
Build without toll	-0.2% (-2)	-0.5% (-320)	-0.5% (-590)
Build with toll	-0.1% (-1)	-0.3% (-175)	-0.3% (-340)

5.0 Economic Impact Analysis

5.1 INTRODUCTION

The analytical framework for the economic analysis approach utilized for the I-67 corridor study outlines the investigation of competitiveness of the study region. Generally, when looking at potential economic opportunities that could arise from a proposed transportation improvement, it is important to understand the existing strengths and weaknesses of the study region. Consequently, three key questions shape the analysis in this section:

- What are the factors helping or hindering the study region in preserving and growing the economic health of current businesses?
- What are the factors helping or hindering the study region in attracting and retaining new businesses?
- Given the region's competitive strengths and weaknesses, how does the I-67 corridor enhance economic opportunities for the study region?

To address these three questions, the analysis first takes a look at the region's current economic profile. The second part of the analysis then focuses on the region's strengths, weaknesses, opportunities, and threats (SWOT) and shift-share analyses, which paint a picture of the region's current status and identify potential economic opportunity paths.

- **Strengths** – These are the current economic competitive advantages of the study region. A strength may be what attracts new employers, encourages investment within the region, or prevents a business from closing its doors. These assets drive much of the current economic success and will need to be capitalized upon for future success.
- **Weaknesses** – These are the current economic competitive disadvantages of the study region. A weakness may discourage new businesses from locating within the region, drive investment towards a competing region, or lead to downsizing of the regional employment base. Weaknesses need to be addressed where possible in order to maintain economic competitiveness.
- **Opportunities** – These include external influences (externalities) which could enhance the region's competitiveness. These factors are outside of the region's control, but nevertheless represent significant opportunities.
- **Threats** – These include external influences that could result in decreases to the competitiveness as well as potential strategic "pitfalls." An example of a threat is the long-term decline of tourism due to severe congestion.

Finally, using travel demand model outputs, economic impacts that are likely to arise from development of the I-67 corridor were estimated.

5.2 THE REGION'S SOCIOECONOMIC PROFILE

This section discusses the socioeconomic profile of the study corridor. This includes historical trends in population, economic structure and employment, education attainment, and housing, as well as projected population and employment. The study corridor of focus in the economic anlaysis comprises eight counties, equally divided between Indiana and Kentucky, along the I-67 corridor: Daviess, Dubois, Spencer, and Martin in Indiana and Daviess, Butler, Ohio, and Warren in Kentucky.

Population

Population in the study corridor increased from 320,687 in 2000 to 351,151 in 2011, representing 10.7 percent growth. This remarkable growth is primarily driven by the 24.5 percent population growth recorded by Warren County, KY over the eleven-year period. Daviess County, IN, Dubois County, IN, and Daviess County, KY follow Warren with 7.2 percent, 6.3 percent, and 6.1 percent growth rates respectively. As shown in Figures 5.1 and 5.2, population growth of the study corridor has mirrored that of Indiana since 2000. Also, the sharp population surge in the corridor between 2009 and 2011 is in response to the remarkable economic performance of the corridor. The recent national economic meltdown in 2008 brought in its wake intra- and inter-state migration in search of economic opportunities. Therefore, the impressive, but potentially temporary economic performance of Indiana and Kentucky led to the recent growth within the study corridor.

Figure 5.1 Study Corridor Annual Population Growth Rate, 2001 – 2011

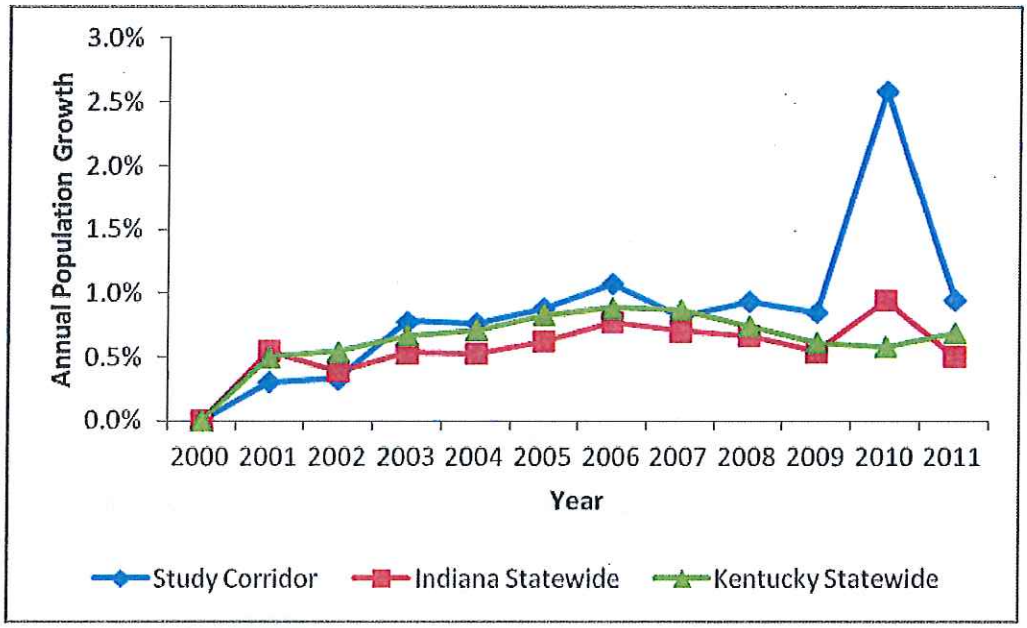
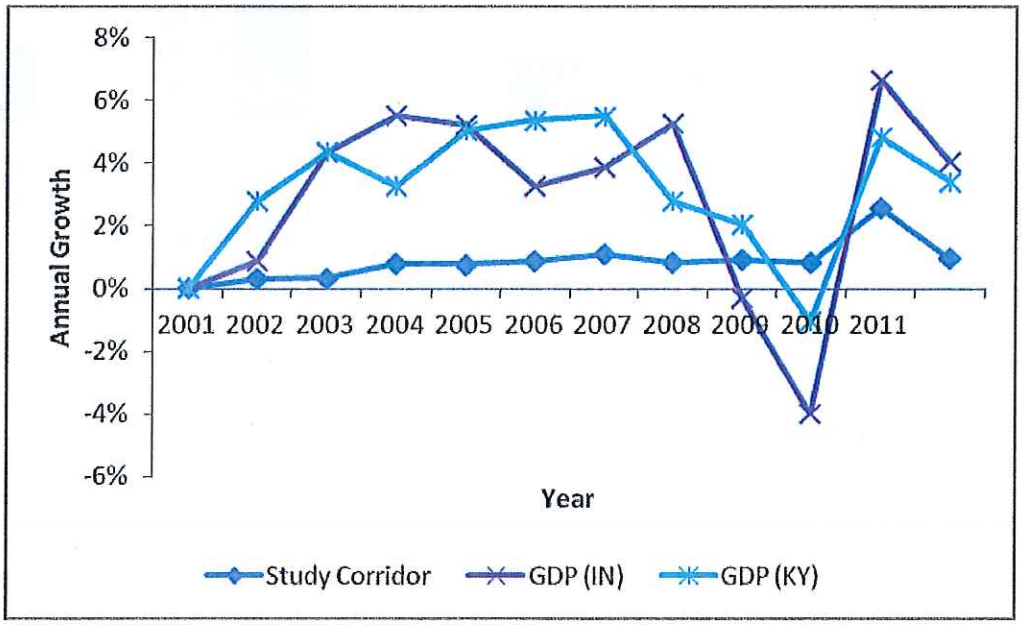


Figure 5.2 Study Corridor Economic Performance of Indiana and Kentucky, 2001 - 2011

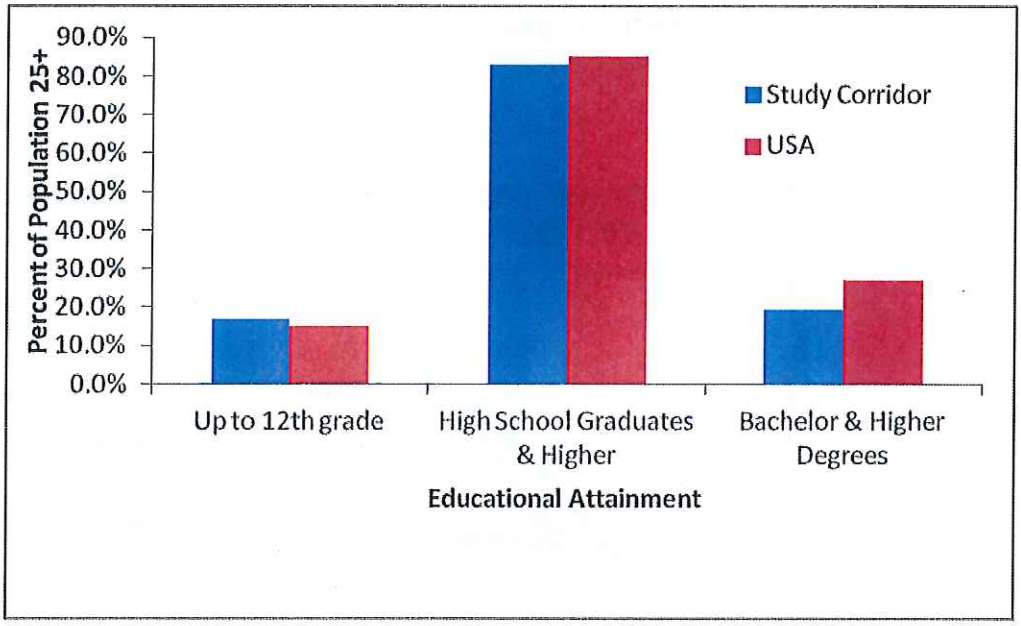


Education

Educational attainment in the study corridor is marginally below the national average. This means that the study corridor has educated population and workforce slightly below the national averages. As shown in Figure 5.3, about 83 percent of the study corridor's population aged 25 years and over have attained a minimum of high school education, two percentage points below the national average. Similarly, the study corridor's population that has gone on to get a minimum of a bachelor's degree is about eight percentage points below the national average; while bachelor and higher degree holders in the study corridor are 19.2 percent, that of the nation is 27 percent.

Educational attainment has been improving since 2000. High-school dropouts declined by 5.3 percent, while high school graduates increased by 4.5 percent and college graduates increased by 2.8.

Figure 5.3 Educational Attainment in Study Corridor, 2010



Housing

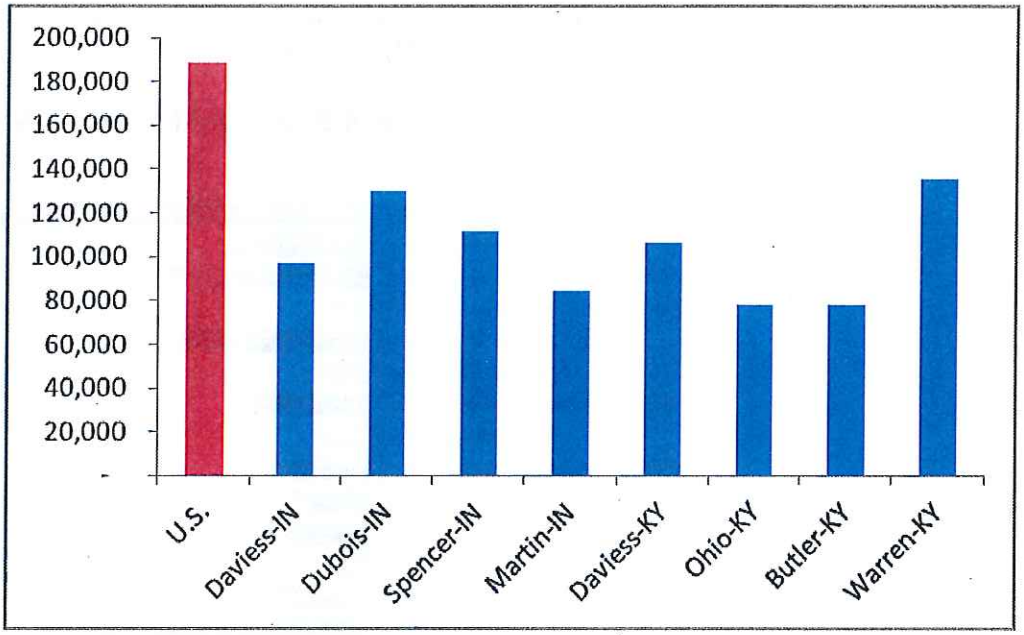
Figure 5.4 indicates that median housing values in the study corridor are below the national average. According to the U.S. Census Bureau, the median housing value in the study corridor in 2010 was $102,500[8], thus representing 34 percent

[8] This represents the weighted mean of median values for the eight counties in the study region reported by the Census Bureau.

growth from 2000. This median value indicates that housing in the corridor is very affordable relative to the national average of $188,400.

