2.0 OVERVIEW OF STUDY AREA

2.1 Regional Demographics

The nine-county study area is located in central Indiana and encompasses the Indianapolis metropolitan area. The area is 3,522 square miles in size. The following demographic data for this area is based on Census data for 1990 and 2000. It is provided for general information and does not necessarily correlate exactly with traffic zone data used in regional transportation models.

Population - Population in the nine-county area grew 28.6% from 1990 to 2000, compared to 9.7% statewide. The most significant gains were experienced by Hamilton County (67.7%), Hendricks County (37.5%) and Johnson County (30.8%). The smallest increases occurred in Madison County (2.1%), Marion County (7.9%) and Shelby County (7.8%).

Density - As a measure of density, persons per square mile were calculated for 1990 and 2000. Statewide, persons per square mile increased 10% between 1990 and 2000. Currently at 170 persons per square mile, Indiana is ranked 17th in the nation in terms of population density. For the nine-county area, persons per square mile increased 17%. Persons per square mile in Hamilton County increased 68%, significantly more than any other county in central Indiana.

Employment – Employment gains also occurred between 1990 and 2000. Overall, employment in the nine-county area increased 8%. The largest growth in employment occurred in Hamilton County, which increased from 57,748 to 105,000, an increase of 82%. Of the nine counties, only Marion County decreased in employment levels, dropping 6% over the ten-year period.

Households – The number of households increased 18.5% in the nine-county area between 1990 and 2000, compared to a statewide increase in households of 13%. The number of persons per household decreased slightly in the nine-county area (from 2.60 persons per household in 1990 to 2.55 persons per household in 2000). A similar decrease occurred at the state level (from 2.61 persons per household in 1990 to 2.53 in 2000).

Housing Units – Statewide, the number of housing units increased 12.7% between 1990 and 2000. The nine-county area also experienced an increase of 19.2%. At the county level, housing units in Hamilton County increased 69.2% during the ten year period.

Home Ownership Rate – The home ownership rate is high in central Indiana. For the nine-county area, there is a home ownership rate of 76.3%. This compares to 71.4% statewide.

Median Household Income – Median household income increased substantially between 1990 and 2000. At the state level the median household income increased 44.3%. Likewise, the nine-county area saw an increase of 31% between 1990 and 2000.

Table 2A, on the following page, summarized the socio-economic statistics by county.

Table 2A: County Statistics

	Boone	Hamilton	Hancock	Hendricks	Johnson	Madison	Marion	Morgan	Shelby	MSA	Indiana
1990 Population	38,147	108,936	45,527	75,717	88,109	130,669	797,159	55,920	40,307	1,380,491	5,544,159
2000 Population	46,107	182,740	55,391	104,093	115,209	133,358	860,454	66,689	43,445	1,607,486	6,080,485
Population % change 1990-2000	20.9%	67.7%	21.7%	37.5%	30.8%	2.1%	7.9%	19.3%	7.8%	28.6%	9.7%
1990 Population % of MSA	2.8%	7.9%	3.3%	5.5%	6.4%	9.5%	57.7%	4.1%	2.9%	-	-
2000 Population % of MSA	2.9%	11.4%	3.4%	6.5%	7.2%	8.3%	53.5%	4.1%	2.7%	-	-
1990 Employment	17,114	57,748	17,463	27,888	38,039	60,817	612,994	18,249	19,506	869,818	-
2000 Employment	21,400	105,000	25,900	43,400	56,700	65,700	576,253	23,800	22,800	940,953	-
Employment % change 1990-2000	25%	82%	48%	56%	49%	8%	-6%	30%	17%	8%	-
Housing units 1990	14,516	41,074	16,495	26,962	33,289	53,353	349,403	20,500	15,654	571,246	2,246,046
Housing units 2000	17,929	69,478	21,750	39,229	45,095	56,939	387,183	25,908	17,633	681,144	2,532,319
Housing unit % change 1990-2000	23.5%	69.2%	31.9%	45.5%	35.5%	6.7%	10.8%	26.4%	12.6%	19.2%	12.7%
Home ownership rate	78.7%	80.9%	81.4%	83.0%	76.5%	74.2%	59.3%	79.7%	73.4%	76.3%	71.4%
1990 Households	13,961	38,775	15,901	26,177	31,435	49,804	319,821	19,589	14,767	530,210	2,065,355
1990 persons/household	2.73	2.81	2.86	2.89	2.80	2.62	2.49	2.85	2.73	2.60	2.61
2000 Households	17,081	65,933	20,718	37,275	42,434	53,052	352,164	24,437	16,561	629,655	2,336,306
2000 persons/household	2.65	2.75	2.65	2.71	2.63	2.41	2.39	2.70	2.58	2.50	2.53
1990 median household income	$34,652	$45,748	$37,333	$39,892	$35,035	$27,435	$29,152	$32,762	$30,366	$34,708	$28,797
2000 median household income	$49,632	$71,026	$56,416	$55,208	$52,693	$38,925	$40,421	$47,739	$43,649	$45,548	$41,567
Median household income % change 1990-2000	43%	55.3%	51.1%	38.4%	50.4%	41.9%	38.7%	45.7%	43.7%	31.2%	44.3%
Square miles	423	398	306	408	320	452	396	406	413	3,522	35,867
Persons/square mile-1990	90.2	273.7	148.8	185.6	275.3	289.1	2013.0	137.7	97.6	392.0	154.6
Persons/square mile-2000	109.0	459.1	181.0	255.1	360.0	295.0	2,172.9	164.3	105.2	456.4	169.5
% change 1990-2000	21%	68%	22%	37%	31%	2%	8%	19%	8%	16%	10%

