
4.0 SYSTEM-LEVEL ANALYSIS AND RECOMMENDATIONS

4.1 Introduction

As described in Chapter 3, the travel demand simulation models used in CISTMS incorporate features from the nine-county Central Indiana model of the Indianapolis MPO and the statewide model of INDOT. In addition to providing traffic forecasts for the four corridor studies included in CISTMS, these models lend themselves well to evaluating other issues related to regional travel. As a part of this study, INDOT requested an evaluation of three systems-level issues, as listed below:

- **Outer Belt.** If a beltway were constructed at Interstate highway standards outside Marion County (Indianapolis), how much traffic would it serve, what relief would it provide to other roadways (including I-465), and what impact would it have on future land use patterns?
- **North-South Mobility Corridor.** If a new north-south roadway was constructed in Eastern Indiana approximately midway between SR 9 and SR 3, how much traffic would it serve and what relief would it provide other roadways, including SR 9 within the CISTMS study area?
- **I-69 Through Central Indiana.** Will the extension of I-69 to the southwest create a need for major changes to the freeway system of Central Indiana, such as a new “bypass” or other roadway constructed on new alignment to avoid existing congested routes?

Analysis results and recommendations for each of these system-level issues is presented in this chapter. Findings and recommendations for the four CISTMS corridors are provided in Chapters 5 through 8.

4.2 An Outer Belt for Indianapolis

The idea of constructing an outer belt to relieve existing traffic congestion in Central Indiana has been brought up numerous times in public meetings conducted by the Indianapolis MPO and by INDOT. In fact, when a public hearing was held in 2001 to discuss roadway and transit options for the Northeast Corridor of the Indianapolis Region, the suggestion to consider an outer belt was the second most frequent comment made in public testimony. (The most frequent comments were those concerning highway noise.)

At the outset of CISTMS, INDOT and the Indianapolis MPO agreed that this study provided an ideal opportunity to evaluate the potential travel and transportation system benefits of an outer belt. Recognizing the potential impact such a facility might have on regional development patterns, it was determined that this element should be defined as well so that an outer belt could be considered in the full context of transportation and land use impacts on the region. This led to the incorporation of the LUCI/T model of the Center for Urban Policy and the Environment, as described in Chapter 3.

One of the first tasks in applying the travel demand model for CISTMS was the formulation of alternatives representing the potential minimum and maximum solutions to addressing suburban roadway congestion. The minimum alternative would essentially mean doing nothing except for

projects and improvements that are already committed. The maximum change alternative would be the provision of a multi-lane freeway encircling the study area. For the purposes of CISTMS, these alternatives are described as follows:

- **Current Plan Alternative:** Also known as the “Minimum Change” alternative, this option incorporates all improvements included in the current 2025 Regional Transportation Plan with only minor improvements within the four CISTMS corridor areas. This alternative adds no through travel lanes and includes only relatively small projects within the study corridors, many of which are already listed in local transportation improvement programs. Therefore, this alternative is identified as the Base Scenario or “Current Plan” alternative for the purposes of this analysis.
- **Outer Belt Alternative:** This alternative, also known as the “Maximum Change” alternative, assumes that in addition to system improvements already included in the Regional Transportation Plan, roadways will be built or upgraded to interstate standards within each of the CISTMS study corridors. Linking these roadways would provide a new circumferential freeway or “outer belt” similar to I-465. It would be located along or generally parallel with the previously identified CISTMS corridors, between ten and fifteen miles outside of I-465. This is the most extensive improvement option being evaluated as a part of CISTMS.

For purposes of study, the “Current Plan” and “Outer Belt” alternatives are intended as “bookends” to compare the “least” and “most” improvements that may occur in the CISTMS corridors. Within this range, the type of improvements proposed for each of the four corridor areas (north, south, east and west) could be different. For example, a new terrain freeway could be located parallel to SR 9 on the east side of the study area, while other corridors receive smaller scale improvements to existing facilities. Upgrading all four corridors to new terrain freeways would represent the “maximum change” alternative.

In this study, a year 2000 baseline scenario was developed for comparison with year 2025 projections. Table 4A illustrates some key statistics that illustrate changes forecasted between 2000 and 2025 if only minimal changes are made to study corridor routes (Current Plan Alternative).

**Table 4A: FORECASTED TRAVEL GROWTH, 2000 – 2025
(Current Plan Alternative)**

	2000	2025	Percent Change
Person Trips	6.1 million	8.2 million	35% increase in person trips
Vehicle Trips	5.2 million	7.2 million	36% increase in vehicle trips
Vehicle Miles of Travel (VMT)	46.5 million	71.1 million	53% increase in daily vehicle miles traveled
Average Trip Length (mi)	8.86	9.94	12% increase in trip length
Miles at LOS E or Worse ¹	414	876	111.6% increase in significantly congested roadways

¹ Level of Service E on a multi-lane highway represents conditions that are at or near capacity; an unstable level of traffic flow.