In 2010, there were 147,100 housing units in the corridor, up from 122,977 in 2000, representing 19.6 percent growth. Over the same period, vacant housing units in the study corridor increased by 41.7 percent, from 10,162 in 2000 to 14,401 in 2010. The significant growth in vacant housing units by 2010 could be attributed to the massive foreclosures that occurred in the wake of the housing collapse that contributed to the national economic meltdown in 2008.

Figure 5.4 Median Housing Values, 2010



Employment

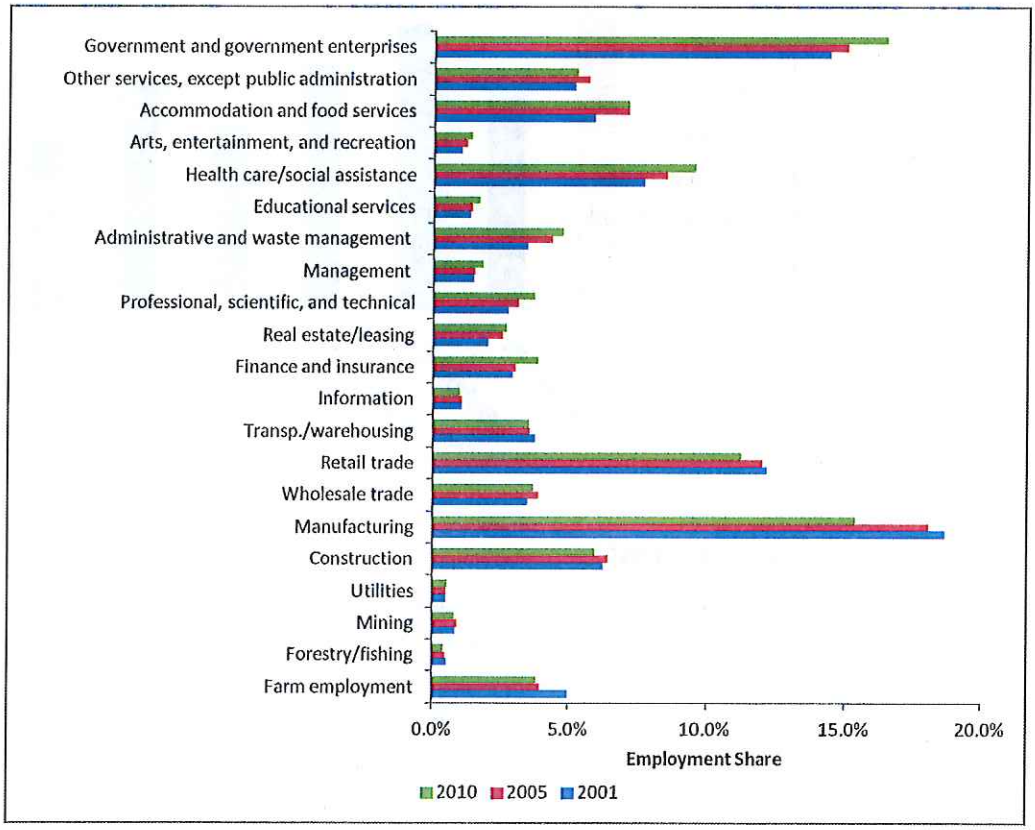
One of the most tangible measures of a region's economic vitality is employment growth. As demand rises for a business's products and services, employees and equipment are added to better satisfy the needs of customers. The jobs produced by these companies provide the incomes people need to sustain themselves and their families and also attract additional workers. The combination of business, visitor, and resident demand then feed transportation growth, both freight and passenger, in the corridor. The ability of the study corridor to accommodate the varying transportation needs of industries, both to transport goods and bring people to work, will be an important factor in future competitiveness and jobs growth.

The study corridor's economy is dominated by the services sector. Total employment reported by the Bureau of Economic Analysis (BEA) was 206,558 in 2010, representing a 4.2 percent increase from 198,173 in 2001. The services sector

contributed about 74 percent of employment, while the goods sector contributed the remaining 26 percent in 2010. From the private sector perspective (no government services), the services sector still dominated the economy in 2010 with 69.4 percent of total private sector employment.

Figure 5.5 shows there has been a historic structural change in the study corridor major industry's contribution to employment between 2001 and 2010. The structural change in the economy is primarily due to the decline in the goods producing sector. While employment shares of the goods producing sector has declined over the period (2001-2010), that of the services sector has increased. By 2010, employment shares of the goods producing sector was 25.7 percent, down from 32 percent in 2001. Over the same period, the services sector employment share rose from 68 percent to 74.3 percent.

Figure 5.5 Economic Structure of Study Corridor, 2001 - 2010



While employment in the manufacturing sector has been *dropping* (similar to almost all other states and regions), manufacturing output in the study corridor has been *rising*.[9] Nationally, manufacturers have invested heavily in automation and sophisticated process technologies, reducing their need for labor while maintaining and increasing output. The drop in manufacturing employment also reflects the internal restructuring of manufacturing firms. To lower costs and maintain competitiveness, and focus on core competencies, manufacturers have been outsourcing functions, such as human resources, payroll, maintenance, engineering, and logistics services. This has shifted employment from manufacturing to other sectors, notably the service sector, which has seen continuing increases in employment in the region.

The drivers of the region's economic growth comprise manufacturing, retail trade, financial and business support, leisure and hospitality, education and healthcare industries, and government services. By 2010, employment contributions of manufacturing and retail had declined by 3.9 percent and 1.4 percent respectively, while those of business support services, education and healthcare, financial, and government services had increased by 2.2 percent, 1.8 percent, 1.4 percent, and 1.4 percent respectively. The top-five industries by employment are shown in Table 5.1.

Table 5.1 Top-Five Industries in Study Corridor by Employment

Industry	Employment	Percent of Total Employment
Government	32,639	16%
Manufacturing	30,446	15%
Wholesale & Retail Trades	29,497	14%
Health & Social Services	18,892	9%
Accommodation & Food Services	14,056	7%
Total	125,530	60%

Source: Bureau of Economic Analysis, Cambridge Systematics Analysis

Transportation Usage

A region, state or nation's goods movement system partly defines its economic base. As a result, freight transportation is often described as a derived demand, because the level of demand (and the modes that are used) is driven by the characteristics of the economy.

[9] According to the Bureau of Economic Analysis (BEA), the value of manufacturing GDP in the Indiana and Kentucky increased by about 29 percent and 10 percent respectively between 2001 and 2010. BEA GDP figures are not available at the county level.

For the purpose of this study, industries that make up the study corridor's economy have been divided into two groups based on their dependence on freight transportation for their basic functioning:

- **Freight Intensive Industries** are industries that rely on transportation to receive raw or input materials and/or manufactured goods from their suppliers or to the consumer markets. This group includes, but is not limited to manufacturing, construction, wholesale and retail trades.
- **Non Freight (Service) Intensive Industries** are not dependent on freight movement, but do rely on shipments of materials such as office products, or other small shipments of goods and supplies. This category includes industries such as government, education, health care, and other professional categories

A list of the industries that are included in both sectors is shown in Table 5.2.

Based on the study corridor's economic structure, freight plays significantly in the regional economy. Freight intensive industries contributed 43.3 percent of total employment in the study corridor, about 13 percent below the contribution of the services sector in 2010. However, from the private sector perspective (no government services), the freight intensive industries dominate in their contribution to total employment. Freight intensive industries contributed 51.5 percent of total private sector employment. The significance of freight in the regional economy is due to the high concentration of manufacturing industries in Indiana and Kentucky. Manufacturing contributes to 15 percent of total employment, while manufacturing contributes 13 percent and 9 percent to Indiana and Kentucky as a whole, respectively. Manufacturing clusters in the region include food processing, transportation equipment, and metals.

Table 5.2 Freight and Non-Freight Intensive Industries in Study Corridor

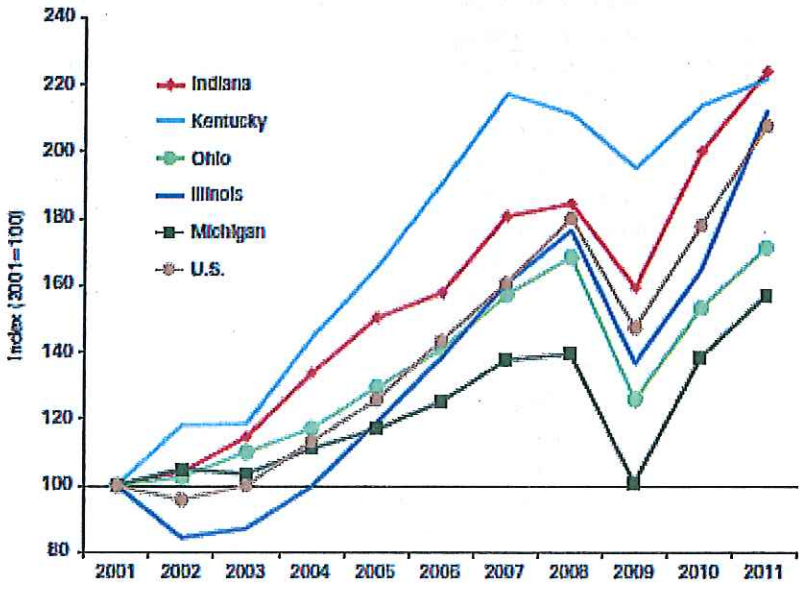
Freight Intensive Industries	Non-Freight (Service) Intensive Industries
Agriculture, forestry, fishing and hunting	Information
Crop and animal production (farms)	*Publishing including software*
Forestry, fishing, and related activities	*Motion picture and sound recording industries*
Mining	*Broadcasting and telecommunications*
Oil and gas extraction	*Information and data processing services*
Mining, except oil and gas	Finance and insurance
Support activities for mining	*Federal Reserve banks, credit intermediation and related services*
Utilities	*Securities, commodity contracts, investments*
Construction	*Insurance carriers and related activities*
Manufacturing: Durable goods	*Funds, trusts, and other financial vehicles*
Wood product manufacturing	Real estate and rental and leasing
Nonmetallic mineral product manufacturing	*Real estate*
Primary metal manufacturing	*Rental and leasing services and lessors of intangible assets*
Fabricated metal product manufacturing	Professional and technical services
Machinery manufacturing	*Legal services*
Computer and electronic product manufacturing	*Computer systems design and related services*
Electrical equipment and appliance manufacturing	*Other professional, scientific and technical services*
Motor vehicle, body, trailer and parts manufacturing	Management of companies and enterprises
Other transportation equipment manufacturing	Administrative and waste services
Furniture and related products manufacturing	*Administrative and support services*
Miscellaneous manufacturing	*Waste management and remediation services*
Manufacturing: Nondurable goods	Educational services
Food product manufacturing	Health care and social assistance
Textile and textile product manufacturing	*Ambulatory health care services*
Apparel manufacturing	*Hospitals and nursing and residential care facilities*
Paper manufacturing	*Social assistance*
Printing and related support activities	Arts, entertainment, and recreation
Petroleum and coal manufacturing	Performing arts, museums, and related activities
Chemical manufacturing	*Amusement, gambling, and recreation*
Plastics and rubber products manufacturing	Accommodation and food services
Wholesale Trade	*Accommodation*
Retail Trade	*Food services and drinking places*
Transportation and warehousing (excludes postal service)	Other services, except government
Air transportation	Government
Rail transportation	*Federal civilian*
Water transportation	*Federal military*
Truck transportation	*State and local*
Transit and ground passenger transportation	
Pipeline transportation	
Other transportation and support activities	
Warehousing and storage	

5.3 THE REGION'S KEY INDUSTRIES AND SUPPLY CHAINS

Key Industries

The Indiana University Kelly School of Business examined Indiana's trade environment and compared it to other Midwest states and to the U.S. from 2001 to 2011 in a report titled "Global Positioning 2012". During the ten year time period, Indiana and Kentucky exports have consistently exceeded the U.S. average growth in exports and have outpaced Midwestern neighbors (Figure 5.6). To realize the full potential for these exporters, a reliable network of rail, road, and rivers must be accessible. Kentucky and Indiana have also outpaced the Illinois, Michigan, and Ohio export index for the Midwestern state groupings. For 2011 Indiana and Kentucky exports were approximately equal. In 2010 Indiana's growth exceeded all others.