Source: U.S. Census

Regional Growth - One of the primary reasons for this study is the expectation that population and employment will continue to grow in the suburban counties surrounding Indianapolis. As such, the growing demands on the transportation system will need to be addressed.

Growth patterns within the study area reflect a pattern of suburbanization that was apparent between 1990 and 2000. Table 2D, on the following page, presents population and housing statistics for selected cities and towns for this time period. Particularly high growth rates were experienced in Hamilton and Hendricks Counties. Over the past 10 years, population in the eight counties surrounding Marion has grown 28%, compared to just 8% in Marion County.

Table 2B: Population

	1990	2000	2015	2025
Marion County	797,200	860,500	866,300	854,000
8 Surrounding Counties	583,300	747,000	942,100	1,104,800

Data sources: 1990 and 2000 from US Census Bureau.
Projections are from the Indianapolis Metropolitan Planning Organization.

The outward growth of employment is even more dramatic, with jobs in the eight counties increasing by 42% between 1990 and 2000, while employment decreased by 6% in Marion County during the same period.

Marion County still has more people and jobs than the surrounding eight counties put together, but the differences are becoming less. Total population in the eight counties is expected to exceed that of Marion County before 2015, and these counties are forecasted to house 56% of the region's residents in 2025.

Table 2C: Employment

	1990	2000	2015	2025
Marion County	613,000	576,300	572,300	558,500
8 Surrounding Counties	256,800	364,700	434,500	495,700

Data source: Indianapolis Metropolitan Planning Organization.

2.2 Regional Transportation Systems

Transit Systems—Local transit service is provided within Marion County by IndyGo and within Madison County by the City of Anderson Transit System. With the exception of the Fishers park and ride service from the Eastern Star Church in Fishers to downtown Indianapolis, regular transit service is currently not available to the counties surrounding Indianapolis. Commuters from the surrounding counties do have the option of driving to park and ride lots at the edges of Marion County and using transit to reach destinations in Indianapolis. There are no current transit options for trips within and between the outlying counties.

As the time this report was being prepared, two initiatives were underway that may result in an expansion of existing transit service to better serve the region. "DiRecTionS" is a study being conducted to identify the best corridors with opportunities for regional transit service, with emphasis on service between downtown and the airport. This study followed a study called "ConNECTions," which reviewed transit (and highway) options to serve the northeast quadrant of the region. Alternatives extended from downtown Indianapolis to Noblesville in Hamilton County.

