APPENDIX F
COMPLETE ALTERNATIVE PLAN EVALUATION RESULTS

INTRODUCTION

This appendix presents the complete evaluation results for the alternative land use and transportation plans considered for VISION 2050, which are documented in Chapter 3 of Volume II of the VISION 2050 plan report. There are three alternatives compared in the evaluation results. The first is a baseline alternative, referred to as the Trend. The Trend is a projection of land use development and transportation investment trends to the year 2050 based primarily on changes experienced from 1990 to 2010. The Trend was used as a comparison for two detailed alternative plans, Alternative Plan I and Alternative Plan II. Alternative Plans I and II differ from the Trend by including more compact regional land use development patterns and changes in transportation system investments.

Compared to the more conceptual scenarios from the previous step in the VISION 2050 process, the added level of detail included in the alternatives allowed a more thorough evaluation using a larger set of criteria than were used to evaluate the scenarios. The alternatives evaluation is based on the VISION 2050 plan objectives and evaluation criteria developed during the alternatives step of the process, which are presented in Chapter 3 of Volume II. The 50 evaluation criteria measure the extent to which each alternative meets each objective.

Appendix F is organized into four important themes for VISION 2050:

- Healthy Communities (Appendix F-1)
- Equitable Access (Appendix F-2)
- Cost and Financial Sustainability (Appendix F-3)
- Mobility (Appendix F-4)

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APPENDIX F-1
ALTERNATIVE PLAN EVALUATION FOR HEALTHY COMMUNITIES

CRITERION 1.1.1: NUMBER OF PEOPLE LIVING IN WALKABLE AREAS

KEY CONCLUSIONS

- **Alternative Plan II would result in the largest improvement to walkability in the Region, with Alternative I providing greater walkability than the Trend.**
- **Alternative II would have the most people living in walkable areas (863,000)—12 percent more than Alternative I (770,000) and 19 percent more than the Trend (725,000).**
- **Alternative II would also have the most developed land in walkable areas (75,000 acres)—17 percent more than Alternative I (64,000) and 27 percent more than the Trend (59,000).**

The term "walkable" refers to the ease by which people can walk in an area to various destinations such as schools, parks, retail services, and employment. Developing walkable neighborhoods can have numerous positive benefits to the health and vibrancy of communities in the Region. It can encourage residents to walk or bike rather than drive and can increase community cohesion by encouraging more social interaction with neighbors. Many participants in the VISION 2050 process, recognizing these types of benefits, have expressed a desire for more walkable neighborhoods.

- **Estimating Walkability:** To estimate walkability for the alternatives, the first step was to estimate existing walkability. Commission staff received existing "walk scores" for all 2,374 internal travel analysis zones (TAZs) in the Region directly from WalkScore® (www.walkscore.com), a private company that specializes in estimating walkability. These scores represent ratings of the walkability of an area on a scale of 0 to 100 using a methodology developed by WalkScore.® The method uses a propriety algorithm to estimate scores based on pedestrian friendliness metrics (such as population density, block length, and intersection density) and walking distance to destinations (such as schools, parks, retail services, and employment). For the purposes of comparing the alternatives, scores greater than 50 were considered "walkable," which is consistent with the WalkScore® categories of Somewhat Walkable (scores of 50-69), Very Walkable (70-89), and Walker's Paradise (90-100).

  Development of the alternatives did not include development of the detailed data to estimate future walkability in the way that WalkScore® estimates existing walkability, so Commission staff used the variability in household density and presence of TOD to estimate future walkability. In general, increasing household density will result in improved walkability because destinations are more likely to be in proximity to residents. Higher-density areas also tend to be more pedestrian-friendly environments because they tend to include sidewalks and shorter block lengths. Many TOD areas, which are located within easy walking distance to/from a fixed-guideway transit station, tend to include development with a mix of destinations that are within walking distance for the area's residents. The design and layout of a TOD area also tend to be more pedestrian-oriented, for example, including curb bump-outs at crosswalks.

  The household density variable was first employed by determining the statistical relationship between the existing walk score and existing 2010 household density for each TAZ. The change in household

Table F.1
Number of People Living in Walkable Areas

Alternative	Population in Walkable Areas	Total Population	Percent of Total Population in Walkable Areas	Developed Land that is Walkable (Acres)	Total Developed Land (Acres)	Percent of Developed Land that is Walkable
Existing - 2010	702,600	2,020,000	34.8	56,400	467,000	12.1
Trend - 2050	724,600	2,354,000	30.8	59,200	568,400	10.4
Alt I - 2050	769,500	2,354,000	32.7	64,000	529,600	12.1
Alt II - 2050	863,100	2,354,000	36.7	75,000	524,600	14.3

Source: WalkScore® and SEWRPC

density from 2010 to 2050 for each TAZ for each alternative was then estimated and applied to the existing walk scores. Lastly, staff identified all the TAZs considered to be included in a TOD area for Alternatives I and II, respectively, and estimated the additional walkability of those TAZs based on the type of development likely to occur.

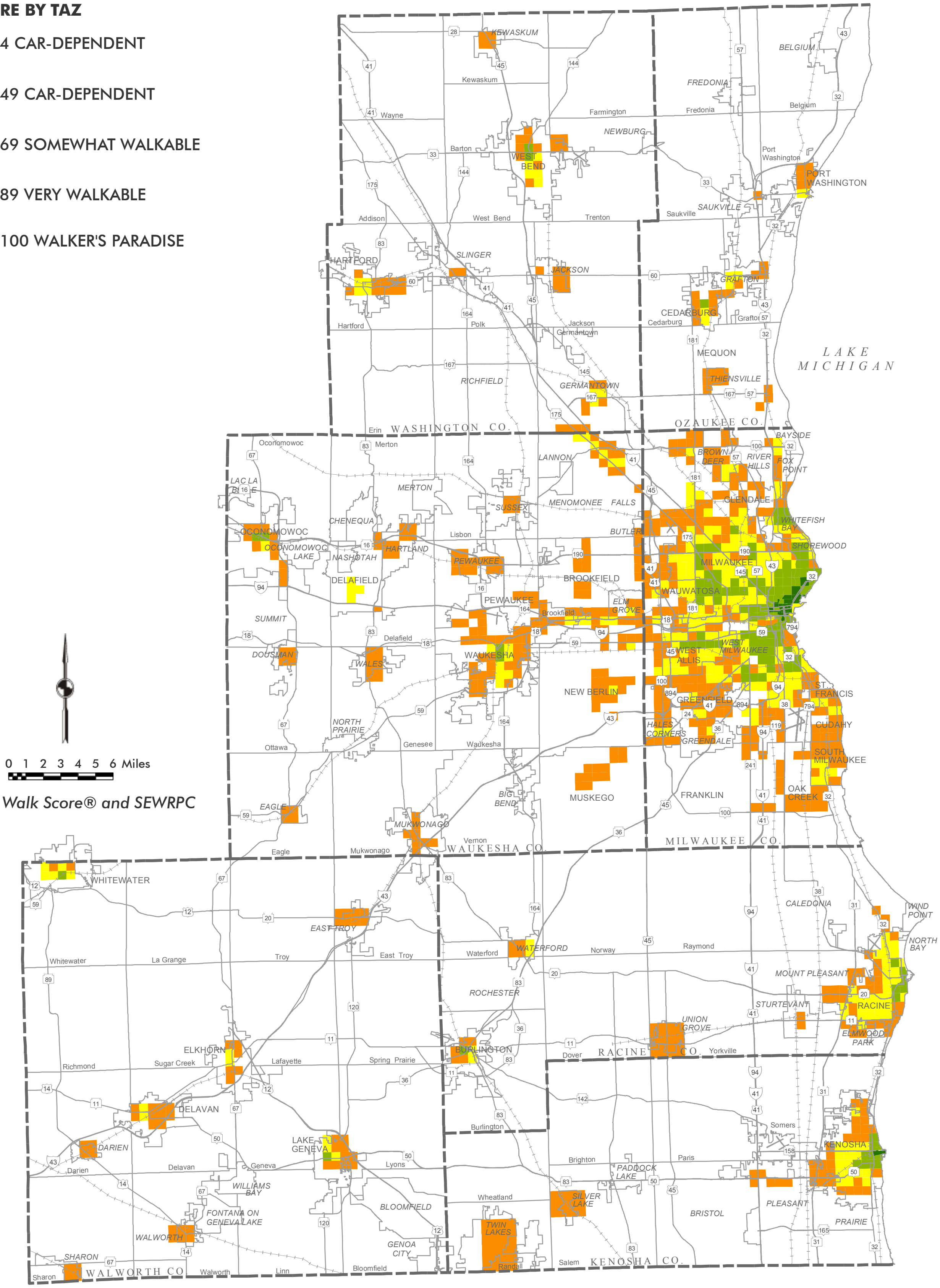
- **Evaluation Results:** Table F.1 and Maps F.1 through F.4 present the estimated walkability under the existing development pattern, as well as under the Trend and Alternatives I and II. A more compact development pattern tends to be more walkable, and the evaluation showed that the Trend, which includes more lower-density development than Alternatives I and II, is the least walkable option. Alternative I includes higher-density development than the Trend and some TOD areas, which results in additional areas identified as being walkable. The Trend would have more people living in walkable areas (724,600) than under the existing development pattern (702,600). Alternative I would improve on the Trend, with 769,500 people living in walkable areas. Alternative II, with its extensive focus on TOD, would have the most people living in walkable areas (863,100)—12 percent more than Alternative I and 19 percent more than the Trend. Similarly, Alternative II would have the most developed land in walkable areas (75,000 acres)—17 percent more than Alternative I (64,000) and 27 percent more than the Trend (59,000).

- **Sidewalk Connectivity:** Well-connected, accessible sidewalks provide a safe place for people to walk separated from motor vehicles. They are particularly important for people with disabilities and children, and provide improved mobility and access to various destinations. The alternatives envision that sidewalks will be designed and constructed consistent with Americans with Disabilities Act (ADA) requirements to accommodate people with disabilities. Primarily due to data availability issues, the analysis for this criterion (and as well the method used by WalkScore® to estimate existing walk scores) does not explicitly consider sidewalk presence. The analysis instead focuses on the destinations that are likely to be within walking distance of the Region's residents. However, sidewalks are important to encouraging walking trips and would be envisioned in most new land developments under any of the alternatives, with the exception of those in the Large Lot Exurban and Rural Estate categories. Sidewalk connectivity—direct links that connect people to other homes in their neighborhood, shopping, schools, parks, and other destinations—would likely be highest in walkable areas. As a result, Alternative II would be envisioned to have the most sidewalk connectivity of the three alternative, followed by Alternative I.

Map F.1
Walkability in the Region: Existing

WALK SCORE BY TAZ

- 0-24 CAR-DEPENDENT
- 25-49 CAR-DEPENDENT
- 50-69 SOMEWHAT WALKABLE
- 70-89 VERY WALKABLE
- 90-100 WALKER'S PARADISE

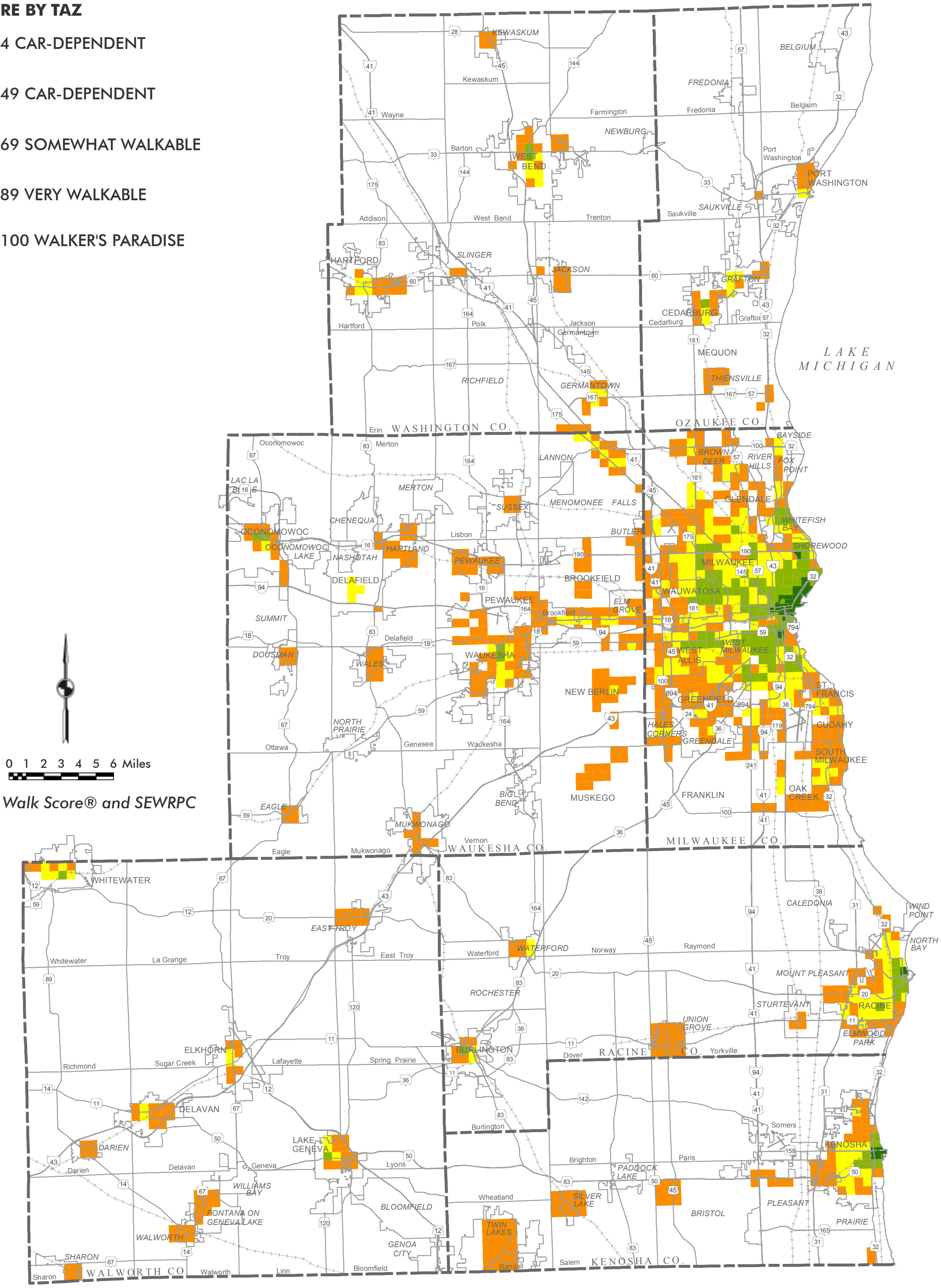


Source: Walk Score® and SEWRPC

Map F.2
Walkability in the Region: Trend

WALK SCORE BY TAZ

- 0-24 CAR-DEPENDENT
- 25-49 CAR-DEPENDENT
- 50-69 SOMEWHAT WALKABLE
- 70-89 VERY WALKABLE
- 90-100 WALKER'S PARADISE



Source: *Walk Score® and SEWRPC*

Map F.3
Walkability in the Region: Alternative Plan I

WALK SCORE BY TAZ

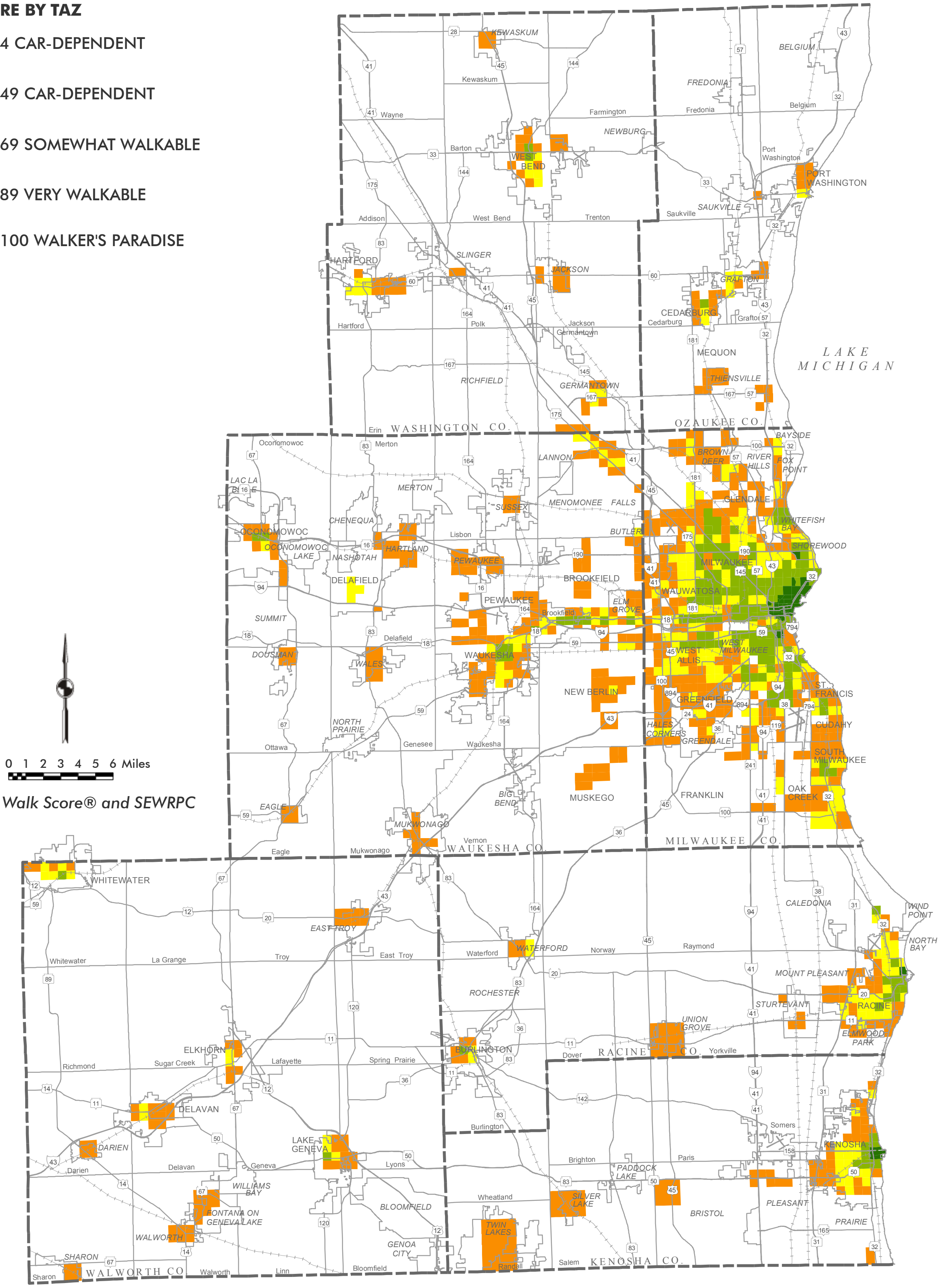
0-24 CAR-DEPENDENT

25-49 CAR-DEPENDENT

50-69 SOMEWHAT WALKABLE

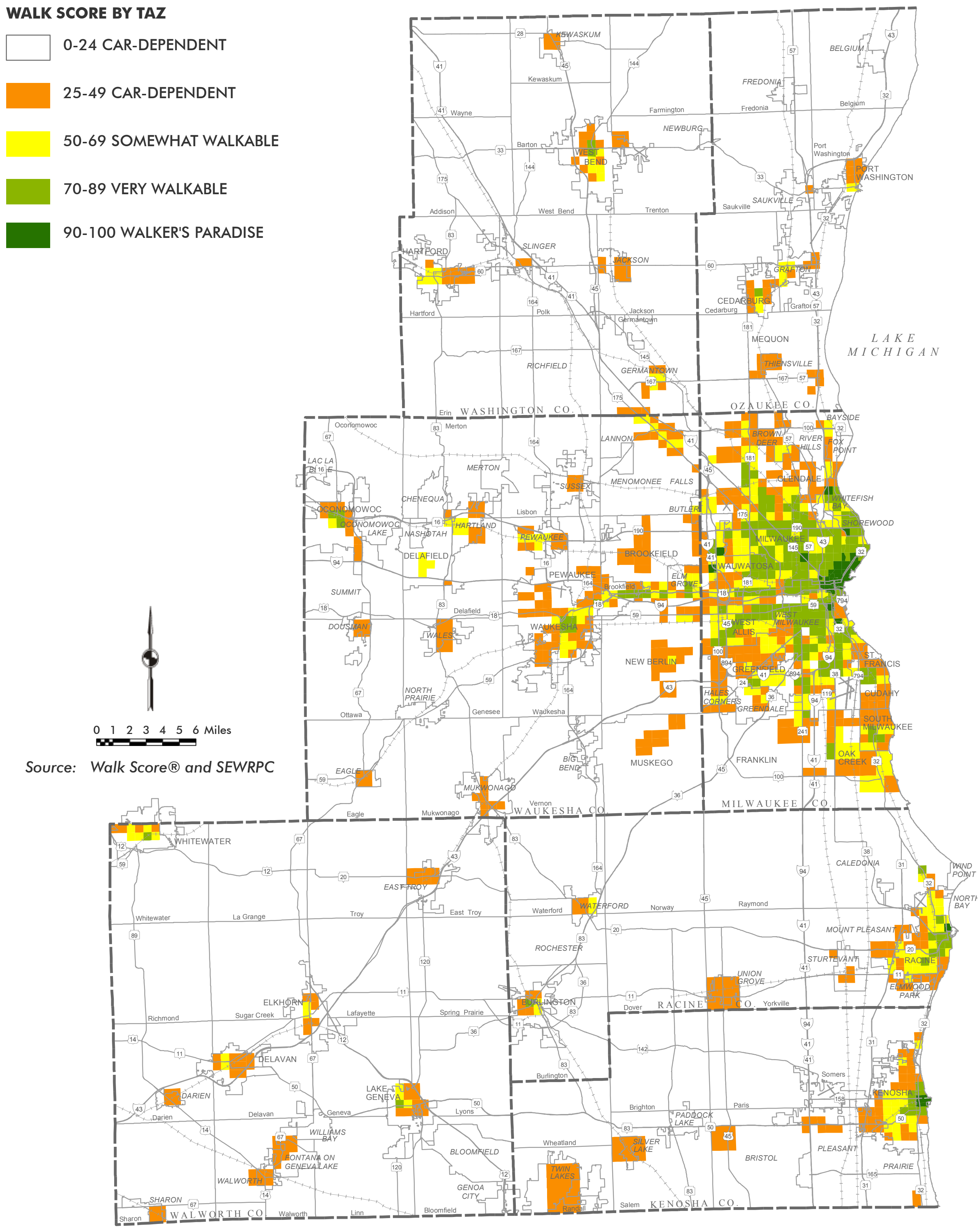
70-89 VERY WALKABLE

90-100 WALKER'S PARADISE



Source: Walk Score® and SEWRPC

Map F.4
Walkability in the Region: Alternative Plan II



Source: *Walk Score® and SEWRPC*

CRITERION 1.1.2: POPULATION DENSITY

KEY CONCLUSIONS

- **Alternative Plans I and II, which have higher population densities, perform better under most of the evaluation criteria than the Trend.**
- **Alternative II has the highest population density.**

Population density (number of people per square mile) is a result of the residential development pattern of the alternatives, which directly or indirectly relates to the other evaluation criteria. The higher-density alternatives perform better under most of the evaluation criteria because services can be provided more efficiently; there are more housing and transportation options; and there are fewer negative impacts on natural and agricultural resources.

- **Trend:** The Trend has the lowest population density of the alternatives. Most new residential development would occur within existing urban centers or at the immediate outer boundary of urban centers; however, more new development would be scattered in locations away from urban centers than under both Alternatives I and II.
- **Alternative Plan I:** The population density of Alternative I is higher than the Trend, but lower than Alternative II. Most new residential development would occur as infill or redevelopment in existing urban centers, and at the immediate outer boundary of urban centers. Alternative I would include some TOD, which would focus compact, mixed-use development around fixed-guideway transit stations. Alternative I reverses the Region's 70 plus year decline in population density.
- **Alternative Plan II:** Alternative II has the highest population density of the alternatives. The pattern of new development under Alternative II would be similar to Alternative I; however, there would be more than twice as many fixed-guideway station areas with potential for TOD.

Table F.2
Population Density

Alternative	Residential Land (square miles)	Population	Population per Square Mile	Incremental Residential Land (square miles)	Population Change	Population per Square Mile of New Residential Development
Existing - 2010	400.9	2,020,000	5,038.7	N/A	N/A	N/A
Trend - 2050	517.7	2,354,000	4,547.0	116.8	334,000	2,859.6
Alt I - 2050	465.4	2,354,000	5,058.0	64.5	334,000	5,178.3
Alt II - 2050	457.8	2,354,000	5,142.0	56.9	334,000	5,869.9

Source: SEWRPC

CRITERION 1.1.3: EMPLOYMENT DENSITY

KEY CONCLUSION

- **Employment density increases somewhat under Alternative Plans I and II because of the focus on TOD.**

Employment density (number of jobs per square mile) does not vary as much as population density between the alternatives because most jobs are located in areas with public sewer service under each of the alternatives. Employment density does increase somewhat from the Trend to Alternative I and from Alternative I to Alternative II. This is largely due to concentrations of jobs in fixed-guideway transit station areas.

- **Public Sewer Service:** Areas of the Region that do not have public sanitary sewer service typically cannot support extensive commercial or industrial development. Most existing and new jobs would be located in public sewer service areas under each of the alternatives as a result.

- **Redevelopment Areas:** A significant number of jobs would occur in redevelopment areas under each of the alternatives. Many of these are employment supporting areas and have the potential to support increased employment on about the same amount of land. This results in increased jobs per square mile for new employment supporting development under each of the alternatives.

- **TOD:** Employment density does increase to some extent in Alternatives I and II because of the focus on TOD near fixed-guideway transit stations proposed under Alternatives I and II. TODs are typically mixed-use with high-density residential and potentially high-density office and retail development. Employment density is higher under Alternative II because more than twice as many stations are proposed.

Table F.3
Employment Density

Alternative	Employment Supporting Land (square miles)	Jobs	Employment per Square Mile	Incremental Employment Supporting Land (square miles)	Employment Change	Jobs per Square Mile for New Employment Supporting Development
Existing - 2010	128.1	1,176,600	9,185.0	N/A	N/A	N/A
Trend - 2050	146.9	1,386,900	9,441.1	18.8	210,300	11,186.2
Alt I - 2050	146.0	1,386,900	9,499.3	17.9	210,300	11,748.6
Alt II - 2050	145.0	1,386,900	9,564.8	16.9	210,300	12,443.8

Source: SEWRPC

CRITERION 1.2.1: BICYCLE LEVEL OF SERVICE

KEY CONCLUSIONS

- **Bicycle level of service (BLOS) refers to bicyclist comfort and the existing or perceived operational conditions on a bicycle facility.**
- **BLOS would be improved under the Trend and Alternatives I and II compared to existing conditions due to the implementation of on-street bicycle facilities as surface arterial streets and highways are resurfaced or reconstructed.**
- **Alternatives I and II would have greater improvements in BLOS due to the implementation of enhanced bicycle facilities in key regional corridors.**

- **How BLOS Was Estimated:** The Bicycle Compatibility Index (BCI) was developed by the Federal Highway Administration (FHWA) to determine how traffic operations impact a bicyclist's decision to use a specific roadway, and was used to estimate existing and future BLOS for the alternative plan evaluation. The BCI methodology uses an equation that considers several variables with specific values that factor into the decision by a bicyclist whether to ride on a roadway. Some variables create a positive impact for the bicyclist, such as the presence of a bike lane (or wide shoulder), the width of the bike lane or shoulder, and whether the facility travels through a residential area. Other variables, such as traffic volumes and speeds, can have a negative impact. The BCI equation adds or subtracts to the BCI score based on these variables. The lower the BCI score, the better the BLOS grade and the more suitable the road is considered to be for bicycling.

  BLOS was estimated by applying the BCI equation to the Region's existing surface arterial street and highway network (excluding freeways) for the existing, Trend, Alternative I, and Alternative II networks. Data were collected for each of the variables in the BCI equation, with some variables modified from those recommended by the FHWA based on regional conditions and data availability. For all four networks, arterial links with a separate path within the roadway right-of-way (ROW) were given the lowest BCI score (BLOS A) to reflect that separate paths remove a bicyclist from the travel way and from the impacts of traffic volumes, speed, and parking lanes. For arterials with enhanced bicycle facilities (not reflected in FHWA's current BCI method) in Alternatives I and II, the constants in the BCI equation relating to traffic volumes and speed were reduced by half since these types of bicycle facilities increase the separation of a bicyclist from motorized vehicles, thereby decreasing the impact of higher traffic volumes and speeds. These arterials with enhanced bicycle facilities would typically have a BLOS grade of A or B.

  The BCI scores for each surface arterial street and highway link were then converted to letter grades, representing the relative BLOS for each road link, as follows:

  - A (<=1.50 Very High)
  - B (1.51 to 2.30 High)
  - C (2.31 to 3.40 Moderate)

- D (3.41 to 4.40 Low)
- E (4.41 to 5.30 Very Low)
- F (>5.30 Extremely Low)

BLOS by travel analysis zone (TAZ) for existing conditions, the Trend, Alternative I, and Alternative II was also calculated by aggregating the BCI scores for arterial links, separate paths, and off-street bicycle paths within each TAZ using a distance weighted average. The comfort levels associated with the BLOS grades by link and by TAZ range from Very High Comfort (BLOS A) to Extremely Low Comfort (BLOS F).

- **Evaluation Results:** Certain factors have the most significant impact on BLOS since their values can increase or decrease BLOS by one or two grades. Presence of a bike lane, paved shoulder, or an enhanced bicycle facility considerably improve the BLOS grade, while high traffic volume and speeds greatly reduce the BLOS grade.

  The evaluation results show considerable improvement in BLOS under all three alternatives compared to the existing network. BLOS in the Trend compared to the existing network is greatly improved due to the expectation that on-street bicycle accommodations would be added on all surface arterial streets and highways as they are resurfaced or reconstructed, where feasible. Although traffic volumes would increase on many arterials in the Region, the addition of on-street bicycle facilities would have a noticeable effect in minimizing the negative impacts of increased volumes and high speeds.

  The most significant improvement to BLOS occurs on arterials in Alternatives I and II where enhanced bicycle facilities would be implemented in regional corridors (note: for the purposes of this analysis, enhanced facilities were envisioned to be implemented on arterials, although the alternatives recognize that neighborhood greenways could be implemented on nearby parallel nonarterials as an alternative in each corridor). The increased separation from vehicles and other traffic conditions provided by enhanced bicycle facilities would greatly reduce the discomfort that bicyclists might experience when riding on arterials in proximity to high volumes and speeds.

  Table F.4 includes the miles of each BLOS grade within each county and for the Region, as well as the weighted average BLOS grade for each county and for the Region, under existing conditions, the Trend, and Alternatives I and II. Maps F.5 through F.8 illustrate BLOS by arterial link under existing conditions, the Trend, and Alternatives I and II. Alternatives I and II include 1,518 and 1,555 miles, respectively, of arterials with BLOS grades of A or B, while the Trend includes 1,360 miles with grades A or B. Maps F.9 through F.12 illustrate BLOS by TAZ for the four networks, which aggregates the BCI scores for arterial links, separate paths, and off-street paths within each TAZ using a distance weighted average.