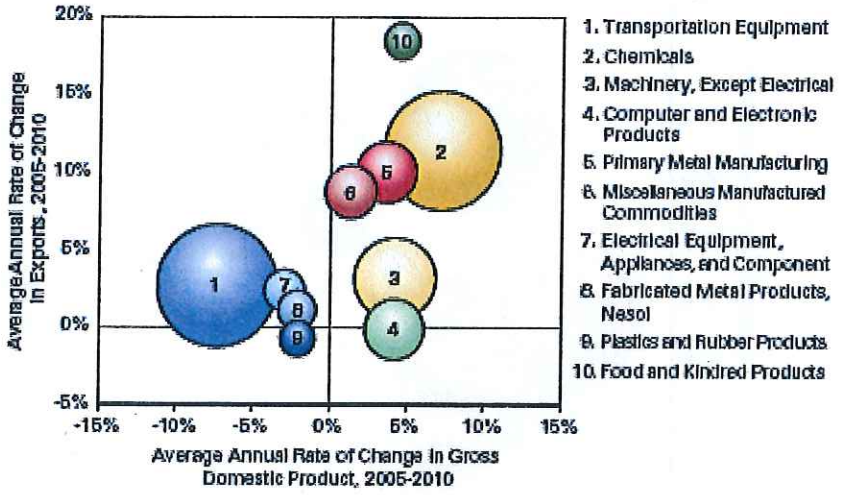
Figure 5.6 Export Index for Select Midwestern States 2001-2011



Source: Indiana University

The top manufacturing sectors in Indiana were also mapped by Indiana University's Kelly School of Business. Figure 5.7 illustrates the top ten industries' relative size and rate of growth. The auto industry (1), although large, shows one of the slower rates of growth; metal manufacturing (5), fabricated metal products (8) and food products (10) were among the fastest growing industries.

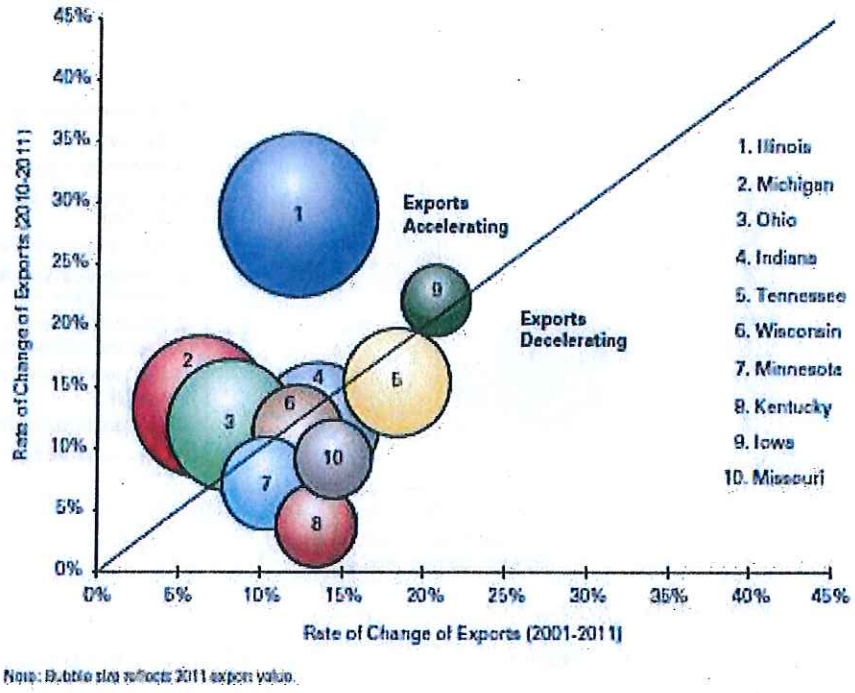
Figure 5.7 Comparing Indiana Growth in Exports and GDP by Industry 2005-2010



Source: Indiana University

Indiana University identified 2011 export activities including the dollar value for the export. In this analysis, the value of Kentucky and Indiana's exports are not keeping pace with neighboring states, which implies a lower percentage of manufactured products relative to regional competitors (Figure 5.8). To help keep Indiana and Kentucky competitive, an efficient transportation system is essential. Agriculture and energy industries rely on high volume bulk transportation modes. The Ohio River and access to this transportation network is essential to global competitiveness. For high value manufacturing such as automotive, furniture and finished food products, transit time and proximity to end users is an important consideration. Given Indiana's proximity to the population center of the U.S. efficient transportation is essential to promote distribution activities.

Figure 5.8 Export Trends in the Midwest 2001-2011



Note: Bubble size reflects 2011 export value.

Source: Indiana University

Key Supply Chains

Individuals from five key industrial sectors located on the proposed I-67 corridor were interviewed, in both Kentucky and Indiana, to determine their transportation connection needs to support freight movement in the region. Five supply chains were investigated: agriculture, automotive, energy, furniture, and steel products.

Agriculture

Many companies in the food and beverage industry located in the Owensboro area due to the purity of the water and the fact that unlimited supplies of fresh unfiltered water could be used in the beverage, baking and food processing business. Unilever produces Ragu spaghetti sauce, Sara Lee uses this water in the baking process, Specialty Food Group is a large food producer and Sazerac uses these same water resources as a primary input in the distillation of spirits (Kentucky Bourbon). Each of these industries located in the Owensboro area near the source of one of their primary raw material supply requirements; they have remained in Owensboro due to the population demographics and to be near their consumers. Nevertheless, lack of an Interstate connection is a limiting factor.

Cargill has two facilities near the proposed corridor. The Indianapolis plant moves 25 trucks per day of corn from local suppliers along local roads. Three trucks of parts and maintenance supplies travel inbound from Louisville, KY along I-65, and a few growers' supplies come in from Chicago, IL via I-65. Outbound, 18 trucks per week are sent to West Chicago, 4 trucks per week travel to North Carolina, and 4 trucks per week are destined for Arkansas. The Cargill facility in Evansville, IN brings in corn, soybeans and wheat from local growers. The I-67 corridor would represent the eastern perimeter of their catchment area. Most outbound product moves by rail or barge.

In Kentucky, Owensboro Grain Company was started in 1906 and has grown into one of the premier soybean processors in the country. Owensboro Grain crushes soybeans and produces biofuel and edible oils.

Several truckers based in the Rockport area and focusing on this supply chain estimated benefits they would experience with I-67. One trucker supplies feed and meal to poultry farms, with outbound products consisting of eggs and egg products. This carrier reports that time savings would be his biggest benefit as he makes numerous short haul trips per day. An upgrade to the corridor would allow him to haul more product and increase productivity. Another carrier operating out of Rockport primarily hauls fertilizer and moves 7 to 8 truckloads per weekday and another 2 to 3 truckloads per weekend. This carrier runs loaded northbound and empty southbound. He estimates that he can save up to 10 percent on the cost of fuel with I-67.

Automotive

The Toyota manufacturing facility in Princeton, IN is located on the US-41 corridor and has 18 tier one suppliers. Five suppliers are located along the study area in Jasper, Huntingburg and Santa Claus, IN and have shipments that move westbound to serve the Toyota facility. One supplier is in Plainville, IN, and the remaining suppliers are located along US-41 from Evansville, IN to Vincennes, IN and would have limited volumes moving via the I-67 corridor. Some suppliers provide auto parts to other auto assembly facilities in Lafayette, IN and Greensburg, IN. Finished vehicles move out by rail and by truck. The truck shipments primarily move via US-41.

The General Motors Corvette plant is located in Bowling Green, KY; they report they move 4 trucks per week between Iowa City, IA and Bowling Green, KY, and another 4 trucks per week move between sourcing points in Grand Rapids, MI and Chicago, IL. Inbound trucks return to these origins with empty racks. They estimate that as much as 20 minutes per truck could be saved if the I-67 corridor were developed. Some finished vehicles could move along the corridor to customers in the Upper Midwest.

Jasper Engines and Kimball Manufacturing are suppliers to automobile makers. Jasper Engines built a 10 acre warehouse in Crawford County because they needed Interstate access. This facility may have been built in Jasper if an

Interstate was available. The company has 1,100 employees in Jasper, IN. They operate a private fleet of 30 tractors which move product to customers. They have 8 shuttle movements per day between the plant and the Crawford warehouse. They receive supplies from 15 inbound carriers and do not control the routing on that traffic. Sixty percent of inbound product comes from Michigan and Northern Indiana, 30 percent comes from Tennessee via US-231, and 10 percent comes from the west on I-64. They rely on some rail movements for outbound shipments which depart from Chicago in containers; these loads move via I-65 to rail terminals. Some outbound product moves via small packages by air. Depending on the destination, Louisville and Indianapolis airports are used. Scrap, which is a byproduct of manufacturing, travels on US-231 to the river. Jasper Engines estimates that the Panama Canal will impact some inbound flows in the future and that more freight could move via Evansville and Rockport. It was estimated that up to two additional trailers per day are possible based on changes in traffic patterns caused by the new Panama Canal capabilities.

Energy

There are 91 power generation plants in Indiana; three are located within the region, with one located in each of Pike, Dubois, and Spencer Counties.

The Peabody Energy Company is based in Evansville, IN and has seven mines in Indiana. Five of the seven mines are located along the US-41 corridor. The Viking Mine, located in Daviess County, will be mining 7 million tons of coal, which will move mostly by truck. The Wild Boar mine in Lynnville, IN would move product toward the river via I-64 and then via the I-67 corridor toward the river. Rail movement is available on CSX for the mines located along the US-41 corridor.

Duke Energy has a warehouse facility in Plainfield, IN, which would use the proposed I-67 corridor for some outbound shipments. One truck per day is received form northeast Indiana with fittings, transformers, nuts and bolts. They rely on a distribution center in Clarksville, IN, and receive one partial load per week. Duke Energy is Indiana's largest electric supplier and owns 7,000 megawatts of electric capacity in the state; they are considering developing a new facility. To construct a new facility, more than 1,000 trucks would bring construction materials to the site and there would be hundreds of oversize and overweight loads needed to haul generators and other components. When a similar plant was built, entire portions of US-41 were closed and loads were moved with police escort. Bridges were inspected, braced and many were routed to alternative routes to comply with weight limitations. New energy plants cost between $2.7 and $3 billion to construct. With the region's proximity to coal reserves and rail lines to bring in western coal for mixing, the lack of an improved highway system would be a barrier to expansion for Duke Energy. Additionally, a new private coal gasification project is being considered in Rockport.

The AEP facility is located in Spencer County and receives coal by barge from Metropolis, IL after being delivered by rail from the Powder River Basin and blending Appalachian Coal to reduce boiler slagging. They have recently agreed to spend $1.8 billion on scrubbers to remain compliant with EPA regulations. Scrubbers are scheduled to go in service this decade, after which AEP may switch to local, Illinois Basin coal and use rail and truck delivery primarily. AEP generates over 150,000 tons per year of bottom ash, a by-product of the energy generation process. This is being used in concrete construction projects and moves outbound by barge.

Furniture

The abundant hardwood forests in the I-67 corridor area have been the source of raw materials for many of the nation's furniture manufactures. Due to labor savings and cheap foreign sources of wood from countries with fewer environmental regulations, much of the institutional furniture manufacturing has been off-shored. Some specialty manufacturers have survived and are still located along the corridor. Three primary production points exist along the corridor: Jasper, IN, Huntingburg, IN and Santa Claus, IN.

For one manufacturer, approximately 60 trucks per week from Georgia, Louisiana, North Carolina, and South Carolina bring board for furniture tops; another 60 trucks per week bring cardboard packing from Wisconsin. Hardware components come from Michigan with on another 60 trucks per week. Lights and fixtures are sourced from various locations. Approximately 120 trucks per week deliver products from the Jasper, IN facility and 25 trucks per week make deliveries of products made in Santa Claus, IN. This company has their own private fleet of 41 trucks, of which 17 are engaged in regional support services. Rail containers come to these two facilities from St. Louis, MO and Louisville, KY via I-64. Other containers are routed via Chicago, IL and would benefit from I-67.

Steel

Steel producers in the area are dependent upon barge transportation and the availability of low cost power. The AK Steel facility is located just north of the Rockport area and is served by the NS railroad. Approximately 1.6 million tons of raw materials come in via barge, truck and rail. Approximately 15% of the outbound finished product moves to local auto and appliance manufacturers; the balance moves outbound primarily by rail. This user is located on the most recent US-231 upgrade and has benefited from improved highway access between the river and their plant.