Table 2D: Selected City/Town Population & Household Statistics

	1990	2000	% Change	1990	2000	% Change	1990	2000	% Change
Boone County									
Lebanon	12,059	14,222	18%	4,729	5,834	23%	4,910	6,202	26%
Zionsville	5,281	8,775	66%	1,834	3,063	67%	1,923	3,169	65%
Hamilton County									
Carmel	25,380	37,733	49%	9,111	13,597	49%	9,645	14,107	46%
Fishers	7,508	37,835	404%	2,682	14,044	424%	2,898	15,241	426%
Noblesville	17,655	28,590	62%	6,650	10,576	59%	7,128	11,294	58%
Westfield	3,304	9,293	181%	1,254	3,386	170%	1,312	3,606	175%
Hancock County									
Greenfield	11,657	14,600	25%	4,249	5,917	39%	4,425	6,449	46%
Hendricks County									
Brownsburg	7,628	14,520	90%	2,841	5,366	89%	2,923	5,574	91%
Danville	4,345	6,418	48%	1,650	2,350	42%	1,719	2,506	46%
Plainfield	10,433	18,396	76%	4,160	7,051	69%	4,303	7,449	73%
Johnson County									
Franklin	12,907	19,463	51%	4,450	6,824	53%	4,661	7,432	59%
Greenwood	26,265	36,037	37%	10,594	14,931	41%	11,399	16,042	41%
Madison County									
Anderson	59,459	59,734	0%	24,311	25,274	4%	26,362	27,643	5%
Pendleton	2,309	3,873	68%	905	1,550	71%	976	1,631	67%
Marion County									
Beech Grove	13,383	14,880	11%	5,488	6,085	11%	5,757	6,506	13%
Indianapolis	731,327	781,870	7%	291,946	320,107	10%	319,980	352,429	10%
Lawrence	26,763	38,915	45%	10,612	14,853	40%	11,621	16,292	40%
Southport	1,969	1,852	-6%	730	733	0%	767	769	0%
Speedway	13,092	12,881	-2%	6,344	6,151	-3%	6,728	6,636	-1%
Morgan County									
Martinsville	11,677	11,698	0%	4,408	4,621	5%	4,604	4,880	6%
Mooresville	5,541	9,273	67%	2,107	3,535	68%	2,220	3,688	66%
Shelby County									
Shelbyville	15,336	17,951	17%	6,133	7,307	19%	6,567	7,930	21%

Source: U.S. Census Bureau

The second initiative is a proposal to form a regional transit authority (RTA). One of the primary purposes of formulating an RTA is to expand transit service beyond the borders of Marion County so that IndyGo can better serve mobility needs of the Central Indiana Region as a whole.

Highway Systems—Central Indiana is truly a crossroads for the nation's transportation systems. At one time, Indianapolis was a crossing point for railroads. Today, four interstate highways converge on the City (I-65, I-69, I-70, I-74). Indianapolis is served by more interstate highways than any other city in the United States. I-69 and I-74 end at I-465 (beltway), and I-65 and I-70 extend to downtown as urban freeways. With the exception of I-465, all interstate highways approaching Indianapolis provide radial, rather than crosstown mobility.

Long before the construction of the interstate highway system, major roadways in Central Indiana were oriented toward Indianapolis. East-west travel is relatively difficult north of downtown Indianapolis, whether the trip is within or outside Marion County. Much higher capacity is provided north-south. West of downtown, east-west movement is facilitated by several multi-lane routes, but there is no continuous high capacity north-south route (other than I-465). Similar patterns exist in all four quadrants of the Indianapolis region.

Evaluating "non-radial" travel demand and meeting the need for "crosstown" mobility between adjacent counties within the Central Indiana area is one of the primary objectives of this study.

2.3 Regional Commuting Patterns

As would be expected, data from the U.S. Census for 1990 and 2000 show that the most significant commuting patterns are to and from Marion County. While this is likely to remain the case for many years to come, commuting between the other counties is continually increasing as employment centers are created in those areas. Table 2E and Figures 2-1 and 2-2 illustrate some of the county to county commuter flows for the eight counties surrounding Marion County.

The most dominant county in terms of "cross-county" commuting is Hamilton County. The most significant employment generator in the study area (outside of Marion County) is the concentration of offices and commercial buildings along and near US 31 in Carmel. In addition to being the highest trip generator, it also experienced the most growth during the 10 year period. Hendricks County is emerging as the second highest destination for commuting trips, although they are still significantly less than Hamilton County. Other concentrations of county-to-county commuters are much less significant.