To assess the impact associated with the construction of a freeway option within the study area corridors, an outer belt was formed by upgrading and linking all four corridors within the 2025 travel forecast model network. This roadway was assumed to be an Interstate-type facility with four lanes for

movement of traffic and grade-separated interchanges at all state highways, interstate highways, and other limited-access highways. Interchanges are spread at least three miles apart.

Table 4B compares the changes between the Current Plan (Minimum Change) Alternative and the Outer Belt (Maximum Change) Alternative. Figures 4-1 and 4-2 illustrate forecasted daily traffic volumes for the Current Plan and Outer Belt alternatives, respectively.

Table 4B: 2025 REGIONAL TRAVEL CONDITIONS, WITH & WITHOUT OUTER BELT (Current Plan and Outer Belt Alternatives)

	Current Plan	Outer Belt	Percent Difference
Vehicle Trips	7.2 million	7.1 million	-0.1% decrease in vehicle trips
Vehicle Miles of Travel (VMT)	71.1 million	72.4 million	1.9% increase in daily vehicle miles traveled
Average Trip Length (mi) ²	9.94	10.13	2% increase in trip length
Miles at LOS E or Worse ¹	876	746	-14.8%

1 Level of Service E on a multi-lane highway represents conditions that are at or near capacity; an unstable level of traffic flow.

2 A detailed analysis of trip lengths based on travel time reveals that all trip lengths for all trip purposes decrease slightly. This means that average travel speeds have increased for the Maximum Change Alternative with the availability of the proposed outer belt highway.

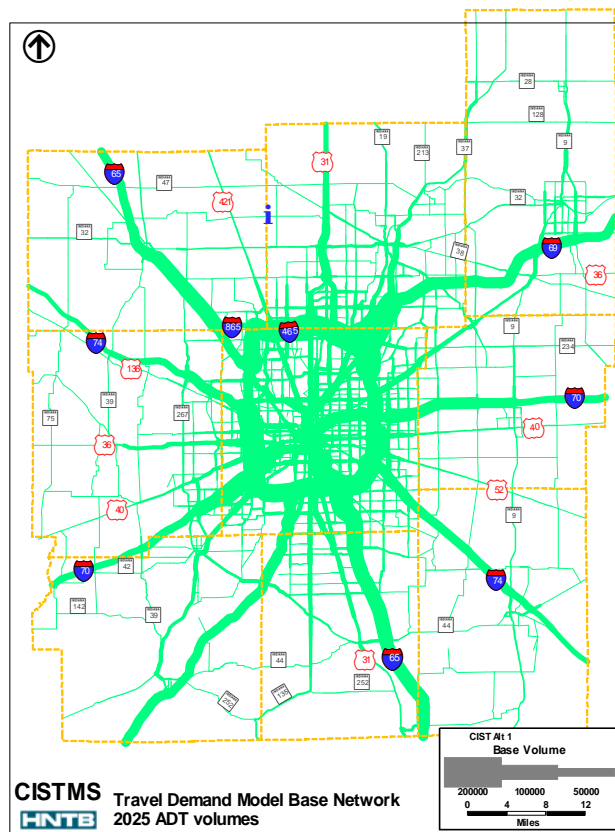


Figure 4-1: 2025 Current Plan Traffic Forecast

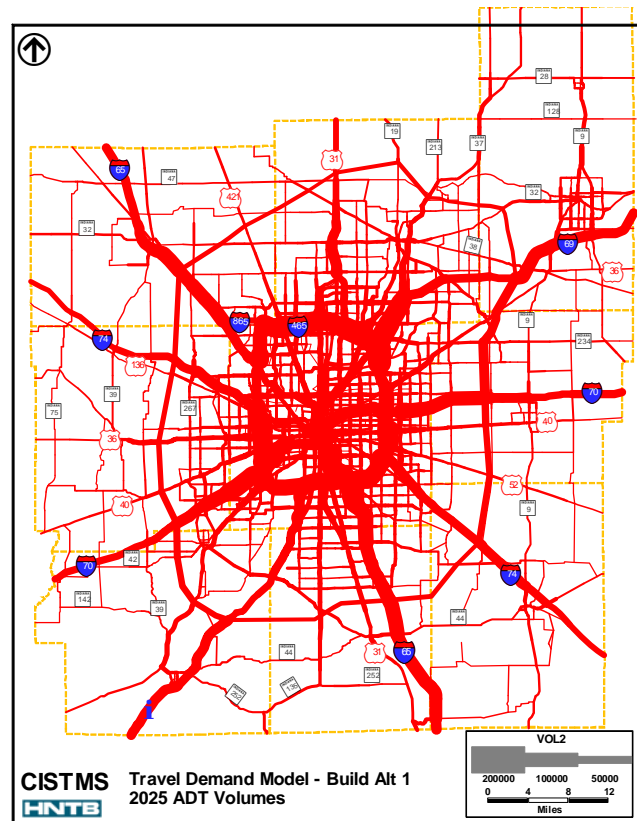


Figure 4-2: 2025 Outer Belt Traffic Forecast

A review of these forecasted traffic levels indicates the following:

- As shown on Figure 4-2, the highest forecasted traffic levels on an outer belt would be between I-69 and I-70 on the northeast side (74,000 vehicles/day), south of I-70 on the east side (44,000 vehicles/day), and between I-70 and the new I-69 on the west side (48,000 vehicles/day).
- The most significant traffic pattern change would be on I-69 north, where the traffic would use a segment of the outer belt to access I-70 instead of I-69 and I-465. This would reduce the traffic volume on I-69 northeast of I-465 by approximately 28,000 vehicles per day.
- To a lesser extent, the future I-69 south exhibits a similar pattern. Some motorists would use a segment of the outer belt to access I-70 on the southwest side. Traffic on I-69 would be reduced by 23,000 vehicles/day.
- Generally, the outer belt would not greatly affect state highway volumes in the study corridors. The greatest traffic volume reductions would occur northeast (Madison County) on SR 9 (20,000 vehicles/day) and southwest (Morgan County) on SR 67 (12,000 vehicles/day).
- Some reduction in traffic volumes would occur on I-465. The greatest reductions would occur on the west and northwest sections (7,000 – 18,000 vehicles/day), and on the east side north of I-70 (13,000 vehicles/day).

The second component of review for an outer belt was land use impact. This was evaluated by applying a regional land use model developed by the Center for Urban Policy and the Environment at IUPUI. The model, called Land Use in Central Indiana (LUCI), was calibrated based on historical patterns of land conversion to urban areas. It was created to evaluate the impact of public policy decisions, considering factors such as availability of water and sewer and environmental constraints on developable land. A version referred to as LUCI/T incorporating transportation accessibility measures, was used to analyze future land use impacts in the CISTMS study. (See Chapter 3.)

As a point of reference, the nine-county Indianapolis region included approximately 550 square miles of urbanized land in 2000. Of this total, nearly half (255 square miles) was in Marion County. In the eight surrounding counties, urbanized land ranged from a high of 69 square miles in Hamilton County to a low of 14 square miles in Shelby County.

According to LUCI/T, development of most land in the region will continue to occur on vacant land in the region regardless of whether an outer beltway is constructed. The 2025 Current Plan forecast shows an increase in urbanized land area of 299 square miles. This is a 54% increase over the year 2000 developed land area, bringing the total urbanized land area in the region to 849 square miles.

Generally, the predicted distribution of new growth follows the patterns that have experienced the most development in the past. Marion and Hamilton Counties are forecasted to experience the largest magnitude of urbanization, with each developing between 60 and 65 square miles of land between 2000 and 2025. This would account for more than 20 percent of new regional land that is forecasted to become urbanized. Hendricks and Johnson Counties would be next highest. The forecasted growth in urbanized land for each county is listed in Table 4C.

Table 4C: URBAN GROWTH BY COUNTY, 2000 – 2025
(Current Plan Alternative)

COUNTY	NEW AREA URBANIZED
Marion	63 square miles
Hamilton	63 square miles
Hendricks	51 square miles
Johnson	33 square miles
Hancock	28 square miles
Boone	23 square miles
Morgan	15 square miles
Madison	14 square miles
Shelby	9 square miles
TOTAL:	299 square miles

Expressed as population density by location, Figure 4-3 depicts the location and density of urbanization with the 2025 Current Plan alternative, and Figure 4-4 illustrates forecasted 2025 urbanization with an outer belt in place. It assumes that the outer belt is a multi-lane roadway at Interstate standards.