5.4 THE REGION'S MULTI-MODAL PROFILE

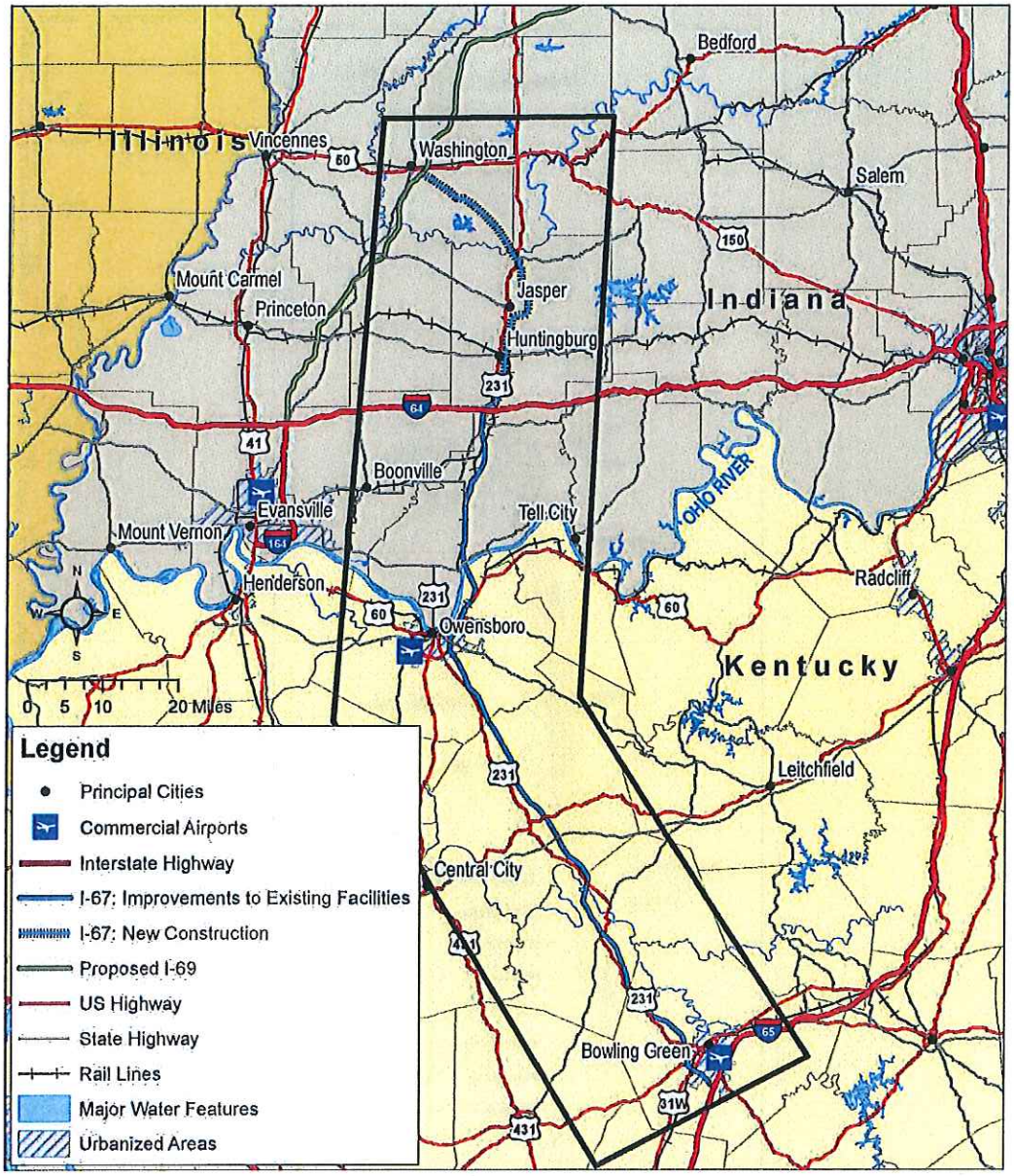
Businesses in the 21st century rely on ready access to international markets to remain competitive in a globalized economy. Surface transportation networks, in addition to air and waterways, work together to provide access to these markets.

This section assesses the region's transportation system, and details how the proposed I-67 would increase efficiency in goods movement and create better connections across modes.

Highways

The area of southern Indiana and western Kentucky through which the proposed I-67 would pass is well situated for intermodal transportation (Figure 5.9). At present, I-64 passes east-west through the region, while the north-south I-69 corridor is forthcoming. Other major roadways in the area include US-231, the Natcher Parkway, and US-50. While most of the major highways have relatively low levels of congestion, US-231—mainly a 2-lane road—has high truck traffic and faces increasing levels of congestion (Figure 5.10).

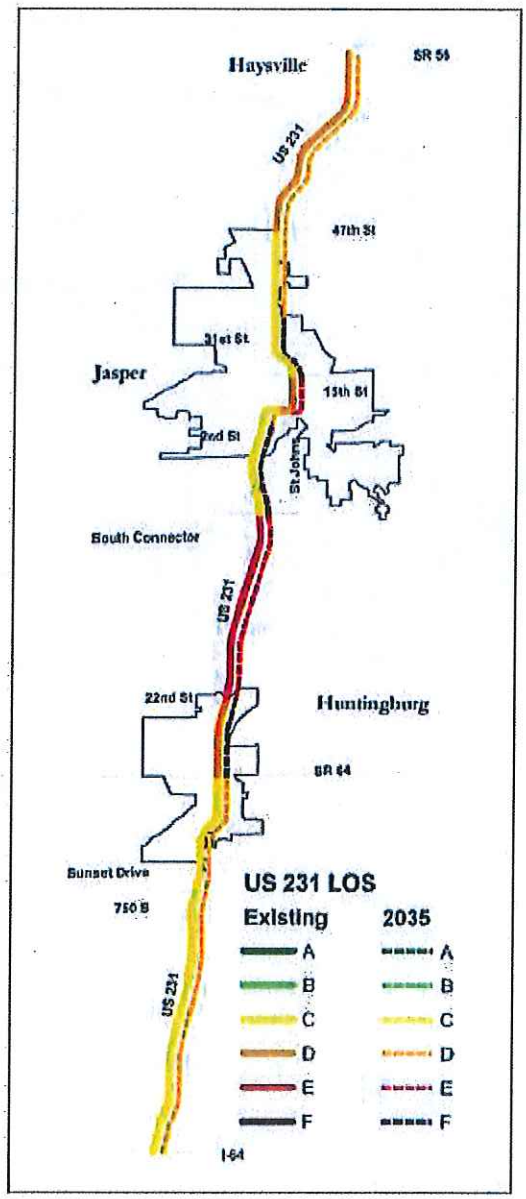
Figure 5.9 I-67 Study Corridor and Regional Transportation Network



Data Source: National Transportation Atlas Databases 2012.

As the main north-south thoroughfare through the study area, US-231 serves as a lifeline for industry in the communities of Jasper and Huntingburg. As one of the few truck routes in the region, safety issues are exacerbated by increasing numbers of semi trucks on the roadway.

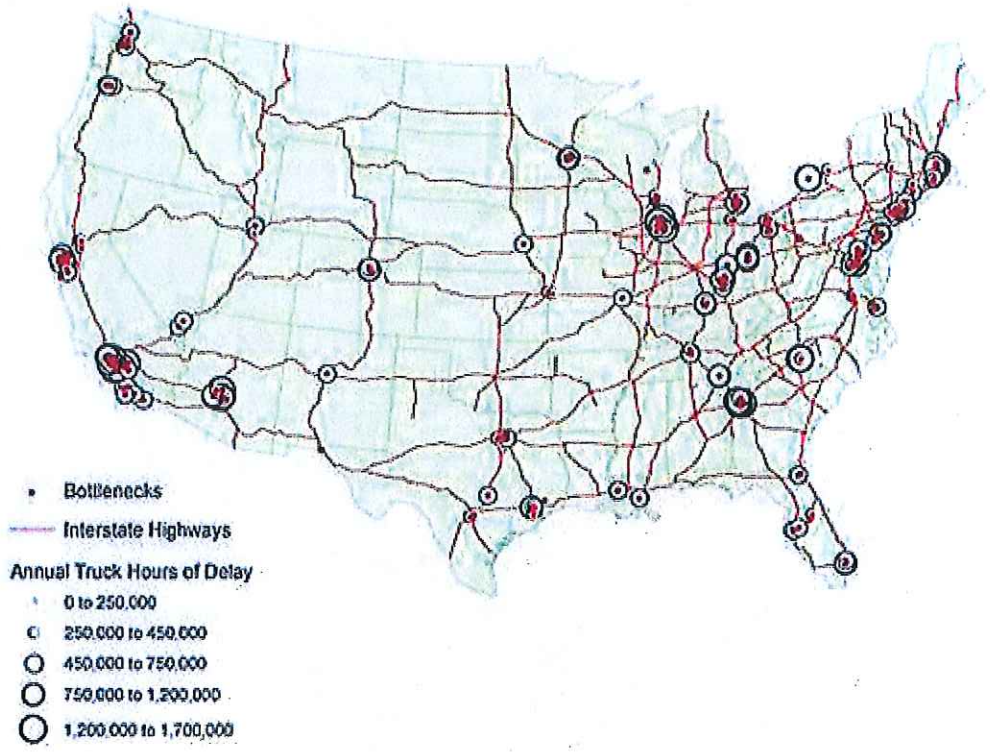
Figure 5.10 Existing and Projected LOS, US-231, Huntingburg-Jasper Indiana



Source: *US 231 Dubois County Indiana Supplemental Draft Environmental Impact Statement.*

Several of the nation's worst truck bottlenecks are in the region, including I-65 through Louisville, increasing the cost of shipping and threatening the continued growth of industry in the area (Figure 5.11). The 55 mph speed limit and narrow roadway design on US-231 do not make it a viable alternative route to I-65 at the moment. These bottleneck delays can be costly for businesses that rely on moving goods quickly between their headquarters and other regions.

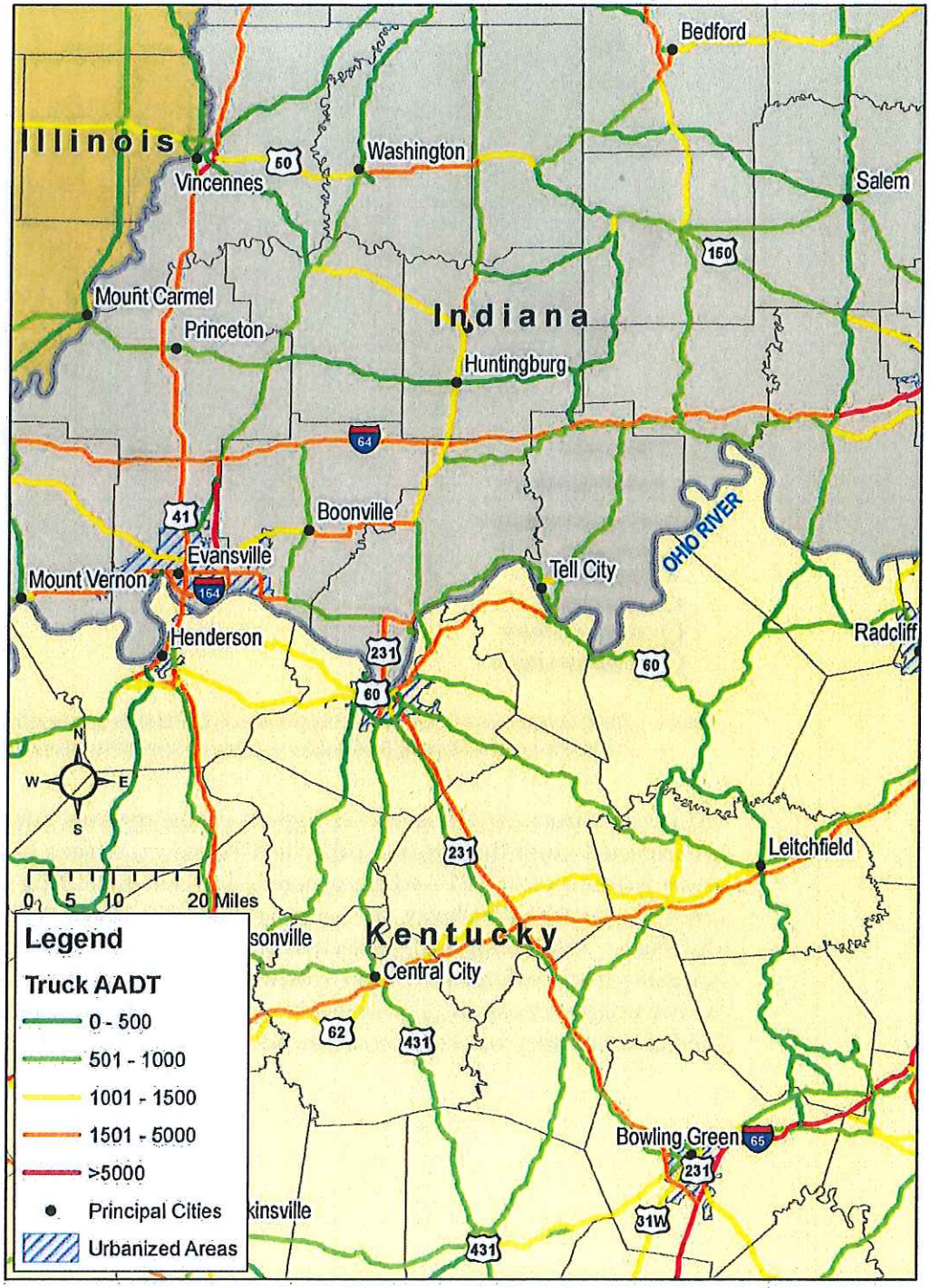
Figure 5.11 Major Freight Bottlenecks on U.S. Highways



Source: *Traffic Congestion and Reliability: Linking Solutions to Problems*, prepared by Cambridge Systematics, Inc. for the Federal Highway Administration, Office of Operations, Washington, D.C., July 2004.