2.4 Roadway and Travel Characteristics Review

The review of roadway and travel characteristics (presented in Section 3) includes an evaluation of traffic operations in both the urban and rural environment. The approach differs under rural and urban conditions, although operating speed and delay are compared to the ideal free flow speed conditions in both environments. It is important to consider that although a specific level-of-service may be evaluated as good in an urban area, the resulting travel times may be considerably higher than those for a comparable length rural section that has a lower level-of-service designation. For example, a two-lane roadway with an average speed of 30 mph through an urban area would be considered to be operating well, but a two-lane highway with the same average speed in a rural area would be considered to be operating poorly.

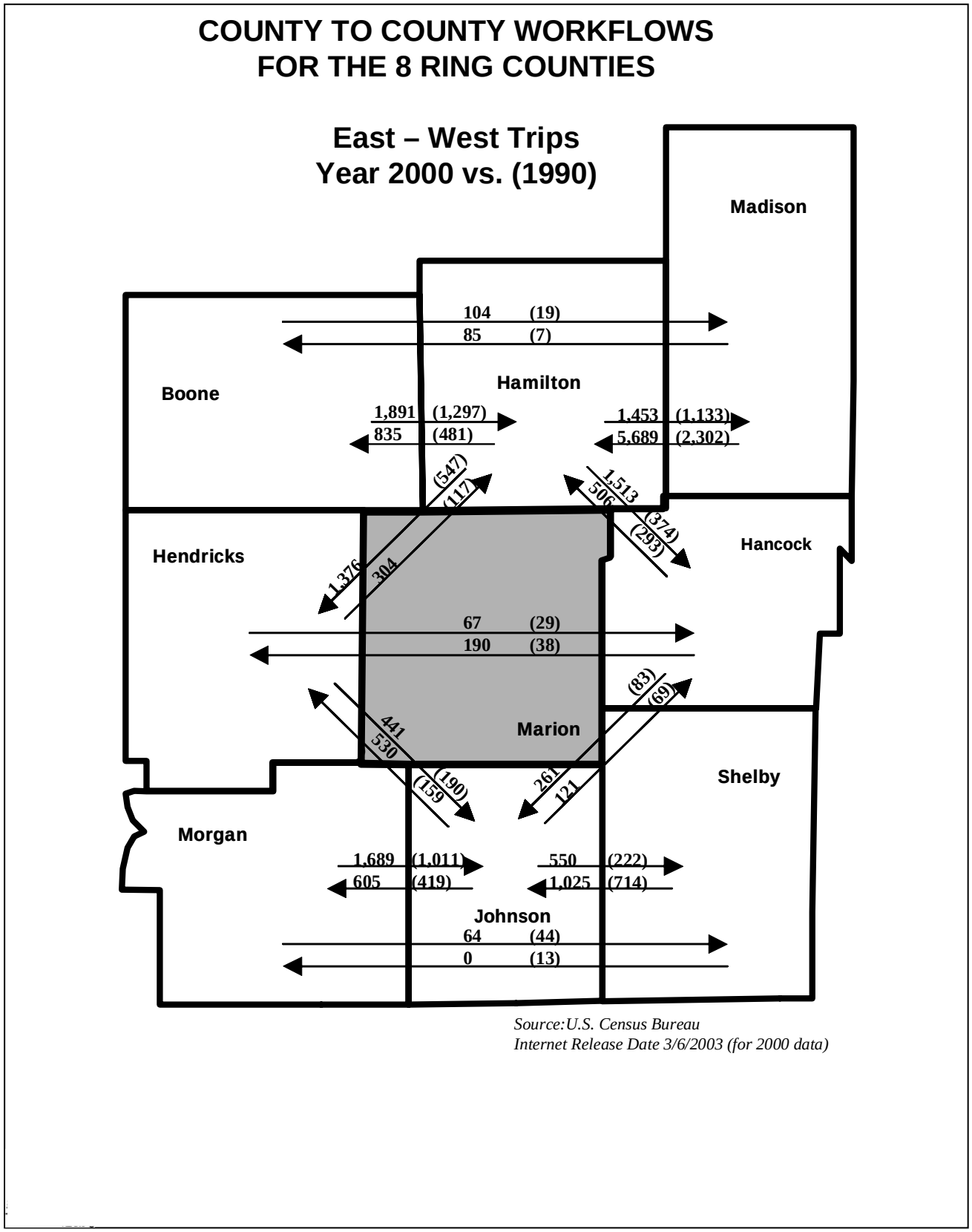
Table 2E: County-to-County Commuter Flows