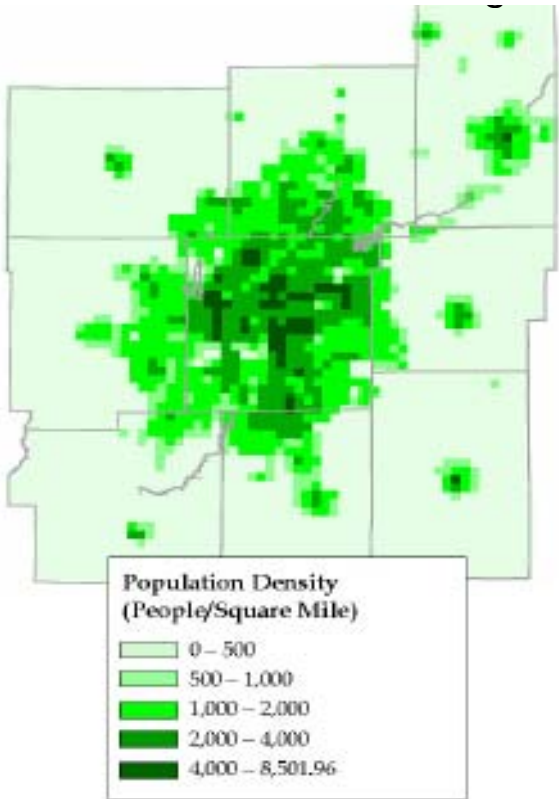
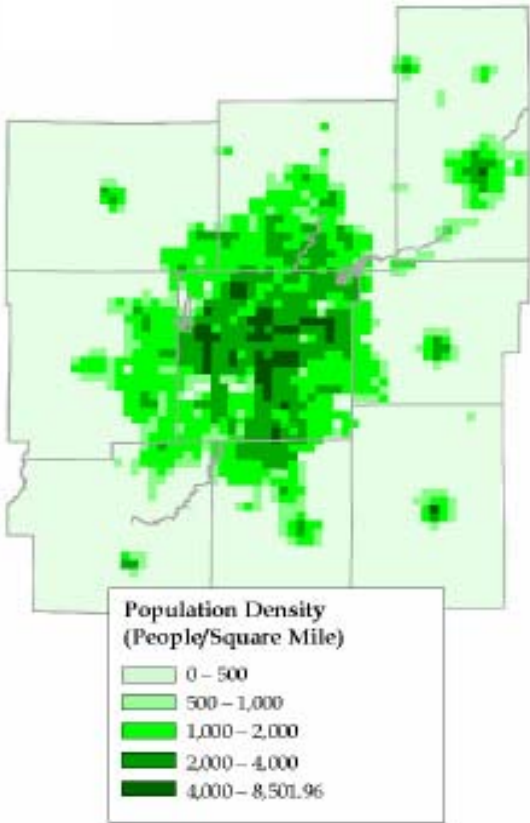


Figure 4-3: 2025 Urbanization
Current Plan Alternative

Figure 4-4: 2025 Urbanization
Outer Belt Alternative

As shown on Figures 4-3 and 4-4, the land use modeling for the Outer Belt Alternative shows negligible change in total urbanized land area in comparison to the Current Plan Alternative. In fact, the difference is less than 0.1 square mile per county. This very small difference in land use patterns suggests that the CISTMS alternatives would have only minor impacts on land use development patterns when viewed from a regional perspective. This conclusion was also reached when a longer-term analysis was conducted, showing little impact on development out to the year 2040, after the outer belt freeway had theoretically been in place for 15 years. (For additional information on the results of land use modeling, including sensitivity tests for adjustments to time period and employment distributions, see the CISTMS Technical Memorandum, "Transportation and Land Use Assessment," dated August, 2004.)

It should be noted that although the regional impact would be limited, an outer belt freeway would affect localized land use patterns. Development would likely occur around major interchanges, especially highway-oriented establishments such as restaurants and gas stations, as well as warehousing and distribution centers. Some smaller office parks may also locate near major interchanges such as a new I-69/outer belt interchange in the northeast.

The results of travel simulation modeling indicate that even at interstate standards, an outer belt would not attract traffic at the level of other regional interstate highways. With one exception, an outer belt would not greatly reduce traffic volumes on any other roadway. This applies to parallel state highways through the counties served, as well as to I-465 in Marion County. The exception is I-69/I-465 south of Anderson, where the outer belt segment linking I-69 to I-70 would provide a new option for accessing downtown Indianapolis. (See further discussion at the end of this section.)

Likewise, an outer belt would apparently have little effect on the location and intensity of regional urbanization (land use). The conclusion that the Outer Belt Alternative would have only minor impacts on land use development patterns was duplicated when a longer-term analysis (to the year 2040) was conducted.

The relatively low traffic forecasts and the lack of associated land use impact may be surprising, given the "build it and they will come" view shared by many people with respect to new roadways. However, there are some reasons as to why the roadway's usage and its impacts on urban growth may indeed be relatively small:

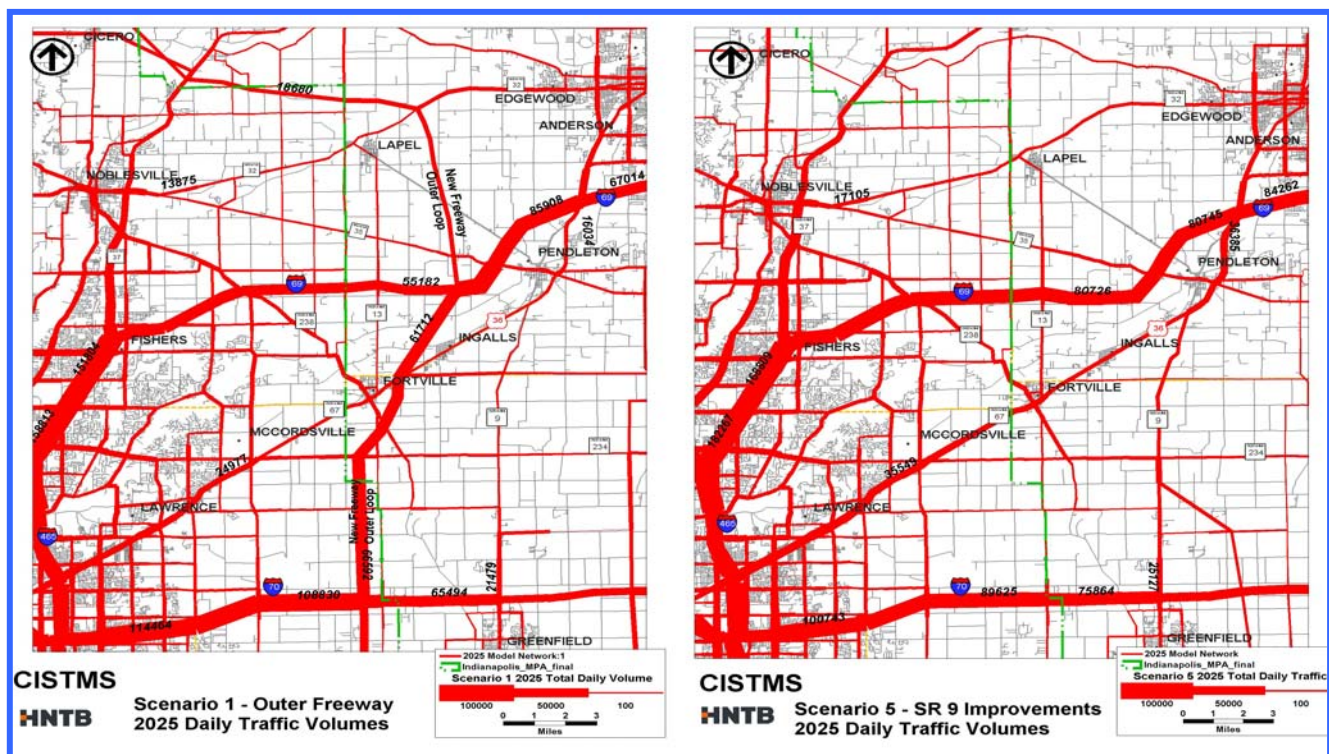
- The outer belt would be located relatively far from the center of the Indianapolis region and would remain well beyond the edge of the urbanized area even in 2040.
- Travel simulation models indicate that much of the traffic on I-465 and other area freeways is local. There is little reason for these travelers to travel out of Marion County and return.
- With one or two possible exceptions, an outer belt would provide little accessibility benefit to existing employment centers, such as downtown Indianapolis, the airport and Hamilton County near I-465, U.S. 31 and SR 431.
- There is a significant amount of land available for development closer to the urban core. These areas will continue to have a higher accessibility to employment, even with the outer belt in place.

These results should not diminish the importance of sound local planning in advance of any highway or other transportation investment. Land use planning can help ensure that future development, when it does occur, will be located for optimum transportation access and designed to create minimum demands on the transportation system. It can also ensure fiscal prudence through the timing of other infrastructure investment and provision of appropriate utilities.

In summary, CISTMS models indicate that a full outer freeway belt would not divert significant volumes of traffic from other congested facilities. Nor would it stimulate significant land use changes in the corridors served. This is not surprising given the high volume of local traffic on the existing Interstate system and the location of the outer belt with respect to the region's urban fringe. Most existing trips (and those forecasted to 2025) would not be served by an outer belt. An exception is the part of the outer belt that would link I-69 to I-70 in the east corridor, as discussed below.

Forecasts indicate that it will literally be decades before growth and development pushes the urban fringe to the CISTMS study corridors. Even then, there is no indication that an outer belt will be needed. Therefore, one finding of CISTMS is that further studies of an outer belt are not warranted based on the information available for this study, and it is recommended that, barring new information, development of an outer belt not be pursued. As mentioned previously, however, there is one link that may warrant additional attention.

Travel simulation modeling results indicate that additional study may be warranted for the portion of the outer belt that would link I-69 with I-70 in the northeast. Models indicate that traffic approaching Indianapolis on I-69 would split about evenly just west of Anderson to use this link, as shown by Figure 4-5. (Traffic volumes with this link are depicted on the left and without it on the right.)