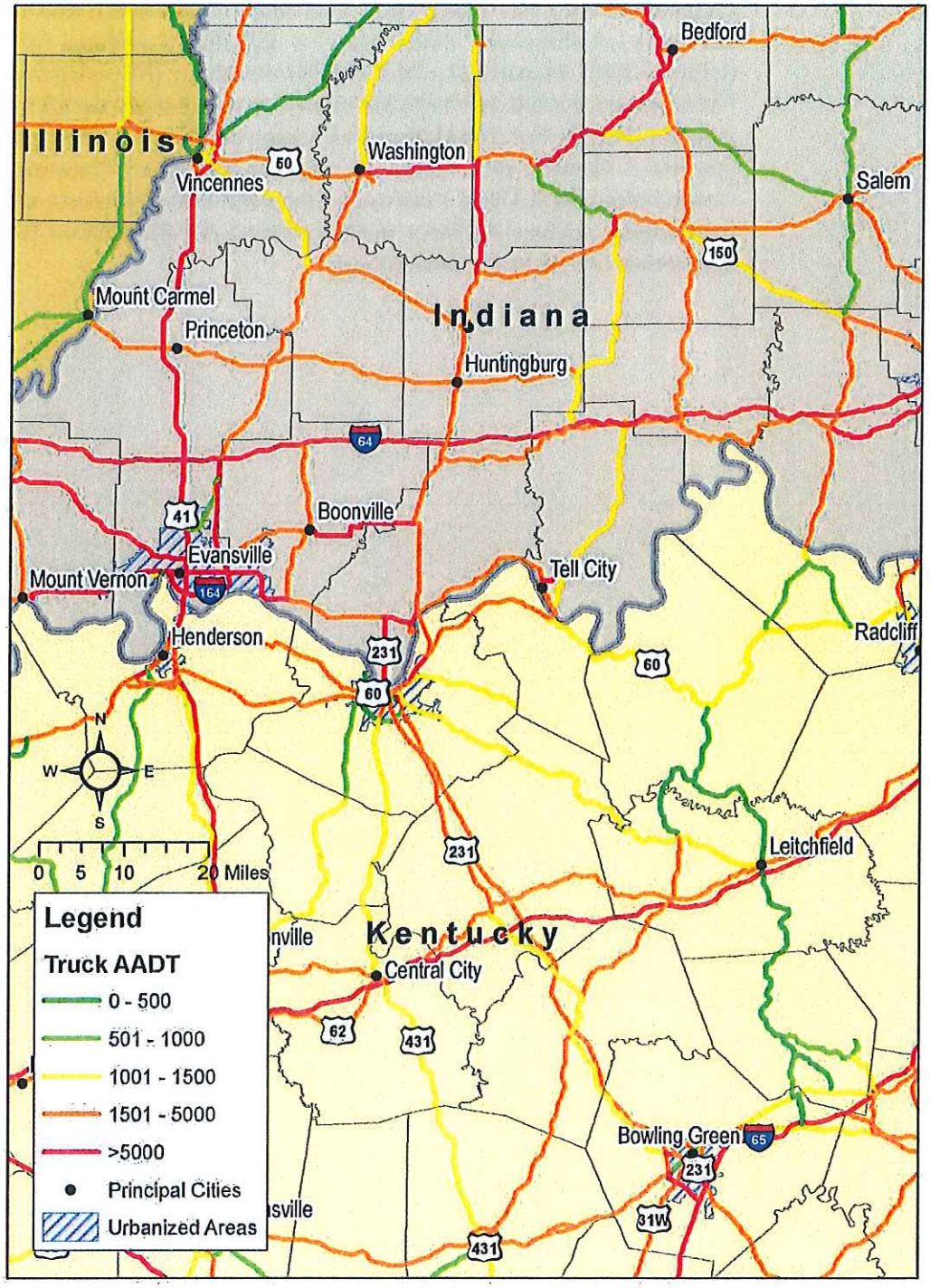
At present, truck AADT levels are highest on the region's Interstates, which is to be expected given their greater capacities. However, as seen below in Figure 5.12, even portions of US-231—which generally has one travel lane in each direction—and the Natcher Parkway are approaching the truck AADT levels of area Interstates. The continued projected growth of local industry is expected to increase truck volumes on local roadways substantially by 2040 (Figure 5.13). Greater highway capacity, as well as an increased reliance on the area's air, water, and rail networks, will be necessary to adequately accommodate this growth.

Figure 5.12 Highway Truck AADT, 2007



Data Source: Freight Analysis Framework, National Transportation Atlas Databases 2012.

Figure 5.13 Projected Highway Truck AADT, 2040

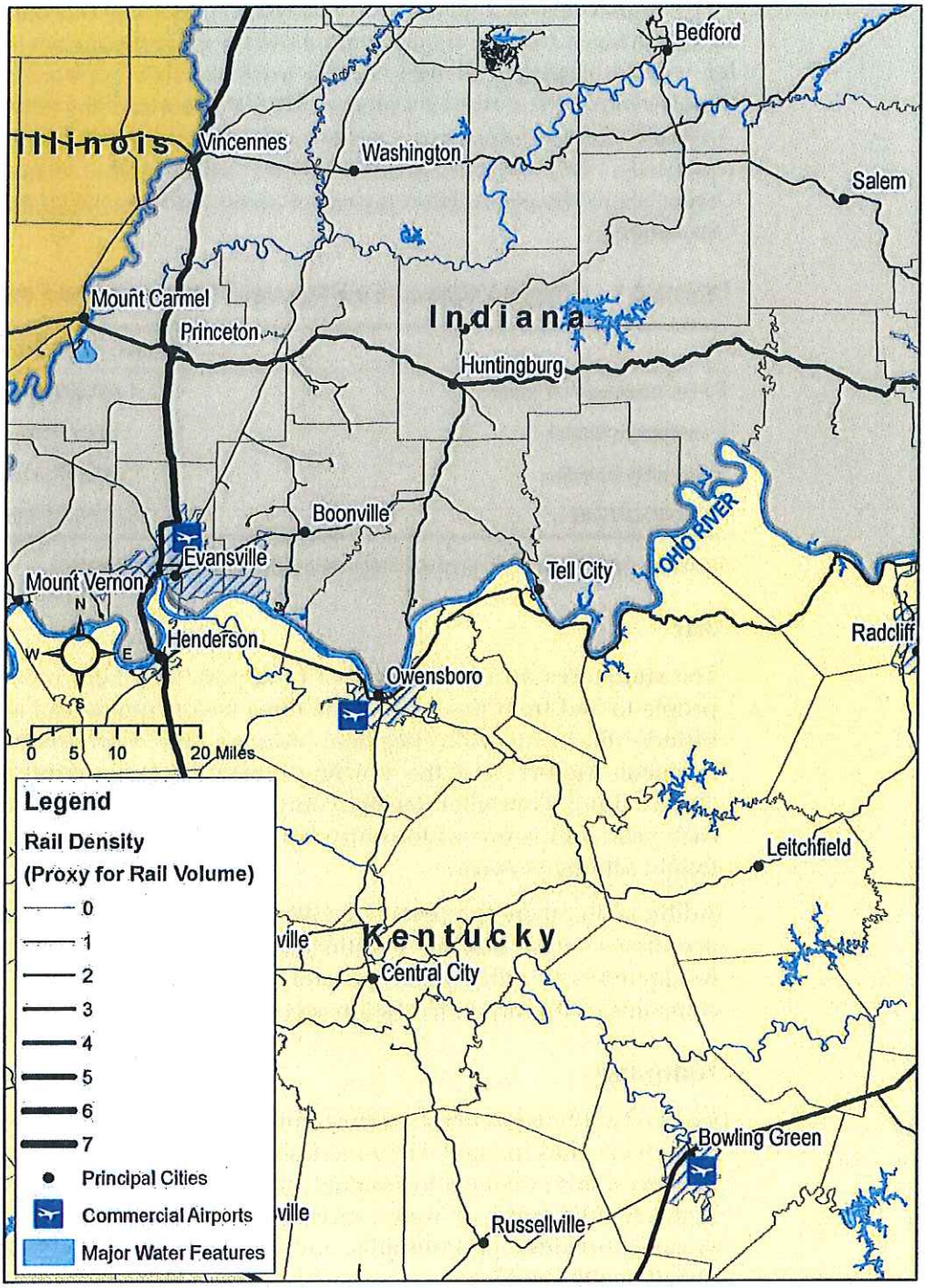


Data Source: Freight Analysis Framework, National Transportation Atlas Databases 2012.

Rail

The study area has access to several major north-south and east-west rail lines. Several of these rail lines carry a significant volume of trains each day (Figure 5.14). In particular, the Norfolk Southern (NS) east-west railway through Huntingburg is cited by local businesses as particularly useful for the movement of goods. The Port of Owensboro has access to CSX and Mid America Terminals in Spencer County has access to Norfolk Southern, creating two intermodal connections with Class 1 railways along the river. Numerous other industries in the region, such as AK Steel, use their direct rail connections to either receive raw materials or ship out finished goods.

Figure 5.14 Regional Rail Volumes



Data Source: Freight Analysis Framework, National Transportation Atlas Databases 2012.

Water

The region boasts a significant waterborne shipping thoroughfare in the Ohio River. This is a major transportation asset for operations such as stone quarries, for which shipping by barge is the least expensive option. Major ports in the region include the Port of Indiana at Mt. Vernon and the Owensboro Riverport. Annual freight volumes are summarized below in Table 5.3. In particular, the proposed I-67 would provide better multi-modal connections with the Owensboro Riverport, allowing easier access for firms located north and south of Owensboro.

Table 5.3 Freight Volumes for Regional Waterways and Ports

	Annual Freight Tonnage
Port of Indiana—Mt. Vernon	4,700,000 tons
Owensboro Riverport	860,000 tons
Green River System	10,382,887 tons
Ohio River System	220,594,275 tons

Source: US Army Corps of Engineers Waterborne Commerce Statistics Center.

Air

The study area also has a number of airports that help move both goods and people to and from the region. The three major commercial airports in the area include the Evansville Regional Airport, the Owensboro-Daviess County Regional Airport, and the Bowling Green Warren County Regional Airport (Figure 5.14). Evansville Regional Airport moves a significant amount of cargo each year, and is one of four airports in Indiana with greater than 100 tons of freight activity per year.

Additionally, there are several smaller airports in the area that cater to private operations, most notably Huntingburg Airport. Easy access from corporate headquarters to this small general aviation airport is a major benefit to companies with corporate headquarters in the region.

Summary

The I-67 study region has a robust multimodal transportation system consisting of highway, rail, air, and water modes that serve local businesses and consumers. However, this system is increasingly strained by congestion, particularly on the highways. In terms of water, easy access to the Ohio and Mississippi River systems provides opportunities for growth among the local industries that depend on this mode.

5.5 SWOT ANALYSIS

Introduction

This section discusses the strengths, weaknesses, opportunities and threats (SWOT) analysis of the study region with respect to business site selection factors and business quality-of-life factors, as ranked in the 2010 Area Development Corporate Survey. The discussion focuses on the top three most important site selection and quality of life factors.

A review of the 2010 Area Development Corporate Survey, shown as Tables 5.4 and 5.5, identifies those factors that drive businesses to locate in a given region. These factors can be interpreted as driving (in part) the success of existing businesses as well. It is important to bear in mind the ranking (and thus the relative importance) of these factors in reviewing the SWOT analysis that follows for the study region.