To Work	Boone		Hamilton		Hancock		Hendricks		Johnson		Madison		Marion	
From Residence Þ	1990	2000	1990	2000	1990	2000	1990	2000	1990	2000	1990	2000	1990	2000
Boone	7,990	9,955	1,297	1,891	10	50	313	544	56	55	19	104	7,521	8,601
Hamilton	481	835	24,018	43,356	293	506	117	304	61	225	1,133	1,453	26,255	43,152
Hancock	39	101	1,139	1,513	7,722	10,150	38	190	69	121	491	389	12,026	13,995
Hendricks	301	467	547	1,376	29	67	12,541	19,548	159	530	12	129	21,811	28,410
Johnson	38	151	224	730	83	261	190	441	18,525	24,603	24	88	22,370	28,594
Madison	7	85	2,302	5,689	616	798	24	152	39	37	43,126	39,545	5,815	7,226
Marion	1,159	2,006	11,202	24,857	1,477	2,309	3,461	6,460	5,929	8,855	913	1,407	355,629	368,274
Morgan	29	82	113	378	22	97	982	2,042	1,011	1,689	17	42	12,036	13,782
Shelby	0	29	87	189	501	566	12	58	714	1,025	12	142	5,207	5,559
Total	10,044	13,711	40,929	79,979	10,753	14,804	17,678	29,739	26,563	37,140	45,747	43,299	468,670	517,593

To Work	Morgan		Shelby		8 Counties		9 Counties		Other		Total	
From Residence	1990	2000	1990	2000	1990	2000	1990	2000	1990	2000	1990	2000
Boone	12	19	9	10	9,237	11,274	17,227	21,229	1,221	1,450	18,448	22,679
Hamilton	8	45	59	82	28,407	46,602	52,488	89,958	2,830	4,603	55,318	94,561
Hancock	7	71	368	520	13,435	16,900	21,157	27,050	726	1,164	21,883	28,214
Hendricks	400	712	5	89	23,264	31,780	35,805	51,328	1,062	1,694	36,867	53,022
Johnson	419	605	222	550	23,570	31,420	42,095	56,023	1,703	2,793	43,798	58,816
Madison	2	11	71	71	8,876	14,069	52,002	53,614	4,699	5,302	56,701	58,916
Marion	1,026	1,299	648	1,243	25,815	48,436	381,444	416,710	7,138	7,888	424,598	388,582
Morgan	10,568	13,098	44	64	14,254	18,176	24,822	31,274	1,475	1,878	33,152	26,297
Shelby	13	0	11,270	12,848	6,546	7,568	17,816	20,416	973	1,381	18,789	21,797
Total	12,455	15,860	12,696	15,477	153,404	226,225	644,856	767,602	21,827	28,153	709,554	752,884