**Figure 4-5: 2025 Northeast Traffic Volumes
With & Without New I-69/I-70 Link**

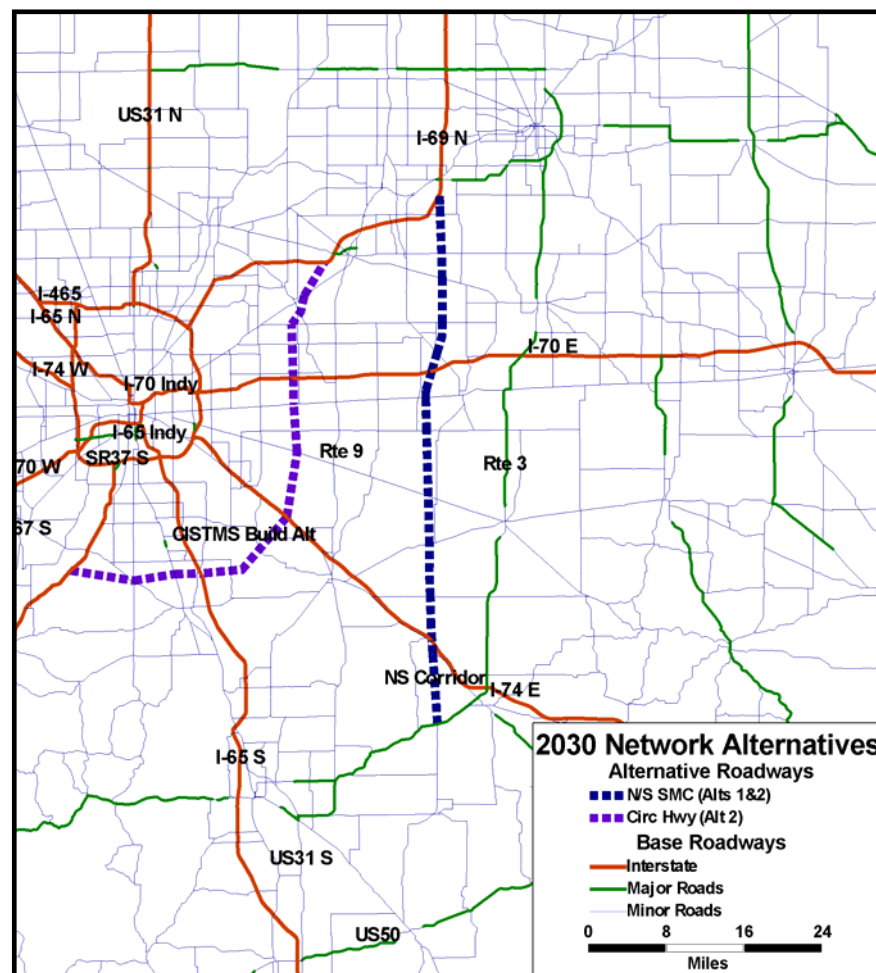
This roadway section drew considerably more traffic than other portions of the outer belt (74,000 vehicles/day). Simulations indicate that it would divert traffic from several congested roadways in the region, including I-69, I-465 (east leg) and SR 9. The greatest traffic reduction would be on SR 9 through Pendleton (55% lower). At the same time, models indicate that 2025 daily traffic volumes on I-70 east of I-465 would increase by about 15% if this link was constructed.

The key question is whether the cost and impact of constructing this new 12-mile roadway (and most likely widening I-70 to I-465) would be offset by reductions in the currently planned projects on I-465 and I-69 in the northeast. More detailed studies are needed to answer this question, as well as to identify a specific alignment and configuration for this potential roadway.

4.3 North-South Mobility Corridor

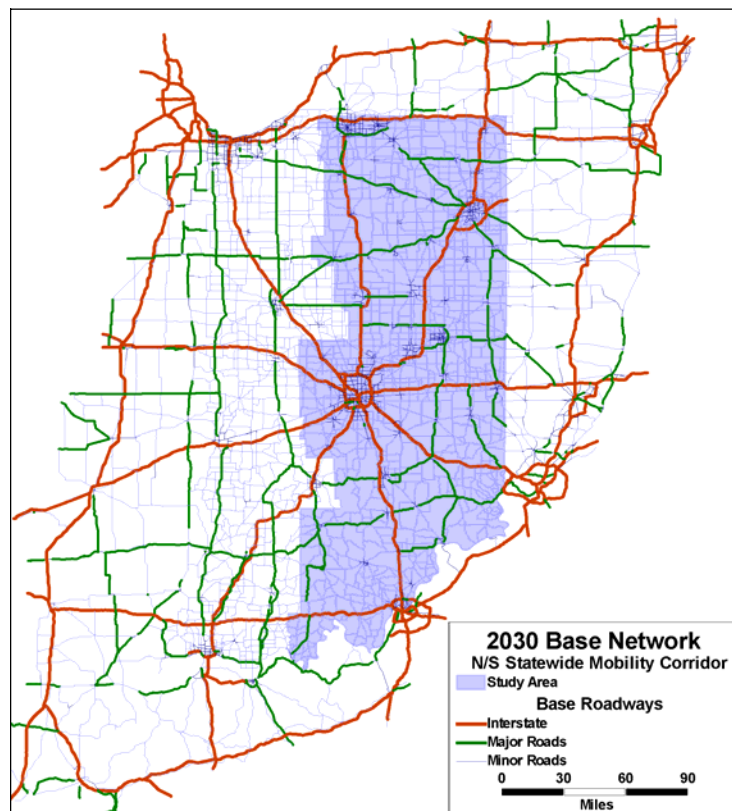
INDOT requested that simulation models used in CISTMS be applied to determine whether a possible new highway facility in the eastern part of the state would draw significant traffic and benefit alternate routes (SR 3, SR 9 and I-465E). The route would link I-69 to I-74, and would be located roughly halfway between SR 9 and SR 3. Figure 4-6 shows the general location of the corridor in the context of existing roadways and with respect to the eastern leg of the outer belt evaluated in CISTMS.