Table 5.4 Business Site Selection Factors

Ranking	2010	2009	2008
1. Highway accessibility	97.3	92.9	95.4
2. Labor costs	91.0	96.7	91.4
3. Tax exemptions	90.9	88.4	88.6
4. Occupancy or construction costs	89.8	86.7	90.4
5. State and local incentives	89.3	84.9	87.2
6. Corporate tax rate	86.3	87.0	85.3
7. Availability of skilled labor	85.9	86.9	87.7
8. Inbound/outbound shipping costs	84.0	81.7	N/A
9. Energy availability and costs	82.1	88.0	87.9
10. Availability of buildings	81.0	75.7	80.8
11. Low union profile	75.4	75.8	82.7
12. Environmental regulations	74.8	71.2	76.1
13. Available land	73.4	75.7	82.0
14. Availability of advanced ICT services	72.9	83.2	55.5
15. Expedited or "fast track" permitting	68.2	72.2	72.5
16. Right-to-work state	67.9	74.0	76.6
17. Proximity to major markets	66.4	73.3	78.7
18. Proximity to suppliers	63.6	63.9	69.2
19. Raw materials availability	61.5	57.0	56.8
20. Availability of long-term financing	58.5	65.4	64.2
21. Training programs	56.7	61.7	62.3
22. Accessibility to major airport	50.0	49.0	53.3
22. Availability of unskilled labor	45.4	55.5	62.9
23. Proximity to technical university	36.1	36.7	38.4
25. Railroad service	36.0	27.4	27.2
26. Waterway or ocean port accessibility	21.9	17.7	15.7

Source: *Area Development* Corporate Survey 2010.

The SWOT analysis in this report focuses on the three most important factors in both the business selection factor (highway accessibility, labor cost and tax exemptions) and quality-of-life factors (healthcare facilities, and housing cost and availability) that are in some way interrelated with transportation.

Table 5.5 Business Quality-of-Life Factors

Ranking	2010	2009	2008
1. Low crime rate	84.6	79.0	95.4
2. Healthcare facilities	72.2	68.4	91.4
3. Housing cost	68.4	61.5	88.6
4. Housing availability	66.4	62.4	90.4
5. Ratings of public schools	61.2	61.4	87.2
6. Climate	56.3	55.0	85.3
7. Colleges and universities in area	53.2	50.7	87.7
8. Cultural opportunities	48.7	46.0	N/A
9. Recreational opportunities	48.2	52.7	87.9

Source: *Area Development* Corporate Survey 2010.

Highway Accessibility

The region's current transportation system was examined in Section 5.4. The proposed I-67 corridor would link Gaylord, MI to Nashville, TN with a new segment connecting I-69 to US-231 through Dubois and Daviess Counties. Current segments of US-231 south of I-64 and the Natcher Parkway between Owensboro and Bowling Green, KY, would be upgraded through minor improvements to Interstate standards. The facility is aimed at improving access within and to the study corridor, as well as diverting traffic from the congested I-65 route through the Louisville metropolitan area.

Owensboro, KY and Rockport, IN are in the middle portion of the corridor and are the farthest from an alternative north-south Interstate connection. Currently, the closest north-south Interstate access from Owensboro, KY is in Elizabethtown, KY at I-65, approximately 97.5 miles away; it is approximately 30.5 miles to Henderson, KY, where a connection to the I-69 corridor is proposed. Owensboro is an influential economy in the study region and the home of notable manufacturing firms including Unilever Foods, Specialty Food Group, and Toyotetsu Mid-America, among others.

Conexus Indiana published "A Plan for Indiana's Logistics Future" in March 2010. Among others, the plan included the following proposals to support infrastructure goals to facilitate travel and improve accessibility in Indiana:

- Support the completion of key infrastructure projects in bottleneck regions; and
- Identify and create a plan to improve/provide infrastructure (Interstate-like) access to regions/cities with limited accessibility based on impact and potential.

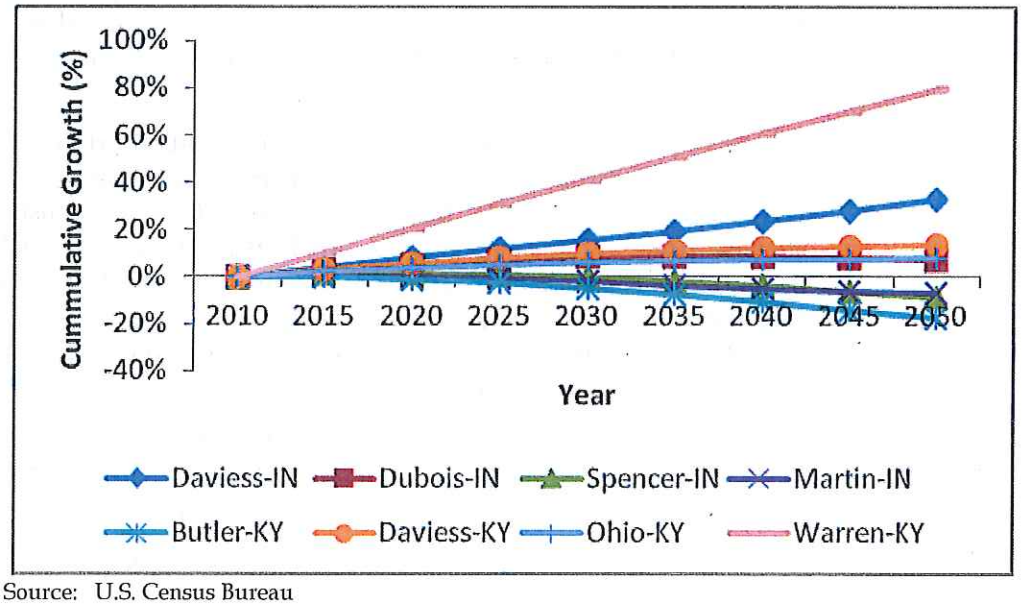
A formula was then developed to identify logical cities for improved access based on impact and potential. Two such cities – Jasper and Washington – are in the study corridor. Development of the proposed I-67 corridor is expected to provide this accessibility.

Labor Availability and Labor Costs

For businesses looking to find a start-up location, relocate, or expand, both the availability and quality of the labor force can be a major location decision factor. Population trends and projections define a region's labor supply, while data on educational attainment and existing employment mix are utilized to assess the skill level.

The study region has posted growth over the past ten years and it is projected to continue into the future. As shown in Figure 5.15, the study region is projected to grow by 22.4 percent and 32.5 percent by 2035 and 2050 respectively, with Warren County posting the highest growth of about 80 percent by 2050. Over the same period, Butler County's population is projected to decline by 17.5 percent. The overall growth trend of the region bodes well in terms of labor supply for businesses choosing to locate in the region, since labor quality in the region is comparable to the national average.

Figure 5.15 Projected Population Growth of the Study Region, 2010-2050

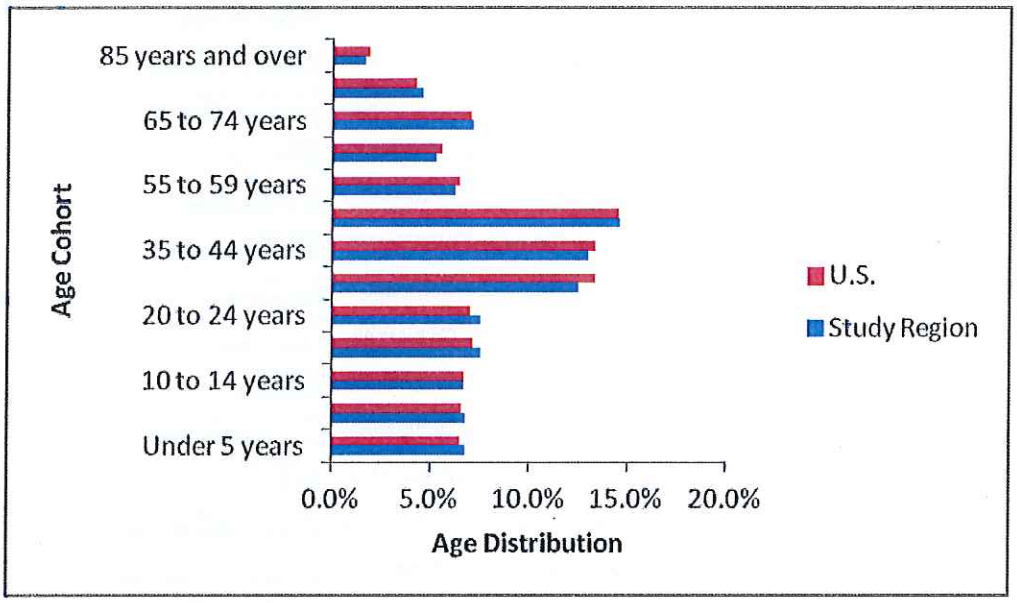


Source: U.S. Census Bureau

In tandem with its population growth, the study region's age distribution indicates availability of long-term labor supply. From Figure 5.16, the study region's working age group closely matches the national average. Similarly, the study region's share of older population over 60 years is at par with the national average of 18.3 percent. Also, the share of the study region's active working-age

group (20-44 years) is 33 percent, compared to 33.6 percent nationally, thus closely matching the national average.

Figure 5.16 Study Region Age Distribution, 2010

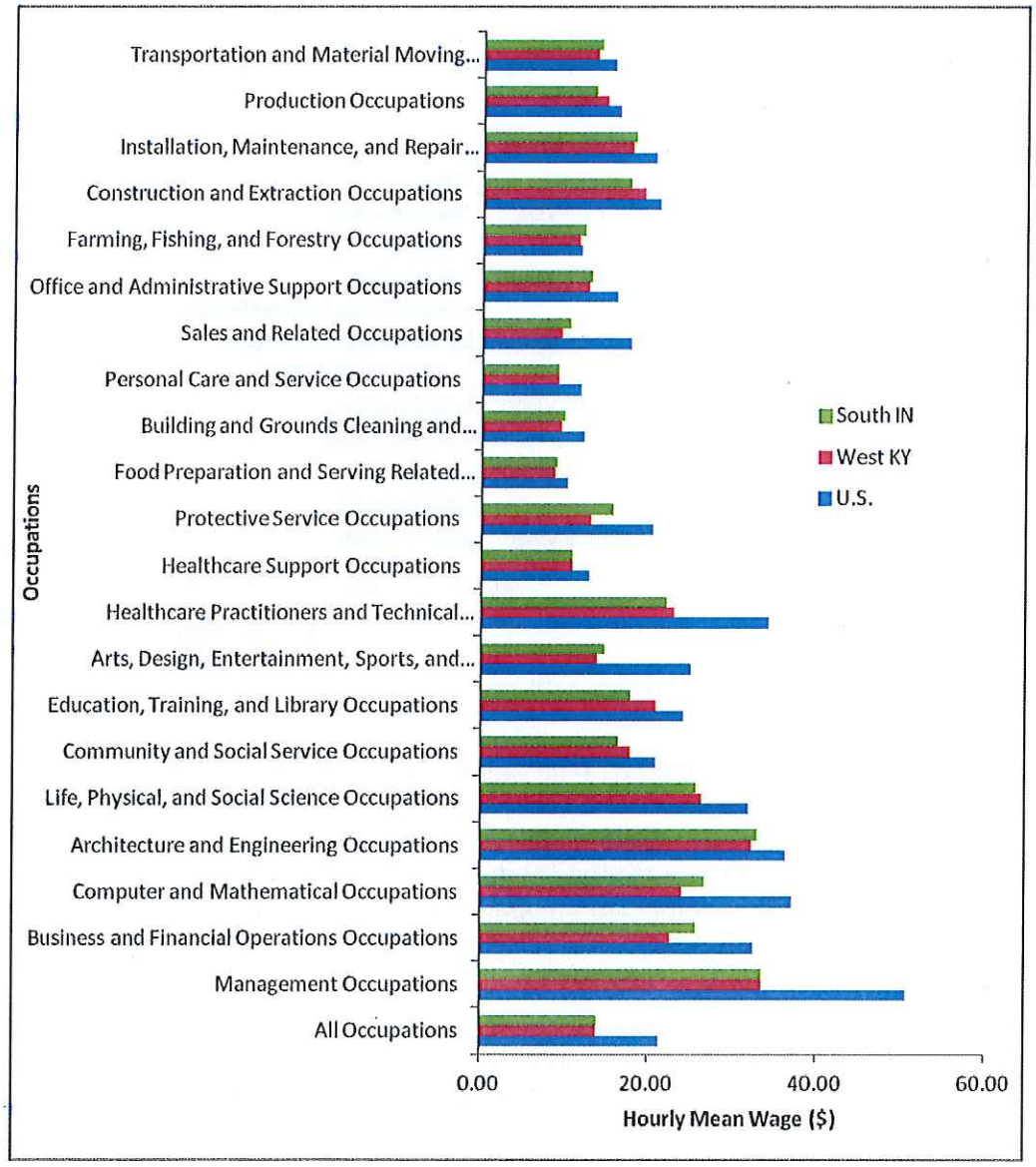


Source: U.S. Census

As indicated in Table 5.4, labor cost is the second most important criterion that influences business site selection. The importance of labor cost is explained by its effect on business competitiveness. Labor is a major production input factor; therefore a relatively higher cost of labor increases the overall business cost. All other factors being equal, the increased production cost translates into higher market prices, thus making it uncompetitive in the market. This leads to reduction in demand for products.

Figure 5.17 shows that labor costs for most occupations in the study region are lower than the national average. According to wage data provided by the Bureau of Labor Statistics (BLS), labor costs for farming, fishing and forestry are at par with the national average.