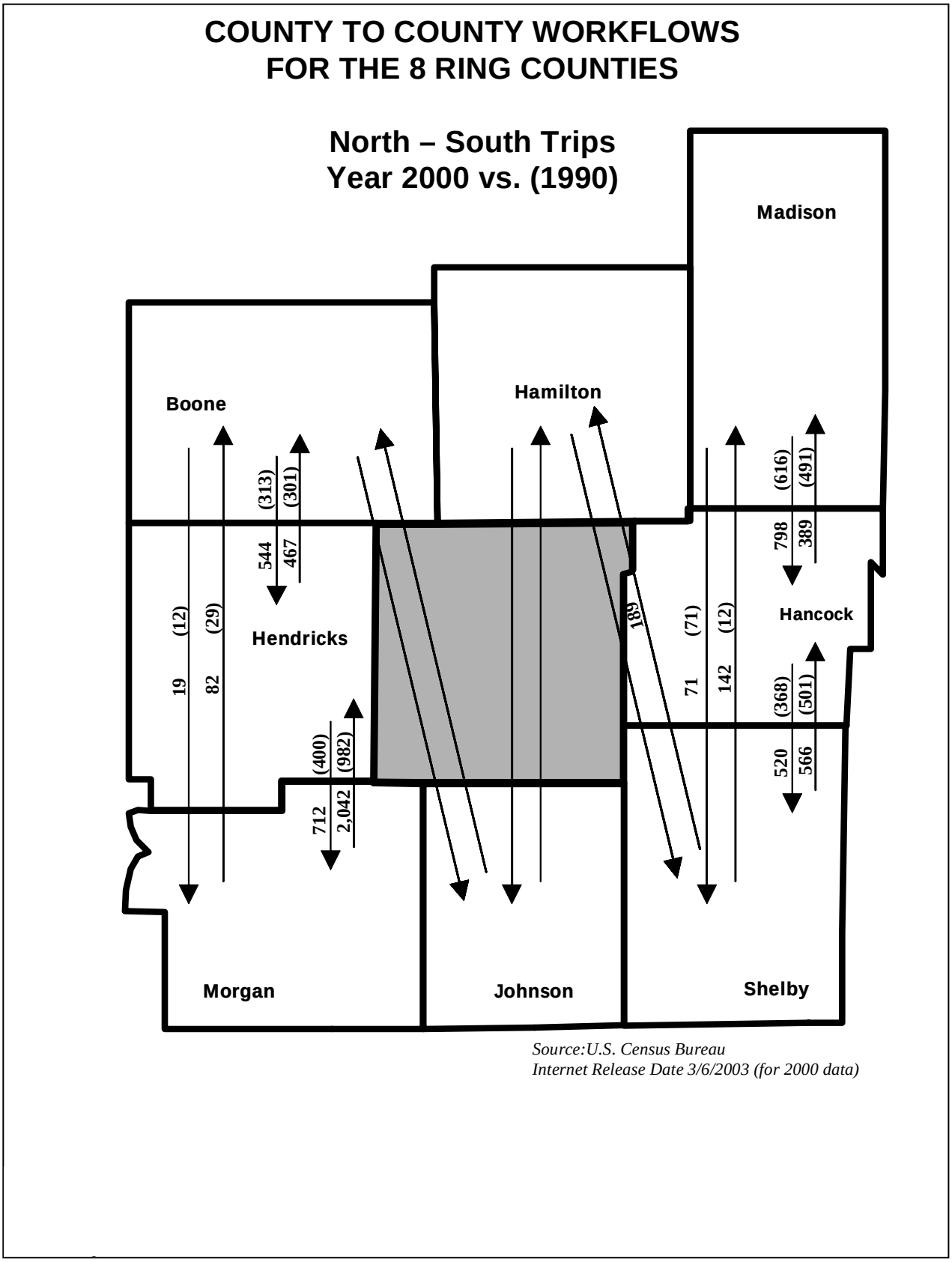
Source: U.S. Census

Figure 2-1: County to County Workflows for the 8 Ring Counties, East-West Trips



Source: U.S. Census Bureau
Internet Release Date 3/6/2003 (for 2000 data)

Figure 2-2: County to County Workflows for the 8 Ring Counties, North-South Trips



Source:U.S. Census Bureau
Internet Release Date 3/6/2003 (for 2000 data)

As the study corridors become more urbanized, the lower speeds associated with operations in urbanized areas will most likely become more prevalent on all study routes, in the absence of major access control adjustments or facility upgrades. These future conditions will be evaluated in the Final CISTMS Report. The focus of this report is to define conditions as they exist today and to suggest short-term solutions to improve those conditions.

2.5 Functional Classification

Figure 2-3 shows the functional classification of major routes in each study corridor. Roadway functional classification is another important consideration in determining how well a particular roadway serves transportation requirements. Freeways provide limited access to adjoining land, have the highest travel speeds, and allow the shortest travel times. Local roads are on the opposite end of the classification range, with high accessibility and low speeds. The primary roadways in the CISTMS study corridors are classified in one of three groups:

1. Urban Principal Arterials
2. Rural Minor Arterials
3. Rural Major Collector

Figure 2-3: CISTMS Corridors – State Route Functional Class Map

The following Level of Service (LOS) descriptions have been taken from the Highway Capacity Manual 2000, published the Transportation Research Board:

Urban Streets (pp 10-4 to 10-5)

The average speed for through vehicles on an urban street determines level of service (LOS). The travel speed along a segment, section, or entire length of an urban street is dependent on the running speed between signalized intersections and the amount of delay incurred at signalized intersections.