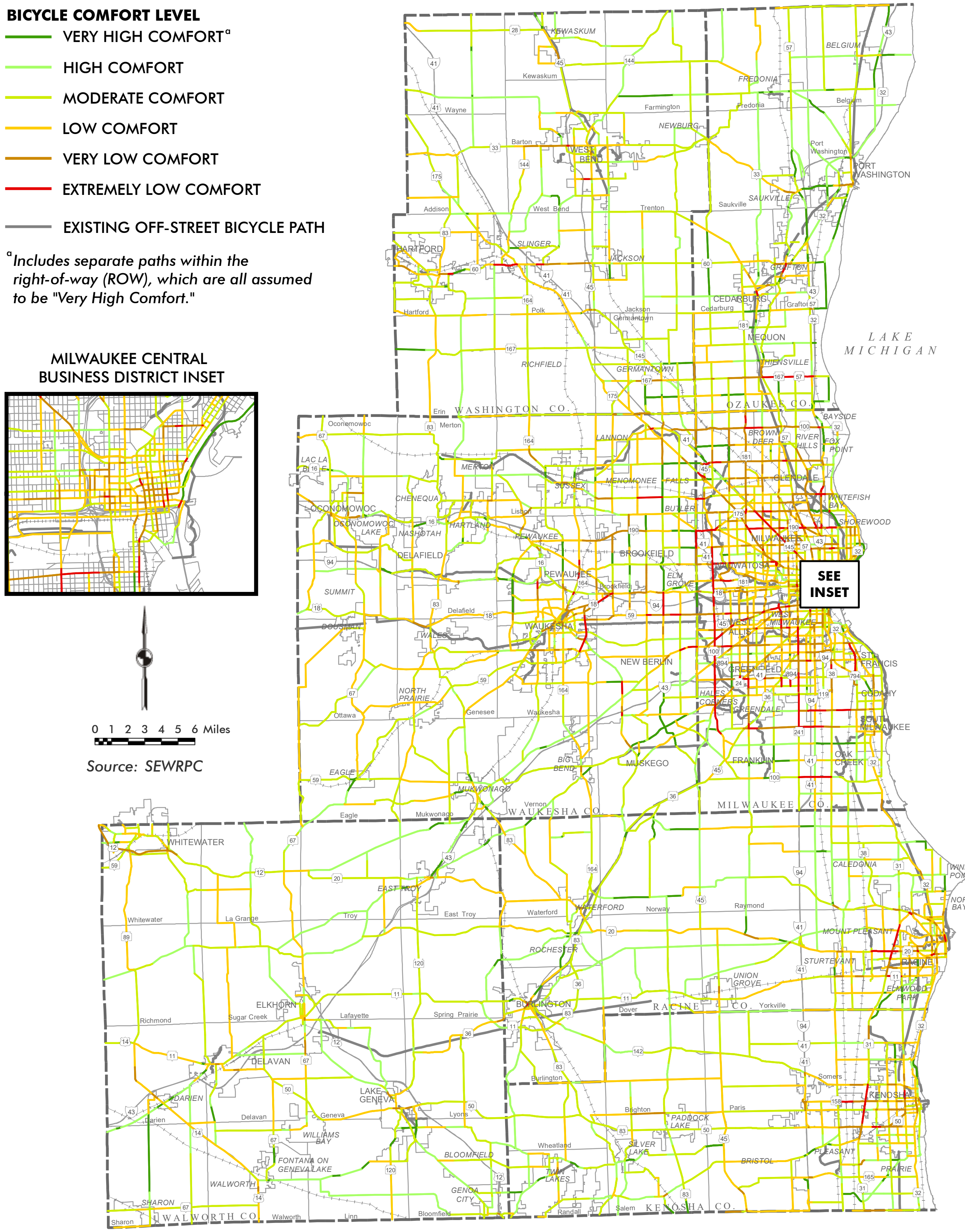
Table F.4
Bicycle Level of Service

		Miles of Arterials by Bicycle Level of Service Grade						
	County	Very High Comfort (BLOS A)	High Comfort (BLOS B)	Moderate Comfort (BLOS C)	Low Comfort (BLOS D)	Very Low Comfort (BLOS E)	Extremely Low Comfort (BLOS F)	**Average Comfort Level[a]**
Existing - 2015	Kenosha	14	68	145	100	18	4	C
	Milwaukee	28	63	217	238	140	47	D+
	Ozaukee	39	69	117	45	7	3	C+
	Racine	22	115	152	118	15	4	C
	Walworth	20	126	175	92	9	0	C
	Washington	17	91	198	85	10	2	C
	Waukesha	47	91	296	244	34	9	C
	Region	187	624	1,299	923	232	70	C
Trend - 2050	Kenosha	13	74	190	61	8	2	C+
	Milwaukee	88	235	302	102	13	1	C+
	Ozaukee	45	132	85	18	4	0	B-
	Racine	30	140	216	39	7	1	C+
	Walworth	32	163	205	26	1	0	B-
	Washington	27	139	216	31	4	0	C+
	Waukesha	50	191	339	113	26	4	C+
	Region	285	1,075	1,552	389	63	9	C+
Alt I - 2050	Kenosha	42	81	168	50	7	2	B-
	Milwaukee	219	199	248	67	7	1	B
	Ozaukee	55	135	72	19	1	0	B-
	Racine	59	143	193	37	2	0	B-
	Walworth	34	169	200	23	1	0	B-
	Washington	36	142	195	38	4	0	C+
	Waukesha	71	240	305	95	12	1	B-
	Region	516	1,108	1,381	329	34	4	B-
Alt II - 2050	Kenosha	48	81	166	50	4	1	B-
	Milwaukee	204	191	253	79	6	1	B
	Ozaukee	63	131	76	13	0	0	B
	Racine	68	142	190	28	2	0	B-
	Walworth	39	175	198	15	0	0	B-
	Washington	38	160	193	24	2	0	B-
	Waukesha	80	242	320	75	6	0	B-
	Region	540	1,122	1,398	283	21	2	B-

[a] *A distance weighted average was used to aggregate the BCI scores for arterial links, separate paths, and off-street paths within each travel analysis zone (TAZ). Comfort level by county was calculated by using a weighted average of TAZs within each county.*

Source: SEWRPC

Map F.5
Bicycle Comfort Level for On-Street Bicycle Accommodations in the Region: Existing



Source: SEWRPC

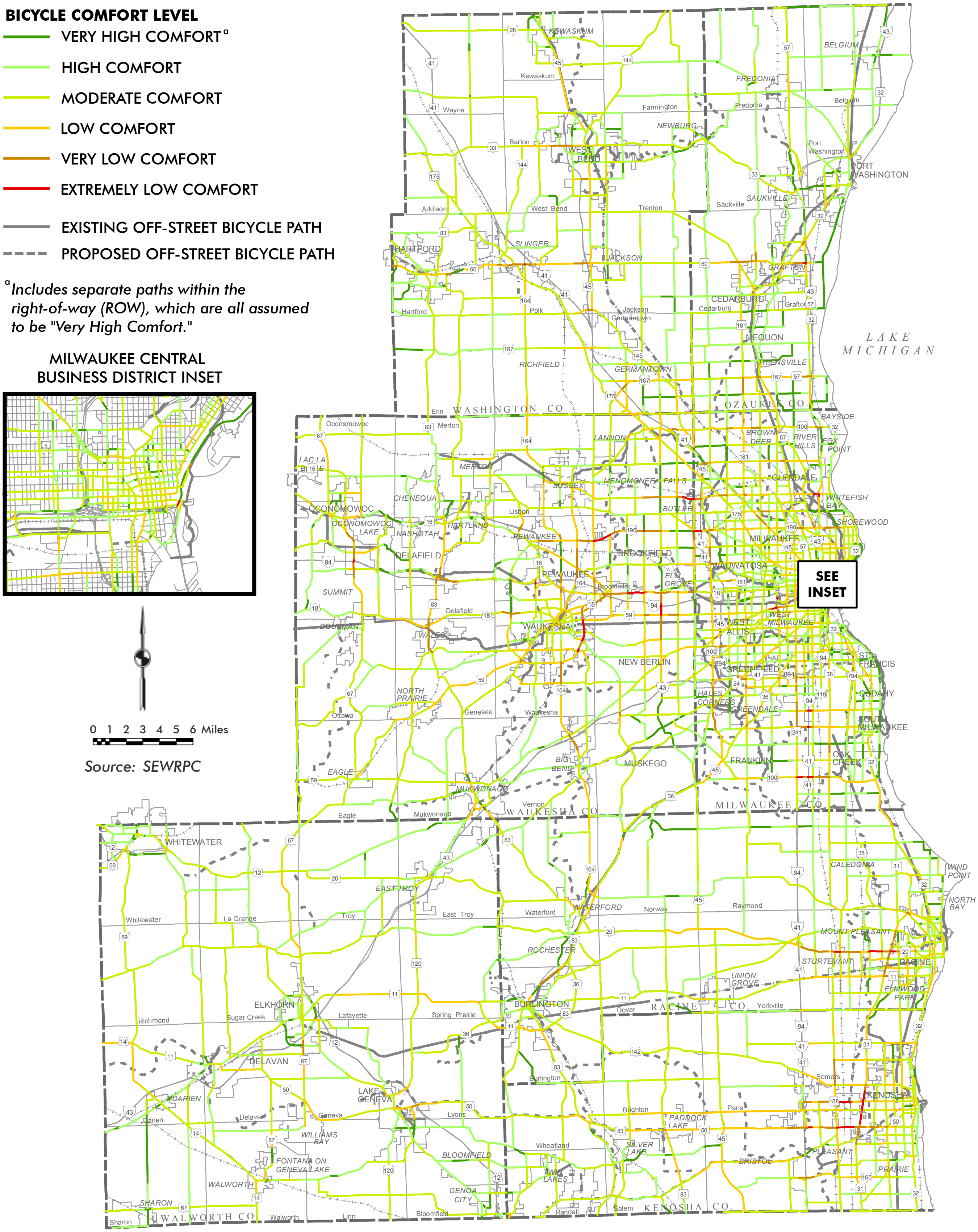
Map F.6
Bicycle Comfort Level for On-Street Bicycle Accommodations in the Region: Trend

BICYCLE COMFORT LEVEL

- VERY HIGH COMFORT[a]
- HIGH COMFORT
- MODERATE COMFORT
- LOW COMFORT
- VERY LOW COMFORT
- EXTREMELY LOW COMFORT
- EXISTING OFF-STREET BICYCLE PATH
- PROPOSED OFF-STREET BICYCLE PATH

[a] *Includes separate paths within the right-of-way (ROW), which are all assumed to be "Very High Comfort."*

MILWAUKEE CENTRAL BUSINESS DISTRICT INSET



0 1 2 3 4 5 6 Miles

Source: *SEWRPC*

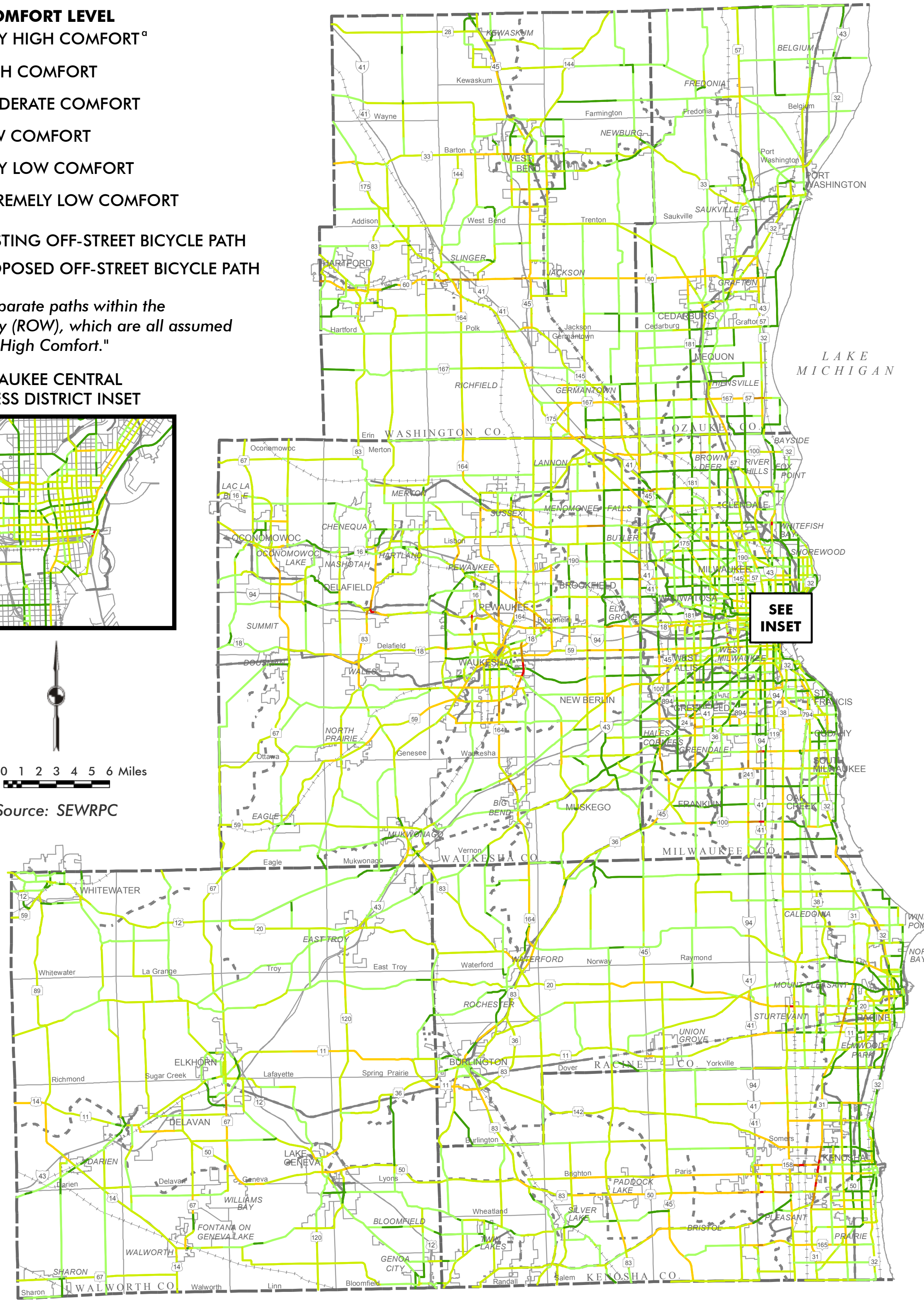
Map F.7
Bicycle Comfort Level for On-Street Bicycle Accommodations in the Region: Alternative I

BICYCLE COMFORT LEVEL

- VERY HIGH COMFORT[a]
- HIGH COMFORT
- MODERATE COMFORT
- LOW COMFORT
- VERY LOW COMFORT
- EXTREMELY LOW COMFORT
- EXISTING OFF-STREET BICYCLE PATH
- PROPOSED OFF-STREET BICYCLE PATH

[a] *Includes separate paths within the right-of-way (ROW), which are all assumed to be "Very High Comfort."*

MILWAUKEE CENTRAL BUSINESS DISTRICT INSET



0 1 2 3 4 5 6 Miles

Source: SEWRPC

Map F.8
Bicycle Comfort Level for On-Street Bicycle Accommodations in the Region: Alternative II

BICYCLE COMFORT LEVEL

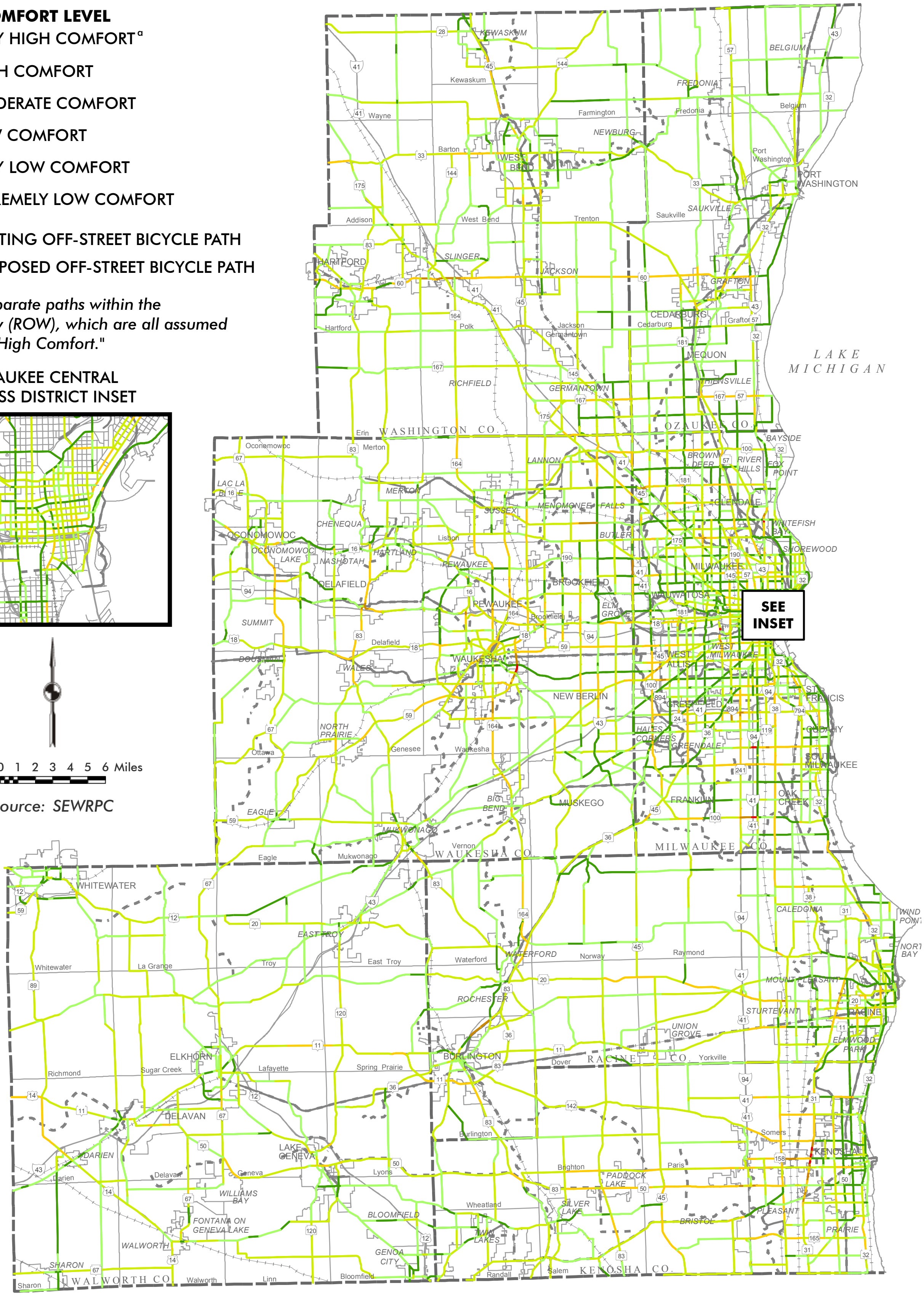
- VERY HIGH COMFORT[a]
- HIGH COMFORT
- MODERATE COMFORT
- LOW COMFORT
- VERY LOW COMFORT
- EXTREMELY LOW COMFORT
- EXISTING OFF-STREET BICYCLE PATH
- PROPOSED OFF-STREET BICYCLE PATH

[a] *Includes separate paths within the right-of-way (ROW), which are all assumed to be "Very High Comfort."*

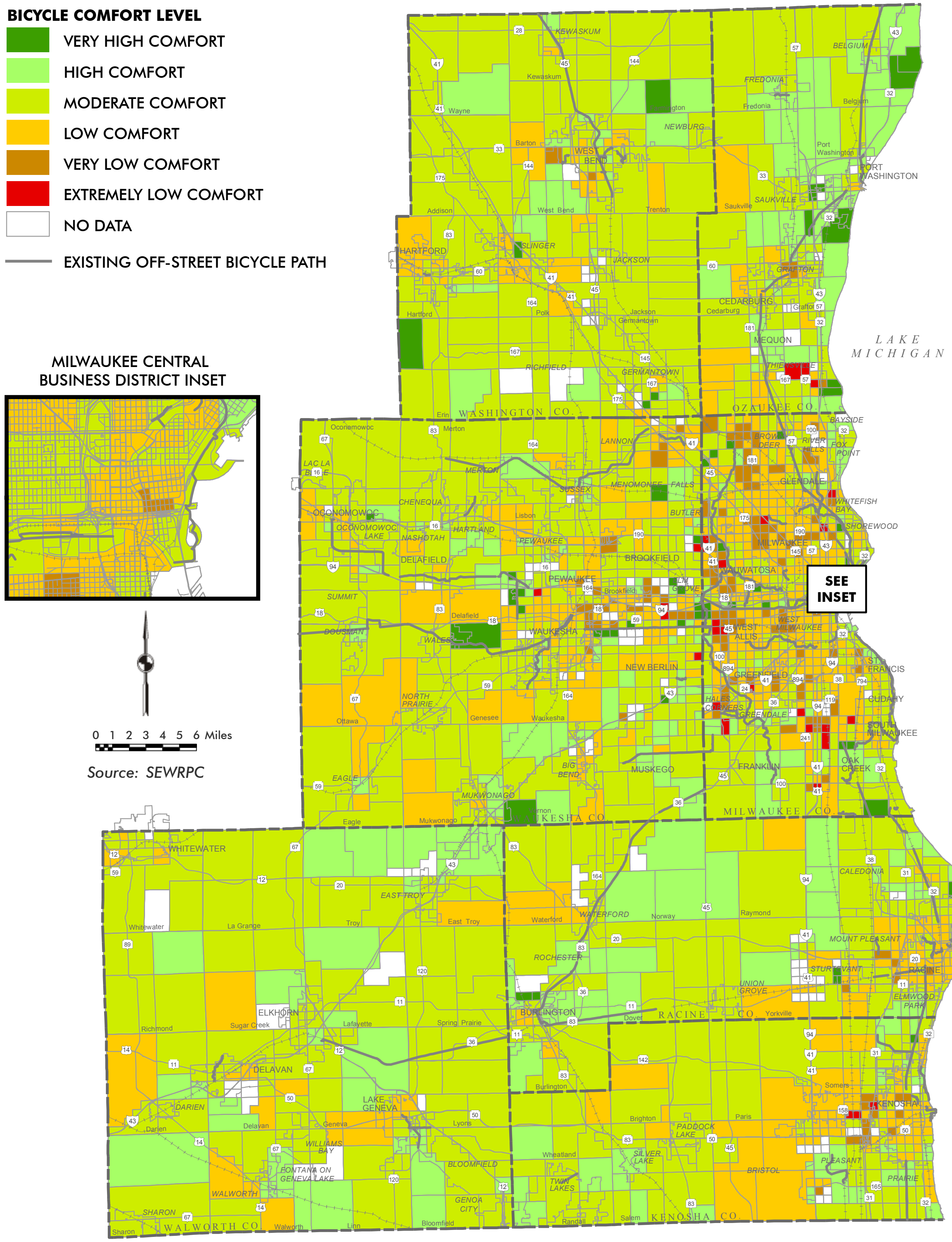
MILWAUKEE CENTRAL BUSINESS DISTRICT INSET

0 1 2 3 4 5 6 Miles

Source: SEWRPC

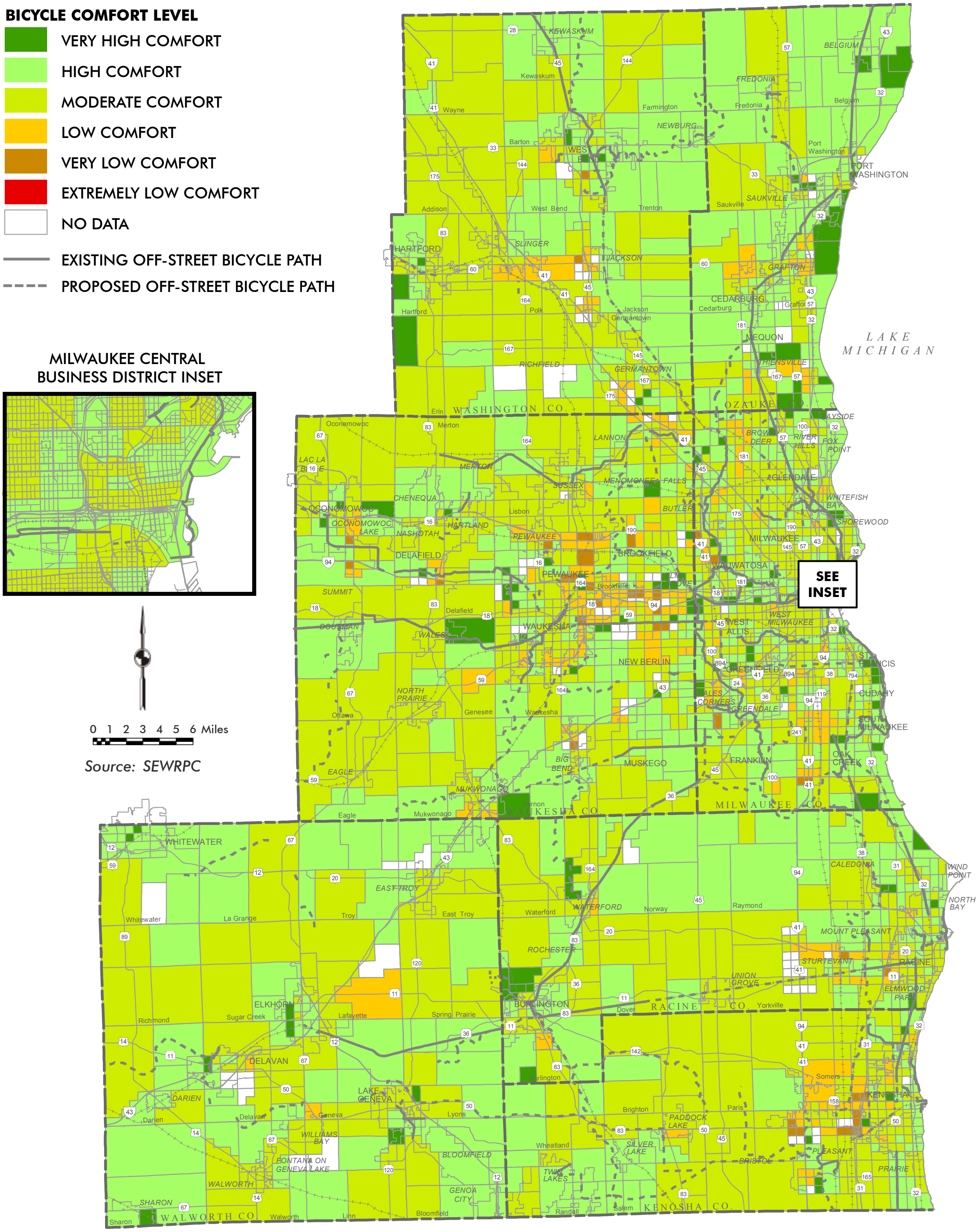


Map F.9
Bicycle Comfort Level by Travel Analysis Zone in the Region: Existing



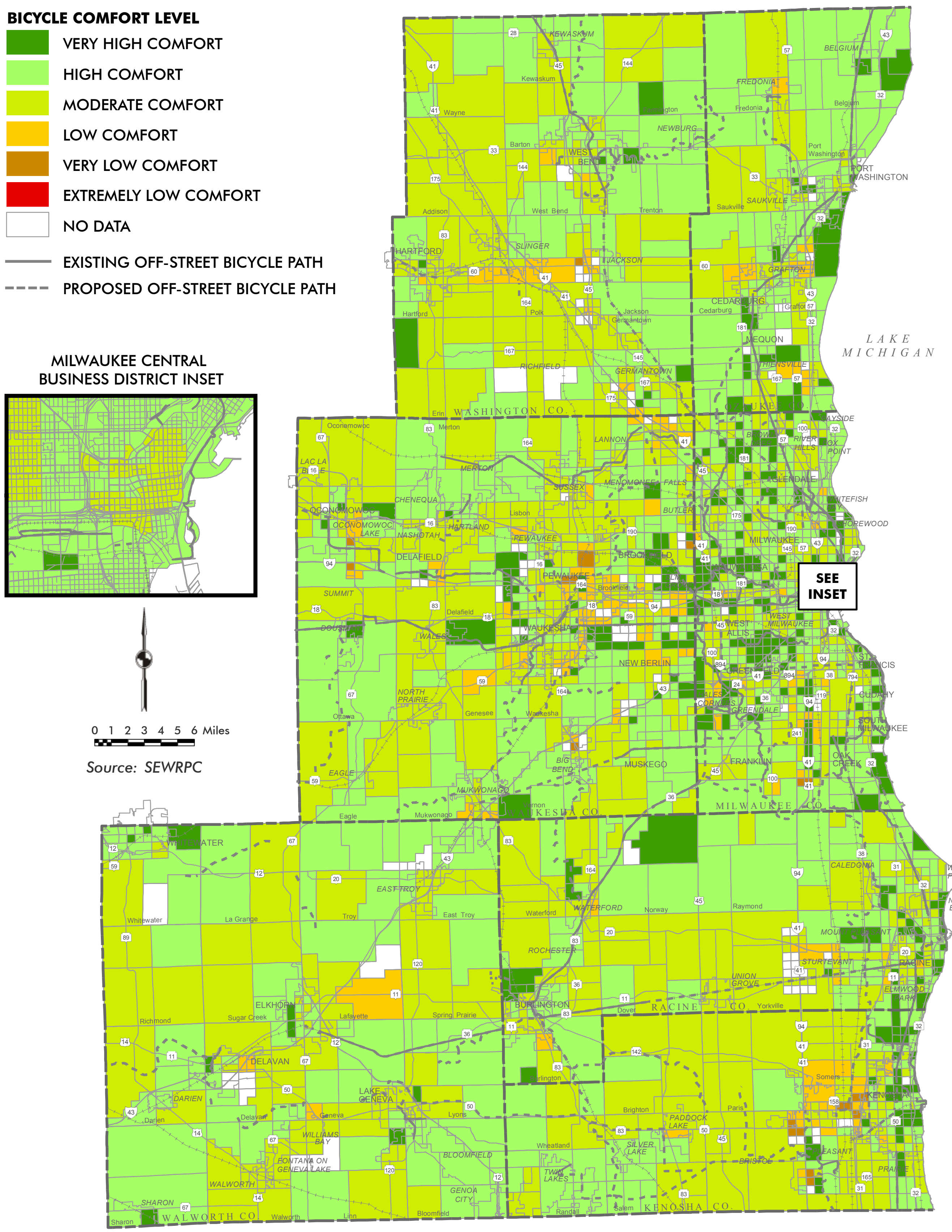
Source: SEWRPC

Map F.10
Bicycle Comfort Level by Travel Analysis Zone in the Region: Trend



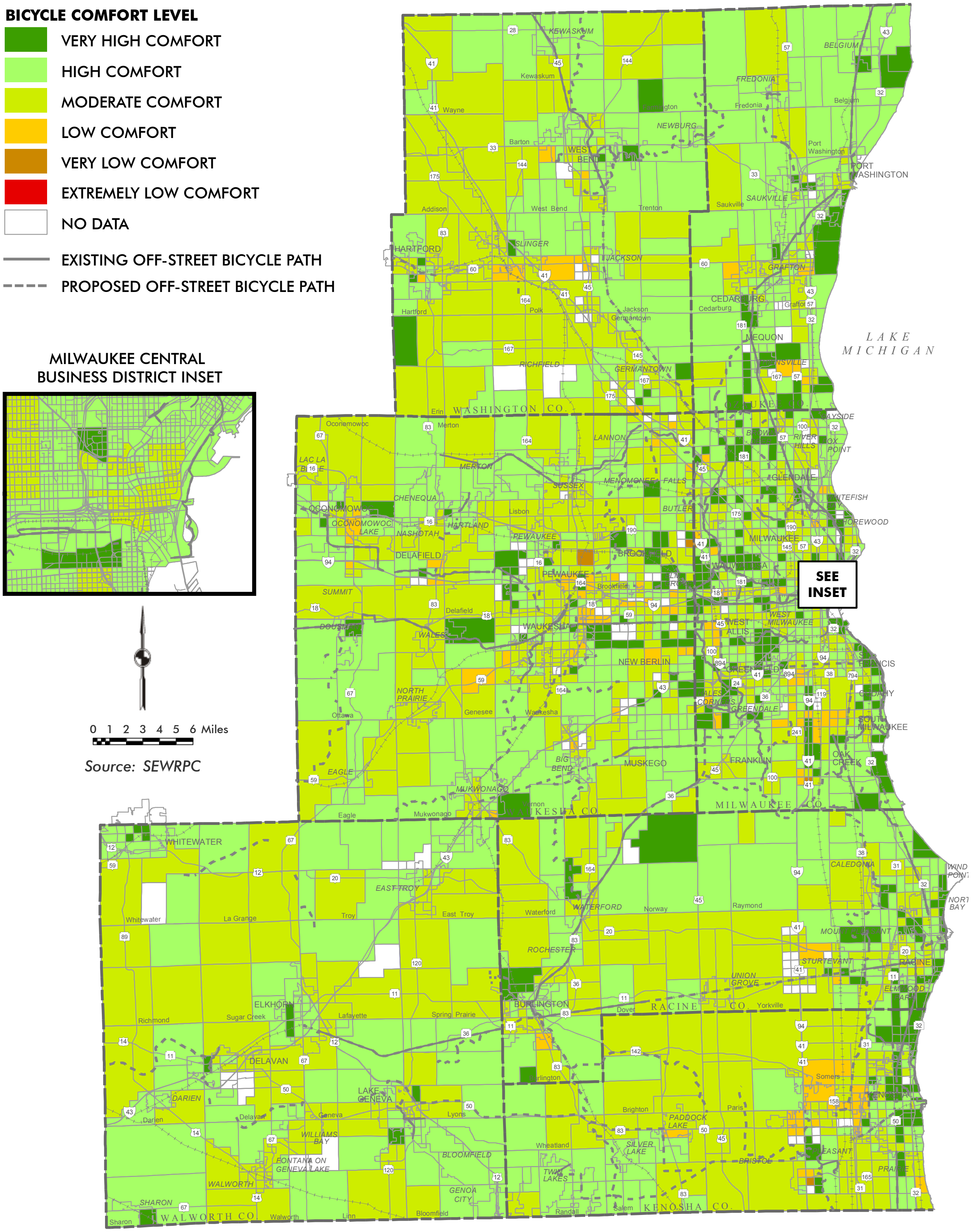
Source: SEWRPC

Map F.11
Bicycle Comfort Level by Travel Analysis Zone in the Region: Alternative I



Source: SEWRPC

Map F.12
Bicycle Comfort Level by Travel Analysis Zone in the Region: Alternative II



CRITERION 1.2.2: BICYCLE NETWORK CONNECTIVITY

KEY CONCLUSIONS

- **The Trend, Alternative I, and Alternative II would improve bicycle connectivity by addressing existing gaps between bicycle facilities through on- and off-street bicycle improvements.**
- **Alternatives I and II would result in additional on-street bicycle connectivity through the implementation of enhanced bicycle facilities in regional corridors.**

Bicycle connectivity provides bicyclists with direct routes to destinations, ensures continuous routes through the Region, and reduces out-of-direction travel. A comprehensive system of on- and off-street bicycle facilities can improve the safety of bicyclists and may encourage more bicyclists to use these facilities. A well-connected system is also a key factor to increasing non-recreational travel by bicycle, such as commutes to work or for school and shopping trips. As a result, improving bicycle connectivity can also have positive public health impacts. Bicycle connectivity throughout the Region would be improved by constructing on-street bicycle facilities when surface arterial streets and highways are resurfaced or reconstructed and through a system of off-street bicycle paths between the Kenosha, Milwaukee, and Racine urbanized areas, as well as between cities and villages with a population of 5,000 or more located outside the three urbanized areas. On-street and off-street bicycle improvements identified in locally adopted bicycle plans were considered and included in the alternatives as appropriate.