Figure 5.17 Comparison of Hourly Wage by Occupation



Source: Bureau of Labor Statistics

Business Tax Climate

While taxes are an important source of revenue for the government services that keep businesses' doors open, the burden of high taxes, especially compared to one's neighbors, can slow economic growth and hinder prosperity. State and local taxes represent a significant business cost for corporations operating in the United States; in fact, they often have a material impact on net income of businesses. Consequently, business location decisions are influenced by

assessments of relative tax burdens across multiple states. This could explain the reason tax exemptions rank third in business site selection factors.

According to the Tax Foundation, Indiana and Kentucky rank 11th and 22nd nationally (respectively) as states with more favorable business tax climates in 2012. The overall ranking is based on each state's performance in five tax categories: corporate income tax, individual income tax, sales tax, unemployment insurance tax, and property tax. A rank of 1 is more favorable than 50. This ranking is based on the tax climate as of July 1, 2011, the first day of the standard state fiscal year. Table 5.6 shows that Indiana and Kentucky rank 1st and 4th among their neighboring states, including Illinois, Tennessee, Michigan, Missouri, Ohio, West Virginia, and Virginia.

Table 5.6 State Business Tax Climate Rankings, 2012

State	Overall Rank	Corporate Tax	Individual Income Tax	Sales Tax	Unemployment Insurance Tax	Property Tax
Indiana	**11**	**18**	**10**	**11**	**16**	**11**
Kentucky	**22**	**26**	**25**	**8**	**47**	**19**
Ohio	39	22	42	29	10	33
Virginia	26	6	37	6	36	27
Illinois	28	45	13	33	43	11
Michigan	18	49	11	7	44	30
West Virginia	23	24	22	18	26	25
Tennessee	14	13	8	43	27	48
Missouri	15	8	23	26	9	7

Source: The Tax Foundation

In a study conducted by the Tax Foundation and KPMG LLP (*Location Matters - 2012*), Indiana ranks 43rd in tax burdens for mature operations, but 15th for newly established operations. Similarly, Kentucky ranks 18th for mature operations and 7th for newly established firms. A summary of Indiana and Kentucky's business tax climates for newly established firms across seven firm-types is presented in Table 5.7.

All other factors being equal, the study region's business tax climate is likely to stimulate attraction of businesses in research and development, call center, retail, corporate offices, distribution centers, and labor-intensive manufacturing. The region's tax climate is less favorable for attracting capital-intensive manufacturing businesses.

Table 5.7 Business Tax Climate Ranking for New Businesses, 2012

Firm Type	Indiana Ranking	Kentucky Ranking
Corporate Headquarters	12	6
Manufacturing – Capital Intensive	38	35
Manufacturing – Labor Intensive	20	11
Call Center	16	4
Retail Store	2	16
Distribution Center	23	12
Research & Development	5	9

Source: Tax Foundation

Healthcare Facilities

As the third largest medical facility in Kentucky, the Owensboro Medical Health System (OMHS) has positioned Owensboro as a medical hub. OMHS operates a full-service medical facility. The facility provides premiere heart services through its partnership with Louisville's Jewish Hospital Heart and Lung Institute and is home to the Owensboro Cancer Research Program, a joint venture with James Graham Brown Cancer Center at the University of Louisville, which include full-time University of Louisville researchers linked to the plant biotech industry and Kentucky BioProcessing.

Other medical facilities located in the study region include the Ohio County Hospital, Commonwealth Regional Specialty Hospital, Greenview Regional Hospital, Western Kentucky Orthopaedic & Neurosurgical Associates, Memorial Hospital and Health Care Center, and Daviess Community Hospital.

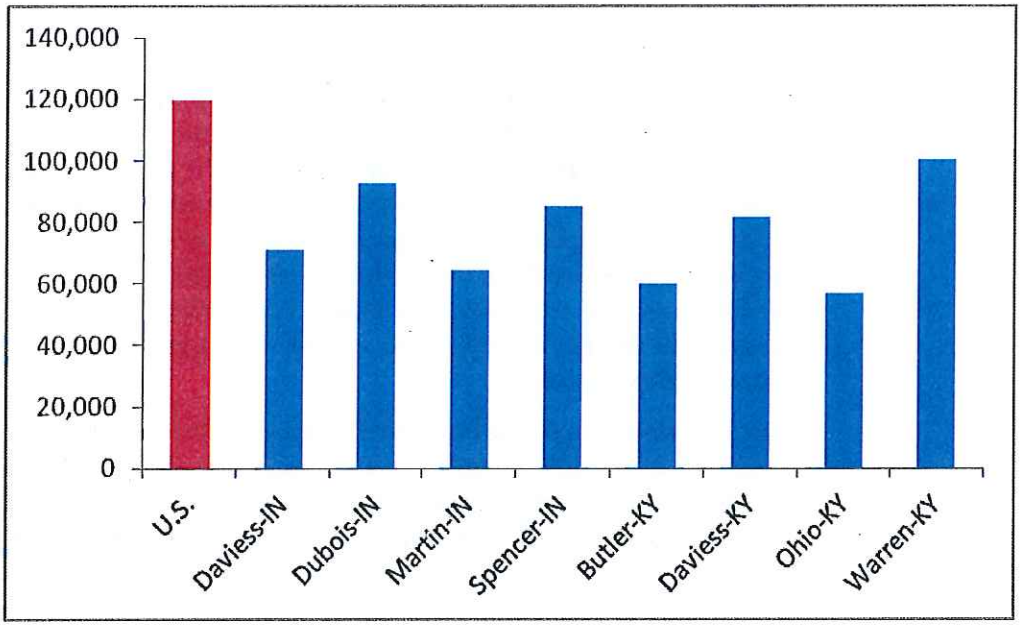
Housing Cost and Availability

The benefits of affordable housing extend beyond its occupants to the community or town. Generally, affordable housing leads to increased spending in the local economy and acts as an important revenue source for local government. In areas where housing demand outstrips housing supply, housing prices are relatively high. This puts employers and the regional economy at a disadvantage as employers are unable to attract and retain workers.

Median housing values in the study area have been consistently lower than the national average since 2000 (Figures 5.4 and 5.18). As mentioned in section 5.2, 10 percent of housing units in the study area are unoccupied, up from 8.3 percent in

2000[10]. The increase in unoccupied housing catalyzed by the recent economic meltdown will continue to contribute to affordable housing in the study area. Additionally, the slow recovery of the U.S. economy is likely to stabilize housing prices in the medium term, as residents continue to face foreclosures, and the demand for multi-family housing remain high.

Figure 5.18 Median Housing Values, 2000



Opportunities

The proposed I-67 corridor is expected to foster long-term economic development of the study region through improved accessibility, improved supply chain connectivity to existing business (especially manufacturing), and accelerated development of new lands earmarked for development.

The region's manufacturing capability, today, is tied together by its transportation system. The manufacturing sector makes extensive use of intermodal rail and water services, but it is trucking and the highway system that provide manufacturers with the capability to access a wide range of materials, labor, technology, and markets, and to integrate these elements into cost-effective, just-in-time manufacturing operations. For these reasons, the proposed I-67 corridor will improve transportation capacity to deliver freight reliably and at stable or lower costs to keep the manufacturing sector competitive.

[10] U.S. Census Bureau

Also, the planned Technology Park to be developed by the Huntington Airport Authority is expected to benefit from the development of the corridor. The corridor will provide access to over 200 acres of land earmarked by the Huntingburg Airport Authority for development of a Technology Park. This technology park has also received Foreign Trade Zone (FTZ) status and there are more than fifteen economic development incentives for aviation based manufacturers to locate at this location; however not being on an Interstate will have an impact on the inbound and outbound transportation costs and reliability for high value goods, limiting the ability to attract businesses.

The proposed I-67 corridor could provide Indianapolis manufactures with competitive access to the Ohio River. This would directly link Indianapolis to ports such as the Mid-America Terminal, with 947 acres available for development and a 150 railcar unit train trans-loading facility for coal and bulk materials. The terminal is expected to have one of the highest capacity coal mixing facilities in the nation, an important service to help electric generation facilities meet new emission standards. Lack of highway accessibility has been a limiting factor for development of the remaining industrial sites at the Mid America Terminals site.

Also, construction of the Natcher Bridge as part of the I-67 corridor has already provided a reliable, congestion free connection to the two Class 1 railroads (Norfolk Southern and CSX) in the region. At the moment neither NS nor CSX has a bridge to cross the Ohio River in the Rockport/Owensboro area.

The General Motors Corvette plant located in Bowling Green, KY estimates that development of I-67 could save about 20 minutes in travel time per truck due to improved accessibility. The saving in transport cost will reflect in market prices, thus improving its competitiveness and profitability and creating more jobs in the region.

Transportation is a key contributor to the overall competitiveness of the study region's manufacturers. Increasingly, high-technology and manufacturing industries depend on reliable transportation systems to support "just-in-time" (JIT) production methods that seek to minimize inventories and produce goods as they are needed by customers. Today, manufacturers draw on a worldwide supply chain and distribution network, hallmarks of JIT, that would not be possible without efficient transportation links. Deficiencies in the transportation system may result in late deliveries of critical manufacturing inputs, potentially delaying production runs and adding to costs.

In addition to manufacturing, tourist access can also be improved. Holiday World, in Santa Claus, IN, would be able to increase its potential market, and would likely lead to increased development of tourist-related amenities (e.g., hotels and restaurants).

Threats

In view of the important role transportation plays in the study region's economy, delay or abandonment of development of the proposed I-67 corridor will pose a threat to the long-term development of the regional economy. Continued lack of high-speed facilities, increased congestion on existing roadways through local communities, and continued issues with safety due to narrow shoulders and limited sight distances will result in increased transportation cost and unreliability in freight delivery to and from manufacturers in the region. In response to unreliability in freight delivery, the region's manufacturers will be forced to invest in buffer stocks to avoid shortage, thus increasing dependency on warehousing. Increased dependency has both upsides and downsides, though the downsides outstrip the upsides.

On the upside, jobs are created in warehouses. On the downside warehousing increases inventory cost (e.g., carrying cost and insurance). These embedded costs increase market prices of goods. In a highly competitive environment, the increased market price will translate into reduction in demand for products, thus affecting profitability of businesses in the region. As a result, the growth of the region's major freight dependent industries will be constrained. As confirmed by Hagler Bailly (1999), the long-run price elasticity of rail and truck freight truck transport is -0.4[11]. This means that a 10 percent increase in freight transportation cost will lead to a 4 percent decline in rail and truck shipment by shippers. This in the long-run will negatively impact the region's economy, particularly since freight dependent industries drive economic growth in the region.

Finally, independent of actual impact on cost, even the perceived lack of highway access can be an impediment to site selection decisions by businesses. Highway access, as identified in Table 5.4 above, is the most critical site selection criterion. For many companies, particularly international corporations, "highway access" is equivalent to "Interstate access". The lack of a signed Interstate highway in the corridor, therefore, could be a threat to further economic growth with new businesses.

Summary

Table 5.8 summarizes several of the key findings from the SWOT analysis. Based on this analysis, availability of housing and lower housing costs, lower labor cost, favorable business tax climate for selected industries, and improved accessibility arising from development of the proposed I-67 corridor have the potential to attract businesses to the region.

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[11] Victoria Transport Policy Institute, Transportation Elasticities, How Prices and Other Factor Affect Travel Behavior

Table 5.8 Summary of SWOT Analysis

Factors	Strengths/Opportunitie	Weakness/Threat
Business Site Selection Factor		
Highway Accessibility	Development of the I-67 corridor will improve accessibility to existing businesses and also open up new lands for development	Lack of Interstate access
Labor Cost	Labor cost for most occupations are lower than the national average	
Tax Exempt	Favorable business tax climate for research and development, call center, retail, corporate offices, distribution centers, and labor-intensive manufacturing related businesses	
Business Quality-Of-Life Factor		
Healthcare Facilities	The study corridor is home to Owensboro Medical Health System (OMHS) and has positioned Owensboro as a medical hub.	
Housing Cost and Availability	Housing is available in the study corridor, and the median value is below the national average.	