Urban street LOS is based on average through-vehicle travel speed for the segment, section, or entire street under consideration. The following general statements characterize the LOS along urban streets.

> LOS A describes primarily free-flow operations at average travel speeds, usually about 90 percent of the free flow speed (FFS) for the given street class. Vehicles are completely unimpeded in their ability to maneuver within the traffic stream. Control delay at signalized intersection is minimal.
>
> LOS B describes reasonably unimpeded operations at average travel speeds, usually about 70 percent of the FFS for the street class. The ability to maneuver within the traffic stream is only slightly restricted, and control delays at signalized intersections are not significant.
>
> LOS C describes stable operations; however, ability to maneuver and change lanes in midblock locations may be more restricted than at LOS B, and longer queues, adverse signal coordination, or both may contribute to lower average travel speeds of about 50 percent of the FFS for the street class.
>
> LOS D borders on a range in which small increases in flow may cause substantial increases in delay and decreases in travel speed. LOS D may be due to adverse signal progression, inappropriate signal timing, high volumes, or a combination of these factors. Average travel speeds are about 40 percent of FFS.
>
> LOS E is characterized by significant delays and average travel speeds of 33 percent or less of the FFS. Such operations are caused by a combination of adverse progression, high signal density, high volumes, extensive delays at critical intersections, and inappropriate signal timing.
>
> LOS F is characterized by urban street flow at extremely low speeds, typically one-third to one-fourth of the FFS. Intersection congestion is likely at critical signalized locations, with high delays, high volumes, and extensive queuing.

Multi-lane Highways (pp 12-7 to 12-8)

The operation of a multilane highway is characterized by three performance measures:

- Density, in terms of passenger cars per mile per lane;
- Speed, in terms of mean passenger car speed; and
- Volume to capacity ratio

Each of these measures indicates how well the highway accommodates traffic flow. Density is the assigned primary performance measure for estimating LOS on multi-lane facilities. The three measures of speed, density and flow or volume are interrelated. If the values of two of these measures are known, the remaining measure can be computed.

> LOS A describes completely free-flow conditions. The operation of vehicles is virtually unaffected by the presence of other vehicles, and operations are constrained only by geometric features of the highway and by driver preferences. Maneuverability within the traffic stream is good. Minor disruptions to flow are easily absorbed without a change in travel speed.
>
> LOS B also indicates free flow, although the presence of other vehicles becomes noticeable. Average travel speeds are the same as in LOS A, but drivers have slightly less freedom to maneuver. Minor disruptions are still easily absorbed, although local deterioration in LOS will be more obvious.
>
> In LOS C, the influence of traffic density on operations becomes marked. The ability to maneuver within the traffic stream is clearly affected by other vehicles. On multilane highways with an FFS above 50 mph. the travel speeds reduce somewhat. Minor disruptions can cause serious local deterioration in service, and queues will form behind any significant disruptions.
>
> At LOS D, the ability to maneuver is severely restricted due to traffic congestion. Travel speed is reduced by the increasing volume. Only minor disruptions can be absorbed without extensive queues forming and the service deteriorating.
>
> LOS E represents operations at or near capacity, an unstable level. The densities vary, depending upon the FFS. Vehicles are operating with the minimum spacing for maintaining uniform flow. Disruptions cannot be dissipated readily, often causing queues to form and service to deteriorate to LOS F. For the majority of multilane highways with FFS between 45 and 60 mi/h, passenger-car mean speeds at capacity range from 42 to 55 mi/h but are highly variable and unpredictable.
>
> LOS F represents forced or breakdown flow. It occurs wither when vehicles arrive at a rate greater than the rate at which they are discharged or when the forecast demand exceeds the computed capacity of a planned facility. Although operations at these points-and on sections immediately downstream – appear to be at capacity, queues form behind these breakdowns. Operations within queues are highly unstable, with vehicles experiencing brief periods of movement followed by stoppages. Travel speeds within queues are generally less than 30 mi/h. Note that the term LOS F may be used to characterize both the point of breakdown and the operating condition within the queue.
>
> Although the point of breakdown causes the queue to form, operations within the queue generally are not related to deficiencies along the highway segment.