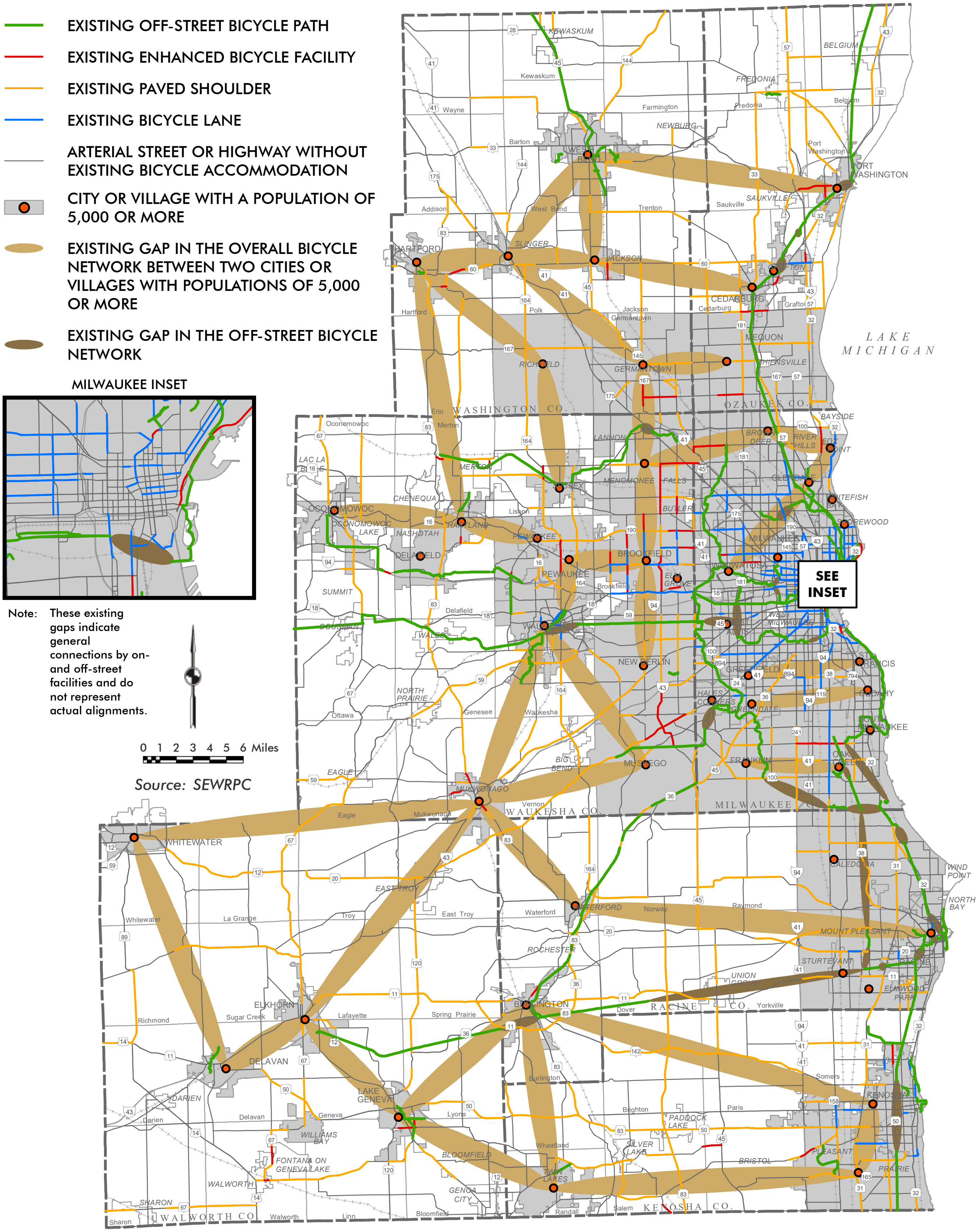
- **Bicycle Network Gaps:** In many areas of the Region, gaps exist where on-street facilities—such as bike lanes and paved shoulders—simply end with no viable connection or continuation to another facility. Small gaps exist within some off-street paths that require a bicyclist to ride on streets with no bicycle facilities in order to continue using the path. There are also gaps between off-street path segments in which an additional path segment or on-street facility is needed to make a connection between them.

  For the purpose of this analysis of bicycle network connectivity, a gap in the bicycle network was defined as:

  - Between cities and villages with a population of 5,000 or more where on- or off-street bicycle facilities do not exist or only exist in intermittent segments.
  - Between two off-street path segments where a viable connection could be made by constructing additional segments of off-street facilities or by providing on-street facilities between the off-street path segments.

  Map F.13 presents the existing bicycle network connectivity and identifies existing gaps in the bicycle network.

Map F.13
Existing Bicycle Network Connectivity



- **<u>Addressing On-street Connectivity:</u>** Each alternative envisions that bicycle facilities will be implemented, where feasible, when surface arterial streets and highways are resurfaced or reconstructed.[7] Integrating bicycle facilities into road construction projects can be an effective way to expand the bicycle network and improve connectivity between cities and villages.

  Implementing enhanced bicycle facilities in regional corridors that connect several communities can improve on-street connectivity at a higher level by going beyond a standard bicycle lane, paved shoulder, or widened outside travel lane. Enhanced bicycle facilities—such as a protected bike lane or a buffered bike lane—provide increased separation from vehicles for bicyclists by using parking lanes, striping, or raised medians as a buffer between the bike lane and the travel lane. The increased separation associated with enhanced bicycle facilities also provides the additional benefit of improving the safety of road segments that bicyclists want to use, but may not necessarily be using because of safety concerns. However, there are challenges relating to the implementation of some enhanced bicycle facilities, such as cost, right-of-way availability, and snow removal. Arterial corridors that extend through multiple communities, provide direct routes to important destinations, have available right-of-way, or have existing on-street bicycle facilities and parking lanes could provide opportunities for implementing enhanced bicycle facilities.

- **<u>Addressing Off-street Bicycle Path Connectivity:</u>** Under each alternative, expansion of the off-street bicycle path system would further improve the connectivity of communities within the Region. Expanding off-street routes would improve bicycle travel within and between counties in the Region. One example would be connecting the Racine-Sturtevant Bike Trail to the White River State Trail, which would create an off-street path through Racine County and into Walworth County, linking the City of Racine, the Village of Sturtevant, the Village of Union Grove, the City of Burlington, and the City of Elkhorn. Rail, river, and utility corridors often provide ideal locations for further connecting communities in the Region.

  Some existing off-street paths have small gaps that require bicyclists to use streets to reach the next segment of the off-street path. Although these streets make a connection, some streets may not be perceived as safe or comfortable for a bicyclist due to a lack of bicycle facilities, high vehicle volumes, and/or high vehicle speeds. These small gaps would be addressed in the alternatives either by constructing additional off-street path segments or by providing adequate on-street bicycle facilities for these connections.

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[7] There may be locations in urban environments where on-street bicycle accommodations may not be feasible. For example, where the right-of-way is restricted by two traffic lanes and two parking lanes, such as on Brady Street in the City of Milwaukee.

CRITERION 1.2.3: BENEFITS AND IMPACTS TO PUBLIC HEALTH

KEY CONCLUSIONS

- **The critical components of the alternatives that impact public health by encouraging active transportation are improved connections via bike lanes, off-street paths, and sidewalks and access to various destinations and amenities. Alternatives I and II provide more active transportation options and have development patterns that improve walking access to various amenities.**
- **Alternative Plans I and II would improve public health by making active transportation easier, which encourages healthy lifestyles and reduces healthcare costs.**
- **Air pollution from transportation sources is being curbed through Federal standards on fuel and vehicle fuel economy, but would also be reduced by the compact development and alternative transportation options envisioned under Alternative Plans I and II.**

Public health, according to the World Health Organization, is about "providing conditions in which people can be healthy." Everything that can be done to improve these conditions should be pursued. In this regard, the way in which the Region's communities develop and the transportation options that are available to people in these communities can significantly impact public health.

- **Connections and Access:** There are two critical components to the VISION 2050 alternatives that impact public health. The first is *connectivity*. To encourage active transportation, communities need to provide well-connected infrastructure—bike lanes, off-street paths, and sidewalks—that makes it easier to bike and walk. While the Trend assumes a well-connected network of bike lanes and off-street paths, Alternative Plans I and II go beyond what is envisioned under the Trend and envision more enhanced on-street bicycle facilities, such as protected bike lanes. They also include more compact development, to varying degrees, and envision more sidewalks. This leads into the second critical component: *access*. More compact development, focused on providing a mix of uses within short distances, translates into better biking and walking access. Access in this instance refers to the ability to reach various destinations and amenities such as schools, parks, retail services, and employment. Increasing the number of destinations one can access by a short walk, bike ride, or transit trip, increases the likelihood that people will incorporate active travel modes into their daily routine, thereby increasing their physical activity. The additional walkable areas and improved mix of land uses envisioned under Alternatives I and II make these two alternatives far superior to the Trend in this regard.

- **Healthy Lifestyles:** Study after study has shown that a sedentary lifestyle can have detrimental effects on one's health, with excess weight and obesity linked to increased risks of heart disease, diabetes, cancer, breathing problems, and other health issues. Walking and biking on a regular basis can curb these health issues. Both Alternative Plans I and II make it easier for people to bike and walk to their various destinations—instead of having to drive their cars—helping people to incorporate regular exercise into their daily commutes, shopping trips, and recreation. Encouraging public transit use can also help, as public transit trips often begin and end by either walking or biking. Alternative Plans I and II envision significant transit improvements, with Alternative Plan II involving the most ambitious transit expansion.

- **Healthcare Costs:** There is also a cost to inactivity. In addition to the physical fitness benefits from more active transportation, it can actually save people money. As active transportation increases, public health tends to improve and obesity-linked conditions tend to decline. As a result, the costly expenditures related to caring for these conditions may be avoided, which would reduce the healthcare costs to individuals and society as a whole. Following this logic, Alternative Plans I and II would have a greater potential to reduce healthcare costs than the Trend.

- **Air Pollution:** From a transportation perspective, Federal standards on fuel and vehicle fuel economy have been the primary drivers in the reduction of vehicle-related air pollution. Based on current Federal standards, transportation-related emissions are expected to continue to significantly decline into the future. The same standards are assumed under the Trend and both alternative plans, which is why the difference in emissions between alternatives is small. However, the differences in the development pattern and transportation system still have an impact. More driving, particularly on congested roads, produces more emissions. So Alternative Plans I and II would modestly improve emissions by providing more alternative transportation options that, in addition to more compact development patterns, would limit the need to drive and allow for more green space that can absorb some pollution.

CRITERION 1.3.1: REMAINING FARMLAND AND UNDEVELOPED LAND

KEY CONCLUSIONS

- **About 77 square miles of agricultural land would be converted to urban uses under the Trend, compared to about 32 square miles under Alternative Plan I and 26 square miles under Alternative Plan II.**
- **Class I and II soils are considered "National Prime Farmlands." About 59 square miles of Class I and II soils would be converted to urban uses under the Trend, compared to about 26 square miles under Alternative I and 21 square miles under Alternative II.**

Agricultural land use in the Region has decreased by 482 square miles since 1963. Despite this decrease, a large portion of the Region remains in agricultural use (about 1,156 square miles), and agriculture remains an important part of the regional economy. Table F.5 shows that some agricultural land would be expected to be converted to urban uses to accommodate projected regional growth under each of the alternatives. Much less agricultural land would be converted under Alternatives I and II than the Trend because of their compact development patterns.

- **Class I and II Soils:** The U.S. Natural Resources Conservation Service (NRCS) has classified soils into capability groupings that indicate their general suitability for most kinds of farming. The groupings are based on the composition of the soils, the risk of damage when they are used, and how they respond to treatment. There are eight capability classes ranging from Class I, the soils that have few limitations, to Class VIII, the soils that have severe limitations and cannot produce economically worthwhile yields of crops, forage, or wood products. Generally, lands with Class I and II soils are considered "National Prime Farmlands." About 887 square miles, or 77 percent, of the lands in agricultural use in the Region are covered by Class I and II soils. Table F.5 shows that significantly less agricultural land covered by Class I and II soils would be converted to urban uses under Alternatives I and II than the Trend.

- **County Farmland Preservation Plans:** The Wisconsin Farmland Preservation Law requires counties to prepare a farmland preservation plan as one of the conditions for continued landowner participation in the Farmland Preservation tax credit program. The six counties in the Region with significant amounts of farmland have all prepared and adopted farmland preservation plans. While large blocks of Class I and II soils have been included in farmland preservation areas identified in the county plans, many farming areas with concentrations of Class I and II soils were excluded. Some Class I and II areas were excluded for non-soil factors, such as minimum farm block size; however, many of the exclusions were because of local government reluctance to specifically identify exclusive-use farming areas. In general, the county farmland preservation plans only identify farmland preservation areas with local government support. Incremental households and jobs were not allocated to farmland preservation areas under any of the alternatives.

Table F.5
Remaining Farmland and Undeveloped Land

Alternative	Agricultural Land (square miles)	Percent Change	Unused and Other Open Land (square miles)	Percent Change	Agricultural Land and Other Unused and Open Land Covered by Class I and II Soils (square miles)	Percent Change
Existing	1,156	--	671	--	887	--
Trend	1,078	-6.7	592	-11.7	828	-6.7
Alt I	1,124	-2.8	607	-9.6	861	-2.9
Alt II	1,130	-2.2	611	-9.0	866	-2.4

Source: SEWRPC

CRITERION 1.3.2: IMPACTS TO NATURAL RESOURCE AREAS

KEY CONCLUSIONS

- **The public transit system under each of the alternatives would not be expected to impact any of the Region's natural resource areas.**
- **The arterial street and highway system under each of the alternatives would modestly affect the Region's natural resource areas, impacting 0.1 percent or less of the total area of each type of natural resource area.**
- **The Trend would be expected to have the greatest impacts to natural resource areas, followed by Alternative I (generally 3 to 7 percent less impact than the Trend) and then Alternative II (generally 9 to 14 percent less impact than the Trend).**

Transportation system improvement impacts to natural resource areas in the Region were estimated for each of the alternatives, as shown in Table F.6. Specifically, impacts were estimated for primary and secondary environmental corridors, isolated natural resource areas, wetlands, natural areas, critical species habitat areas, Wisconsin Department of Natural Resources (DNR) managed lands[8] and Legacy Places,[9] lands protected by land trusts or other conservation lands, and prime agricultural areas (farmland with Class I or Class II soils).

- **Public Transit:** Public transit would not be expected to require the expansion of arterial street and highway or railroad right-of-ways, even under Alternatives I and II, which assume significant increases in public transit service. As a result, public transit under each of the alternatives would not be expected to impact any of the Region's natural resource areas.

- **Arterial Streets and Highways:** While each of the alternatives would be expected to have impacts to the Region's natural resource areas, the impacts are expected to be modest—typically representing less than 0.1 percent of the total area of natural resource areas. The Trend would be expected to have the greatest impact on natural resource areas in the Region, compared to Alternative Plans I and II. The Trend would have the most capacity expansion of all of the alternatives due to the need to address the increased traffic resulting from less compact development and a decline in transit under the Trend. There would be a modest decrease in impacts to natural resource areas under Alternative I—generally 3 to 7 percent less than the Trend, depending on the type of natural resource area—due to the greater emphasis on infill development and redevelopment and improvement and expansion of transit service under this alternative. Alternative II would have the least impacts to natural resource areas—generally 9 to 14 percent less than the Trend—resulting from this alternative proposing the most compact land use development, including the most TOD, and the most extensive transit service—including

[8] *The DNR has acquired large areas of park and open space lands in the Region and manages those lands for a variety of resource protection and recreational purposes.*

[9] *The DNR has identified Legacy Places that are critical for meeting Wisconsin's conservation and outdoor recreation needs through the year 2050. Source: Wisconsin Department of Natural Resources,* Wisconsin Land Legacy Report: An inventory of places to meet Wisconsin's future conservation and recreation needs*, 2006.*

Table F.6
Transportation System Impacts to Natural Resource Areas

Category	Trend (2050)	Alternative I (2050) With Highway Improvements	Alternative I (2050) Without Highway Improvements[a]	Alternative II (2050) With Highway Improvements	Alternative II (2050) Without Highway Improvements[a]
Environmental Corridors (Acres)[b]					
Primary	224.9	215.2	39.8	199.0	39.8
Secondary	57.3	54.5	6.4	44.0	6.4
Isolated Natural Resource Areas	41.6	38.6	2.7	35.7	2.7
Other Natural Resource Areas (Acres)[c]					
Wetlands	161.9	156.4	44.5	140.7	44.5
Natural Areas	18.3	18.3	4.5	16.4	4.5
Critical Species Habitat Areas	2.0	2.0	0.0	0.3	0.0
DNR Managed Lands	39.8	39.4	0.4	39.4	0.4
DNR Legacy Places	124.9	124.6	8.8	90.1	8.8
Land Trust or Other Conservation Organization Lands	2.1	2.1	0.0	2.1	0.0
Prime Agricultural Lands (Class I or Class II)	621.5	601.6	25.9	564.8	25.9

[a] *The impacts of committed highway improvements are included under these alternatives.*

[b] *Existing primary environmental corridors in the Region total about 311,900 acres, existing secondary environmental corridors total about 51,600 acres, and existing isolated natural resource areas total about 45,800 acres.*

[c] *Existing wetlands in the Region total about 201,700 acres, natural areas total about 64,600 acres, critical species habitat areas total about 19,800 acres, DNR managed lands total about 64,900 acres, DNR Legacy Places total about 137,800 acres, and land trust or conservation organization lands total about 12,700 acres. Existing prime agricultural lands in the Region total about 567,900 acres.*

Source: SEWRPC

significant investment in fixed-guideway transit. Also included in Table F.6 are the potential impacts if the highway improvements under Alternatives I and II are not implemented, except for committed highway improvements and freeway modernization. As expected, not including the highway improvements under Alternatives I and II would greatly reduce the potential impacts to natural resource areas.

CRITERION 1.4.1: PRESERVATION OF AREAS WITH HIGH GROUNDWATER RECHARGE POTENTIAL

KEY CONCLUSION

- **It is estimated that approximately 51 square miles of areas with high and very high groundwater recharge potential would be converted to urban uses under the Trend, compared to 32 square miles under Alternative Plan I and 28 square miles under Alternative Plan II.**

Groundwater is a key element of the Region's natural resource base. Groundwater sustains lake levels and wetlands; provides the base flows of streams; and comprises a major source of water supply for domestic, municipal, industrial, and agricultural water users. About 40 percent of the Region's residents are dependent upon groundwater for their water supply. Recharge represents the means by which water enters the groundwater system. Some areas of the Region exhibit higher rates and volumes of recharge than others, and the land use development pattern can affect the amount of recharge entering the groundwater system.

- **Areas with High Groundwater Recharge Potential:** Groundwater recharge areas are those areas where surface water moves downward through the soil column to the groundwater aquifer. The recharge potential of an area is dependent on surface soil permeability, slope, land use, and the permeability of subsurface materials above the water table. Many of the Region's areas with high and very high recharge potential are located in environmental corridors, isolated natural resource areas, and agricultural and unused land.

- **Development Impacts on Groundwater Recharge:** Preserving environmental corridors, isolated natural resource areas, and agricultural land facilitates preserving areas with high and very high groundwater recharge potential. Incremental households and employment were not allocated to areas with significant natural resource features, such as environmental corridors, natural areas, critical species habitat, and parkland, under any of the alternatives. However, there would be more agricultural and other unused land converted to urban uses under the Trend than under Alternative I or Alternative II.

  It is estimated that approximately 51 square miles of areas with high and very high groundwater recharge potential would be converted to urban uses under the Trend, compared to 32 square miles under Alternative I and 28 square miles under Alternative II. There are currently about 794 square miles of areas with high and very high recharge potential in the Region. Thus, about 94 percent of the areas in the Region with high and very high recharge potential would be preserved under the Trend, compared to about 96 percent under Alternatives I and II.

CRITERION 1.4.2: IMPERVIOUS SURFACE

KEY CONCLUSIONS

- **Alternative Plan II, with the most compact development pattern, would have the least amount of impervious surface, at 10.9 percent of the Region's total land area.**
- **Alternative Plan I (11.0 percent) would also perform better than the Trend (11.4 percent).**
- **All watersheds perform best under Alternative II except the Oak Creek watershed (which performs best under Alternative Plan I) and the Sheboygan River and Kinnickinnic River watersheds (which perform best under the Trend).**

Impervious surfaces are materials that water cannot easily travel through, such as the concrete or asphalt that makes up many of our roads and parking lots, and the roofing material covering our buildings. These surfaces prevent stormwater from being absorbed into the ground where it falls, and also result in changes in the timing of stormwater reaching streams, rivers, and lakes due to the speed with which water flows over an impervious surface as opposed to a permeable surface. Impervious surfaces can also result in reductions in water quality due to the accumulation of salt, oils, and debris from rooftops, roadways, and parking lots that is transported into streams, rivers, and lakes during rainfall and snowmelt events.

- **<u>Effects of Impervious Surfaces:</u>** Research has shown that as impervious surfaces grow as a percentage of the overall land area within the watersheds of streams, rivers, and lakes, significant declines in water quality can result. When the connected impervious area[10] approaches 10 percent of the area of a watershed, subtle changes in physical (increased temperature and turbidity) and chemical (reduced dissolved oxygen and increased pollution levels) properties of a stream may occur, leading to a decline in the biological integrity of the stream. When 25 percent or more of a watershed is covered by impervious surfaces, many more types of aquatic life can no longer be supported, and aquatic resources may be significantly degraded. In Table F.7, watersheds with more than 25 percent of their area covered by impervious surfaces are highlighted in orange, and watersheds with 10 to 25 percent of their area covered by impervious surfaces are highlighted in yellow.

  Impervious surfaces also reflect and absorb the sun in different ways than permeable surfaces, increasing local air temperatures in areas with high amounts of impervious surfaces relative to nearby areas with more permeable surfaces, and increasing the temperature of runoff to streams, rivers, and lakes. The increase in local air temperatures is known as the urban heat island effect, and it can result in increased energy consumption by air conditioning units and therefore greater emissions of air pollutants and greenhouse gas emissions. However, due to the climate of Southeastern Wisconsin, it could be argued that the urban heat island effect may reduce the amount of heating needed in the winter months, and therefore the overall impact of the urban heat island effect on energy use and emissions in our Region is unclear.

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[10] Connected impervious area has a direct hydraulic connection to a stormwater drainage system, and ultimately, to a stream, river, or lake.

As shown in Table F.7, the percent of the Region's total land area covered by impervious surfaces would increase by the year 2050 when compared to existing conditions, but Alternative Plan II, with the most compact development pattern, would have the least amount of impervious surface, at 10.9 percent of the Region. Alternative Plan I would also perform better than the Trend, with 11.0 percent of the Region covered by impervious surfaces. In most cases, individual watersheds also perform best under Alternative Plan II, with only the Oak Creek watershed performing better under Alternative Plan I, and only the Kinnickinnic River and Sheboygan River watersheds having the least amount of impervious surface under the Trend. Alternatives I and II would have slightly less impervious surface if they were implemented without highway improvements. It should be noted that this analysis does not include any assumptions regarding an increase in green infrastructure for managing stormwater through infiltration (e.g., green roofs, porous pavements, rain gardens, and biofiltration and infiltration facilities), which—if implemented on a larger scale in the future—would reduce the amount of impervious surface or mitigate some of the impacts of impervious surfaces.

Table F.7
Impervious Surface

Watershed	Total Acres	Existing (2010)		Trend (2050)		Alt I with Highway Improvements (2050)		Alt I Without Highway Improvements (2050)		Alt II with Highway Improvements (2050)		Alt II Without Highway Improvements (2050)	
		Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent
Des Plaines River[a]	85,989	5,676	6.6	7,712	9.0	7,335	8.5	7,321	8.5	7,276	8.5	7,262	8.4
Fox River[a]	598,280	46,192	7.7	54,459	9.1	52,153	8.7	51,963	8.7	51,588	8.6	51,420	8.6
Kinnickinnic River	16,239	5,895	36.3	6,032	37.1	6,042	37.2	6,031	37.1	6,053	37.3	6,053	37.3
Menomonee River	86,891	20,693	23.8	22,051	25.4	21,937	25.2	21,868	25.2	21,858	25.2	21,805	25.1
Milwaukee River[a]	277,550	30,797	11.1	35,208	12.7	33,841	12.2	33,754	12.2	33,368	12.0	33,281	12.0
Oak Creek	17,752	4,181	23.6	4,657	26.2	4,538	25.6	4,511	25.4	4,564	25.7	4,563	25.7
Pike River	32,913	4,665	14.2	6,050	18.4	5,960	18.1	5,912	18.0	5,940	18.0	5,894	17.9
Rock River[a]	390,889	23,766	6.1	28,229	7.2	26,690	6.8	26,585	6.8	26,327	6.7	26,226	6.7
Root River	126,082	14,560	11.5	16,624	13.2	16,159	12.8	16,120	12.8	16,140	12.8	16,116	12.8
Sheboygan River[a]	6,944	285	4.1	316	4.5	333	4.8	333	4.8	326	4.7	326	4.7
Sauk Creek[a]	22,161	1,378	6.2	1,681	7.6	1,573	7.1	1,570	7.1	1,534	6.9	1,531	6.9
Lake Michigan Direct[a]	59,738	11,575	19.4	12,823	21.5	12,700	21.3	12,669	21.2	12,647	21.2	12,631	21.1
Region	1,721,428	169,663	9.9	195,842	11.4	189,262	11.0	188,639	11.0	187,622	10.9	187,108	10.9

[a] *These watersheds extend beyond the borders of the Region. Only the portion of the watershed contained within the Region is included here.*

Source: SEWRPC

CRITERION 1.4.3: ENERGY USE

KEY CONCLUSIONS

- **Alternative Plans I and II have the lowest home and transportation energy use of the three alternatives.**
- **Based on building type and development pattern, the Trend would have the highest average energy use for households added by 2050 (111.8 million BTU per household per year)—7 percent more than Alternative I (104.1 million BTU) and 12 percent more than Alternative II (100.1 million BTU).**
- **Transportation-related energy use would be more under the Trend (87 million BTUs), but only slightly more than Alternative I (86 million BTUs) and Alternative II (85 million BTUs).**

Energy is used in peoples' daily lives for lighting, cooking, heating and cooling rooms, entertainment, transportation, and many other uses. The amount of energy used in these activities impacts the environment and cost of living. New technologies that make homes and transportation more energy efficient and individual actions to conserve energy have a significant impact on energy use. The development pattern of the Region also has an impact on energy use through building types and the distance people travel from their homes to important destinations such as work, school, and services. The mode and technology used for transportation are also factors in energy use.

- **Building Type and Development Pattern:** End use refers to the energy content of electricity and other fuels at the point of use by customers, such as households. The amount of energy used by a household varies due to a number of factors, including building type; development pattern; age of the building; building materials; and the energy efficiency of lighting, appliances, and heating and cooling. Two of these factors, building type and development pattern, are directly affected by the VISION 2050 alternatives.

  Multifamily housing tends to be more energy efficient than single-family housing because multifamily housing units typically have shared ceilings/floors and walls. This results in greater efficiencies in heating, which accounts for a significant portion of the energy used in a home according to the U.S. Energy Information Administration (EIA). EIA figures from the last Residential Energy Consumption Survey (conducted in 2009) show that Midwest Region households living in single-family homes consume on average about 126.1 million BTU per household per year. Households living in multifamily housing units consume about 69.4 million BTU per household per year.

  More compact development patterns that support a greater number of multifamily housing units would consume less energy based on the EIA data. The Trend would add the least multifamily housing units (25 percent of the new housing units) among the alternatives. Alternative I envisions a more compact development pattern with some mixed-use, high-density TOD. About 39 percent of new housing units would be multifamily under Alternative I. Alternative II has a development pattern similar to Alternative I; however, the fixed-guideway transit system is more extensive and could support more than twice as much TOD. About 46 percent of the new housing units would be multifamily under Alternative II. Using these figures and the EIA data, the average energy use per household added under the Trend would be 111.8 million BTU per year, which is 7 percent more than under Alternative I (104.1 million BTU per year), and 11 percent more than under Alternative II (100.1 million BTU per year).[11]

- **Transportation:** The vast majority of energy used by the transportation sector comes from petroleum fuels, including gasoline and diesel. In 2014, petroleum fuels accounted for 92 percent of the total energy used by the transportation sector in the United States, according to the EIA. Total petroleum fuel usage in the transportation sector is directly affected by vehicle fuel economy and VMT. Based on current Federal standards on vehicle fuel economy, vehicles are expected to become significantly more fuel efficient. Figure F.1 illustrates the expected fuel efficiency through the year 2050 based on the current Federal standards, which are assumed to be the same under all three alternatives. Projected fuel efficiency is estimated using MOVES2014, the U.S. Environmental Protection Agency (EPA) most recent emission modeling system for transportation sources. The average fuel economy of the Region's personal use vehicle fleet is anticipated to increase from an average of 23.4 mpg in 2015 to 43.5 mpg by 2050, which will significantly reduce transportation-related energy use.

  Given the expected downward trend in transportation-related energy use, there is a relatively large difference between existing and future levels of energy use, regardless of the alternative. Existing transportation-related energy use is estimated to be about 124 million BTUs per household per year, which is significantly higher than the Trend (87 million BTUs in the year 2050), Alternative I (86 million BTUs in the year 2050), and Alternative II (85 million BTUs in the year 2050). Between alternatives, the differences are comparatively small, but the variations in the development pattern and transportation system still have an impact. In addition to supporting more multifamily housing, which tends to be more energy efficient, more compact development patterns also tend to have destinations closer to residents. This results in shorter auto trips, makes public transit a more viable alternative to driving, and also encourages biking and walking trips, all of which can reduce transportation-related energy use. The significant improvements to public transit in Alternatives I and II also result in more transit ridership and lower VMT.

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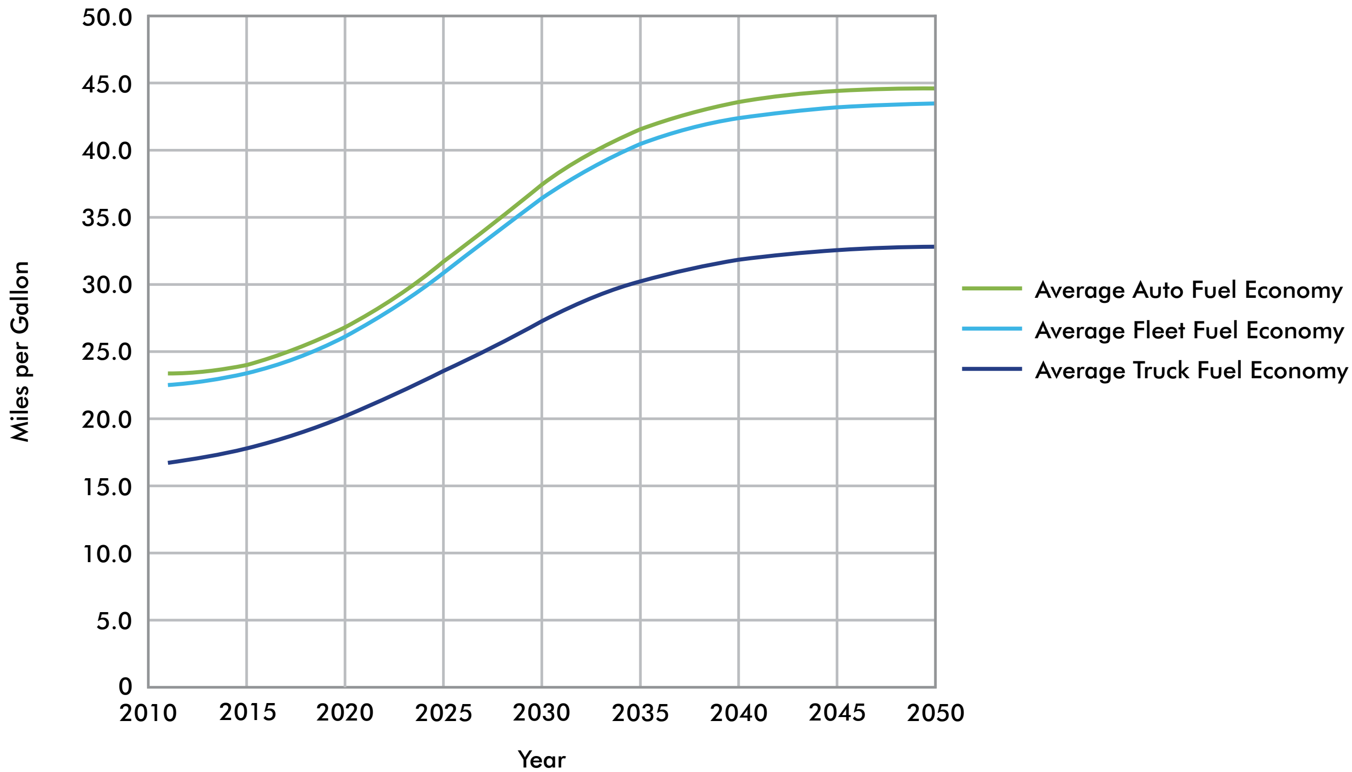
[11] It should be noted that home energy use under all three alternatives could be less than estimated given that new homes tend to be more energy efficient than older homes.

Figure F.1
Fuel Efficiency of Personal Use Vehicles Estimated by MOVES2014



Note: Average fleet fuel economy assumes light duty trucks make up approximately 8 percent of the personal use vehicles.

Source: U.S. Environmental Protection Agency and SEWRPC

CRITERION 1.4.4: GREENHOUSE GAS EMISSIONS AND OTHER AIR POLLUTANTS

KEY CONCLUSIONS

- **Transportation air pollutant emissions are projected to significantly decline from current levels due to Federal fuel and vehicle fuel economy standards and improved vehicle emissions controls, even with forecast increases in regional travel and traffic.**
- **Transportation air pollutant emissions are lowest under Alternative II, generally about 2 to 3 percent lower than the Trend. Transportation air pollutant emissions under Alternative I fall in the range between the Trend and Alternative II.**
- **Residential development would be projected to result in less greenhouse gas emissions under Alternative II. The CO_2 emissions per household added to the Region through the year 2050 would be 12 percent less than under the Trend, and 7 percent less than under Alternative I.**

Reducing air pollution caused by human activity is important to not only ensure the health and welfare of the Region's residents, but it also can have the added benefit of reducing unintended economic impacts caused by the effects of air pollutants. These impacts include the accelerated deterioration of building facades and structures, crop damage, water quality impacts, elevated pollutant levels in fish and wildlife, and increased hospital visits by sensitive individuals. In addition, assessments by the Intergovernmental Panel on Climate Change (IPCC) suggest that the Earth's climate has warmed by 1.53°F over the past 130 years. Studies have linked this increase in the average surface temperature of the Earth to an increase in greenhouse gas (GHG)[12] concentrations observed in the atmosphere. Rising temperatures have been linked to changes in precipitation patterns, storm severity, and sea levels. These conditions are collectively referred to as climate change, which is described in more detail under Criterion 1.4.6 (Ability to Address Issues Related to Climate Change). IPCC assessments also suggest that human activity is an important factor in climate change, with GHG emissions caused by human activity resulting primarily from the burning of fossil fuels.