Source: Cambridge Systematics Analysis

5.6 ESTIMATED ECONOMIC IMPACTS

Transportation Efficiency Benefits

Economic composition and level of economic activity are key factors that affect the demand for transportation, and conversely – as indicated in the SWOT analysis – transportation supply impacts level of economic activity through improvements in travel efficiencies. To estimate the travel efficiencies associated with the highway improvement, output from the I-67 Travel Demand Model, expressed in daily VMT and daily VHT, is employed. VMT and VHT are produced by vehicle classification (auto, non-freight truck, and freight truck) for build without toll, build with toll, and no-build scenarios for 2035. The base year model produces similar outputs for 2010. VMT and VHT for the benchmark years are interpolated to attain travel data for a 20-year study period spanning between an assumed opening year of 2016 and 2035. The daily changes in VMT and VHT are estimated, annualized and monetized to determine the net benefit or travel efficiency gains in terms of four areas between the build (toll and toll-free) and no-build scenarios:

- **Travel time.** System VHT changes for autos and trucks are output from the I-67 Model for the model area as well as within the eight-county study

corridor. Within the corridor, as the number of vehicles in the corridor is projected to increase considerably with the new facility, the total VHT is also expected to increase – though the overall *speed* in the corridor is expected to improve for all vehicles. To normalize the VHT across scenarios and capture the improved time savings for vehicles with likely origins and destinations in the corridor (and therefore economic impacts to the corridor counties), the average speed was calculated (VMT/VHT) for the build scenarios in the eight counties and multiplied by the original no-build VMT in the eight counties. These new VHTs, as well as the model area VHTs, are multiplied by values of time for trucks and autos from the Illiana Expressway Feasibility Study.

- **Reliability.** Reliability is measured in time lost due to non-recurring delay (unanticipated delays, such as traffic accidents), and is usually valued at a higher dollar value per hour than standard time savings. For trucks, reliability is estimated as 25% of travel time savings as calculated above.[12] For autos, non-recurring congestion (incidents) are estimated to be about 30 percent of total delays, also calculated from the travel time savings above. Auto reliability benefits are estimated at 6 percent of this.
- **Vehicle operating costs.** VMT by auto and truck were multiplied by vehicle operating cost rates (including fuel) by speed from the California Department of Transportation's economic model, CAL-B/C, for each scenario. Similar to the travel time calculations for the eight-county study corridor, the average vehicle operating cost for each scenario was found and multiplied by the VMT from the no-build in order to normalize the traffic volume.
- **Safety.** VMT by functional classification and volume level from the model was multiplied by crash rates from the HERS-ST model, as described in Section 4. As with the other benefit calculations in the study corridor, average rates calculated from the build scenarios were multiplied by the VMT from the no-build to get normalized changes in crashes.
- **Emissions.** Using emissions rates by pollutant, speed, and vehicle type from the EPA's MOVES model, a CO, VOC, PM, and NO_x emission rate was assigned to each segment in all scenarios. These rates were multiplied by VMT for each segment. To normalize for the eight-county study corridor in the build scenarios, the average rates were found and multiplied by the no-build VMT. The results were monetized based on estimated health impact costs from the literature and EPA's 2010 and 2012 recommendations.

To estimate the economic impact of the investments, travel efficiency gains are disaggregated into changes in monetary (explicit, out-of-pocket) costs and

[12] Guide to Quantifying Economic Impacts of Federal Investment in Large Scale Freight Transportation Projects, Cambridge Systematics and Boston Logistics.

opportunity (implicit) costs and are mapped to households or industry, depending on the beneficiary. Changes in explicit costs arising from personal travels (changes in vehicle operating and safety costs), are mapped to households, while those related to business travels (truck and business related auto trips) are mapped to industry. The gains or savings mapped to industry are further distributed across various industries in the study region based on each industry's transportation cost. Estimated changes in explicit costs mapped to household and industry serve as input into the IMPLAN input/output economic model to estimate economic impacts. The output from the IMPLAN model is expressed as changes in employment, output, and value added.

Tables 5.9 and 5.10 show present value and allocation of estimated user benefits associated with I-67 corridor investment (discounted at three percent) at the corridor level and model area level, respectively. The model area level results reflect all benefits to the entire region with the I-67 improvements, including cost savings to road users with longer trips through the study corridor that have been diverted from other facilities (namely, I-65). These trips, without an origin or destination in the study corridor, do not directly impact the economies of the eight counties but do impact the economy of the region.

If I-67 is built with a toll, households and industries in the eight-county study corridor are expected to experience a present value of $1.1 billion worth of transportation-related benefits over 20 years. While there are increases in some travel costs, such as vehicle operating costs (a user cost) and emissions costs (a societal cost) due to increased speeds and decreased vehicle efficiencies, as well as increased driving distances to access a now faster route, this is compensated by the time and reliability savings of that faster route, as well as the improved safety of an Interstate-class facility. Across users from the entire model area, incorporating most of southern Indiana and central Kentucky, a total of $1.8 billion in travel benefits are expected to accrue over 20 years, indicating that potential benefactors of I-67 extend far beyond the eight counties physically in the corridor. Finally, revenues also accrue to the government or operating agency at a present value of $44 million.

Without tolls, while no direct revenues are obtained, user benefits within the eight counties more than double to $2.4 billion, driven primarily by improved travel time, reliability, and safety savings due to the reduced out-of-pocket cost of using the new facility, which attracts more users. For the entire model area, the present value of these benefits is $3.2 billion.

Table 5.9 20-Year Present Value of Transportation Benefits to Eight-County Study Corridor (Million US$, 2012)

	Build Without Toll Scenario	Build With Toll Scenario

Benefit Category	Household	Industry	Household	Industry
Travel Time & Reliability	349.2	1,013.7	331.0	424.0
Vehicle Operating Cost	(302.5)	(113.9)	(303.2)	(100.9)
Safety Cost	926.0	513.2	463.5	253.53
Emission Cost	(14.3)	(5.7)	(4.5)	(0.2)
Total	958.6	1,407.3	486.8	576.4
Toll Revenue (accrues to government)	N/A	N/A	15.8	27.9

Source: Cambridge Systematics Analysis

Table 5.10 20-Year Present Value of Transportation Benefits to Entire Model Area (Million US$, 2012)

	Build Without Toll Scenario		Build with Toll Scenario	
Benefit Category	Household	Industry	Household	Industry
Travel Time & Reliability	628	1,031.6	375.0	549.0
Vehicle Operating Cost	(106.5)	(41.4)	(18.7)	(5)
Safety Cost	1,172.2	595.4	631.0	318.7
Emission Cost	(5.1)	(1.13)	(1.8)	(0.9)
Total	1,688.4	1,584.4	985.5	861.8
Toll Revenue (accrues to government)	N/A	N/A	15.8	27.9

Source: Cambridge Systematics Analysis

Economic Impacts

Economic impacts are measured as changes in economic activity in a given region, arising from a project or a change in policy. They can be expressed in various economic variables including sales (output), employment, and personal income (earnings). Reduction in transportation cost and improved connectivity to domestic and international markets arising from roadway capacity expansion increases output of firms (especially export oriented manufacturing industries) and increases demand for key factors of production including labor, materials, equipment, and supporting downstream activities which are supplied by other local and non-local firms. This chain of activities leads to local economic expansion through increased employment, personal income, and business profits. Generally, total assessment of economic impacts comprises estimation of three impact types, namely direct, indirect and induced.

- **Direct impacts.** Direct impacts associated with roadway capacity improvement are the direct effects of changes in output (sales) or production

cost, and spending in key economic industries including wholesale and retail trades, manufacturing, and transportation and logistics. For instance, the direct effect of an improved roadway to a manufacturing firm is the reduction in crew and inventory costs.

- **Indirect impacts.** As business sales increase, demand for key input materials also increases in tandem, and vice versa. Therefore, the indirect impact associated with increased business sales (output) is estimated or referred to as increase in demand (purchases) for key input materials by local firms who are the direct suppliers to these businesses. For example, increased construction activities increase the demand (purchases) for steel, concrete, timber, fuel, and other materials. Consequently, spending on factors of production stimulate expansion of businesses downstream of the production chain. Accordingly, changes in output, employment, and income arising from these expansions are considered to be indirect impacts.
- **Induced impacts.** Direct and indirect impacts are the sources of induced impacts, and it normally constitutes the largest portion of total impacts. Changes in output, employment, and income stemming from household consumption of goods and services are induced impacts. Similar to indirect impacts, increases or decreases in personal consumption also lead to increases or decreases in business sales (output). This chain of activities also translates into changes in employment, and income.

To estimate the economic impact of the proposed study, the user benefits shown in Table 5.10 are disaggregated into explicit and implicit benefits. The explicit benefits are mapped to the respective beneficiaries: households and industry. Based on 2010 industry output reported by IMPLAN and transportation cost per dollar of output, explicit costs mapped to industry are distributed across industries to estimate each industry's transportation cost savings. Changes in industry output arising from these savings are introduced into IMPLAN. Similarly, household savings are introduced into the IMPLAN model for simulation.

The results of the IMPLAN simulation are summarized in Tables 5.11 and 5.12. These results represent the present value of impacts over 20 years in terms of increased GRP and total output. Total permanent jobs (not related to temporary construction jobs for the construction of the facility itself) created over 20 years are presented as job-years. The new facility is anticipated to increase economic output in the study corridor by $460 million if I-67 is tolled, and $1.3 billion without tolls, over 20 years. This equates to the creation of 3,600 job-years and 10,800 job-years, respectively.

Table 5.11 20-Year Present Value of Economic Impacts to Eight-County Study Corridor, Toll Free Scenario (Million US$, 2012)

Impacts	Job Years	Gross Regional Product	Output

Direct	6,980	434.3	898.8
Indirect	1,920	122.4	236.4
Induced	1,930	116.9	194.3
Total	10,830	673.5	1,329.5

Source: IMPLAN, Cambridge Systematics Analysis

Table 5.12 20-Year Present Value of Economic Impacts to Eight-County Study Corridor, Toll Scenario (Million US$, 2012)

Impacts	Job-Years	Gross Regional Product	Output
Direct	2,310	149.5	313.9
Indirect	660	42.1	81.7
Induced	650	39.0	64.9
Total	3,610	230.5	460.5

Source: IMPLAN, Cambridge Systematics Analysis

6.0 Conclusions and Next Steps

I-67, if built, is expected to attract anywhere from 16,000 to 30,000 vehicles per day along its length in 2035, with the highest volumes toward the central and southern ends of the corridor. It provides some diversion not only from parallel arterials (such as US-231) for trips to, from, and within the corridor, but also diverts some longer-distance traffic from I-65, providing some congestion relief in that corridor. I-67 is not expected to divert traffic from I-69, but rather increase demand on the facility north of Washington, IN.

Through the transportation cost savings experienced by users in the corridor, $2.4 billion is expected in benefits for households and businesses over 20 years. These benefits increase to $3.2 billion for all of southern Indiana and central Kentucky. Tolls provide some revenue but also decrease demand and usage on the facility, and therefore decrease transportation benefits of the facility.

These transportation benefits to households and industry translate into direct economic impacts in the form of increased industry output and additional job creation. These direct impacts, in turn, ripple through the economy in the form of indirect and induced economic impacts. Total increased combined economic output over these 20 years due to these impacts from I-67 are expected to reach $1.3 billion in the corridor, with over 10,000 new job-years created.

With the highly skilled labor force, available land, productive local industry in the form of manufacturing and power generation, diverse intermodal transportation options, and affordable and available housing, the region would benefit in the form of growth of existing businesses and increased business attraction. Numerous industries have identified supply chains that rely on highway transportation, whose costs would be reduced by improvements in the corridor. Highway access, and particularly Interstate access, is known to be a key factor in business location decisions.

Several next steps are recommended based on typical progression of highway corridor projects as well as issues specific to the study corridor:

- **Further analysis of financial feasibility and funding options.** A more detailed traffic and revenue study would carefully examine a range of toll rates and the sensitivity of traffic to these rates, helping to determine the optimal point for both regional benefits and revenues. It would also explore other potential funding sources and implementation mechanisms in this context, such as public private partnerships, build-operate-transfer, or others, though the specifics of a delivery model should be explored at later stages.
- **Consideration of phasing.** There may be logical phasing of improvements in the corridor. By breaking the project into phases that move towards the end product while independently providing measureable benefits, it may be

easier to move portions of I-67 forward at an earlier date. It might also be easier to acquire funding and convince elected officials and state DOTs of short term feasibility of the project.

- **Concurrence to proceed with developing the I-67 Corridor between the States of Indiana and Kentucky.** It is imperative to continue outreach to both INDOT, KYTC, and representatives from each state, by presenting results from this and other potential studies. Buy-in from each state is crucial for moving the process forward for further study, funding, and eventual construction.
- **NEPA Studies.** An environmental impact study (EIS) will have to be performed if Federal funds are anticipated as necessary for implementation. Such a study will also help to articulate a more specific corridor and design, costs, benefits, and other information necessary for moving the concept forward.
- **Corridor Preservation.** With information from the NEPA study, corridor preservation can begin. Due to the long timeframe in which highway corridor planning, design, and construction occurs, unanticipated development within a proposed highway corridor often hinders or increases the cost of highway construction. In areas were growth is occurring, proactive corridor preservation measures should be considered.
- **Preliminary Design and Final Design.**
- **Right-of-way Acquisition and Construction.**