Two-lane highways (pp 12-15 to 12-16)

The primary measures of service quality for Class I two-lane highways are percent time-spent-following and average travel speed. For Class II two-lane highways, service quality is based only on

percent time-spent-following. LOS criteria are defined for peak 15-min flow periods and are intended for application to segments of significant length. Level of service designations are described below:

LOS A describes the highest quality of traffic service, when motorists are able to travel at their desired speed. Without strict enforcement, this highest quality would result in average speeds of 55 mi/h or more on two-lane highways in Class I. The passing frequency required to maintain these speeds has not reached a demanding level, so that passing demand is well below passing capacity, and platoons of three or more vehicles are rare. Drivers are delayed no more than 35 percent of their travel time by slow-moving vehicles. A maximum flow rate of 490 passenger cars per hour (pc/h) total in both directions may be achieved with base conditions. On Class II highways, speeds may fall below 55 mi/h, but motorists will not be delayed in platoons for more than 40 percent of their travel time.

LOS B characterizes traffic flow with speeds of 50 mi/h or slightly higher on level-terrain Class I highways. The demand for passing to maintain desires speeds becomes significant and approximates the passing capacity at the lower boundary of LOS B. Drivers are delayed in platoons up to 50 percent of the time. Service flow rates of 780 pc/h total in both directions can be achieved under base conditions. Above this flow rate, the number of platoons increases dramatically. On Class II highways, speeds may fall below 50 mi/h, but motorists will not be delayed in platoons for more than 55 percent of their travel time.

LOS C describes further increases in flow, resulting in noticeable increases in platoon formation, platoon size, and frequency of passing impediments. The average speed still exceeds 45 mi/h on level-terrain Class I highways, even though unrestricted passing demand exceeds passing capacity. At higher volumes the chaining of platoons and significant reduction is passing capacity can occur. Although traffic flow is stable, it is susceptible to congestion due to turning traffic and slow-moving vehicles. Percent time-spent-following may reach 65 percent. A service flow rate of up to 1,190 pc/h total in both directions can be accommodated under base conditions. On Class II highways, speeds may fall below 45 mi/h, but motorists will not be delayed in platoons for more than 70 percent of their travel time.

LOS D describes unstable traffic flow. The two opposing traffic streams begin to operate separately at high volume levels, as passing becomes extremely difficult. Passing demand is high, but passing capacity approaches zero. Mean platoon size of 5 to 10 vehicles are common, although speeds of 40 mi/h still can be maintained under base conditions on Class I highways. The proportion of no-passing zones along the roadway section usually has little influence on passing. Turning vehicles and roadside distractions cause major shock waves in the traffic stream. Motorists are delayed in platoons for nearly 80 percent of their travel time. Maximum service flow rates of 1, 830 pc/h total in both directions can be maintained under base conditions. On Class II highways, speeds may fall below 40 mi/h, but in no case will motorists be delayed in platoons for more than 85 percent of their travel time.

At LOS E, traffic flow conditions have a percent time-spent-following greater than 80 percent on Class I highways and greater than 85 percent on Class II. Even under base conditions, speeds may drop below 40 mi/h. Average travel speeds on highways with less than base conditions will be slower, even down to 25 mi/h on sustained upgrades. Passing is virtually impossible at LOS E, and platooning becomes intense, as slower vehicles or other interruptions are encountered.

The highest volume attainable under LOS E defines the capacity of the highway, generally 3,200 pc/h total in both directions. Operation conditions at capacity are unstable and difficult to predict. Traffic operations seldom reach near capacity on rural highways, primarily because of a lack of demand.

LOS F represents heavily congested flow with traffic demand exceeding capacity. Volumes are lower than capacity and speeds are highly variable.

The LOS approach described in previous paragraphs is consistent with nationally accepted guidelines, but it differs from that used in many transportation studies. Typically, studies that focus on relatively small study areas utilize LOS analysis at critical interchanges or intersections to identify problem areas that require improvement. For traffic impact studies and project level corridor studies, that is a valid approach since these locations are almost always the primary determinant of localized operating characteristics. The use of operating speeds and delay to determine LOS is more appropriate for the extended corridors in this study, although care must be taken in interpreting the results for urban and rural sections, as discussed in Section 2.4. Fortunately, the road inventory and traffic data available from INDOT are sufficient to support this approach.