The EPA also establishes human health-based and/or environmentally-based National Ambient Air Quality Standards (NAAQS) for a number of "criteria" pollutants. Nonattainment areas are defined based on a monitored pollutant level exceeding the relevant NAAQS. A plan is then prepared to describe the specific actions a nonattainment area will take to achieve the NAAQS. Once an area achieves the NAAQS, a plan is prepared to show what actions the area will take to ensure continued maintenance of the NAAQS and the area is redesignated as a maintenance area. Once designated as either nonattainment or maintenance, an analysis must be prepared to show that the regional transportation plan will not prevent an area from either achieving or maintaining the relevant NAAQS. Within Southeastern Wisconsin, Milwaukee, Racine, and Waukesha Counties are currently designated as a $PM_{2.5}$ (fine particulate matter) maintenance area and Kenosha County east

[12] A greenhouse (GHG) allows sunlight to enter the Earth's atmosphere, but prevents heat from escaping. Examples of important GHGs include carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O).

of IH 94 is designated as an ozone (O_3) nonattainment area.[13] In addition to GHG and criteria pollutants, there are several additional transportation-related air pollutants, referred to as "mobile source air toxics." These air toxics are known or suspected to cause cancer or other serious health effects, such as reproductive effects, birth defects, or adverse environmental effects.

Scientific studies have indicated that air pollution exposure can be a trigger for a variety of health issues, including premature death in people with heart or lung disease, nonfatal heart attacks, irregular heartbeat, aggravation of asthma, decreased lung function, and increased respiratory symptoms, such as irritation of the airways, coughing, or difficulty breathing. In addition, as fine particles travel and settle, they can have other environmental impacts, such as increasing lake and stream acidity; changing the nutrient balance in coastal waters and large river basins; depleting the nutrients in soil; damaging sensitive forests and farm crops; and affecting the diversity of ecosystems.

The following describes how each of the alternatives address the reduction of the various pollutants described above.

- **Transportation:** From a transportation perspective, Federal standards on the sulfur content in fuel, and vehicle fuel economy and improved vehicle emissions controls, have been the primary drivers in the reduction of vehicle-related air pollution. Estimated air pollutant and air toxic emissions have declined in recent years due to cleaner, more efficient vehicles and lower sulfur fuels. Based on the current Federal standards, which are assumed to be the same under all three alternatives, fuels are expected to continue to become cleaner and vehicles are expected to become more fuel efficient, resulting in the continued significant decline of transportation-related emissions. As discussed under Criterion 1.4.3 (Energy Use), the average fuel economy of the Region's vehicle fleet is anticipated to increase from 23.4 mpg in 2015 to 43.5 mpg by 2050.

  Two transportation-related criteria pollutants of particular concern in Southeastern Wisconsin are ozone and $PM_{2.5}$. Depending on its location in the atmosphere, ozone can be good (located in the upper atmosphere) or bad (located at ground level) for people's health and for the environment. The primary pollutants from motor vehicles are unburned volatile organic compounds (VOCs), nitrogen oxides (NO_x), and carbon monoxide (CO). VOCs and NO_x emissions can combine in a complex series of reactions, catalyzed by sunlight, to produce photochemical oxidants, including ozone. The focus on monitoring and regulating ozone, since it is a byproduct of a photochemical reaction, is on its precursors, VOCs and NO_x.

  Table F.8 presents existing and future levels for a range of criteria pollutants, mobile source air toxics, and GHG emissions. Levels were estimated using MOVES2014, EPA's emission modeling system

[13] As pollutant levels and the standards themselves change over time, areas identified as meeting or not meeting a standard can also change. EPA periodically updates standards for criteria pollutants based on current research on the impacts of each pollutant. These updates have typically resulted in more stringent standards. Most recently, on October 1, 2015, EPA set more stringent standards for ground-level ozone. While the exact impacts are unknown, based on current monitor data it is anticipated that under the new ozone standards more areas within Southeastern Wisconsin and throughout the State will be designated as not attaining the new standards.

Table F.8
Transportation-Related Greenhouse Gas Emissions and Other Air Pollutants

Pollutant Name	Type	Average Annual Emissions from Transportation Sources (tons)			
		Existing (2010)	Trend (2050)	Alt I (2050)	Alt II (2050)
Carbon Dioxide (CO_2)	GHG	10,435,000	7,369,000	7,232,000	7,189,000
Methane (CH_4) (in CO_2 equivalents)	GHG	10,200	8,400	8,200	8,200
Nitrous Oxide (N_2O) (in CO_2 equivalents)	GHG	100,300	35,200	34,500	34,300
Carbon Monoxide (CO)	Criteria	124,200	26,400	26,000	25,700
Fine Particulate Matter ($PM_{2.5}$)	Criteria	1,382	231	226	226
Sulfur Dioxide (SO_2)	Criteria and precursor for $PM_{2.5}$	182	54	53	53
Nitrogen Oxides (NO_x)	Precursor for Ozone/$PM_{2.5}$	28,460	3,640	3,580	3,570
Volatile Organic Compounds (VOC)	Precursor for Ozone/$PM_{2.5}$	12,740	2,120	2,070	2,060
Acetaldehyde (C_2H_4O)	Air toxic	150	30	30	30
Acrolein (C_3H_4O)	Air toxic	15	3	3	3
Ammonia (NH_3)	Air toxic	704	480	471	468
Benzene (C_6H_6)	Air toxic	309	33	32	32
Butadiene (C_4H_6)	Air toxic	47	4	3	3
Formaldehyde (CH_2O)	Air toxic	233	68	66	66

Source: U.S. Environmental Protection Agency and SEWRPC

for transportation sources. Given the expected downward trend in transportation-related emissions, there is a relatively large difference between existing and future levels for several emission types, regardless of the alternative. Between the alternatives, the differences are comparatively small, but the variations in the development pattern and transportation system still have an impact. Alternatives I and II would further reduce transportation-related GHG emissions by providing more transportation options as alternatives to driving and the more compact development patterns envisioned in Alternatives I and II would also reduce the distance required to travel. This would reduce the length of auto trips, make public transit a more viable alternative to driving, and encourage biking and walking trips, all of which would reduce transportation-related emissions.

- **Building Type and Development Pattern:** The alternatives with more compact development patterns that result in more multifamily housing would reduce the amount of energy used by the Region's households, and in doing so would also reduce air pollutant emissions. Multifamily housing tends to be more energy efficient than single-family housing because multifamily housing units typically have shared ceilings/floors and walls. About 26.1 tons of CO_2 (per year in the year 2050) would be produced per household added under the Trend (25 percent multifamily housing units), based on structure type and the primary sources of energy used by electrical power plants in the Region. Alternative I (39 percent multifamily housing units) and Alternative II (46 percent multifamily housing units) perform somewhat better at 24.3 tons and 23.3 tons of CO_2 produced per new household (per year in the year 2050), respectively.[14] The alternatives compare similarly regarding the amount of other GHG emissions and air pollutants produced by the energy used per new household.

[14] *Emissions per housing unit are based on the end use energy consumed. End use refers to the energy content of electricity and other fuels at the point of use by customers, such as households.*

CRITERION 1.4.5: IMPACTS TO WATER RESOURCES AND WATER QUALITY

KEY CONCLUSIONS

- **Due to its compact development pattern and fewest lane-miles of arterial streets and highways, Alternative Plan II would have the least detrimental impact on water resources and water quality.**
- **Alternative Plan I would also result in smaller impacts on water resources and water quality than the Trend.**

Since passage of the Federal Clean Water Act in 1972, improvements in surface water quality have been made through modernization and consolidation of wastewater treatment plants and implementation of urban and agricultural practices to manage pollutants in stormwater runoff. Future improvements in water quality will likely be made through restoring and recreating the natural buffers along our streams, lakes, and rivers; using compact development to reduce the amount of impervious surface built in the Region; avoiding development in areas with high groundwater recharge potential; reducing or replacing use of salt for de-icing on pavement; and increasing the use of green infrastructure such as permeable pavement and green roofs for buildings. Some of these future improvements are impacted by land development patterns and transportation system investment.

- **Impervious Surfaces:** Criterion 1.4.2 (Impervious Surfaces) discusses the impact of the growth of impervious surfaces on water quality. The amount of impervious surface in the Region in 2050 would be slightly less under Alternative Plan II (10.9 percent) than under Alternative Plan I (11.0 percent). The Trend would perform the worst, with 11.4 percent of the Region's land area covered by impervious surfaces. Alternatives I and II perform slightly better than the Trend because they have more compact development patterns, which could reduce the amounts of pollutants delivered to some of the Region's streams, rivers, and lakes in stormwater runoff from impervious surfaces.

- **Areas with High Groundwater Recharge Potential:** About 40 percent of the Region's residents are dependent upon groundwater for their water supply, as discussed in Criterion 1.4.1 (Preservation of Areas with High Groundwater Recharge Potential). Some areas of the Region have higher potential for recharge of groundwater than others, and the land development pattern can affect the amount of recharge entering the groundwater system. Alternative II would preserve the most areas with high groundwater recharge potential. Alternative I would also preserve significantly more areas than the Trend. Approximately 51 square miles (about 6 percent) of the total 794 square miles of areas with high and very high groundwater recharge potential would be converted to urban uses under the Trend, compared to 32 square miles (about 4 percent) under Alternative I and 28 square miles (about 4 percent) under Alternative II.

- **Reducing the Use of Salt for De-icing:** In winter, salt spread on roads and parking lots can quickly lead to significant increases in salinity in nearby streams, rivers, wetlands, and lakes, and can also have long-term effects on groundwater. Many municipalities in the Region have adopted winter road maintenance practices that use road salt efficiently while maintaining safe driving conditions. Additional reductions in the amount of salt delivered to surface water and groundwater, while maintaining safety for vehicles and pedestrians, may come from other municipalities improving their application efficiency, reductions in de-icing salt applied to privately maintained impervious surfaces, and possible future development of more environmentally friendly and cost-effective alternatives to road salt.

Also, under the different alternatives, fewer lane-miles of roadway and fewer surface parking lots (as more compact development and improved public transit lead to lower per capita demand for parking and more parking in covered parking garages) could result in less salt being used in the Region. Therefore, Alternative II may result in less salt reaching the Region's streams, rivers, wetlands, and lakes, than Alternative I, with Alternative I resulting in less salt than the Trend. The versions of Alternative II and Alternative I that do not include highway improvements would also result in less salt being used than those that do include highway improvements.

CRITERION 1.4.6: ABILITY TO ADDRESS ISSUES RELATED TO CLIMATE CHANGE

KEY CONCLUSIONS

- **One of the primary effects of climate change in the Region may be an increase in flooding as a result of a potential increase in the frequency of large storm events.**
- **The Region's ability to accommodate precipitation and runoff from an increased frequency of large storm events would be greatest under Alternative II, followed by Alternative I, and then the Trend.**
- **The ability of the Region's native ecosystems to adapt to a changing climate would be greatest under Alternative II, followed by Alternative I, and then the Trend.**
- **The Region's air quality in a warming climate would benefit the most from Alternative II, followed by Alternative I, and then the Trend.**

As described in more detail in Criterion 1.4.4 (Greenhouse Gas Emissions and Other Air Pollutants), the Intergovernmental Panel on Climate Change (IPCC) has concluded that the Earth is experiencing climate change, with an increase in the average surface temperature of the Earth over time that has been linked to changes in precipitation patterns and storm severity. The possible effects of climate change on Wisconsin and potential strategies for adapting to these effects are being investigated by the Wisconsin Initiative on Climate Change Impacts (WICCI). SEWRPC is collaborating with this effort. According to WICCI, Wisconsin may experience a warmer and wetter climate by mid-century, with an increased frequency of large storm events.[15]

- **Possible Effects of Climate Change in Southeastern Wisconsin:** WICCI has identified a number of ways that climate change potentially may affect Southeastern Wisconsin. The projected increase in the frequency of large storm events may result in the Region's arterial street and highway system being more susceptible to flooding, impacting traffic flow and public transit operations. The projected increase in the frequency of large storm events may also result in more sewer overflow events as well as additional runoff that harms streams and lakes. A warmer and wetter climate may weaken the resilience of the Region's native ecosystems. Finally, a warmer and wetter climate may result in a greater occurrence of weather conditions that are conducive to reduced air quality in the Region.

  WICCI examined potential adaptation strategies for addressing the effects of climate change in Wisconsin. Some of these strategies would be implemented at the State level, while others would be implemented at a regional or local level. The following regional adaptation strategies would be implemented to varying degrees under the alternatives.

- **Preserving Areas with High Groundwater Recharge Potential and Minimizing Impervious Surfaces:** Preserving areas with high groundwater recharge potential and minimizing impervious surfaces

[15] *Wisconsin Initiative on Climate Change Impacts, Nelson Institute for Environmental Studies, University of Wisconsin-Madison, and the Wisconsin Department of Natural Resources,* Wisconsin's Changing Climate: Impacts and Adaptation, *2011.*

would help mitigate flooding resulting from the projected increase in large storm events and improve water quality in the Region while recharging the groundwater system. The Milwaukee Metropolitan Sewerage District (MMSD) already has begun an initiative to preserve and create "green infrastructure"[16] throughout its service area to better manage precipitation where it falls, improving water quality and reducing runoff into streams, lakes, and sewers, particularly during smaller storm events. MMSD's goal is to create, by the year 2035, enough green infrastructure to capture in place 740 million gallons of water every time it rains.

As described in more detail in Criterion 1.4.1 (Preservation of Areas with High Groundwater Recharge Potential), Alternative Plan II would convert the smallest area of non-urban land with high or very high groundwater recharge potential to urban uses, followed by Alternative Plan I, and then the Trend. As described in more detail in Criterion 1.4.2 (Impervious Surface), Alternative II would result in the least amount of impervious surface area in the Region, followed by Alternative I, and then the Trend. With respect to Criteria 1.4.1 and 1.4.2, Alternative II would best support MMSD in its efforts to preserve and create green infrastructure within its service area.

- **Preserving Natural Resource Areas:** Preserving natural resource areas would help the Region's native ecosystems adapt to climate change in several ways, including providing habitat for native animal and plant species and providing environmental corridors that would help animal and plant species to disperse, if necessary, to new areas that have more suitable habitat. Preserving natural resource areas such as wetlands would also provide storage and filtration of precipitation and runoff from large storm events, helping to limit flooding and improve water quality.

  Accommodating the Region's forecast population and employment growth with higher-density development would help preserve natural resource areas by requiring less agricultural land and open space—which can function as habitat for native animal and plant species—be converted to urban uses. It also allows for more green space that can absorb pollution. As described in more detail in Criteria 1.1.2 (Population Density) and 1.1.3 (Employment Density), Alternative II would have the highest population and employment density and would require the least amount of new residential and employment-supporting land, followed by Alternative I, and then the Trend.

  Southeastern Wisconsin's natural resource areas would be impacted by expansion of the Region's arterial street and highway system. As described in more detail in Criterion 1.3.2 (Impacts to Natural Resource Areas), Alternative II would result in the least amount of natural resource areas experiencing transportation impacts, followed by Alternative I, and then the Trend.

[16] *Green infrastructure consists of a range of strategies designed to capture rain water in place (where it would recharge the groundwater system or evaporate over time) and reduce runoff into streams, lakes, and sewers. Green infrastructure can include large scale options such as preservation of forests, flood plains, and wetlands as well as small scale options such as parking lots with porous pavement, green roofs, rain gardens, and rain barrels.*

- **Reducing Greenhouse Gases and Other Air Pollutants:** As noted in Criterion 1.4.4 (Greenhouse Gas Emissions and Other Air Pollutants), the alternatives vary in how they would help limit climate change in the future by reducing greenhouse gas emissions, and they vary in how they would reduce emissions of other air pollutants that have harmful health and environmental effects. With respect to climate change, the ability of the alternative plans to reduce emissions of certain air pollutants such as nitrogen oxides (NO_x), volatile organic compounds (VOCs), and fine particulate matter ($PM_{2.5}$) would be particularly important, as their harmful effects would be enhanced in a warmer and wetter climate.[17]

  Walking and bicycling produce essentially no emissions, and public transit generally produces fewer emissions per trip than personal vehicles. As a result, encouraging use of these modes of transportation, in conjunction with cleaner fuels and more fuel-efficient vehicles, would help to improve air quality in the Region. As described in more detail in Criteria 1.1.1 (Number of People Living in Walkable Areas), 1.2.1 (Bicycle Level of Service), 1.2.2 (Bicycle Connectivity), and 4.5.3 (Transit Service Quality), Alternative II would result in the most people living in walkable areas and would provide the highest quality regional transit system, and both Alternatives I and II would provide a bicycle network that is more robust than the Trend, encouraging more travel by alternative travel modes.

  As described in more detail in Criterion 1.4.4, Federal standards on fuel and vehicle fuel economy and improved vehicle emissions controls are expected to result in a significant decline in transportation-related emissions in the future, even with forecast increases in regional travel and traffic. As a result, there is a relatively large difference between existing and future levels of several emission types, regardless of the alternative. The differences in emissions of air pollutants between the three alternatives are comparatively small, with Alternative II resulting in the fewest emissions, followed by Alternative I, and then the Trend.

- **Increasing Transportation System Resiliency to Flooding:** Identifying streets, highways and other transportation facilities (e.g., bus stops and park-ride lots) that are susceptible to flooding, and identifying adjacent roadway facilities that could serve as alternative routes when flooding occurs, would help the Region's transportation system become more resilient with respect to the projected increase in frequency of large storm events. As part of a potential future study, the Commission staff intends to identify transportation facilities in low-lying areas, such as within 1-percent-annual-probability (100-year recurrence interval) floodplains, and identify potential improvements that would help the regional transportation system become more resilient to flooding.

[17] *Ground-level ozone (O_3), a byproduct of a photochemical reaction involving nitrogen oxides (NO_x) and volatile organic compounds (VOCs), is more likely to reach unhealthy levels on hot, sunny days in urban environments. Unhealthy concentrations of fine particulate matter ($PM_{2.5}$) may occur more frequently as a result of climate changes such as warmer winters coupled with increased water vapor in the air.*

CRITERION 1.4.7: OVERALL ENVIRONMENTAL SUSTAINABILITY

KEY CONCLUSIONS

- **The Trend has a greater impact on the Region's natural resources, including water resources and air quality, than Alternative Plans I and II. Alternative Plan II has the least impact.**
- **Alternative Plan II would support strategies to adapt to climate change better than Alternative Plan I and the Trend. The Trend would provide the least support for these strategies.**

Environmental sustainability involves managing natural resources to meet the needs of present and future generations. The overall environmental sustainability of the alternatives was evaluated based on their performance under other alternative evaluation criteria that relate to the condition of the Region's natural resources, including water resources and air quality. Alternative II performs the best because it has the most compact development pattern of the alternatives, resulting in the least impact on the Region's natural resources. The Trend has the least compact development pattern, resulting in the greatest impact on the Region's natural resources.

- **Natural and Agricultural Resource Areas:** The development pattern of the alternatives affects encroachment of urban development and transportation infrastructure on resources such as primary and secondary environmental corridors, isolated natural resource areas, wetlands, natural areas, critical species habit sites, and agricultural land.

  All three alternatives perform well with respect to the impact of their land use development patterns on natural resource areas. Incremental households and employment were not allocated to areas with significant natural resources under any of the alternatives, including primary environmental corridors, secondary environmental corridors, and isolated natural resource areas. Incremental households and employment were also excluded from other wetlands, woodlands, natural areas, critical species habitat sites, and park and open space sites outside of environmental corridors.

  Alternatives I and II perform better than the Trend with respect to their impact on agricultural land. Incremental households and employment were not allocated to farmland preservation areas identified in county farmland preservation plans under any of the alternatives; however, significantly more agricultural land outside of farmland preservation areas would be converted to urban uses under the Trend (77 square miles) than Alternative I (32 square miles) or Alternative II (26 square miles).

  Potential impacts to natural and agricultural resource areas directly related to the transportation component of the alternatives were also estimated as part of evaluating the alternatives. Each of the alternatives has a minimal impact on natural and agricultural resources, with the Trend having the greatest impact. This is because the arterial street and highway network would experience greater expansion to address congestion levels under the Trend than Alternatives I and II. Both Alternatives I and II include significant increases in public transit service to address congestion levels, with the greatest increase in transit service occurring under Alternative II. As a result, Alternative II has the least impact of the alternatives on natural and agricultural resources. Criterion 1.3.2 (Impacts to Natural Resource Areas) provides detailed information on the natural and agricultural resources that would be disturbed under each alternative.

- **Water Resources:** Both surface water and groundwater are susceptible to varying degrees of degradation due to land development patterns. Alternative Plans I and II perform slightly better than the Trend in the amount of estimated impervious surface because they have more compact development patterns. It should be noted that the Des Plaines River and Fox River watersheds would be close to exceeding 10 percent impervious surface under the Trend, which could lead to declines in the biological integrity of streams. Impervious surface levels within these watersheds are somewhat lower under Alternative Plans I and II. Criterion 1.4.2 (Impervious Surface) provides detailed information on impervious surface in each of the major watersheds of the Region.

  Alternatives I and II also perform better than the Trend in preserving areas with high groundwater recharge potential. Areas with high groundwater recharge potential often coincide with natural resource areas and agricultural land. The alternatives all perform well in preserving natural resource areas; however, less agricultural land is converted to urban uses under Alternative Plans I and II than the Trend. As a result, it is estimated that approximately 51 square miles (about 6 percent) of areas with high and very high groundwater recharge potential would be converted to urban uses under the Trend, compared to 32 square miles (about 4 percent) under Alternative Plan I and 28 square miles (about 4 percent) under Alternative Plan II.

- **Air Quality:** Alternatives I and II have a less negative impact on the Region's air quality than the Trend. Walking and bicycling produce essentially no greenhouse gas (GHG) emissions or emissions of other air pollutants, and public transit generally produces fewer emissions per trip than personal vehicles. Encouraging the use of these modes of transportation results in less air pollution produced in the Region. The compact development patterns of Alternatives I and II result in more people living in walkable areas than the Trend, with the most people living in walkable areas under Alternative II. Alternatives I and II also have higher-quality bicycle facilities and transit service than the Trend, with the highest quality transit service under Alternative II. Although the differences in transportation air pollutant emissions between alternatives are modest—generally about 1 to 2 percent lower under Alternative II than the Trend and generally less than 1 percent lower under Alternative I than the Trend—transportation emissions under all three alternatives are projected to significantly decline from current levels due to Federal fuel and vehicle fuel economy standards, even with forecast increases in regional travel and traffic.

  In addition, the alternatives with more compact development patterns reduce emissions by providing more multifamily housing. Multifamily housing is more energy efficient than single-family housing, and therefore produces fewer emissions. The Trend would add the fewest multifamily housing units (25 percent of new housing units) among the alternatives. About 39 percent of new housing units would be multifamily under Alternative I, and about 46 percent of new housing units would be multifamily under Alternative II.

Environmental performance features can also be incorporated into new residential and commercial building design to further reduce energy use and resulting emissions of GHGs and other pollutants. A report issued by the World Green Building Council indicates that new high environmental performance buildings could reduce energy use by 25 to 50 percent compared to new conventional buildings.

- **Adapting to Climate Change:** The Intergovernmental Panel on Climate Change (IPCC) has concluded that the Earth is experiencing climate change, with an increase in average surface temperature of the Earth over time that has been linked to changes in precipitation patterns and storm severity. The possible effects of climate change on Wisconsin and potential strategies for adapting to these effects are being investigated by the Wisconsin Initiative on Climate Change Impacts (WICCI).[18] Wisconsin may experience a warmer and wetter climate by mid-century, with an increased frequency of large storm events. This may result in more flooding, more sewer overflow events, more stormwater runoff, a weakened resiliency of the Region's native ecosystems, and reduced air quality.

  The WICCI examined potential adaption strategies for addressing the effects of climate change in Wisconsin. Strategies that could be implemented at a regional level involve preserving natural areas, preserving areas with high groundwater recharge potential, minimizing impervious surfaces, and reducing emissions of GHGs and other pollutants. Alternative II would support strategies to adopt to climate change better than Alternative I and the Trend. The Trend would provide the least support for these strategies.

- **Sustainable Transportation Infrastructure:** Alternatives I and II both propose significantly improved and expanded transit infrastructure, with Alternative II proposing the most improvement and expansion. Increasing the use of transit, and other modes of transportation that provide an alternative to driving, produces numerous benefits related to environmental sustainability. While projected increases in transit ridership and non-motorized travel may be relatively modest with respect to their effect on total regional travel, as discussed in Criterion 4.1.1 (Trips per Day by Mode), the expanded transit infrastructure would provide the capacity to carry even more of the Region's residents. By increasing the capacity of the transportation system to handle more travel by alternative modes to the automobile, the system would be capable of producing even greater advances to the environmental sustainability of the Region.

[18] *SEWRPC is collaborating with this effort.*

CRITERION 1.5.1: HOMES, BUSINESSES, LAND, AND PARKLAND ACQUIRED

KEY CONCLUSIONS

- **The public transit systems under each of the alternatives would not be expected to result in any building, right-of-way, or parkland impacts in the Region, while the arterial streets and highways would be expected to result in modest impacts.**
- **The Trend would be expected to result in the greatest number of building relocations, followed by Alternative I (about 14 percent fewer relocations than the Trend), and then Alternative II (about 35 percent fewer relocations than the Trend).**
- **The Trend would be expected to result in the greatest area of right-of-way acquisition, followed by Alternative I (about 0.2 percent less impact than the Trend), and then Alternative II (about 8 percent less impact than the Trend).**
- **The Trend would be expected to result in the greatest area of parkland acquisition, followed by Alternative I (about 0.2 percent less impact than the Trend), and then Alternative II (about 18 percent less than the Trend).**

The number of residential, business, and governmental/institutional buildings that potentially would be relocated, the number of historic buildings and sites that would be impacted, and the amount of right-of-way and parkland that potentially would be acquired as a result of transportation system improvements were estimated for each of the alternatives, as shown in Table F.9.

- **Public Transit:** Public transit would not be expected to require the expansion of arterial street and highway or railroad right-of-ways, even under Alternatives I and II, which assume significant increases in public transit service. As a result, public transit under each of the alternatives would not be expected to require any building relocations or result in right-of-way or parkland impacts.

- **Arterial Streets and Highways:** The Trend would be expected to have the greatest impact on buildings and parkland in the Region, compared to Alternative Plans I and II (note: no historic buildings or sites would be expected to be within the right-of-way of a new or widened arterial street or highway under any of the alternatives). The Trend would have the most capacity expansion of all the alternatives due to the need to address the increased traffic resulting from less compact development and a decline in transit under the Trend. There would be a modest decrease in the number of building relocations (about a 14 percent decrease), right-of-way acquisitions (a less than 1 percent decrease), and parkland acquisitions (a less than 1 percent decrease) under Alternative I compared to the Trend, due to the greater emphasis on infill development and redevelopment and improvement and expansion of transit service under this alternative. Alternative II would result in the fewest number of building relocations (about a 35 percent decrease), the least amount of right-of-way acquisitions (about an 8 percent decrease), and the least amount of parkland acquisitions (about an 18 percent decrease) compared to the Trend. This would be due to Alternative II proposing the most compact land use development—including the most TOD—and the

Table F.9
Homes, Businesses, Land, and Parkland Acquired

Category	Trend (2050)	Alternative I (2050)		Alternative II (2050)	
		With Highway Improvements	Without Highway Improvements[a]	With Highway Improvements	Without Highway Improvements[a]
Estimated Right-of-Way Impacts (Acres)	2,340.9	2,337.2	441.5	2,165.3	441.5
Relocations					
Residential	344	297	122	229	122
Businesses	70	61	30	43	30
Governmental/Institutional	2	0	0	0	0
Historic Buildings and Sites					
Buildings	0	0	0	0	0
Sites	0	0	0	0	0
Parkland (Acres)[b]					
State	40.7	40.4	0.4	39.4	0.4
County	38.9	38.9	10.2	22.9	10.2
Local	36.5	36.5	3.0	32.7	3.0

[a] *The impacts of committed highway improvements are included under these alternatives.*

[b] *Existing State parkland in the Region totals about 67,400 acres, existing county parkland totals about 31,400 acres, and existing local parkland totals about 24,700 acres.*

Source: SEWRPC

most extensive transit service—including significant investment in fixed-guideway transit. Also included in Table F.9 are the potential impacts if the highway improvements under Alternatives I and II are not implemented, except for committed highway improvements and freeway modernization. As expected, only implementing the committed highway improvements under Alternatives I and II would greatly reduce the potential relocations of buildings and acquisitions of right-of-way and parkland.

CRITERION 1.6.1: CRASHES BY MODE

KEY CONCLUSIONS

- **Vehicular crashes contribute to overall transportation costs; increase public costs for police, emergency medical, and other social services; and contribute to nonrecurring congestion on the highway system.**
- **Based on applying existing vehicle crash rates to forecast vehicle-miles of travel, the vehicular crashes under the Trend, Alternative I, and Alternative II would be expected to be very similar, varying by less than 4 percent.**

The monitoring and analysis of vehicular crashes in the Region provides information essential to addressing unsafe roadways and improving the transportation system and the quality of life in Southeastern Wisconsin. Vehicular crashes occur due to one or a combination of the following factors: human error, vehicle failure, and roadway/environmental conditions. The occurrence of crashes can have negative effects on the Region as they contribute to overall transportation costs; increase public costs for police, emergency medical, and other social services; and cause nonrecurring congestion on the highway system. In addition, vehicular crashes take a heavy toll in life, property damage, and human suffering.

Strategies that can reduce the number of crashes on roadways include modifying roadway and roadside elements (such as increasing lane width, adding/widening paved shoulders, installing side barricades, and removing fixed objects along the roadside), improving horizontal and vertical grades, modifying intersections (such as improving signal timing and adding turn lanes), adding/modifying signage and pavement markings, and controlling access. In some cases, the rate of crashes may be reduced by adding capacity along a surface arterial, such as reconstruction of an urban two-lane arterial that exceeds its design capacity with a divided roadway. With respect to freeways, strategies to reduce the number of crashes could also include removing ramp entrances and exits on the left side of the freeway, increasing the distance between ramp terminals, and increasing entrance ramp length. Adding capacity on heavily congested freeways can also be expected to reduce crash rates. With respect to addressing excessive bicycle crashes, implementation of measures that provide a dedicated space for bicyclists, with the appropriate separation from moving and parked vehicles, can reduce the number of vehicular crashes with bicyclists. Typical measures to better accommodate bicycles include bike lanes, paved shoulders, separate paths within the right-of-way, and widened travel lanes. Enhanced bicycle facilities (e.g., protected or buffered bike lanes and colored pavement) can also be implemented to increase bicycle safety in corridors highly used by bicyclists.

The number and rate of crashes can also vary depending upon the operational characteristics of a roadway, such as number of lanes, roadway cross-section type, roadway function (surface arterial or freeway), traffic volumes, and the type of adjacent development (urban/suburban or rural). For example, crash rates tend to be significantly lower on freeways than on surface arterials because freeways have controlled access. On surface arterials, there are more conflict points, such as intersections and driveways, where vehicles are traveling at different speeds and changing direction, increasing the likelihood of a crash. Crash rates are typically higher in urban and suburban areas than in rural areas because conflict points are more densely spaced, which increases the risk of a crash. With respect to freeways, the number and rate of crashes generally increase as the level of congestion increases. Vehicular crashes resulting in fatalities and incapacitating injuries occur more frequently in urban/suburban areas and on higher volume roadways. Similarly, bicycles and pedestrian crashes on surface arterials are more frequent in urban/suburban areas and on higher volume roadways.

- **Estimating Crashes:** It is not possible at the regional level—considering a 3,600-mile arterial street and highway network—to be able to consider all factors in projecting the number of crashes for each VISION 2050 alternative. The crashes for each alternative were estimated by applying the estimated average existing crash rate to the future level of freeway and surface arterial vehicle-miles of travel under each alternative. Thus, the projected number of crashes under each alternative is based on the existing roadway design and conditions of the Region's arterials, and does not account for the implementation of improved roadway design and safety measures, which would occur with roadway resurfacing and reconstruction.

  The number and rate of existing crashes were estimated based on year 2009 through 2013 crash data available from the University of Wisconsin's Traffic Operations and Safety Laboratory (TOPS Lab). Due to the random nature of crashes, the frequency of crashes from year to year can fluctuate and it is possible that the number of crashes in one year may be higher or lower than a typical year. Thus, to avoid annual anomalies that can skew the analysis, the annual average of the number of crashes over the five-year period was used.

- **Vehicular Crashes:** As shown in Table F.10, the projected number of crashes under each alternative is very similar, varying by less than 4 percent. Again, the projected number of crashes is based on applying the existing crash rate to future vehicle-miles of travel, and should be considered a conservatively high estimate, as it does not account for implementation of improved roadway design and safety measures or any reduction in traffic congestion over the next 35 years.

- **Transit Crashes:** The data for the number of crashes that involve transit vehicles—buses and trains—are not readily available and because transit crashes represent a small proportion of the total number of crashes on arterial streets and highways, it is difficult to accurately estimate the total number crashes involving transit vehicles under each alternative. It would be expected that the number of crashes involving transit vehicles would increase under Alternatives I and II as transit service levels increase; however, crash rates would likely decrease particularly since fixed-guideway transit vehicles will be separated from traffic under Alternatives I and II. Additionally, the increased use of transit under Alternatives I and II would be expected to provide improvements in overall travel safety, as travel by public transit tends to be safer than travel by personal vehicle, and increased transit use results in fewer vehicles on the roadways (resulting in less opportunity for crashes).