Figure 4-6: North-South Mobility Corridor



The potential facility was evaluated using the Indiana Statewide Travel Demand Model because it has a larger model analysis network than the nine-county model used for other analyses in CISTMS. The statewide model encompasses all of Indiana as well as a significant portion of the surrounding states. Figure 4-7 shows the study area used in the evaluation of the North-South Mobility Corridor.

Figure 4-7: North-South Corridor Modeling Area



Alternatives considered in the analysis include the following:

- Base - INDOT's Long Range Plan network without the proposed North-South Statewide Mobility Corridor roadway,
- Alternative 1 - an alternative which adds to the base only the proposed North-South Statewide Mobility Corridor roadway,
- Alternative 2 - an alternative, which adds to the base both the proposed North-South Statewide Mobility Corridor roadway and the eastern portion of the circumferential highway or "outer belt" as discussed in the previous section.

Traffic volumes were compared among all of the alternative forecasts to help identify the travel demand and any interaction or influence that one might have on the other.

The travel demand model was run with the new roadway added to the base network and volumes and V/C (volume to capacity) ratios were reported for each link. Table 4D summarizes the study area travel characteristics and shows the base network statistics for comparison purposes. Slight increases in vehicle miles of travel (VMT) and vehicle hours of travel (VHT) are estimated as traffic is attracted into the study area to utilize the new roadway. On a systemwide basis, there is little difference between the number of miles of congested roadway for the two alternatives. In fact, almost 95% of the roadway miles included in these networks are uncongested (V/C less than 0.50), whether or not the North-South Mobility Corridor roadway is constructed.

**Table 4D Study Travel Characteristics –
With and Without North-South Mobility Corridor**

Statistic	Base Network	Mobility Corridor	Difference
Vehicle Miles of Travel (1,000's)	161,742	162,379	< 1%
Vehicle Hours of Travel (1,000's)	6,164	6,219	+ 1%
Average Effective Speed (mph)	26.2	26.1	< 1%
<u>Roadway Miles @ Volume to Capacity (V/C) Ratio</u>			
V/C 0.00 to 0.50	19,284	19,285	
V/C 0.50 to 0.75	1,025	1,023	
V/C 0.75 to 1.00	259	261	
V/C > 1.00	39	38	

Additional simulations were performed with the eastern leg of an outer belt in place. The analysis showed that there is some redundancy between the two roads, but it is limited. Less than 10% of the traffic on the North-South Mobility Corridor roadway would use the eastern beltway leg, indicating that these two facilities would serve different travel markets.

In terms of the amount of traffic drawn to the North-South Mobility Corridor roadway and diversions from other routes, the analysis can be summarized as follows:

- Average daily traffic volumes on the proposed Statewide Mobility Corridor roadway are estimated to be as high as 23,600 in the year 2030;
- The proposed roadway is estimated to carry a significant amount of regional and multi-state traffic;
- The proposed roadway would divert traffic from existing parallel facilities and thereby improve their operating conditions;
 - State Route 3 is estimated to experience a 35% reduction in vehicle miles traveled with the addition of the North-South Mobility Corridor roadway.

- State Route 9 is estimated to experience an 18% reduction in VMT within the corridor.
- The impact on I-465 traffic (east leg) would be negligible.

The attraction of 18,000 to 24,000 vehicles per day to the North-South Mobility Corridor roadway and the reductions in traffic levels on SR 9 and SR 3 would be significant. The key point, however, is that a new roadway at this location is not critical for addressing identified problems (except for a section of SR 9 in Pendleton). This is demonstrated by the small amount of congestion with or without the roadway, as indicated in Table 4D. Overall, the cost and impacts of constructing this roadway do not appear to be warranted.

4.4 I-69 through Central Indiana

CISTMS is not intended to evaluate the benefits or impacts of extending I-69 to Evansville, but the travel simulation models used in CISTMS provided the opportunity to review future travel patterns and service levels with the future I-69 included in the 2025 network. No special studies were conducted for this review, nor were they needed. The prior inclusion of I-69 in the models was sufficient to support this review.