Table F.10
Average Annual Crashes on Arterial Streets and Highways

Alternative	Surface Arterials	Freeways	Total
Existing - 2009 to 2013	25,200	4,300	29,500
Trend - 2050	29,600	6,000	35,600
Alt I - 2050	28,700	5,900	34,600
Alt II - 2050	28,500	5,800	34,300

Source: SEWRPC

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CRITERION 2.1.1: LEVEL OF ACCESSIBILITY TO JOBS AND ACTIVITY CENTERS FOR MINORITY POPULATIONS AND LOW-INCOME POPULATIONS BY MODE

KEY CONCLUSIONS

- **Alternative I provides the most access for the existing minority population (438,000 people) and families in poverty (36,300 families) to at least 500,000 jobs by automobile within 30 minutes, slightly more than the Trend (437,600 people and 36,300 families) and Alternative II (435,800 people and 36,200 families).**
- **Nearly all (about 90 to 100 percent) of the existing minority population and low-income families would have reasonable access by automobile to most of the activity centers identified under all alternatives, with Alternative I providing minimally more access than the Trend and Alternative II.**
- **Alternative II would provide the most access to over 100,000 jobs within 30 minutes by transit to the existing minority population (111,000 people) and families in poverty (10,100 families), followed by Alternative I (84,600 people and 8,000 families).**
- **Alternative II would provide the greatest accessibility to the activity centers identified via transit for existing minority populations and low-income populations (generally serving 5 to 8 percent more in minority population and low-income population than Alternative I).**
- **The transit elements of Alternatives I and II would result in more increases in transit accessibility to jobs and activity centers than the highway elements would result in increases in highway accessibility.**

Significant disparities exist between whites and minorities in the Region, particularly in the Milwaukee metropolitan area, with respect to educational attainment levels, per capita income, and poverty.[19] These disparities are far more pronounced than in almost all other metro areas. Reducing these disparities requires significant action on many fronts. With respect to the transportation component of VISION 2050, the relevant actions primarily revolve around ensuring that the benefits and impacts of investments in the Region's transportation system are shared fairly and equitably and serve to reduce disparities between white and minority populations. One of the primary ways to measure this is to compare how well the alternatives improve the ability for existing minority populations and low-income populations to reach jobs and other destinations. The transit and highway elements of the alternative plans are designed in part to increase the level of accessibility by transit and automobile to jobs and other activity centers—such as retail centers, major parks, public technical colleges/universities, health care facilities, grocery stores, the Milwaukee Regional Medical Center (MRMC), and General Mitchell International Airport (GMIA)—for all residents of the Region, including for minority populations and low-income populations. The following sections describe the results of analyses to determine whether existing minority populations and low-income populations would be expected to have improved accessibility to jobs and other activities by automobile and transit under the alternatives. In addition, a comparison is provided of the increases in transit accessibility to increases in highway accessibility for existing minority populations and low-income populations.

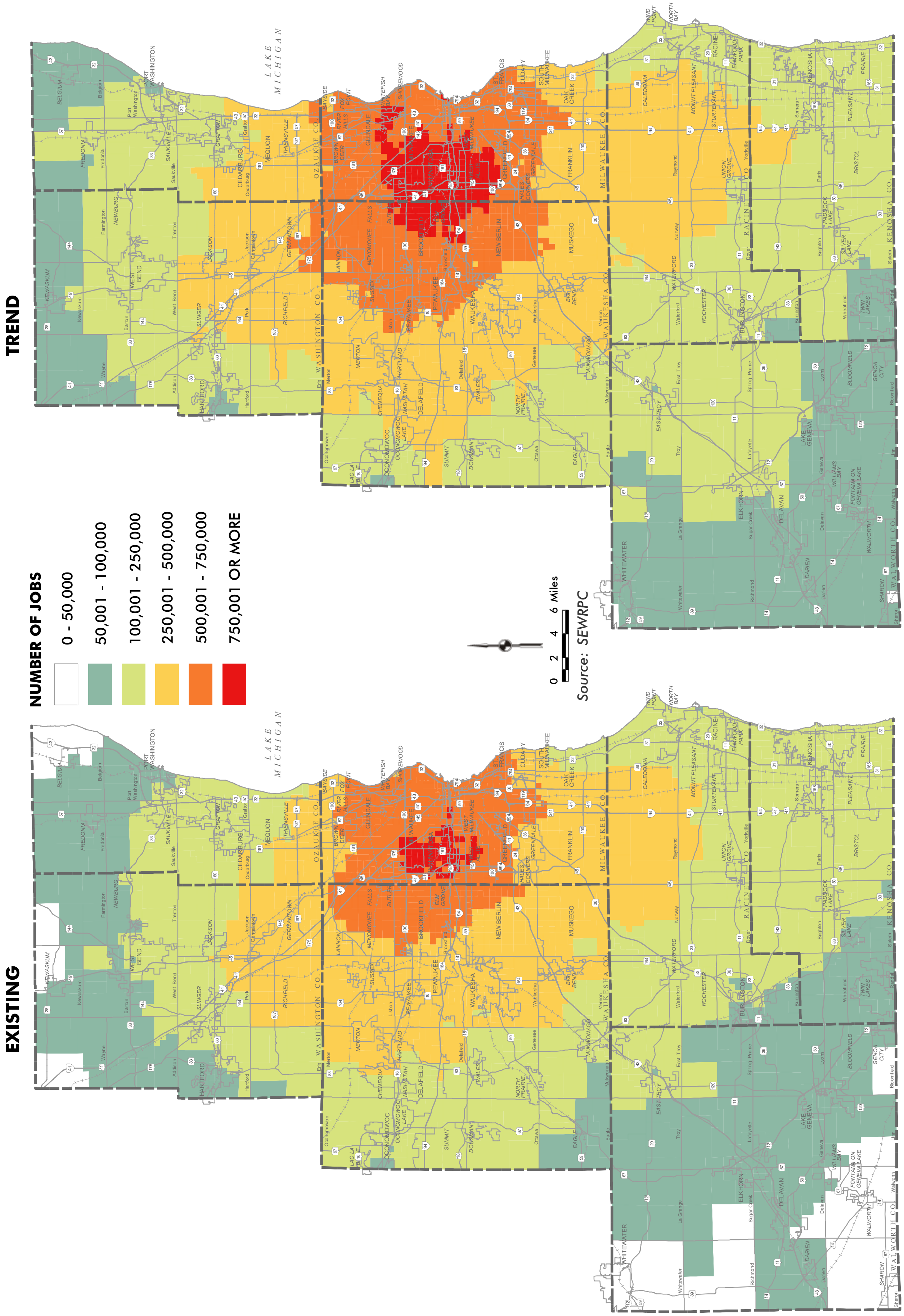
[19] *These disparities are documented in SEWRPC Memorandum No. 221,* A Comparison of the Milwaukee Metropolitan Area to Its Peers.

- **<u>Improved Driving Accessibility to Jobs and Other Activities:</u>** In Southeastern Wisconsin, the dominant mode of travel for all population groups is the automobile. For example, in Milwaukee County, minority populations use the automobile for 81 to 88 percent of their travel to and from work (depending on race or ethnicity), compared to 88 percent of the white population. Similarly, in Milwaukee County about 70 percent of travel by low-income populations to and from work is by automobile, compared to 89 percent for populations of higher income. Thus, improvements in accessibility by automobile to jobs and other activities would likely benefit a significant proportion of minority populations and low-income populations. Under the alternatives, the Region would generally be able to modestly improve accessibility via automobile with implementation of the highway improvements—new roadways and highway widenings—under the alternatives. Should these improvements not be implemented, access to jobs and other activities using automobiles would be expected to decline for the residents of the Region, particularly residents in Milwaukee County, and as well for minority populations and low-income populations.

  The number of jobs accessible in 30 minutes or fewer under existing conditions and for the alternatives is shown on Maps F.14 through F.16. These maps were compared to locations of existing minority populations and low-income populations, as shown on Maps F.17 and F.18. The highway improvements under the Trend and Alternatives I and II would modestly improve access to jobs for areas of existing concentrations of minority populations and low-income populations. Even the committed highway improvement projects under Alternatives I and II, particularly the freeway widenings, appear to provide some improvement to access to jobs for the existing minority populations and low-income populations. Specifically, the highway improvements under the alternatives are projected to increase access to at least 500,000 jobs within 30 minutes by automobile for the existing minority population from about 70 percent of the minority population to about 75 percent under the alternatives, as shown in Table F.11. Alternative I would provide access to the most minorities (438,000 people), slightly more than the Trend (437,600 people) and Alternative II (435,800 people). Similarly, the existing families in poverty with access to at least 500,000 jobs within 30 minutes by automobile would be expected to increase from 65 percent to about 70 percent. The Trend and Alternative I would provide such access to 36,300 families, followed by Alternative II with 36,200 families. The percentage of the existing minority population and families in poverty with access to at least 500,000 jobs within 30 minutes would be about 5 percent greater under all of the alternatives than under existing conditions, compared to about 9 percent greater in the non-minority population and families not in poverty.

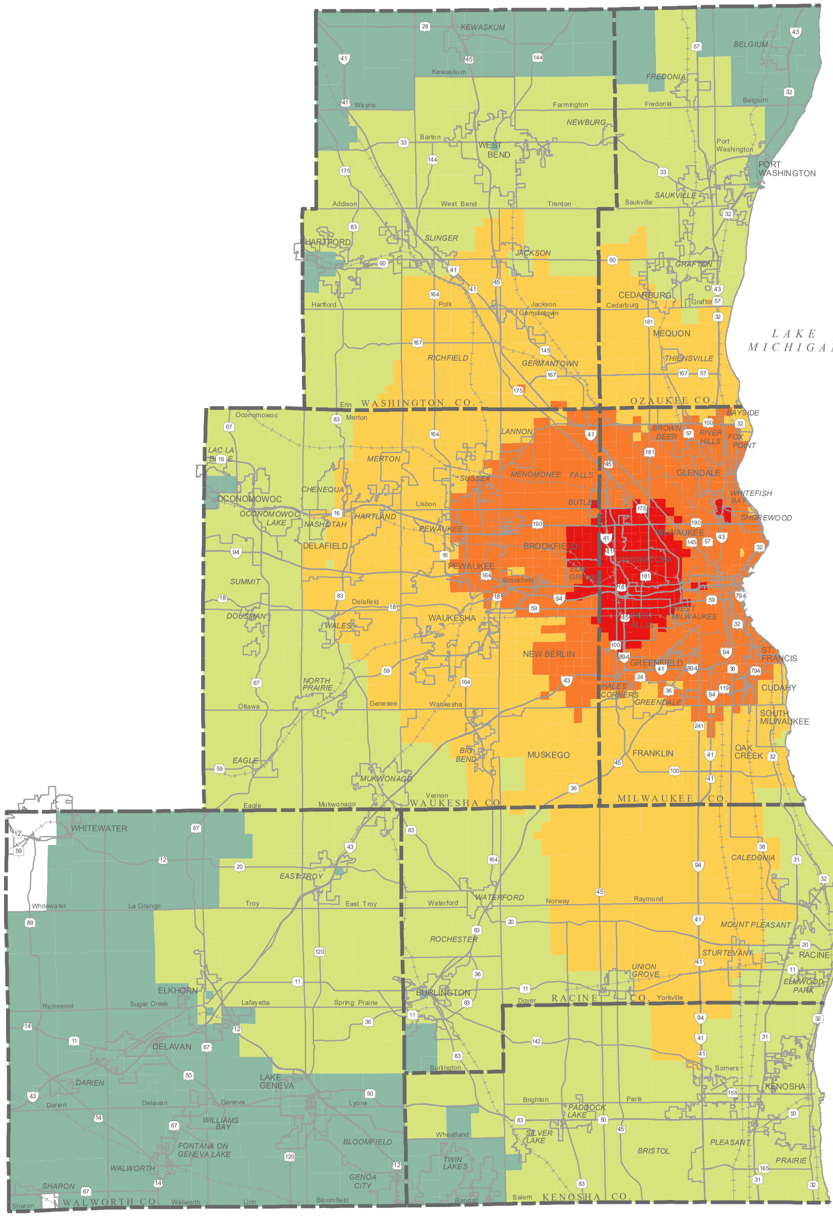
  The estimated lower-wage jobs that would be accessible by automobile within 30 minutes under existing conditions and the alternatives are shown on Maps F.19 through F.21. Lower-wage jobs are estimated to represent about 32 percent of the total jobs. Comparing these maps to areas of existing concentrations of minority populations and low-income populations (as shown on Maps F.17 and F.18) indicates that access to lower-wage jobs for these populations would improve with implementation of the highway improvements under the alternatives. Much like with total jobs, accessibility would modestly improve for existing minority populations and low-income populations in

Map F.14
Jobs Accessible Within 30 Minutes by Automobile: Existing and Trend

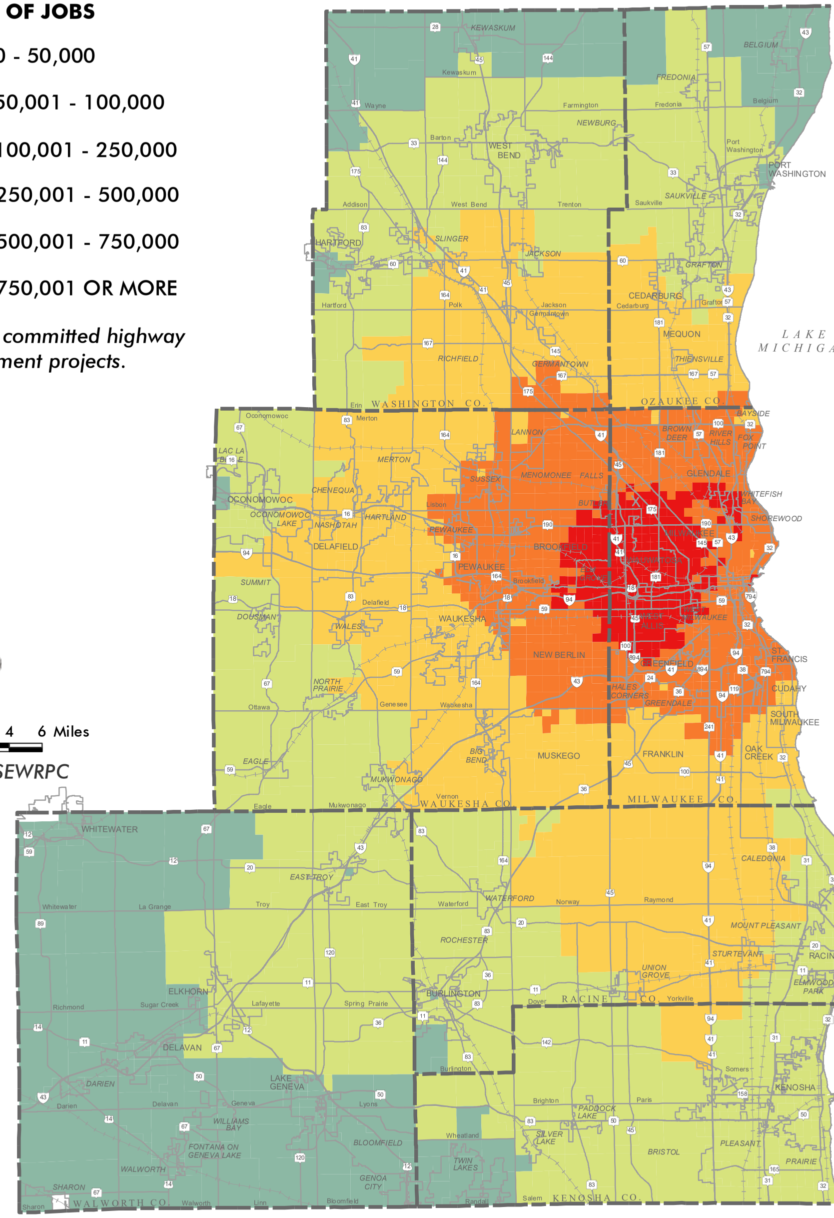


Map F.15
Jobs Accessible Within 30 Minutes by Automobile: Alternative I

ALTERNATIVE I - WITHOUT HIGHWAY IMPROVEMENTS[a]



ALTERNATIVE I - WITH HIGHWAY IMPROVEMENTS



NUMBER OF JOBS

- 0 - 50,000
- 50,001 - 100,000
- 100,001 - 250,000
- 250,001 - 500,000
- 500,001 - 750,000
- 750,001 OR MORE

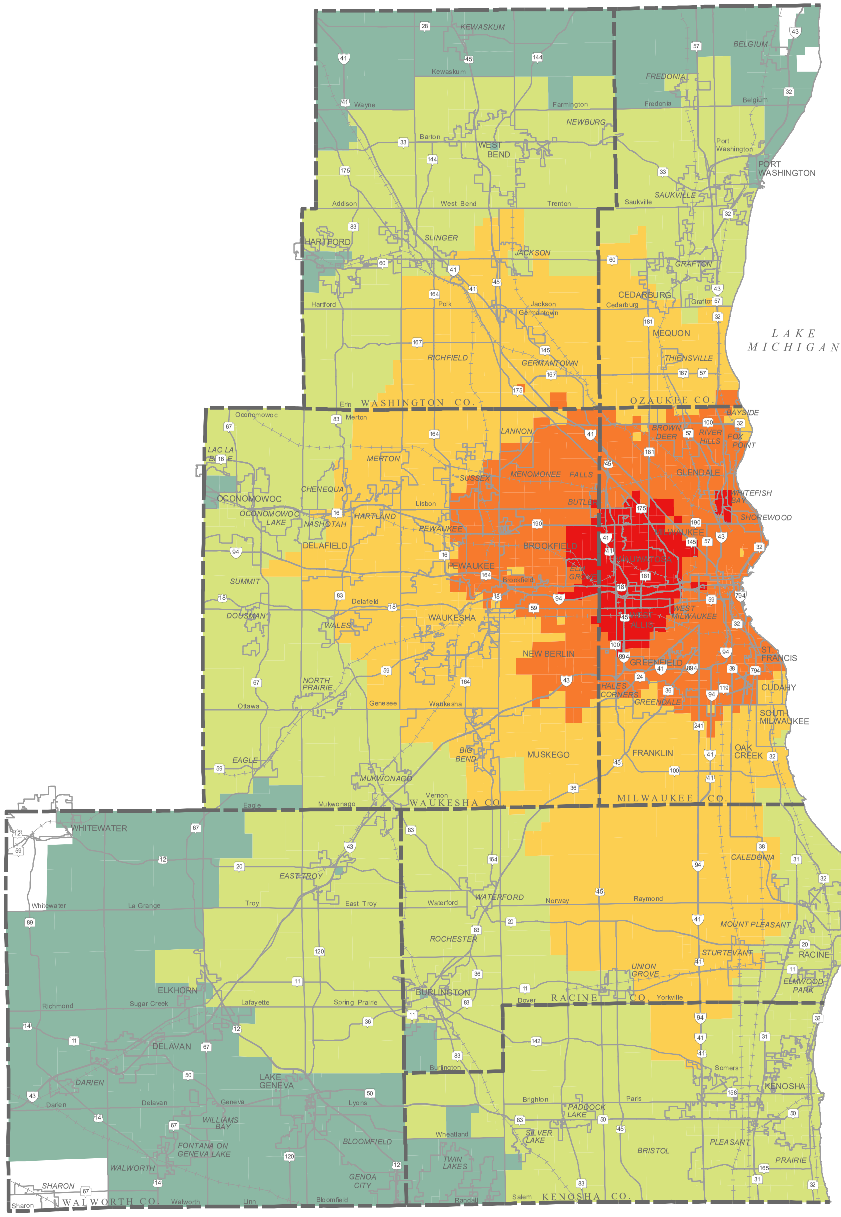
[a] *Includes committed highway improvement projects.*

0 2 4 6 Miles

Source: SEWRPC

Map F.16
Jobs Accessible Within 30 Minutes by Automobile: Alternative II

ALTERNATIVE II - WITHOUT HIGHWAY IMPROVEMENTS[a]



NUMBER OF JOBS

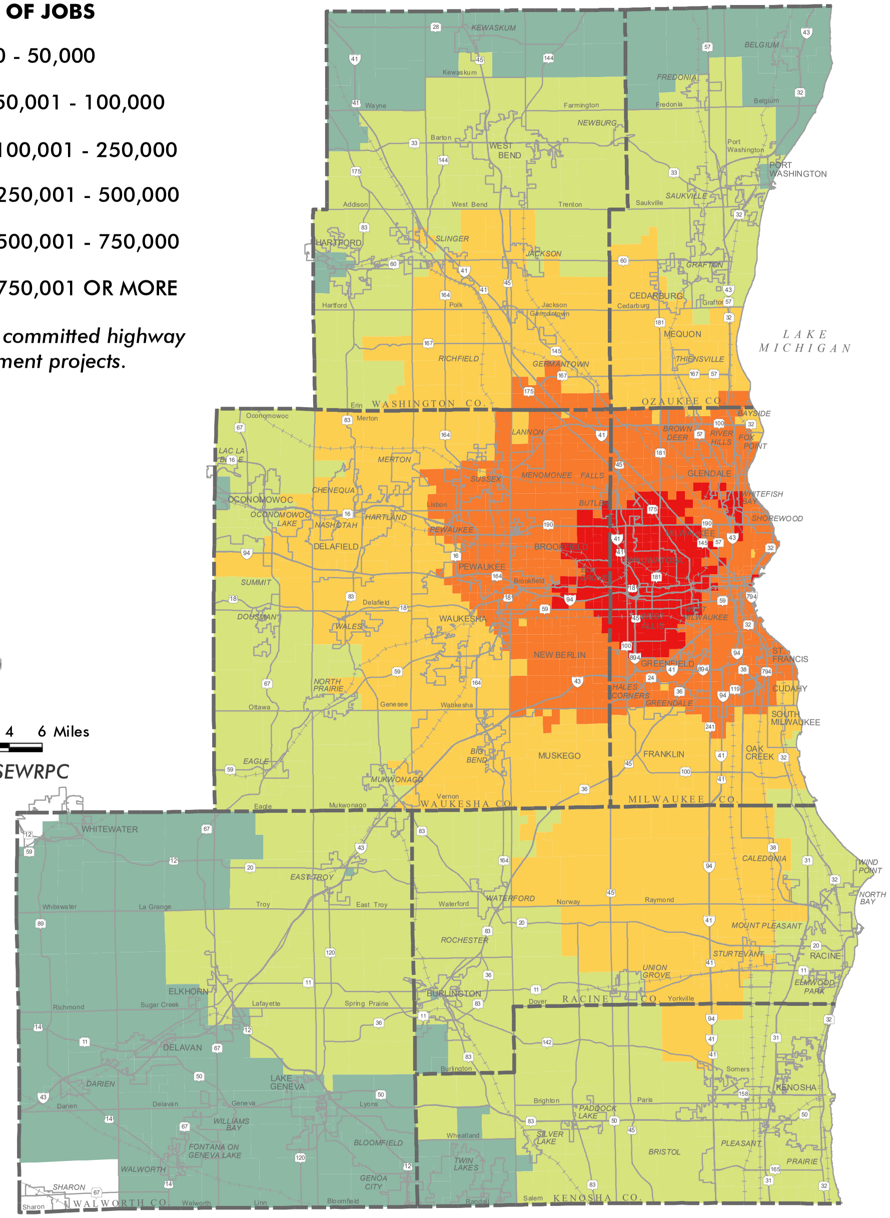
- 0 - 50,000
- 50,001 - 100,000
- 100,001 - 250,000
- 250,001 - 500,000
- 500,001 - 750,000
- 750,001 OR MORE

[a] *Includes committed highway improvement projects.*

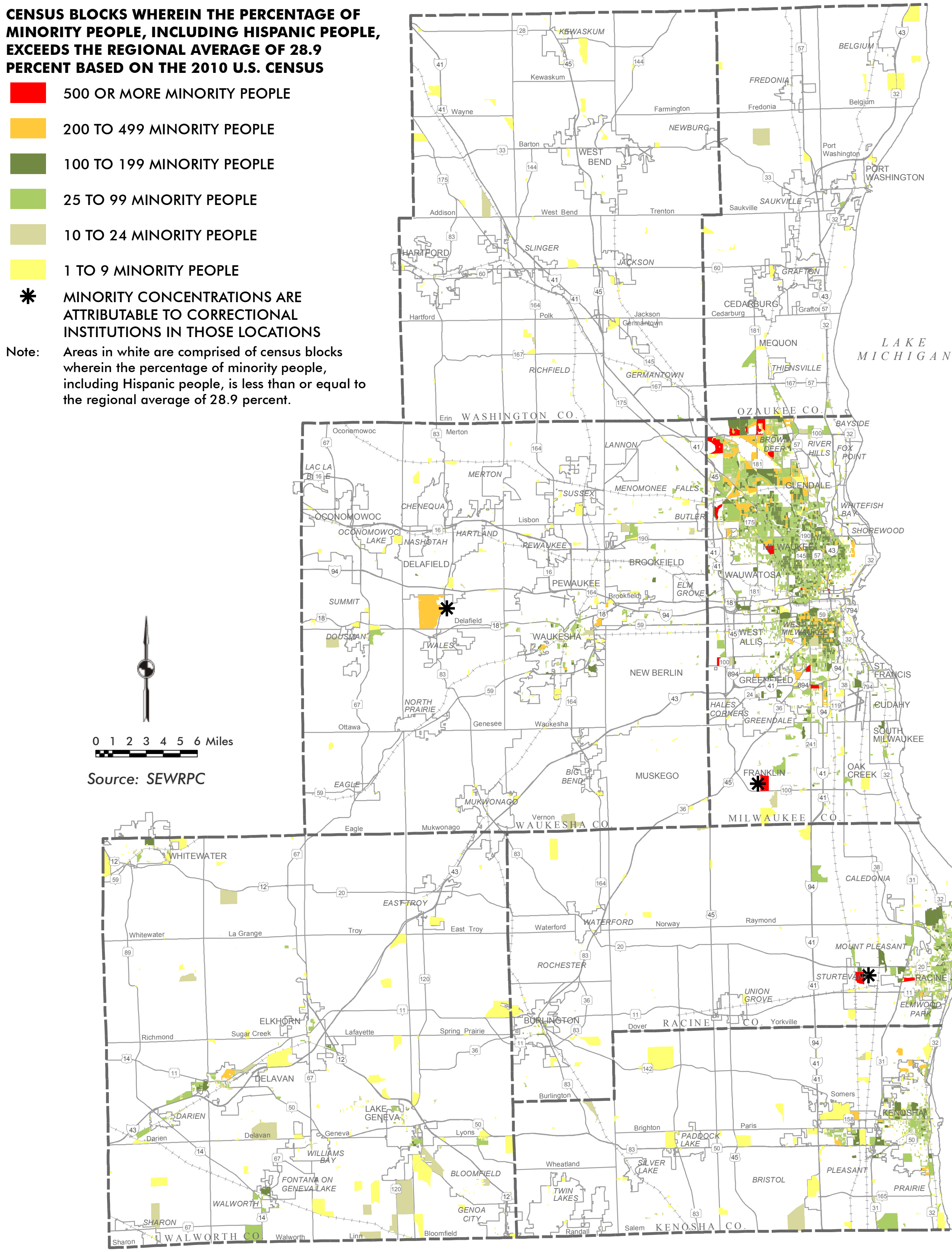
0 2 4 6 Miles

Source: SEWRPC

ALTERNATIVE II - WITH HIGHWAY IMPROVEMENTS



Map F.17
Concentrations of Total Minority Population in the Region: 2010



Source: SEWRPC

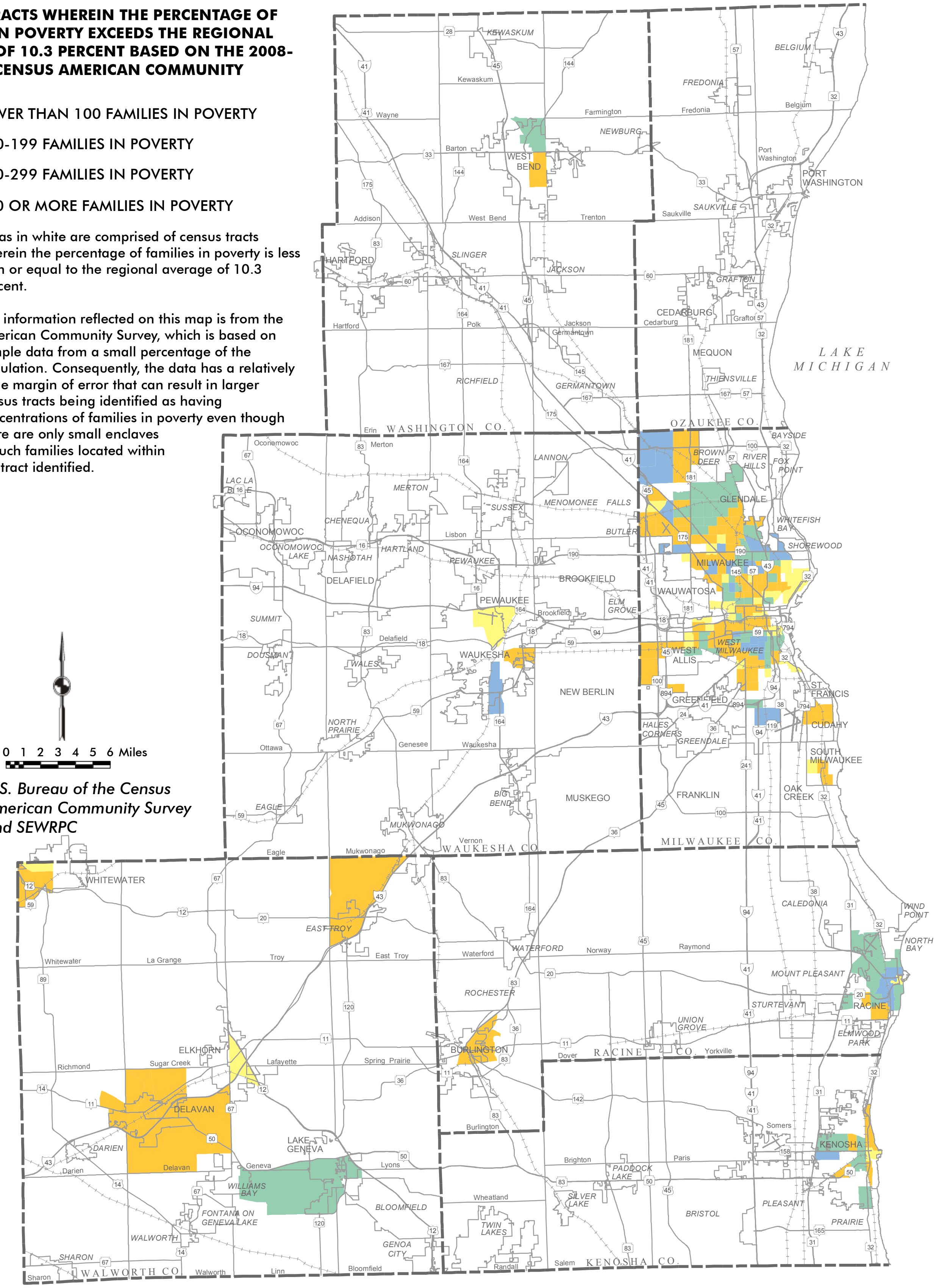
Map F.18
Concentrations of Families in Poverty in the Region: 2008-2012

CENSUS TRACTS WHEREIN THE PERCENTAGE OF FAMILIES IN POVERTY EXCEEDS THE REGIONAL AVERAGE OF 10.3 PERCENT BASED ON THE 2008-2012 U.S. CENSUS AMERICAN COMMUNITY SURVEY

- FEWER THAN 100 FAMILIES IN POVERTY
- 100-199 FAMILIES IN POVERTY
- 200-299 FAMILIES IN POVERTY
- 300 OR MORE FAMILIES IN POVERTY

Notes: Areas in white are comprised of census tracts wherein the percentage of families in poverty is less than or equal to the regional average of 10.3 percent.

The information reflected on this map is from the American Community Survey, which is based on sample data from a small percentage of the population. Consequently, the data has a relatively large margin of error that can result in larger census tracts being identified as having concentrations of families in poverty even though there are only small enclaves of such families located within the tract identified.



Source: U.S. Bureau of the Census American Community Survey and SEWRPC

Table F.11
Access to Jobs Within 30 Minutes by Automobile

Minority Population[a]

Alternative	100,000 – 249,999 Jobs		250,000 – 499,999 Jobs		500,000 or More Jobs		Total Minority Population
	People	Percent	People	Percent	People	Percent	
Existing - 2010	95,400	16.4	59,800	10.3	407,700	69.9	582,900
Trend - 2050	93,700	16.1	38,800	6.7	437,600	75.1	582,900
Alt I - 2050	93,300	16.0	38,300	6.6	438,000	75.1	582,900
Alt II - 2050	93,700	16.1	39,800	6.8	435,800	74.8	582,900

Families in Poverty[a]

Alternative	100,000 – 249,999 Jobs		250,000 – 499,999 Jobs		500,000 or More Jobs		Total Families in Poverty
	Families	Percent	Families	Percent	Families	Percent	
Existing - 2010	10,200	19.5	5,000	9.6	33,800	64.6	52,300
Trend - 2050	10,500	20.1	3,400	6.5	36,300	69.4	52,300
Alt I - 2050	10,500	20.1	3,300	6.3	36,300	69.4	52,300
Alt II - 2050	10,500	20.1	3,400	6.5	36,200	69.2	52,300

[a] *Minority population is based on the 2010 U.S. Census and families in poverty are based on the 2008-2012 American Community Survey.*

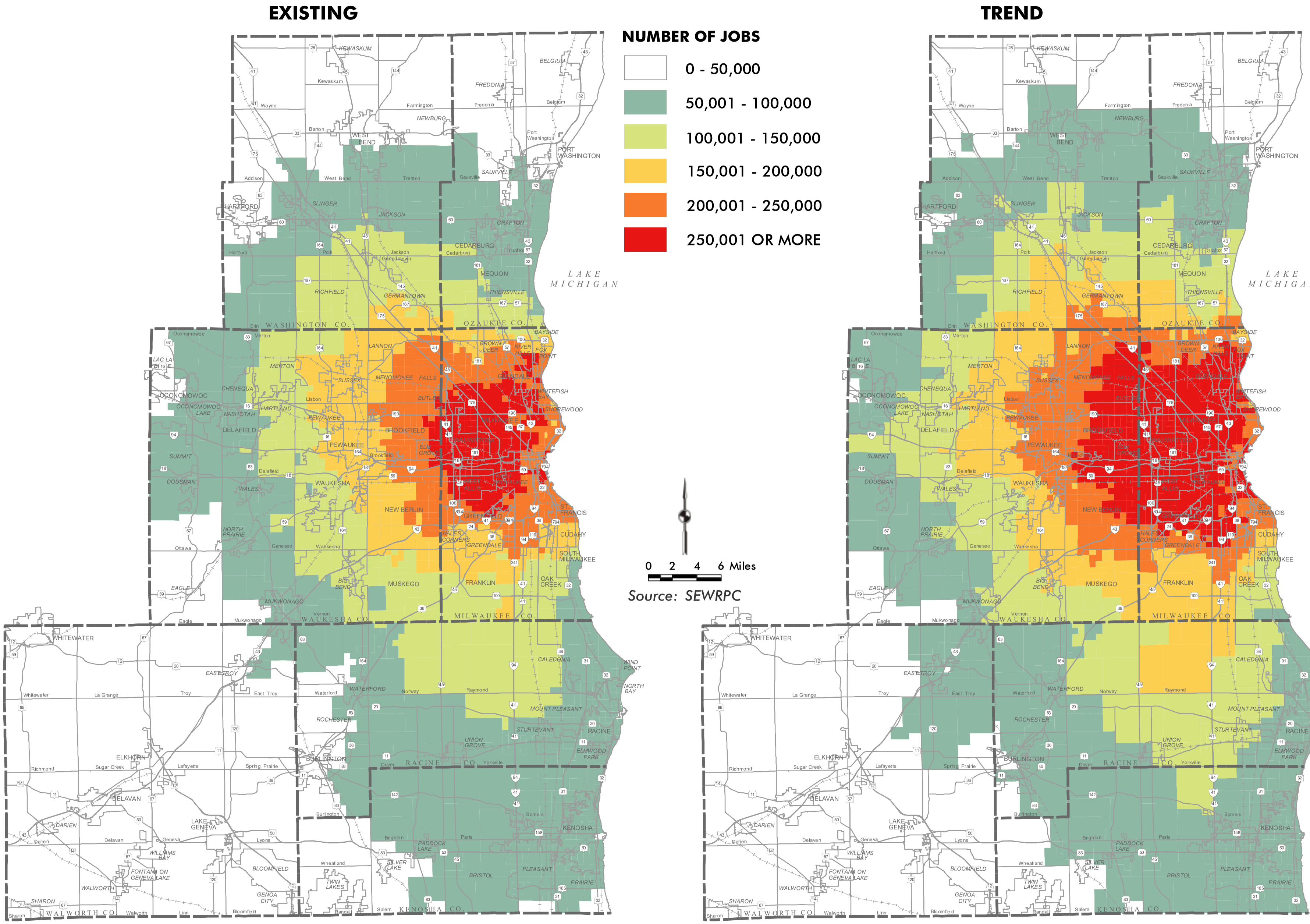
Source: U.S. Bureau of the Census, U.S. Census and American Community Survey; and SEWRPC

these areas by implementing only the committed projects under the alternatives. As shown in Table F.12, it is projected that the existing minority population with access to at least 200,000 lower-wage jobs by automobile would increase from about 70 percent to about 75 percent under the alternatives, with Alternative I providing access for the most minorities (438,300 people), followed by the Trend (435,600), and then by Alternative II (434,300). Similarly, the existing families in poverty with access to at least 200,000 lower-wage jobs by automobile would increase from about 64 percent to about 70 percent under the alternatives, with Alternative I providing access for the most families in poverty (36,400 families), followed by the Trend (36,200), and then by Alternative II (36,100).

Criterion 4.2.1 (Travel Time to Important Places by Mode) includes an evaluation of access by automobile to various activity centers, including retail centers, major parks, public technical colleges/ universities, health care facilities, grocery stores, MRMC, and GMIA. Based on this analysis, most of the Region's residents have reasonable access to these activity centers by automobile. As shown in Table F.13, nearly all (about 90 to 100 percent) of the existing minority population and families in poverty would have reasonable access by automobile to most of these activity centers under all alternatives, with Alternative I providing minimally more access than the Trend and Alternative II.

- **<u>Improved Transit Accessibility to Jobs and Other Activities:</u>** Although most minority residents use the automobile for their travel, they utilize public transit at a higher proportion relative to other modes of travel than the white populations in the Region. In Milwaukee County, about 4 to 13 percent of the minority population (depending on race or ethnicity) uses public transit to travel to and from work compared to 3 percent of the white population. Also in Milwaukee County, about 15 percent of the low-income population uses public transit to travel to and from work compared to 5 percent of the population with higher wages. Comparing the accessibility provided to employment and major activity centers under Alternative Plans I and II to those of the Trend

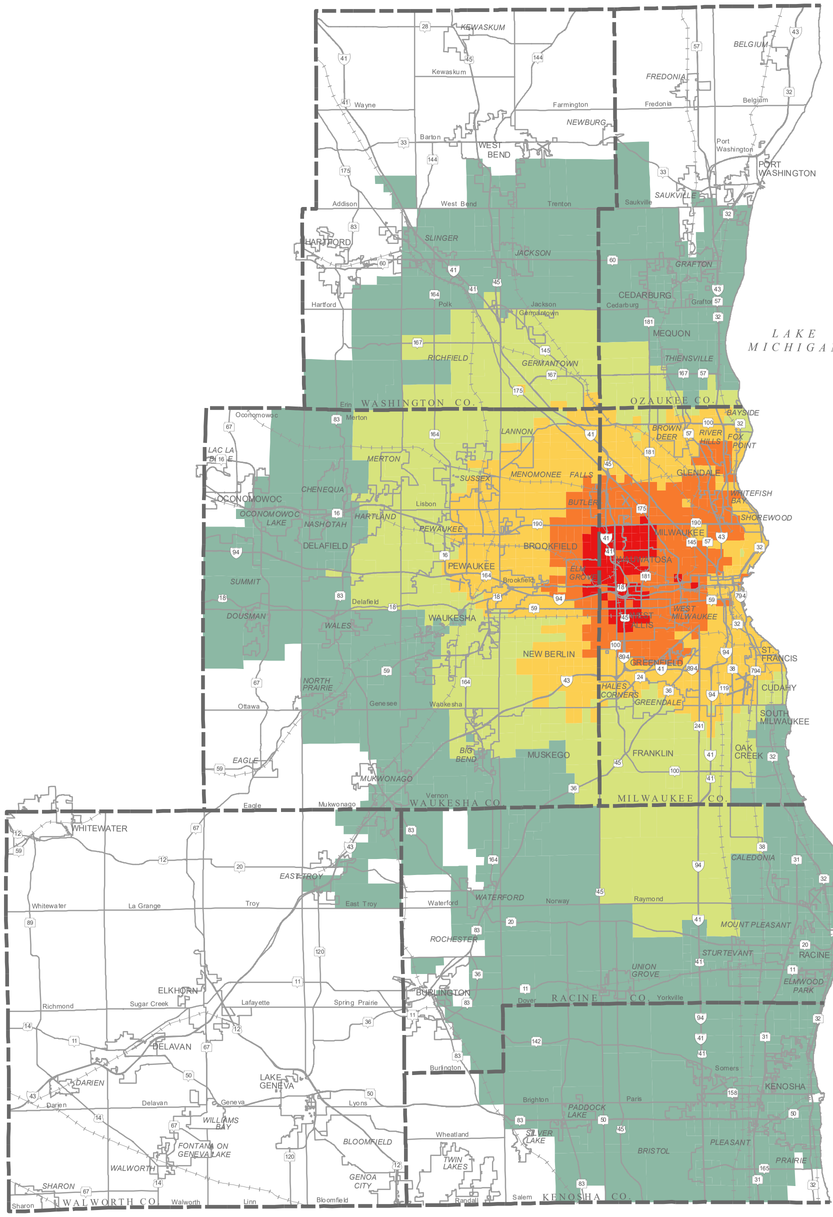
Map F.19
Lower-Wage Jobs Accessible Within 30 Minutes by Automobile: Existing and Trend



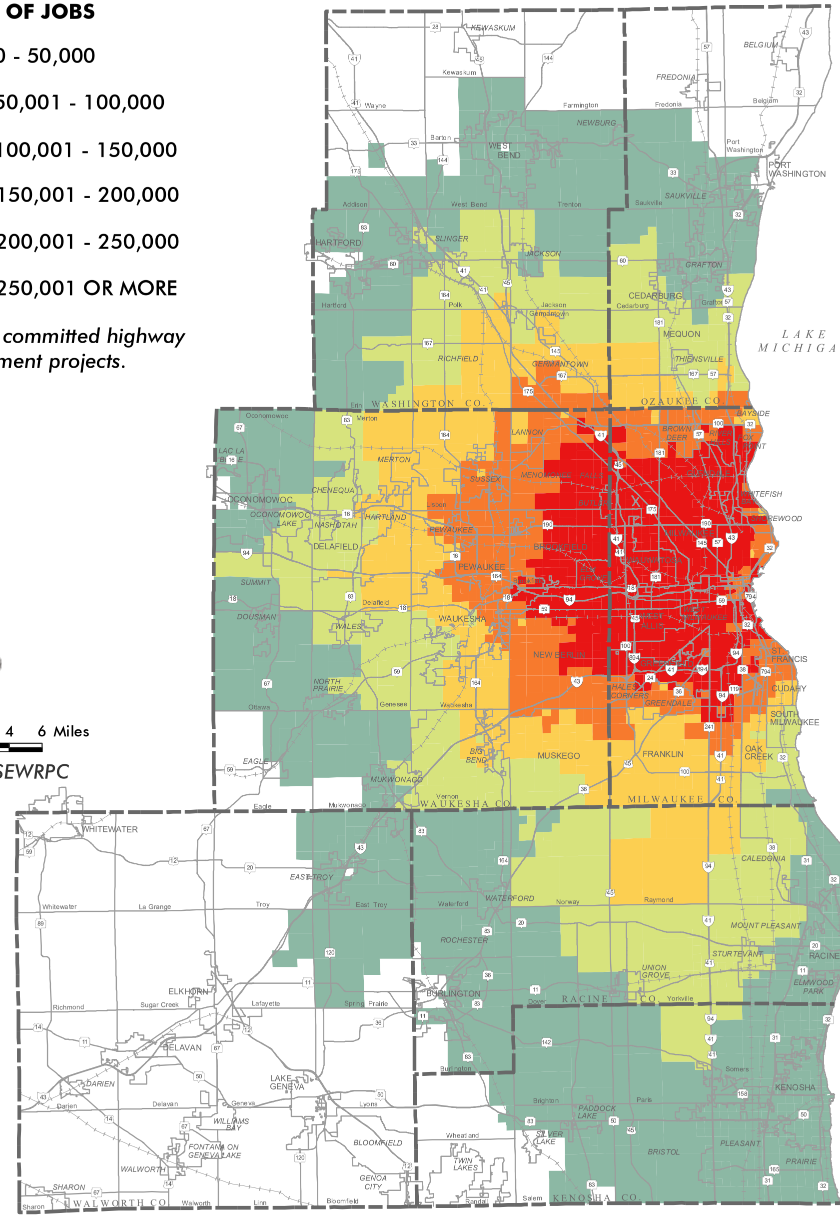
Source: SEWRPC

Map F.20
Lower-Wage Jobs Accessible Within 30 Minutes by Automobile: Alternative I

ALTERNATIVE I - WITHOUT HIGHWAY IMPROVEMENTS[a]



ALTERNATIVE I - WITH HIGHWAY IMPROVEMENTS



NUMBER OF JOBS

- 0 - 50,000
- 50,001 - 100,000
- 100,001 - 150,000
- 150,001 - 200,000
- 200,001 - 250,000
- 250,001 OR MORE

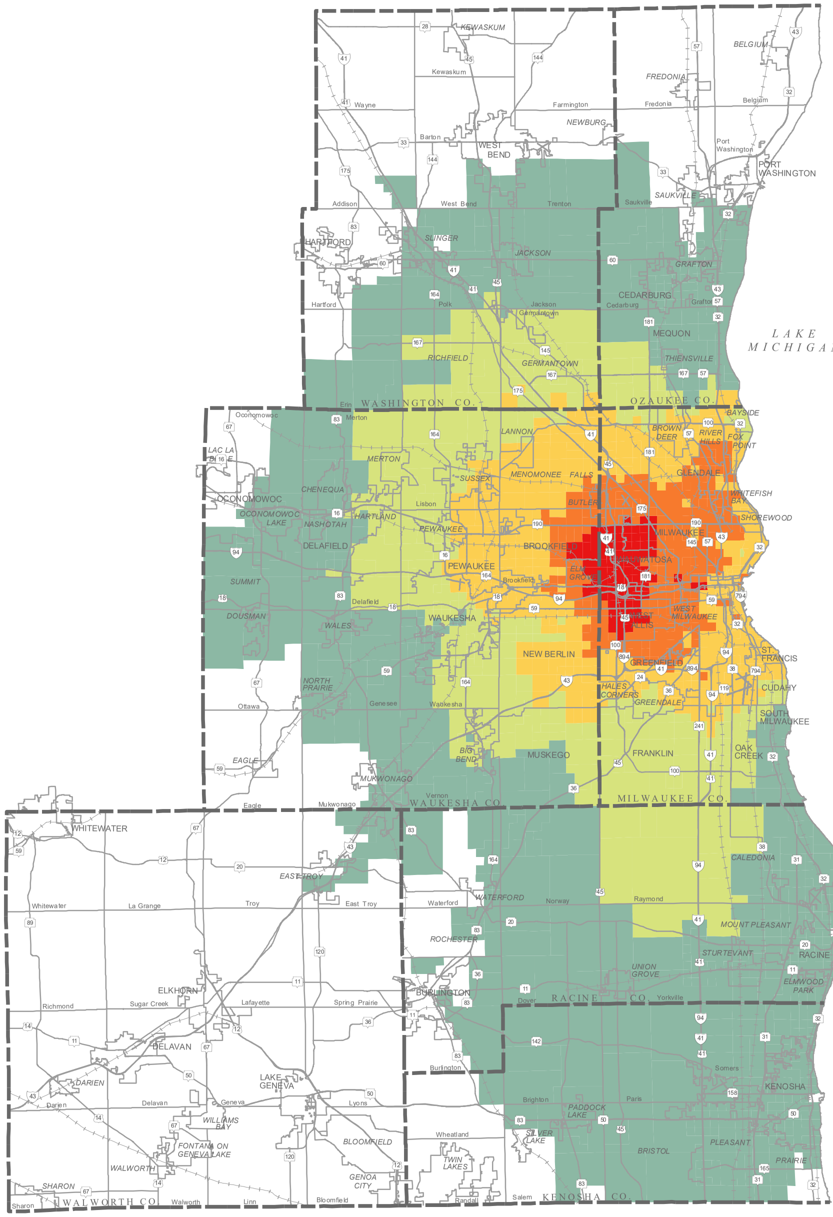
[a] *Includes committed highway improvement projects.*

0 2 4 6 Miles

Source: SEWRPC

Map F.21
Lower-Wage Jobs Accessible Within 30 Minutes by Automobile: Alternative II

ALTERNATIVE II - WITHOUT HIGHWAY IMPROVEMENTS[a]



NUMBER OF JOBS

- 0 - 50,000
- 50,001 - 100,000
- 100,001 - 150,000
- 150,001 - 200,000
- 200,001 - 250,000
- 250,001 OR MORE

[a] *Includes committed highway improvement projects.*

0 2 4 6 Miles

Source: SEWRPC

ALTERNATIVE II - WITH HIGHWAY IMPROVEMENTS

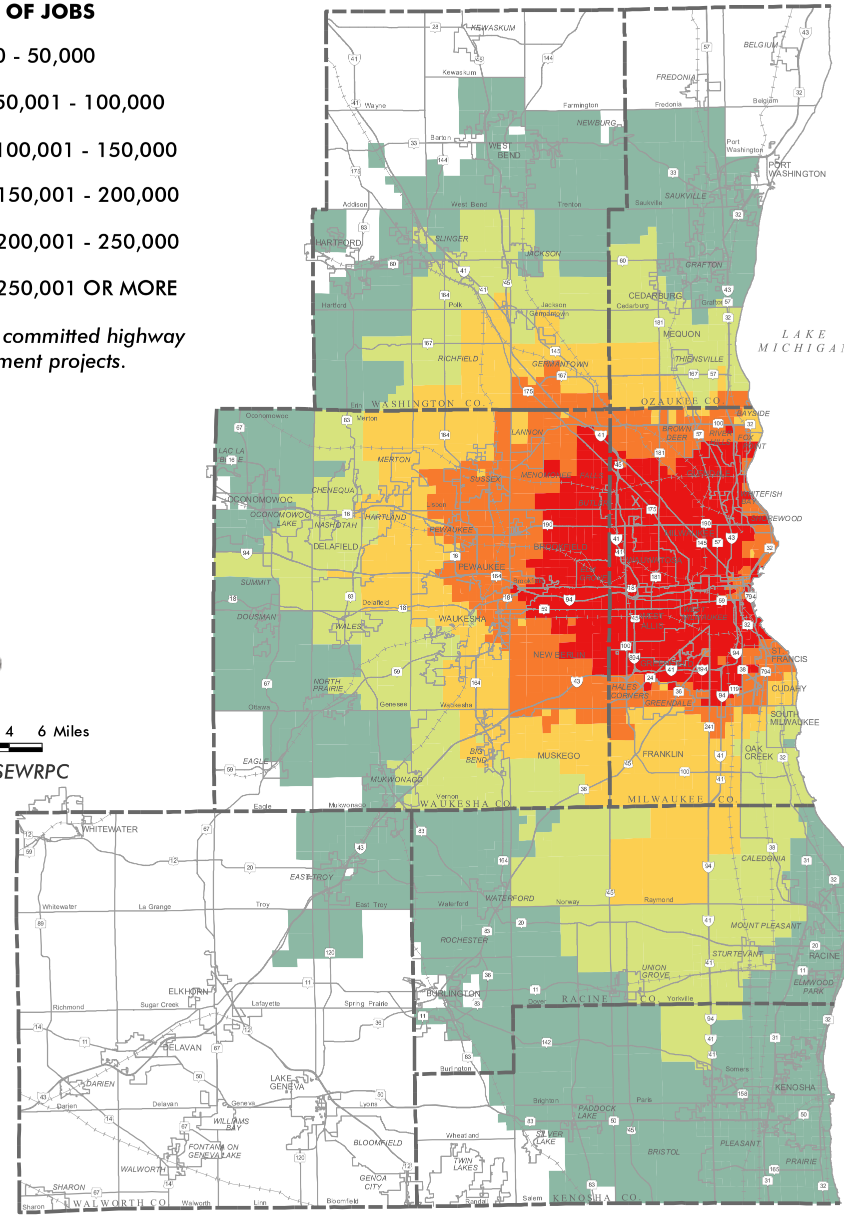


Table F.12
Access to Lower-Wage Jobs Within 30 Minutes by Automobile

Minority Population[a]

Alternative	100,000 – 249,999 Jobs		250,000 – 499,999 Jobs		500,000 or More Jobs		Total Minority Population
	People	Percent	People	Percent	People	Percent	
Existing - 2010	89,600	15.4	61,300	10.5	407,400	69.9	582,900
Trend - 2050	88,700	15.2	40,800	7.0	435,600	74.7	582,900
Alt I - 2050	88,400	15.2	38,400	6.6	438,300	75.2	582,900
Alt II - 2050	88,300	15.1	41,900	7.2	434,300	74.5	582,900

Families in Poverty[a]

Alternative	100,000 – 249,999 Jobs		250,000 – 499,999 Jobs		500,000 or More Jobs		Total Families in Poverty
	Families	Percent	Families	Percent	Families	Percent	
Existing - 2010	9,100	17.4	5,200	9.9	33,700	64.4	52,300
Trend - 2050	9,800	18.7	3,500	6.7	36,200	69.2	52,300
Alt I - 2050	9,800	18.7	3,300	6.3	36,400	69.6	52,300
Alt II - 2050	9,700	18.5	3,500	6.7	36,100	69.0	52,300

[a] *Minority population is based on the 2010 U.S. Census and families in poverty are based on the 2008-2012 American Community Survey.*

Source: U.S. Bureau of the Census, U.S. Census and American Community Survey; and SEWRPC

and existing conditions indicates that both alternative plans significantly improve accessibility provided by transit, and many of the investments in transit are targeted in areas that would result in the minority populations and low-income populations in the Region benefiting from these improvements.

Maps F.22 and F.23 show those areas of the Region with the highest job densities that would be directly served by transit under existing conditions, the Trend, and Alternatives I and II. As shown on these maps, the transit service areas under the alternatives would principally serve the areas of the Region with the highest density of jobs, with the transit service improvement and expansion under Alternatives I and II providing access to the most jobs. Specifically, the number of jobs that would be served by transit under these alternatives would increase from 734,000 jobs under current conditions to 967,000 jobs under Alternative I and to 1,020,000 jobs under Alternative II.

Maps F.24 through F.27 show the number of jobs that could be accessible within 30 minutes by transit under existing conditions and under each alternative. Comparing these maps to areas of existing concentrations of minority populations and low-income populations (as shown on Maps F.17 and F.18) indicates that access to jobs for these populations would improve significantly due to the improvement and expansion of transit service under Alternative II, followed by the transit service under Alternative I. As shown in Table F.14, the significant improvement and expansion of transit (including expansion of rapid transit service) under Alternative II would provide access to at least 100,000 jobs within 30 minutes by transit to the highest proportions of the existing minority population (19.0 percent) and families in poverty (19.3 percent). In comparison, improving and expanding transit under Alternative I would provide access to at least 100,000 jobs to about 14.5 percent of the existing minority population and 15.3 percent of the existing families in poverty.

Table F.13
Reasonable Access to Activity Centers by Automobile[a]

Minority Population[b]

Activity Center	Existing (2010)		Trend (2050)		Alternative I (2050)		Alternative II (2050)		Total Minority Population
	People	Percent	People	Percent	People	Percent	People	Percent	
Retail Centers	565,400	97.0	565,800	97.1	566,000	97.1	565,900	97.1	582,900
Major Parks	582,900	100.0	582,900	100.0	582,900	100.0	582,900	100.0	582,900
Public Technical Colleges and Universities	582,800	99.9	582,800	99.9	582,800	99.9	582,800	99.9	582,900
Health Care Facilities	581,800	99.8	582,900	100.0	582,900	100.0	582,900	100.0	582,900
Grocery Stores	582,900	100.0	582,900	100.0	582,900	100.0	582,900	100.0	582,900
General Mitchell International Airport	571,500	98.0	575,600	98.7	575,700	98.8	575,400	98.7	582,900
Milwaukee Regional Medical Center	531,000	91.1	533,400	91.5	536,600	92.1	534,300	91.7	582,900

Families in Poverty[b]

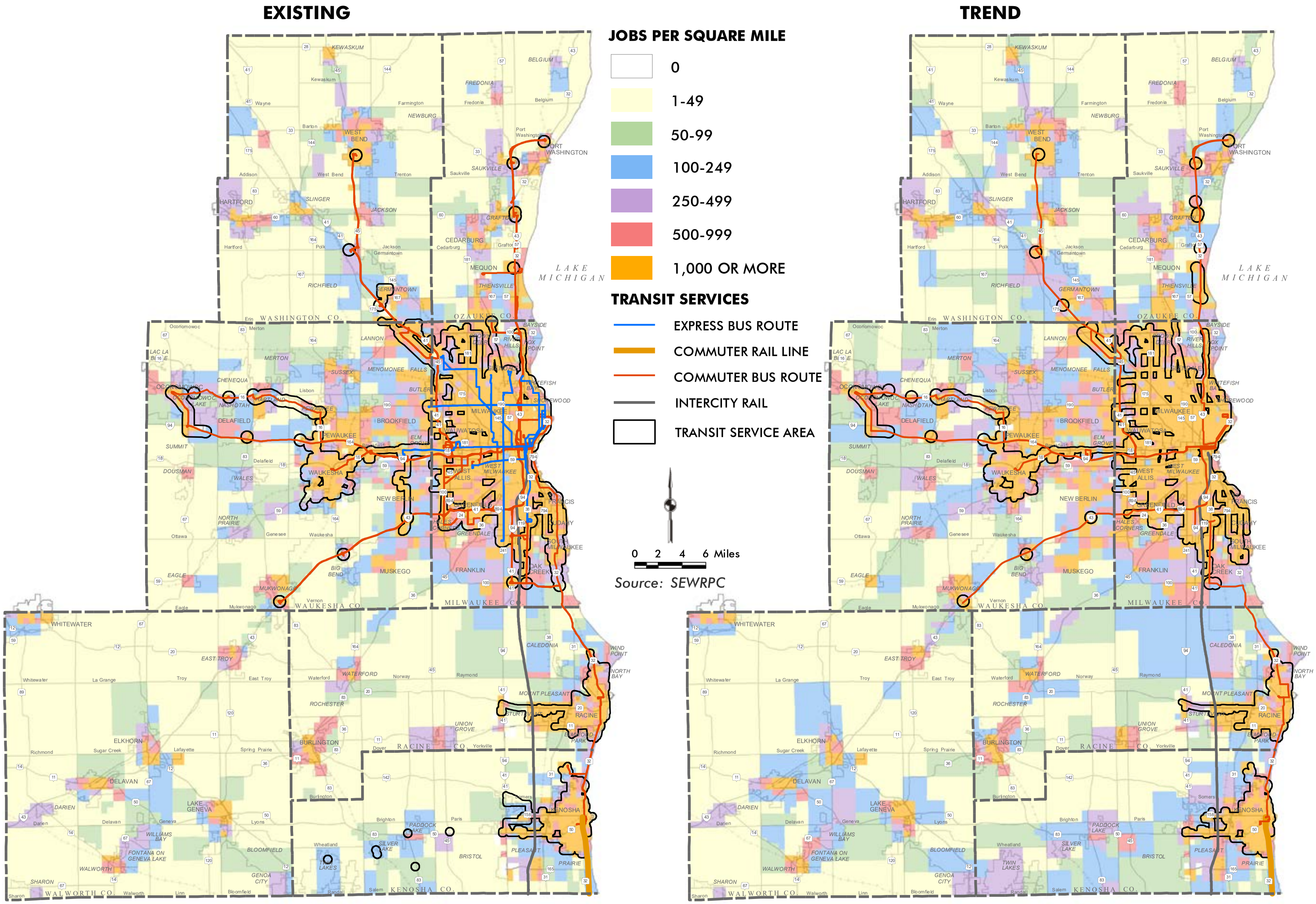
Activity Center	Existing (2010)		Trend (2050)		Alternative I (2050)		Alternative II (2050)		Total Families in Poverty
	Families	Percent	Families	Percent	Families	Percent	Families	Percent	
Retail Centers	49,300	94.3	49,400	94.5	49,400	94.5	49,400	94.5	52,300
Major Parks	52,300	100.0	52,300	100.0	52,300	100.0	52,300	100.0	52,300
Public Technical Colleges and Universities	52,300	100.0	52,300	100.0	52,300	100.0	52,300	100.0	52,300
Health Care Facilities	52,100	99.6	52,300	100.0	52,300	100.0	52,300	100.0	52,300
Grocery Stores	52,300	100.0	52,300	100.0	52,300	100.0	52,300	100.0	52,300
General Mitchell International Airport	50,100	95.8	51,000	97.5	51,100	97.7	51,100	97.5	52,300
Milwaukee Regional Medical Center	46,300	88.5	46,700	89.3	47,000	89.9	46,900	89.7	52,300

[a] *Reasonable access is defined as the ability to travel by automobile within 60 minutes to General Mitchell International Airport and the Milwaukee Regional Medical Center and within 30 minutes to all the other activity centers.*

[b] *Minority population is based on the 2010 U.S. Census and families in poverty are based on the 2008-2012 American Community Survey.*

Source: U.S. Bureau of the Census, U.S. Census and American Community Survey; and SEWRPC

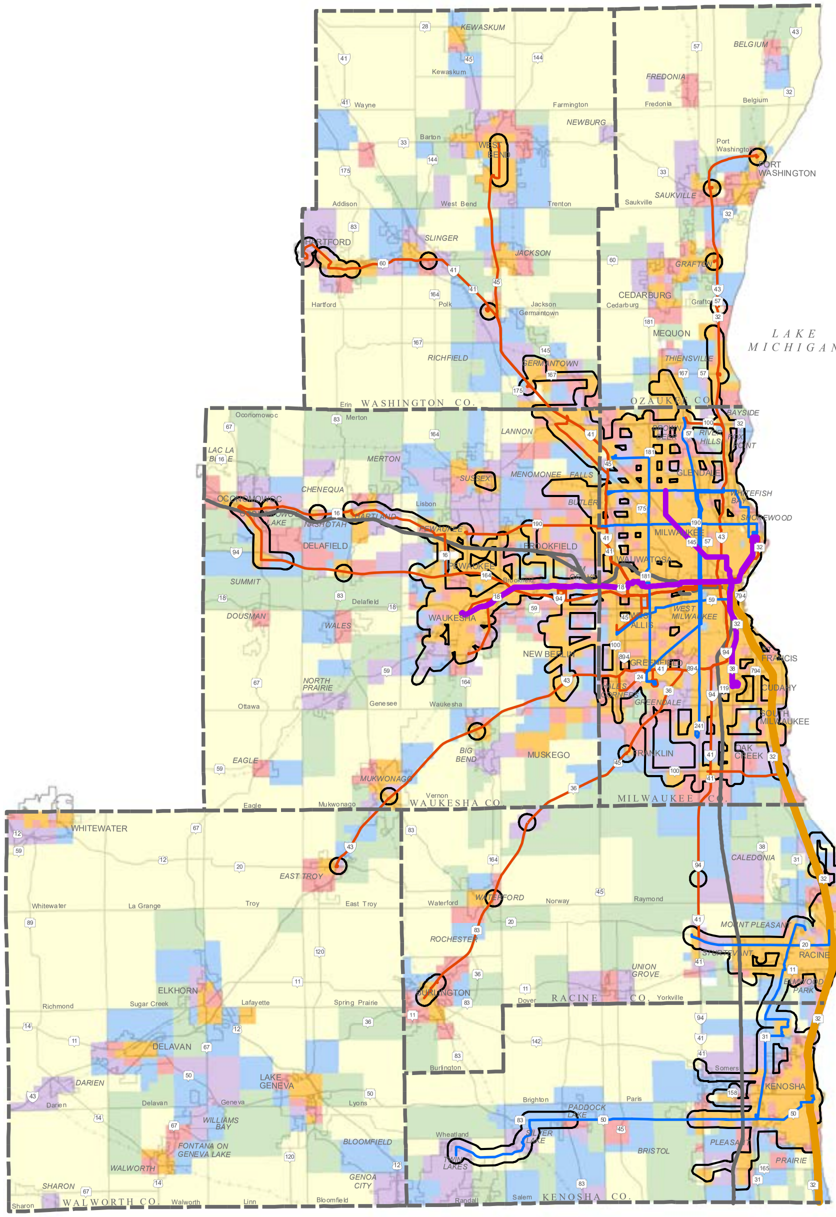
Map F.22
Comparison of Public Transit Services to Job Density in the Region: Existing and Trend



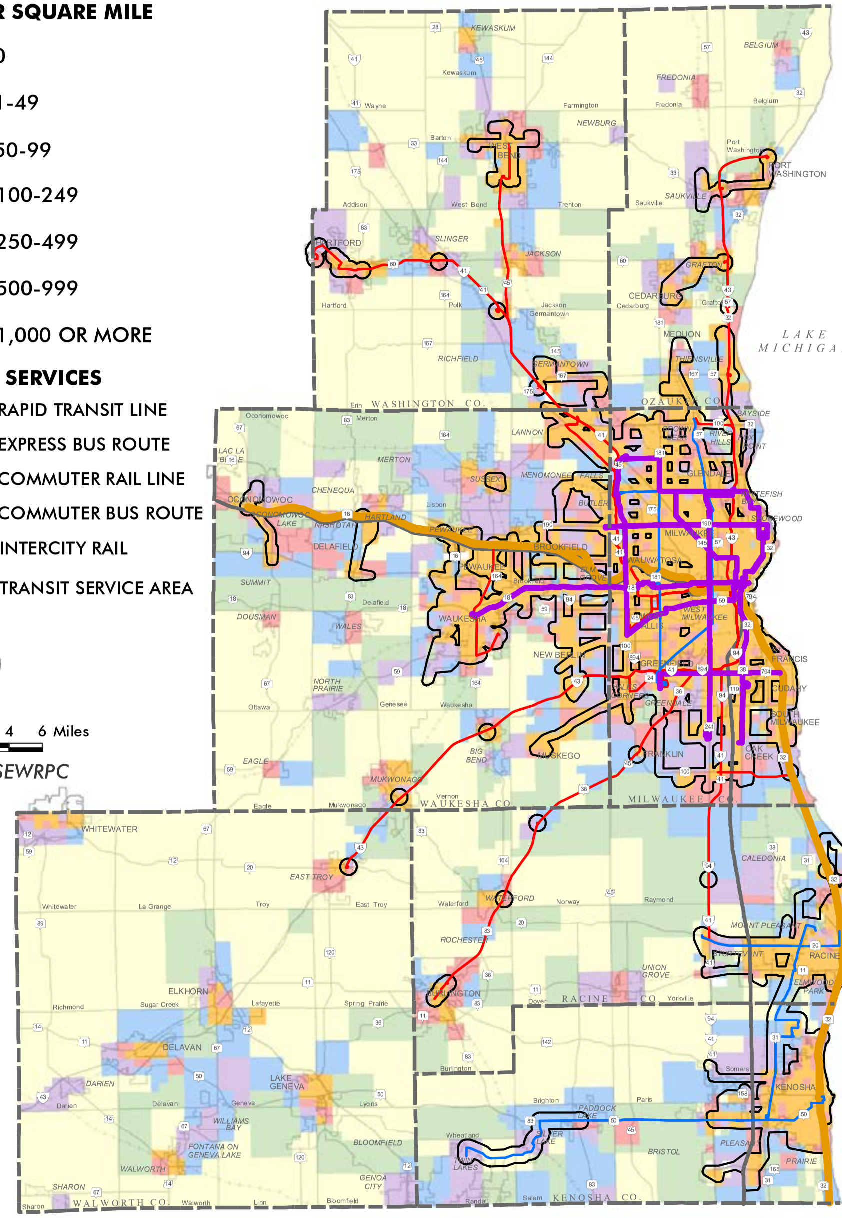
Source: SEWRPC

Map F.23
Comparison of Public Transit Element to Job Density in the Region: Alternative I and Alternative II