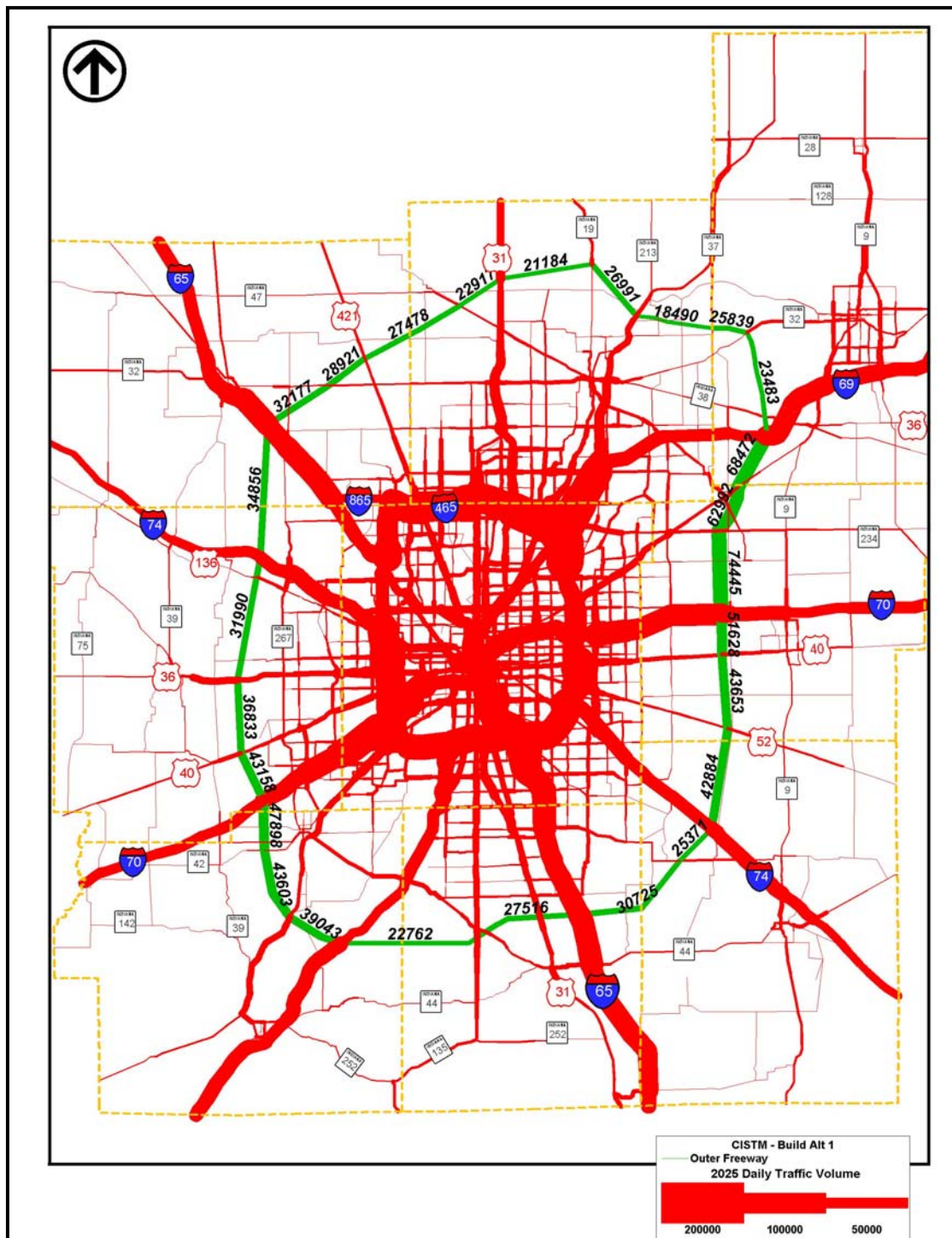
There are fundamentally three options for routing I-69 through Central Indiana. These options are listed below.

- Option 1: New terrain highway located west of Indianapolis (simulated in CISTMS by the western leg of a potential outer belt).
- Option 2: New terrain highway located east of Indianapolis (simulated in CISTMS by the eastern leg of a potential outer belt).
- Option 3: Existing roadway system, relying primarily on I-465 to carry I-69 traffic through the urbanized area (simulated in CISTMS by the Base Scenario).

Simulated daily traffic volumes with the new terrain connections formed by a potential outer freeway belt east and west of I-465 are shown on Figure 4-8. The following observations can be made regarding the inclusion of I-69 in this modeling network:

- Much of the travel to/from I-69 (S) has a local origin or destination in the Indianapolis area.
- Diversion of through trips on I-69 to new terrain routes east or west of Indianapolis is relatively small.
- As currently planned, I-465 and the existing freeway system will accommodate additional demand of I-69.
- A new terrain route around Indianapolis is not needed or recommended due to the planned construction of I-69.

**Figure 4-8: New Terrain Traffic Forecast
With I-69 Extension to Evansville**



As indicated by these forecasts (and as described in the previous discussion of an outer belt), most traffic through the area will continue to utilize I-465. Traffic volumes on eastern and western new terrain highways are not sufficient to warrant further development, even with I-69 included in the regional and statewide system.