ALTERNATIVE I



ALTERNATIVE II



JOBS PER SQUARE MILE

- 0
- 1-49
- 50-99
- 100-249
- 250-499
- 500-999
- 1,000 OR MORE

TRANSIT SERVICES

- RAPID TRANSIT LINE
- EXPRESS BUS ROUTE
- COMMUTER RAIL LINE
- COMMUTER BUS ROUTE
- INTERCITY RAIL
- TRANSIT SERVICE AREA

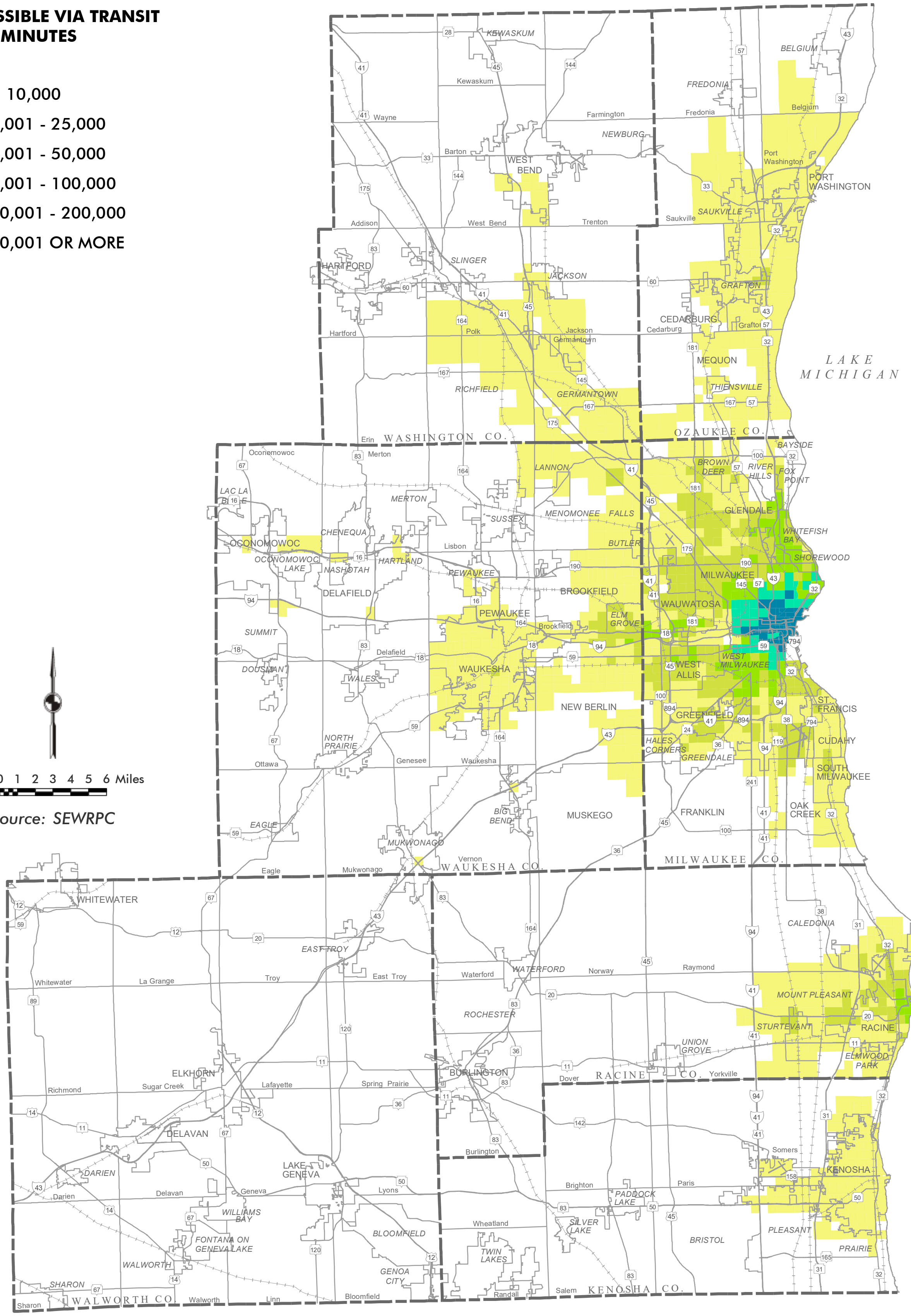
0 2 4 6 Miles

Source: SEWRPC

Map F.24
Access to Jobs Within 30 Minutes by Transit: Existing

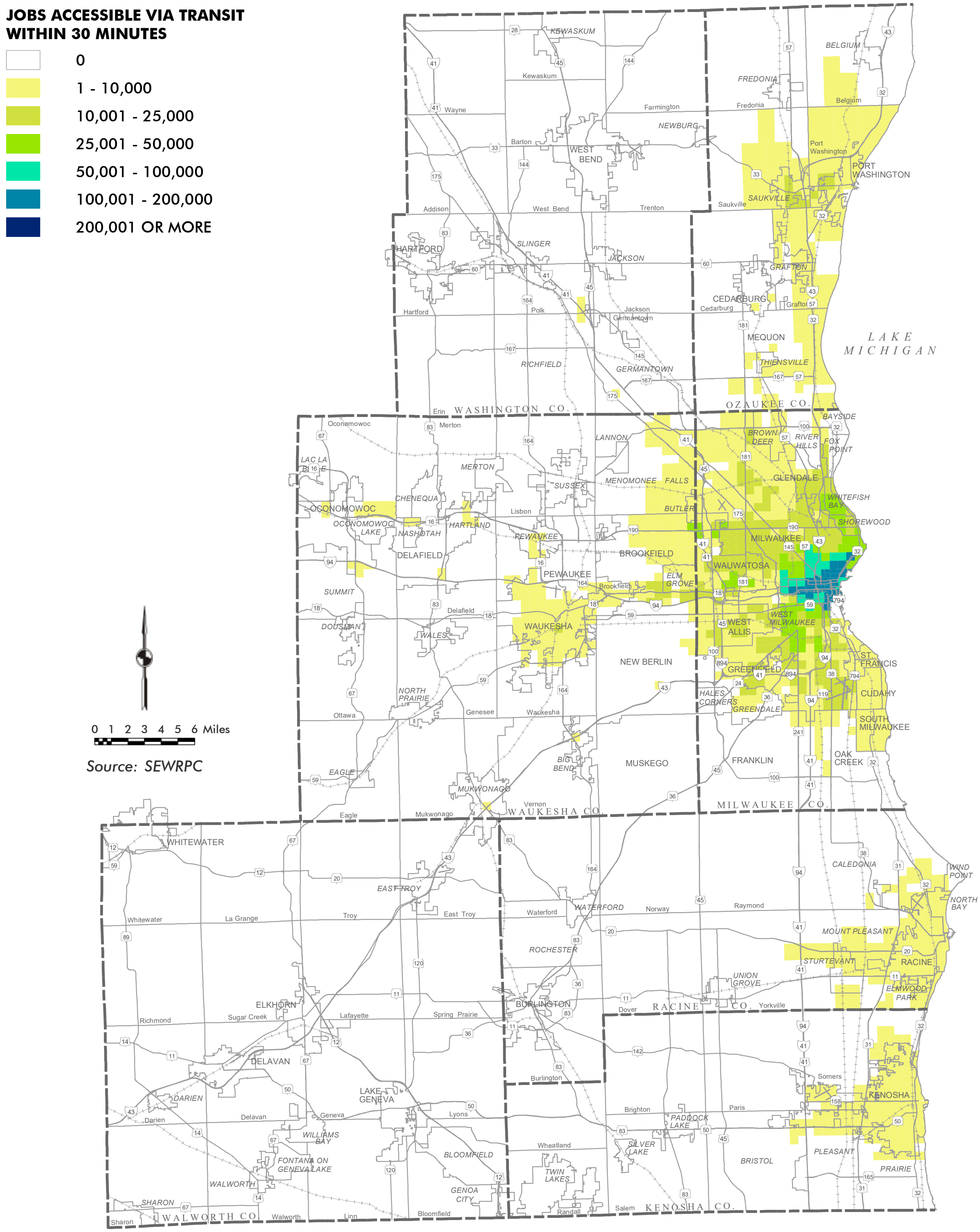
JOBS ACCESSIBLE VIA TRANSIT WITHIN 30 MINUTES

- 0
- 1 - 10,000
- 10,001 - 25,000
- 25,001 - 50,000
- 50,001 - 100,000
- 100,001 - 200,000
- 200,001 OR MORE



Source: SEWRPC

Map F.25
Access to Jobs Within 30 Minutes by Transit: Trend

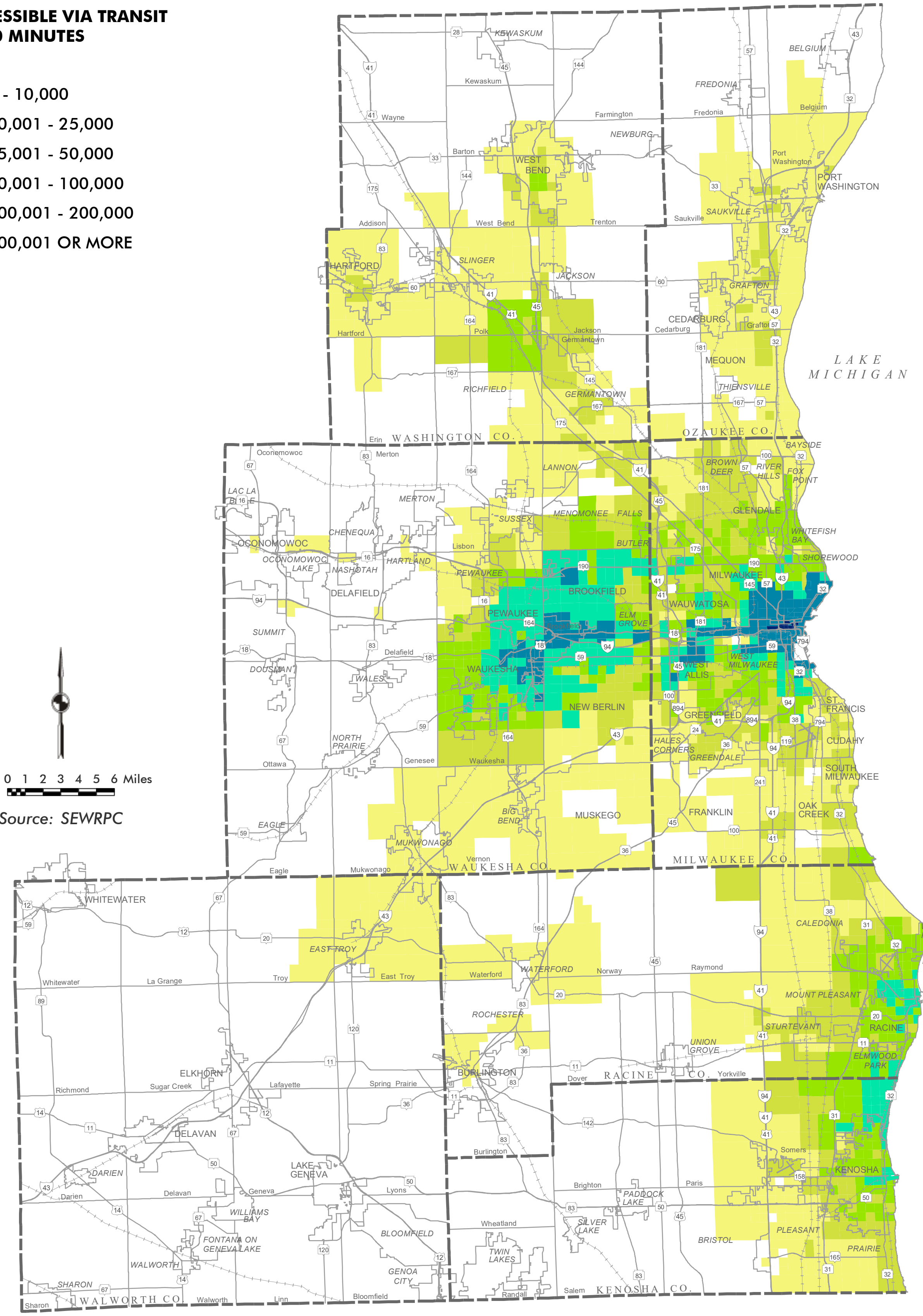


Source: SEWRPC

Map F.26
Access to Jobs Within 30 Minutes by Transit: Alternative I

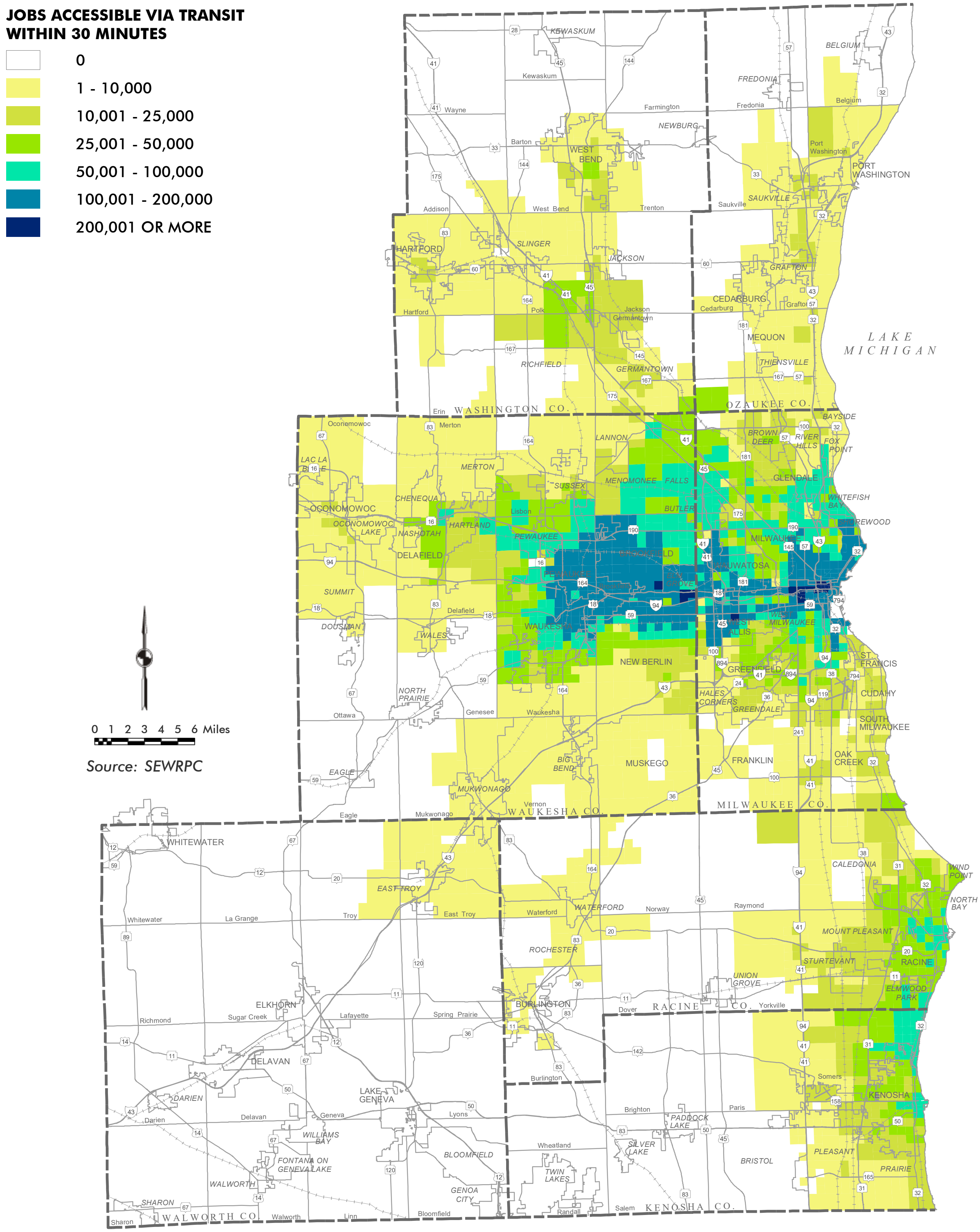
JOBS ACCESSIBLE VIA TRANSIT WITHIN 30 MINUTES

- 0
- 1 - 10,000
- 10,001 - 25,000
- 25,001 - 50,000
- 50,001 - 100,000
- 100,001 - 200,000
- 200,001 OR MORE



Source: SEWRPC

Map F.27
Access to Jobs Within 30 Minutes by Transit: Alternative II



Source: SEWRPC

Table F.14
Access to Jobs Within 30 Minutes by Transit

Minority Population[a]

Alternative	10,000 - 49,999 Jobs People	10,000 - 49,999 Jobs Percent	50,000 - 99,999 Jobs People	50,000 - 99,999 Jobs Percent	100,000 or More Jobs People	100,000 or More Jobs Percent	Total Minority Population
Existing - 2015	254,800	43.7	68,500	11.8	18,900	3.2	582,900
Trend - 2050	234,800	40.3	30,000	5.1	13,900	2.4	582,900
Alt I - 2050	309,800	53.1	97,700	16.8	84,600	14.5	582,900
Alt II - 2050	240,200	41.2	158,100	27.1	111,000	19.0	582,900

Families in Poverty[a]

Alternative	10,000 - 49,999 Jobs Families	10,000 - 49,999 Jobs Percent	50,000 - 99,999 Jobs Families	50,000 - 99,999 Jobs Percent	100,000 or More Jobs Families	100,000 or More Jobs Percent	Total Families in Poverty
Existing - 2015	21,500	41.1	6,200	11.9	1,700	3.3	52,300
Trend - 2050	20,100	38.4	2,700	5.2	1,300	2.5	52,300
Alt I - 2050	25,200	48.2	8,700	16.6	8,000	15.3	52,300
Alt II - 2050	19,600	37.5	13,600	26.0	10,100	19.3	52,300

[a] *Minority population is based on the 2010 U.S. Census and families in poverty are based on the 2008-2012 American Community Survey.*

Source: U.S. Bureau of the Census, U.S. Census and American Community Survey; and SEWRPC

Table F.15
Additional Percent of Total Minority/Non-Minority Population[a] and Families in Poverty/Families Not in Poverty[a] Having Access to 100,000 or More Jobs by Transit Under Alternatives I and II

Alternative	Minority Population	Non-Minority Population	Families in Poverty	Families Not in Poverty
Alt I - 2050	11	4	12	4
Alt II - 2050	16	11	16	10

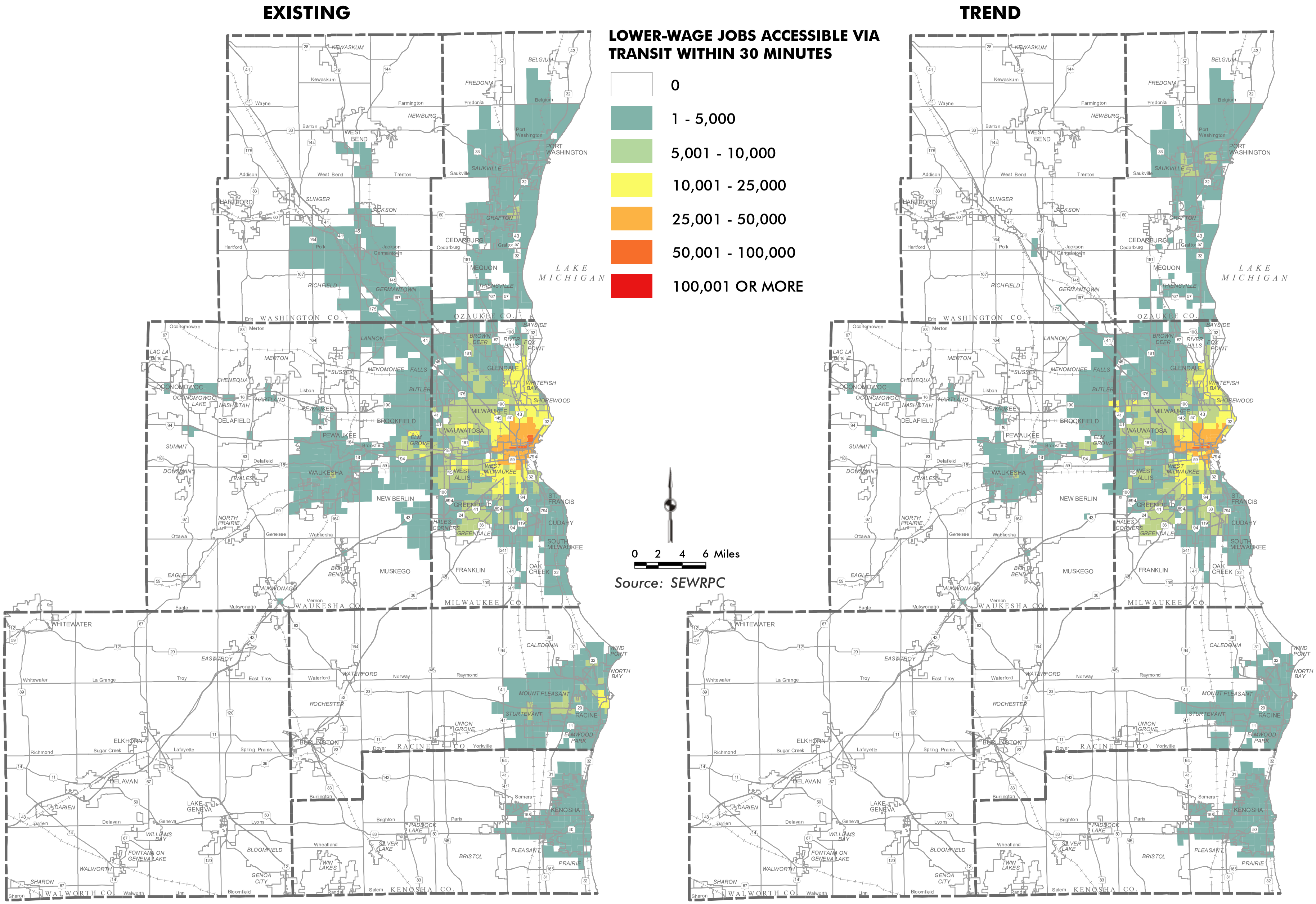
[a] *Minority population and non-minority population are based on the 2010 U.S. Census and families in poverty and families not in poverty are based on the 2008-2012 American Community Survey.*

Source: U.S. Bureau of the Census, U.S. Census and American Community Survey; and SEWRPC

As shown in Table F.15, the existing minority population and families in poverty with access to at least 100,000 jobs by transit would increase by about 16 percent under Alternative II, compared to about 10 to 11 percent for the non-minority population and families not in poverty. Under Alternative I, it is projected that there would be an increase of about 11 to 12 percent in the existing minority population and families in poverty that would have access to at least 100,000 by transit, compared to an increase of about 4 percent for the non-minority population and families not in poverty.

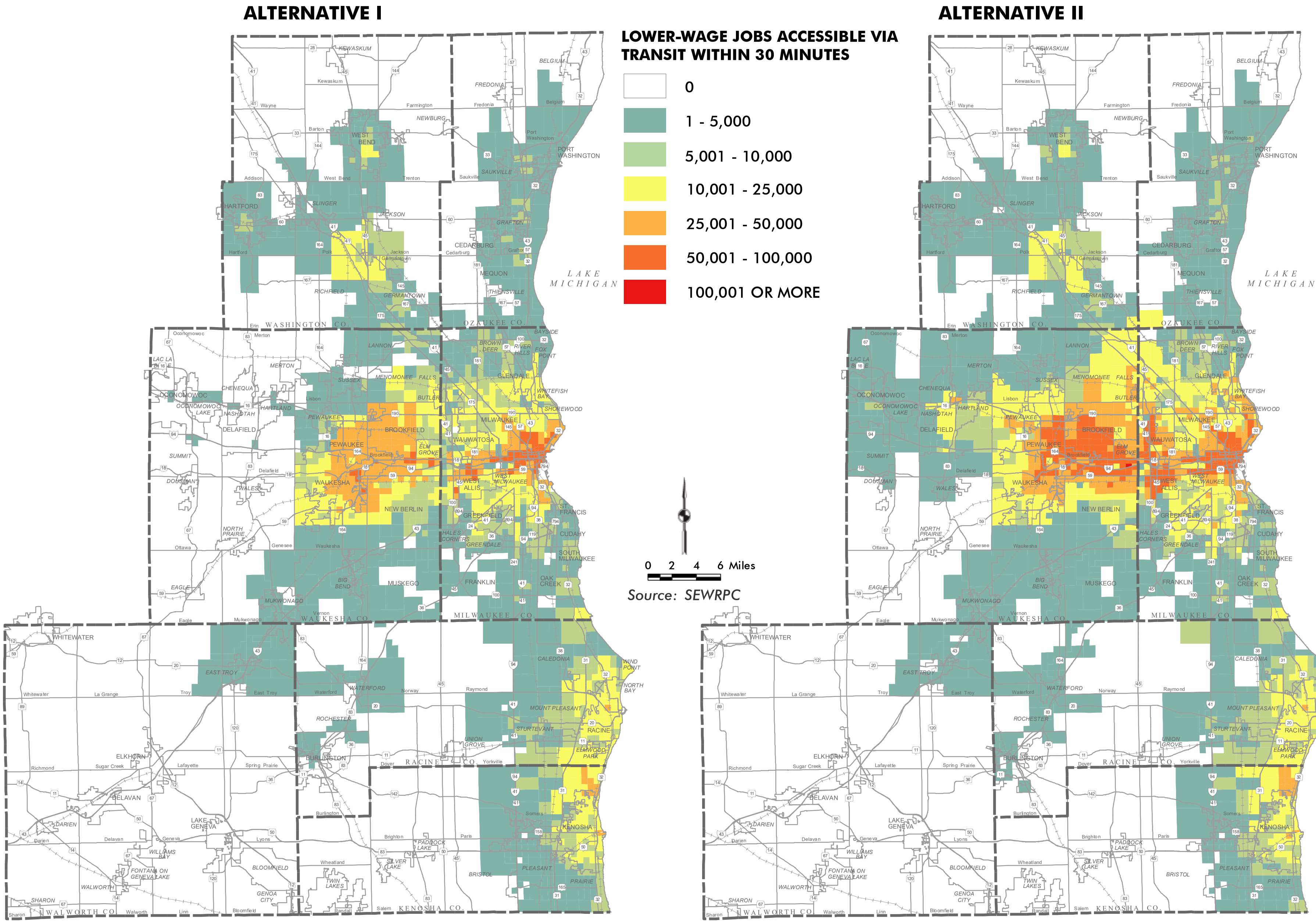
Maps F.28 and F.29 show the number of lower-wage jobs that would be accessible in 30 minutes under existing conditions and the alternatives. Lower-wage jobs are estimated to represent about 32 percent of the total jobs in the Region. Comparing these maps to areas of existing concentrations of minority populations and low-income populations (as shown on Maps F.17 and F.18) shows that access to lower-wage jobs for these populations would improve significantly due to the improvement and expansion of transit service under Alternative II, followed by the transit service under Alternative I. As shown in Table F.16, it is projected that about 31 percent each of the existing minority population and families in poverty would have access to at least 25,000 lower-wage jobs within 30 minutes by transit under Alternative II, compared to about 21 to 22 percent of the existing minorities and families in poverty under Alternative I.

Map F.28
Access to Lower-Wage Jobs Within 30 Minutes by Transit: Existing and Trend



Map F.29

Access to Lower-Wage Jobs Within 30 Minutes by Transit: Alternative I and Alternative II



Source: SEWRPC

Table F.16
Access to Lower-Wage Jobs Within 30 Minutes by Transit

Minority Population[a]

Alternative	5,000 - 9,999 Jobs		10,000 - 24,999 Jobs		25,000 or More Jobs		Total Minority Population
	People	Percent	People	Percent	People	Percent	
Existing - 2015	127,000	21.8	110,300	18.9	66,800	11.5	582,900
Trend - 2050	146,500	25.1	73,300	12.6	35,100	6.0	582,900
Alt I - 2050	110,000	18.9	236,200	40.5	124,300	21.3	582,900
Alt II - 2050	79,000	13.6	234,600	40.2	182,500	31.3	582,900

Families in Poverty[a]

Alternative	5,000 - 9,999 Jobs		10,000 - 24,999 Jobs		25,000 or More Jobs		Total Families in Poverty
	Families	Percent	Families	Percent	Families	Percent	
Existing - 2015	9,800	18.7	10,200	19.5	6,000	11.5	52,300
Trend - 2050	12,500	23.9	6,600	12.6	3,100	5.9	52,300
Alt I - 2050	8,600	16.4	20,400	39.0	11,400	21.8	52,300
Alt II - 2050	6,500	12.4	19,500	37.3	16,300	31.2	52,300

[a] *Minority population is based on the 2010 U.S. Census and families in poverty are based on the 2008-2012 American Community Survey.*

Source: U.S. Bureau of the Census, U.S. Census and American Community Survey; and SEWRPC

As described for Criterion 4.2.1 (Travel Time to Important Places by Mode), the substantial increases in transit service under Alternative II provide access for the most people to existing retail centers, major parks, public technical colleges/universities, health care facilities, grocery stores, MRMC, and GMIA. Table F.17 shows the existing minority populations and low-income populations that would have reasonable access (within 30 minutes) by transit to these activity centers. The significant expansion under Alternatives I and II would greatly improve access for existing minority populations and low-income populations to the activity centers analyzed, with Alternative II generally serving 5 to 8 percent more minority populations and low-income populations than Alternative I.

As shown in Table F.18, the improvement and expansion of transit under Alternative II would result in increases from existing conditions of between 11 and 39 percent in total minority population and families in poverty that would have reasonable access to the various activity centers under Alternative II, compared to increases of 9 to 28 percent in total non-minority population and families not in poverty. Under Alternative I, it is projected that there would be increases of 8 to 20 percent in minority population and families in poverty with reasonable access to the various activity centers, compared to increases of 6 to 19 percent in total non-minority population and families not in poverty.

- **Comparing Improved Accessibility for Transit and Driving:** A comparison of the improvements in accessibility under the transit element of the alternatives to the highway element of the alternatives clearly indicates that the transit elements of Alternatives I and II would result in substantial increases in transit accessibility to jobs and other activities, and the highway elements of Alternatives I and II would result in only modest increases in highway accessibility to jobs and other activities. The modest increases in highway accessibility would benefit the majority of minority residents and low-income residents who travel by automobile. The substantial increases in transit accessibility, particularly under Alternative II, would provide significant benefits to those who may not be able to afford a car and need public transit service to be able to reach jobs and other activities.

Table F.17
Reasonable Access to Activity Centers by Transit[a]

Minority Population[b]

Activity Center	Existing (2015)		Trend (2050)		Alternative I (2050)		Alternative II (2050)		Total Minority Population
	Population	Percent	Population	Percent	Population	Percent	Population	Percent	
Retail Centers	104,000	17.8	75,800	13.0	181,100	31.1	229,800	39.4	582,900
Major Parks	46,300	7.9	31,100	5.3	106,200	18.2	151,400	26.0	582,900
Public Technical Colleges and Universities	157,700	27.1	135,200	23.2	217,500	37.3	259,700	44.6	582,900
Health Care Facilities	292,700	50.2	258,000	44.3	342,000	58.7	369,800	63.4	582,900
Grocery Stores	455,400	78.1	444,900	76.3	512,600	87.9	525,800	90.2	582,900
General Mitchell International Airport	72,900	12.5	59,300	10.2	124,300	21.3	164,300	28.2	582,900
Milwaukee Regional Medical Center	144,800	24.8	123,700	21.2	262,300	45.0	376,000	64.5	582,900

Families in Poverty[b]

Activity Center	Existing (2015)		Trend (2050)		Alternative I (2050)		Alternative II (2050)		Total Families in Poverty
	Families	Percent	Families	Percent	Families	Percent	Families	Percent	
Retail Centers	9,000	17.2	6,500	12.4	15,800	30.2	19,900	38.0	52,300
Major Parks	4,400	8.4	3,100	5.9	9,300	17.8	13,100	25.0	52,300
Public Technical Colleges and Universities	14,800	28.3	12,700	24.3	20,300	38.8	24,000	45.9	52,300
Health Care Facilities	25,600	48.9	22,600	43.2	29,800	57.0	32,500	62.1	52,300
Grocery Stores	38,400	73.4	37,200	71.1	42,700	81.6	44,100	84.3	52,300
General Mitchell International Airport	5,900	11.3	5,000	9.6	10,800	20.7	14,800	28.3	52,300
Milwaukee Regional Medical Center	13,100	25.0	11,200	21.4	22,500	43.0	31,800	60.8	52,300

[a] *Reasonable access is defined as the ability to travel by transit within 60 minutes to General Mitchell International Airport and the Milwaukee Regional Medical Center and within 30 minutes to all the other activity centers.*

[b] *Minority population is based on the 2010 U.S. Census and families in poverty are based on the 2008-2012 American Community Survey.*

Source: U.S. Bureau of the Census, U.S. Census and American Community Survey; and SEWRPC

Table F.18
Additional Percent of Total Minority/Non-Minority Population[a] and Families in Poverty/Families Not In Poverty[a] Having Reasonable Access[b] to Activity Centers by Transit Under Alternatives I and II

	Alternative I (2050)				Alternative II (2050)			
Activity Center	Minority	Non-Minority	Families in Poverty	Families Not in Poverty	Minority	Non-Minority	Families in Poverty	Families Not in Poverty
Retail Centers	13	19	13	17	22	28	21	25
Major Parks	10	11	9	11	18	20	17	19
Public Technical Colleges and Universities	10	15	11	13	17	23	18	21
Health Care Facilities	8	13	8	12	13	23	13	20
Grocery Stores	10	15	8	14	12	22	11	20
General Mitchell International Airport	9	7	9	6	16	10	17	9
Milwaukee Regional Medical Center	20	10	18	11	39	25	36	26

[a] *Minority population and non-minority population are based on the 2010 U.S. Census and families in poverty and families not in poverty are based on the 2008-2012 American Community Survey.*

[b] *Reasonable access is defined as the ability to travel by transit within 60 minutes to General Mitchell International Airport and the Milwaukee Regional Medical Center and within 30 minutes to all the other activity centers.*

Source: U.S. Bureau of the Census, U.S. Census and American Community Survey; and SEWRPC

CRITERION 2.1.2: MINORITY POPULATIONS AND LOW-INCOME POPULATIONS SERVED BY TRANSIT

KEY CONCLUSIONS

- **The transit systems under all three alternatives would serve the principal concentrations of existing minority populations and low-income populations, with Alternative II providing the highest level of transit service.**
- **The transit service area under Alternative II would provide the best access for existing minority populations and low-income populations, serving 518,500 minority people and 43,400 families in poverty (as compared to 469,600 people and 39,200 families under the Trend and 512,200 people and 42,900 families under Alternative I).**
- **Alternative II would provide the best access to fixed-guideway transit (bus rapid transit/light rail service and commuter rail service) to existing minority populations and low-income populations, with 238,800 minority people and 21,000 families in poverty within walking distance (compared to 3,200 minority people and 300 families in poverty under the Trend and 98,300 minority people and 8,300 families in poverty under Alternative I).**

Minority populations and low-income populations utilize public transit at a higher proportion relative to other modes of travel than the non-Hispanic white population of the Region. To an extent, any improvement in transit within the Region would be expected to benefit minority populations and low-income populations. For this criterion, an evaluation was conducted of the characteristics of the existing population located within the service area of each of the alternative public transit systems to compare the existing minority populations and low-income populations that would be served. Table F.19 and Maps F.30 through F.41 show information on the existing minority populations and low-income populations within walking distance of transit under existing conditions, the Trend, and Alternatives I and II.

- **Existing Transit Service:** While most of the base year 2015 routes and service areas for the public transit systems in the Region serve the principal concentrations of existing minority populations and low-income populations, serving about 488,100 minority people and 40,800 families in poverty, transit service in the Region has declined by 25 percent since the early 2000s and is expected to further decline based on expected existing and future available Federal and State funding.

- **The Trend:** Most of the transit routes and service areas under the Trend would continue to serve the principal concentrations of existing minority populations and low-income populations. However, based on the expected decline in transit service of an additional 22 percent under the Trend, the existing minority population served is expected to decline to about 469,600 people and the existing number of families in poverty served is expected to decline to about 39,200 families. This future transit service decline would particularly affect existing local bus service, potentially resulting in entire routes being cut, lower service frequencies, reduced service hours, and/or weekend service being eliminated, depending on the transit system.

Table F.19
Minority Population and Families in Poverty Served by Transit

Minority Population[a]

Alternative	Total Transit Service		Fixed-Guideway Transit Service[b]		Total Minority Population
	People	Percent	People	Percent	
Existing - 2015	488,100	83.7	3,200	0.5	582,900
Trend - 2050	469,600	80.6	3,200	0.5	582,900
Alt I - 2050	512,200	87.9	98,300	16.9	582,900
Alt II - 2050	518,500	89.0	238,800	41.0	582,900

Families in Poverty[a]

Alternative	Total Transit Service		Fixed-Guideway Transit Service[b]		Total Families in Poverty
	Families	Percent	Families	Percent	
Existing - 2015	40,800	78.0	300	0.6	52,300
Trend - 2050	39,200	75.0	300	0.6	52,300
Alt I - 2050	42,900	82.0	8,300	15.9	52,300
Alt II - 2050	43,400	83.0	20,500	39.2	52,300

[a] *Minority population is based on the 2010 U.S. Census and families in poverty are based on the 2008-2012 American Community Survey.*

[b] *Includes rapid transit and commuter rail services.*

Source: U.S. Bureau of the Census, U.S. Census and American Community Survey; and SEWRPC

- **Alternative I:** Under this alternative, the existing minority population served by transit would increase to 512,200 people and the existing number of families in poverty served by transit would increase to 42,900 families. The existing minority populations and low-income populations in this service area would benefit from a significant expansion of transit service under Alternative I, including a reversal of the recent decline in transit service levels and the introduction of fixed-guideway transit in a few major travel corridors. Under this alternative, existing minority populations and low-income populations would receive a direct benefit from the increased service area and frequency of local bus routes, more express and commuter bus routes, increased frequency on existing express bus routes, and reverse commute, all-day service on existing commuter bus routes. With respect to fixed-guideway transit, 98,300 minority people and 8,300 families in poverty would be served by rapid transit (bus rapid transit or light rail) or commuter rail service under Alternative I, compared to the Trend, under which only 3,200 minority people and 300 families in poverty would be served.

- **Alternative II:** The transit routes and service area under Alternative II would have the greatest benefit for existing minority populations and low-income populations, serving 518,500 minority people and 43,400 families in poverty. Similar to Alternative I, there would be a significant expansion of public transit service under this alternative. In addition to the large expansion of bus service, Alternative II includes a significant investment in fixed-guideway transit corridors, including rapid transit and commuter rail. Specifically, existing minority populations and low-income populations would likely receive a benefit from the increased service area and frequency of local bus routes, the 10 rapid transit corridors, increased frequency on existing express bus routes, and additional express and commuter bus routes. Alternative II would provide the greatest benefit to existing minority populations and low-income populations in terms of service provided by fixed-guideway transit—rapid transit or commuter rail—with an expected 238,800 minority people and 21,000 families in poverty served.

Map F.30
Comparison of Existing Concentrations of Total Minority Population in the Region to Public Transit Services: Existing

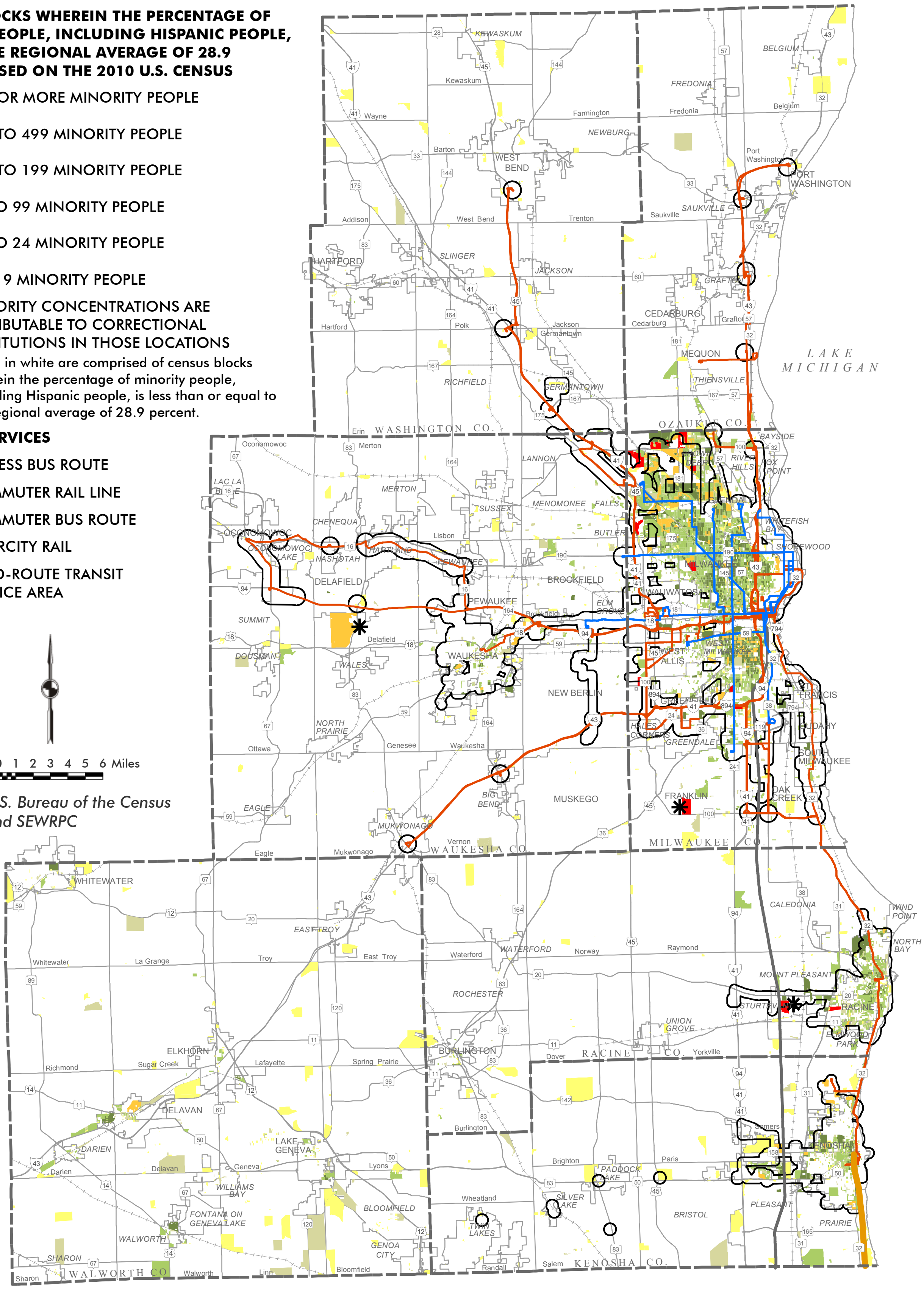
CENSUS BLOCKS WHEREIN THE PERCENTAGE OF MINORITY PEOPLE, INCLUDING HISPANIC PEOPLE, EXCEEDS THE REGIONAL AVERAGE OF 28.9 PERCENT BASED ON THE 2010 U.S. CENSUS

- 500 OR MORE MINORITY PEOPLE
- 200 TO 499 MINORITY PEOPLE
- 100 TO 199 MINORITY PEOPLE
- 25 TO 99 MINORITY PEOPLE
- 10 TO 24 MINORITY PEOPLE
- 1 TO 9 MINORITY PEOPLE
- * MINORITY CONCENTRATIONS ARE ATTRIBUTABLE TO CORRECTIONAL INSTITUTIONS IN THOSE LOCATIONS

Note: Areas in white are comprised of census blocks wherein the percentage of minority people, including Hispanic people, is less than or equal to the regional average of 28.9 percent.

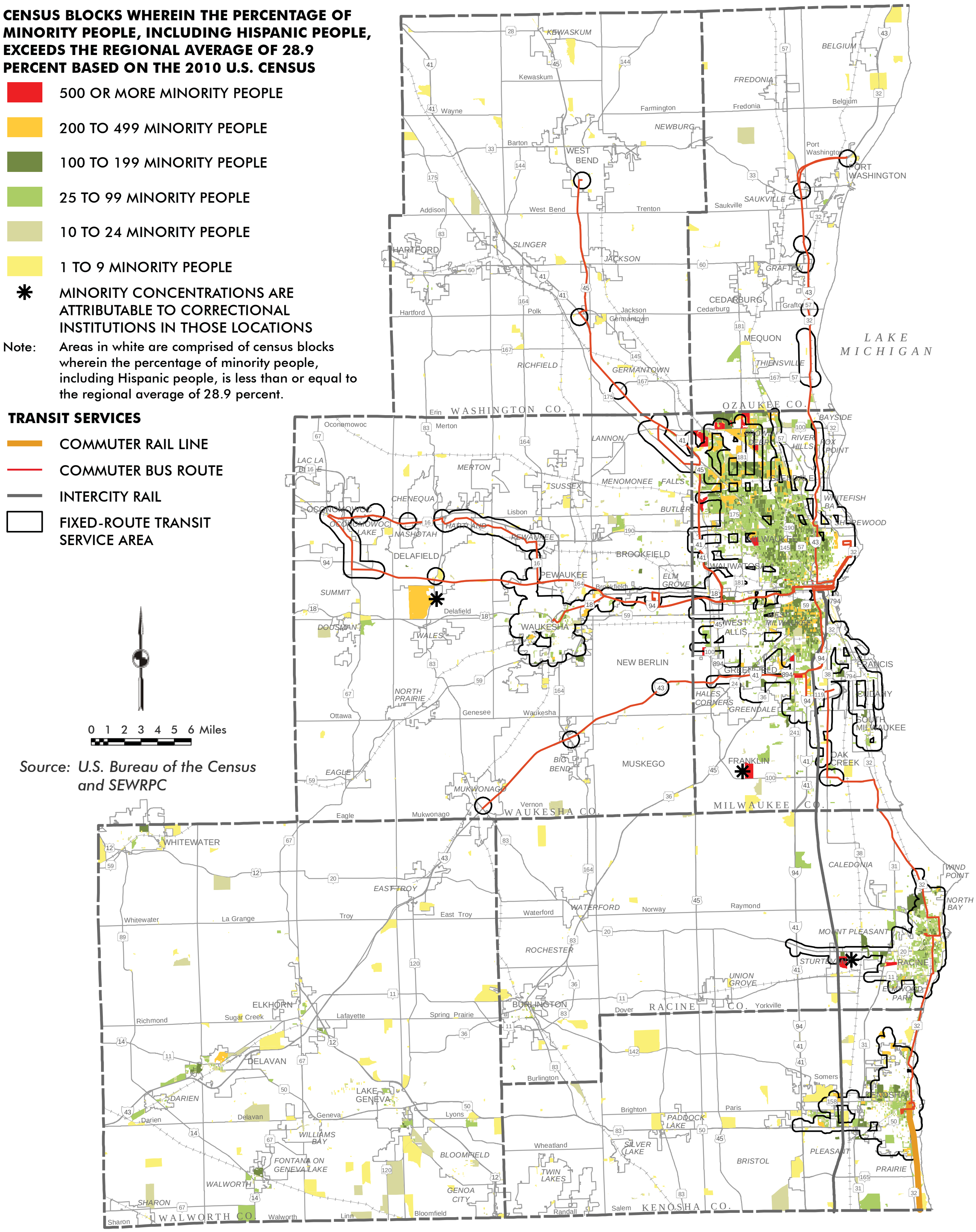
TRANSIT SERVICES

- EXPRESS BUS ROUTE
- COMMUTER RAIL LINE
- COMMUTER BUS ROUTE
- INTERCITY RAIL
- FIXED-ROUTE TRANSIT SERVICE AREA



Source: U.S. Bureau of the Census and SEWRPC

Map F.31
Comparison of Existing Concentrations of Total Minority Population in the Region to Public Transit Element: Trend



Source: *U.S. Bureau of the Census and SEWRPC*

Map F.32
Comparison of Existing Concentrations of Total Minority Population in the Region to Public Transit Element: Alternative I

CENSUS BLOCKS WHEREIN THE PERCENTAGE OF MINORITY PEOPLE, INCLUDING HISPANIC PEOPLE, EXCEEDS THE REGIONAL AVERAGE OF 28.9 PERCENT BASED ON THE 2010 U.S. CENSUS

- 500 OR MORE MINORITY PEOPLE
- 200 TO 499 MINORITY PEOPLE
- 100 TO 199 MINORITY PEOPLE
- 25 TO 99 MINORITY PEOPLE
- 10 TO 24 MINORITY PEOPLE
- 1 TO 9 MINORITY PEOPLE
- * MINORITY CONCENTRATIONS ARE ATTRIBUTABLE TO CORRECTIONAL INSTITUTIONS IN THOSE LOCATIONS

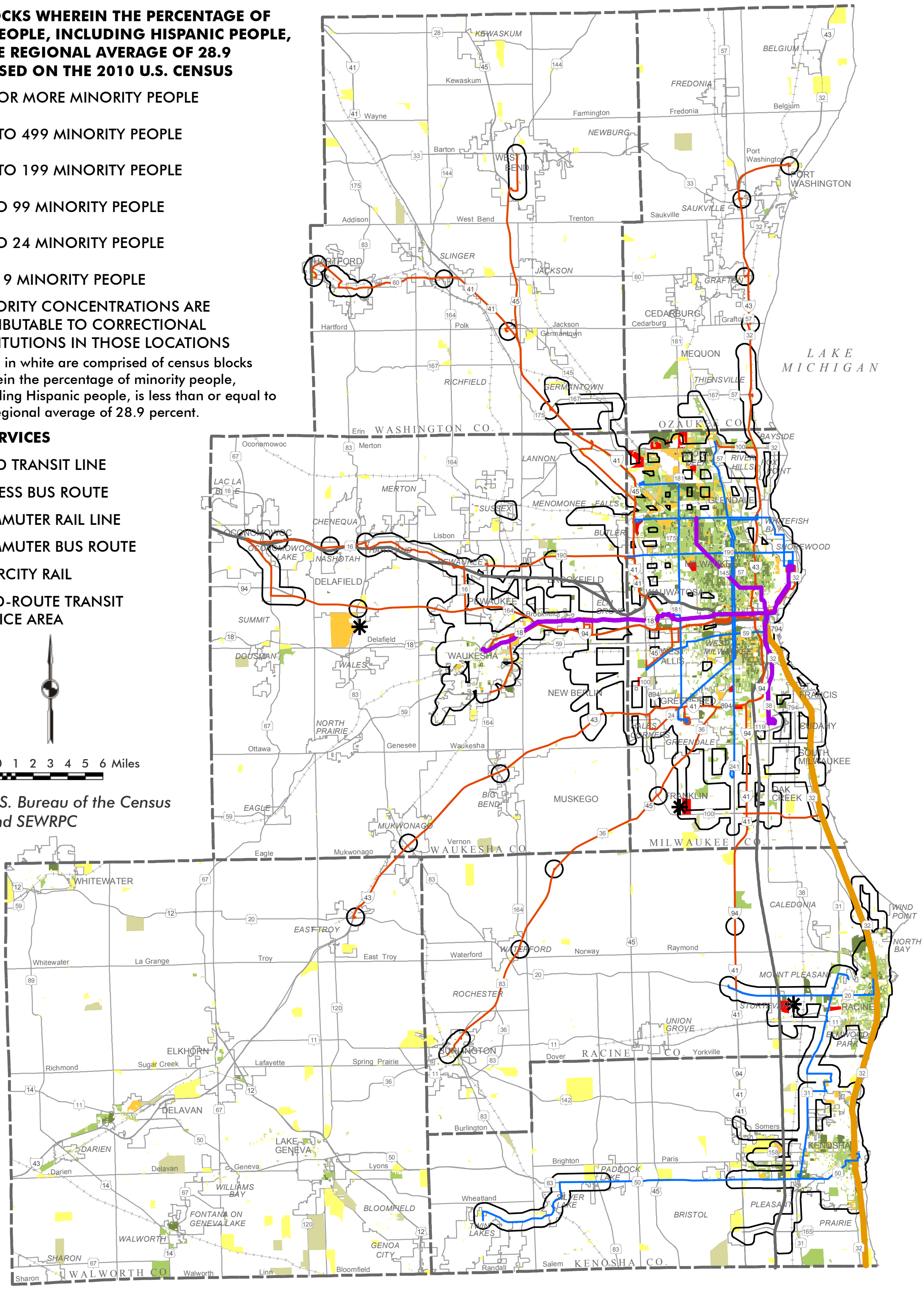
Note: Areas in white are comprised of census blocks wherein the percentage of minority people, including Hispanic people, is less than or equal to the regional average of 28.9 percent.

TRANSIT SERVICES

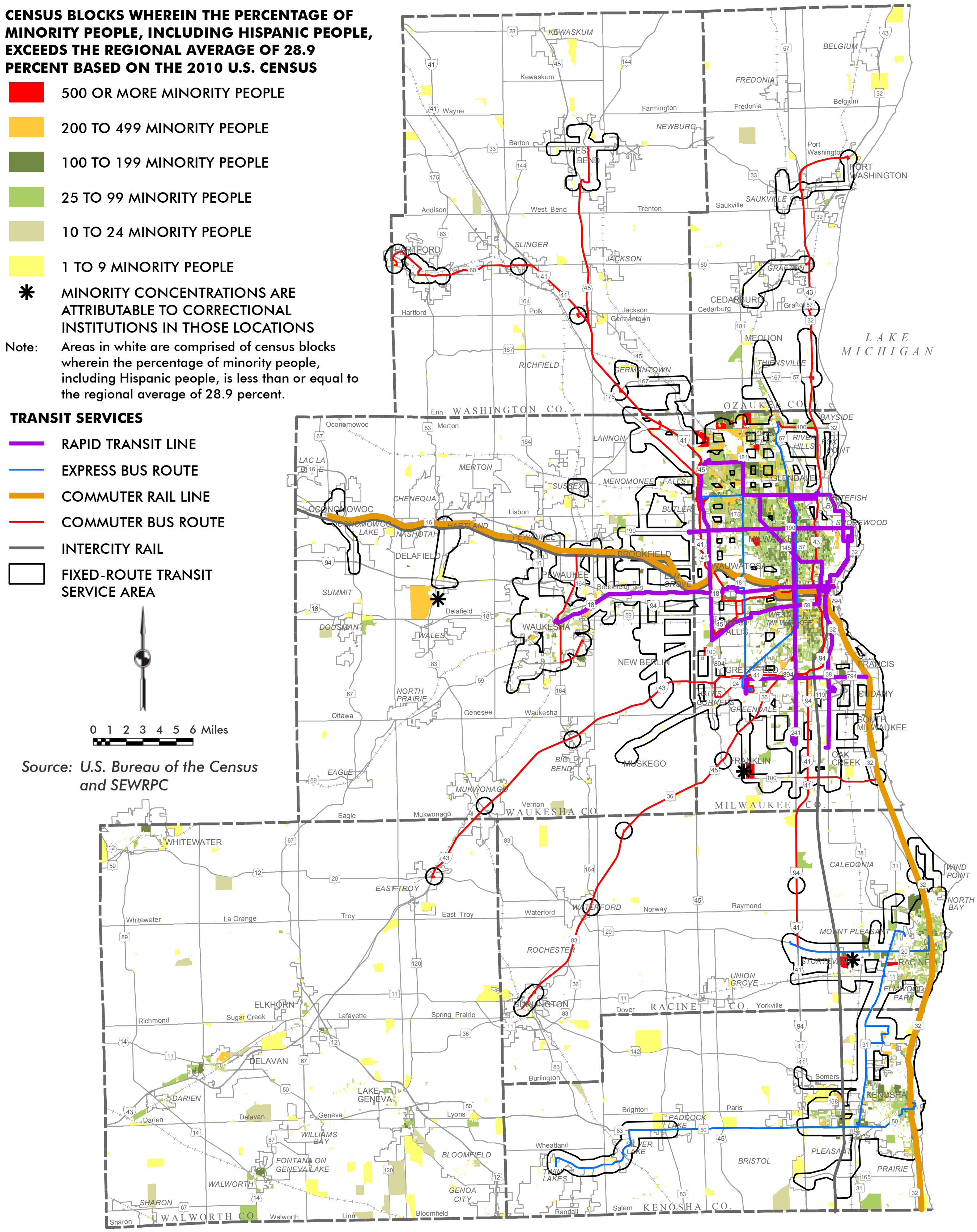
- RAPID TRANSIT LINE
- EXPRESS BUS ROUTE
- COMMUTER RAIL LINE
- COMMUTER BUS ROUTE
- INTERCITY RAIL
- FIXED-ROUTE TRANSIT SERVICE AREA

0 1 2 3 4 5 6 Miles

Source: U.S. Bureau of the Census and SEWRPC



Map F.33
Comparison of Existing Concentrations of Total Minority Population in the Region to Public Transit Element: Alternative II



Source: U.S. Bureau of the Census and SEWRPC

Map F.34
Comparison of Existing Concentrations of Families in Poverty in the Region to Public Transit Services: Existing

CENSUS TRACTS WHEREIN THE PERCENTAGE OF FAMILIES IN POVERTY EXCEEDS THE REGIONAL AVERAGE OF 10.3 PERCENT BASED ON THE 2008-2012 U.S. CENSUS AMERICAN COMMUNITY SURVEY

- FEWER THAN 100 FAMILIES IN POVERTY
- 100-199 FAMILIES IN POVERTY
- 200-299 FAMILIES IN POVERTY
- 300 OR MORE FAMILIES IN POVERTY

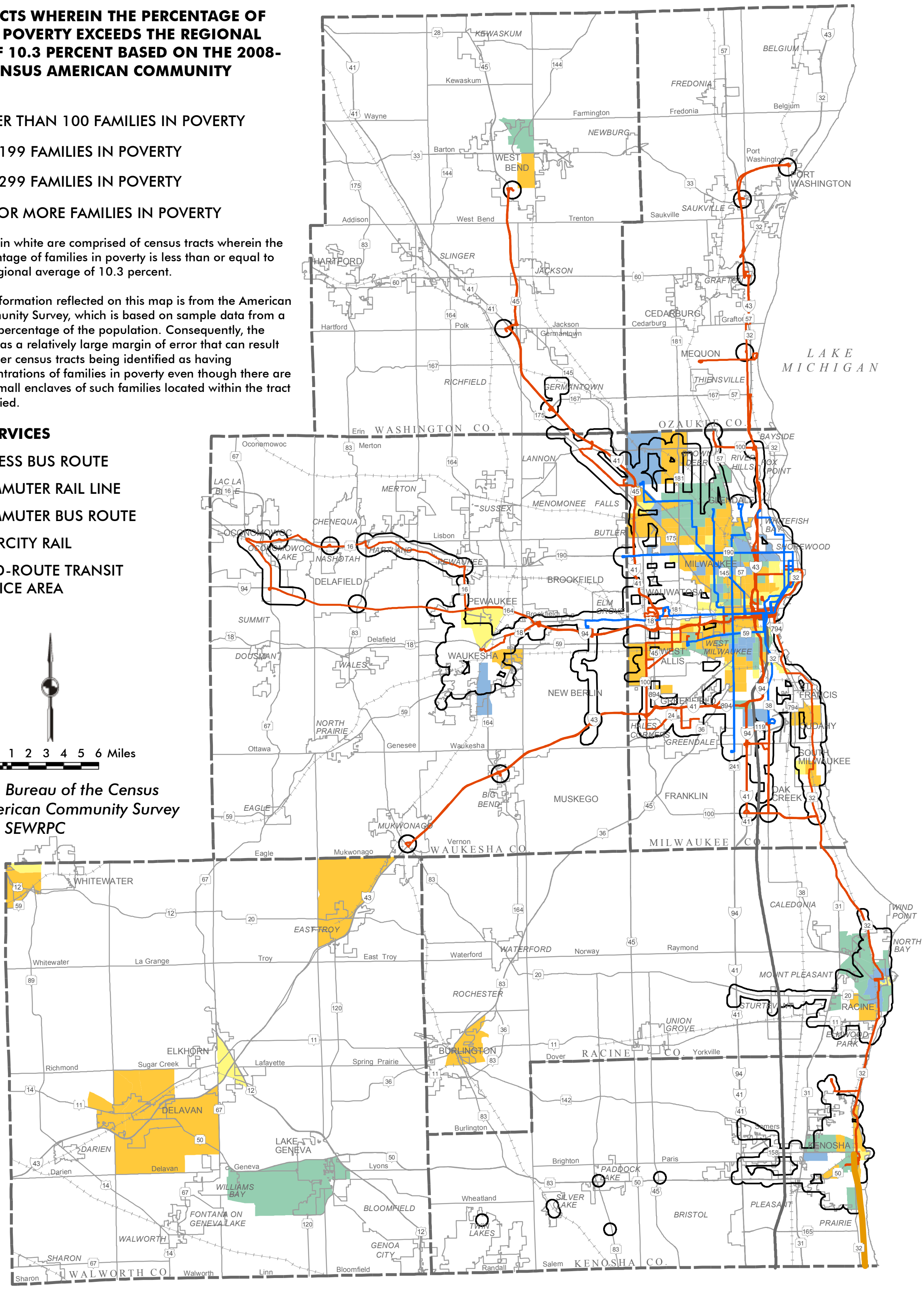
Notes: Areas in white are comprised of census tracts wherein the percentage of families in poverty is less than or equal to the regional average of 10.3 percent.

The information reflected on this map is from the American Community Survey, which is based on sample data from a small percentage of the population. Consequently, the data has a relatively large margin of error that can result in larger census tracts being identified as having concentrations of families in poverty even though there are only small enclaves of such families located within the tract identified.

TRANSIT SERVICES

- EXPRESS BUS ROUTE
- COMMUTER RAIL LINE
- COMMUTER BUS ROUTE
- INTERCITY RAIL
- FIXED-ROUTE TRANSIT SERVICE AREA

0 1 2 3 4 5 6 Miles



Source: U.S. Bureau of the Census American Community Survey and SEWRPC

Map F.35
Comparison of Existing Concentrations of Families in Poverty in the Region to Public Transit Element: Trend

CENSUS TRACTS WHEREIN THE PERCENTAGE OF FAMILIES IN POVERTY EXCEEDS THE REGIONAL AVERAGE OF 10.3 PERCENT BASED ON THE 2008-2012 U.S. CENSUS AMERICAN COMMUNITY SURVEY

- FEWER THAN 100 FAMILIES IN POVERTY
- 100-199 FAMILIES IN POVERTY
- 200-299 FAMILIES IN POVERTY
- 300 OR MORE FAMILIES IN POVERTY

Notes: Areas in white are comprised of census tracts wherein the percentage of families in poverty is less than or equal to the regional average of 10.3 percent.

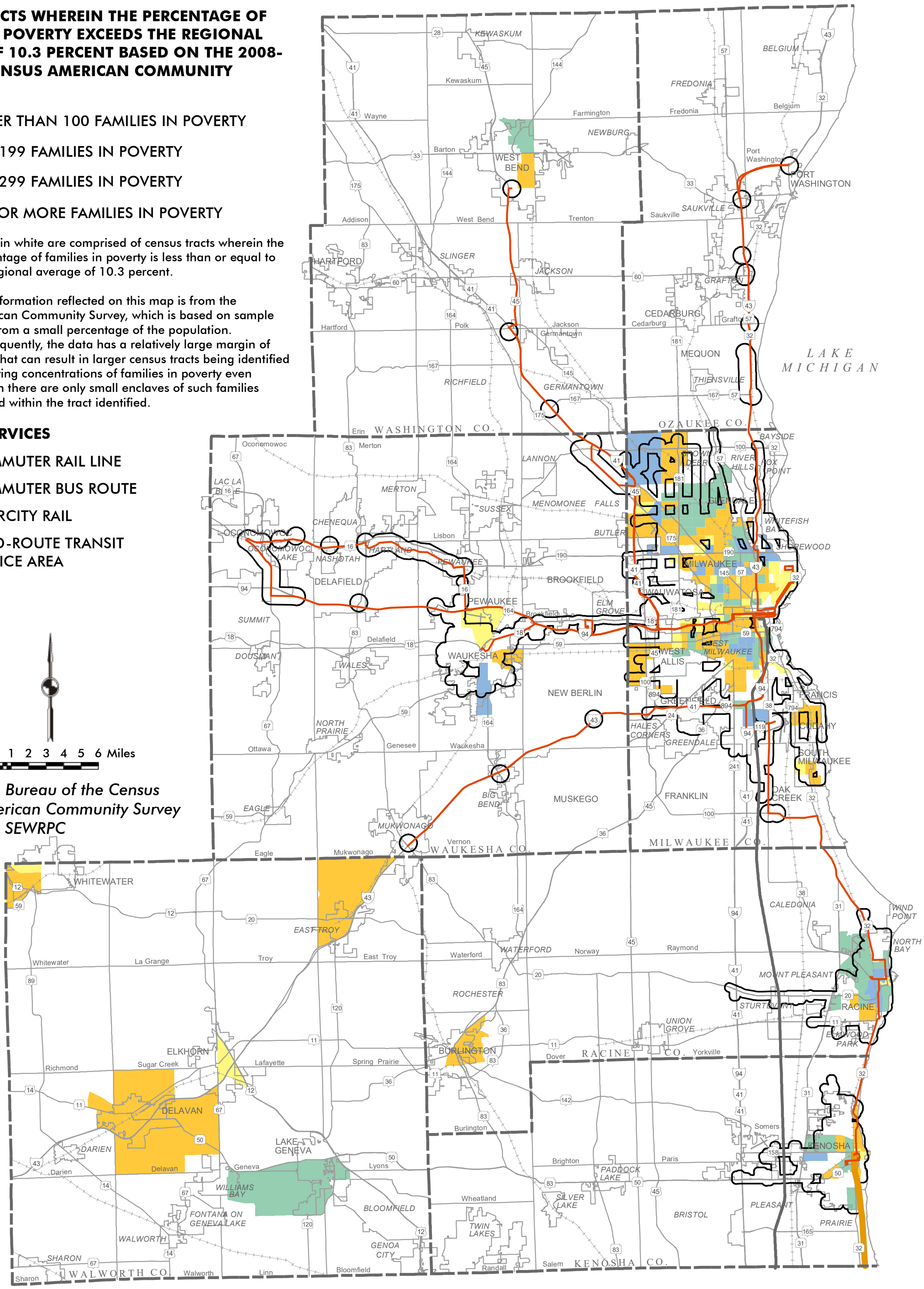
The information reflected on this map is from the American Community Survey, which is based on sample data from a small percentage of the population. Consequently, the data has a relatively large margin of error that can result in larger census tracts being identified as having concentrations of families in poverty even though there are only small enclaves of such families located within the tract identified.

TRANSIT SERVICES

- COMMUTER RAIL LINE
- COMMUTER BUS ROUTE
- INTERCITY RAIL
- FIXED-ROUTE TRANSIT SERVICE AREA

0 1 2 3 4 5 6 Miles

Source: U.S. Bureau of the Census American Community Survey and SEWRPC



Map F.36
Comparison of Existing Concentrations of Families in Poverty in the Region to Public Transit Element: Alternative I

CENSUS TRACTS WHEREIN THE PERCENTAGE OF FAMILIES IN POVERTY EXCEEDS THE REGIONAL AVERAGE OF 10.3 PERCENT BASED ON THE 2008-2012 U.S. CENSUS AMERICAN COMMUNITY SURVEY

- FEWER THAN 100 FAMILIES IN POVERTY
- 100-199 FAMILIES IN POVERTY
- 200-299 FAMILIES IN POVERTY
- 300 OR MORE FAMILIES IN POVERTY

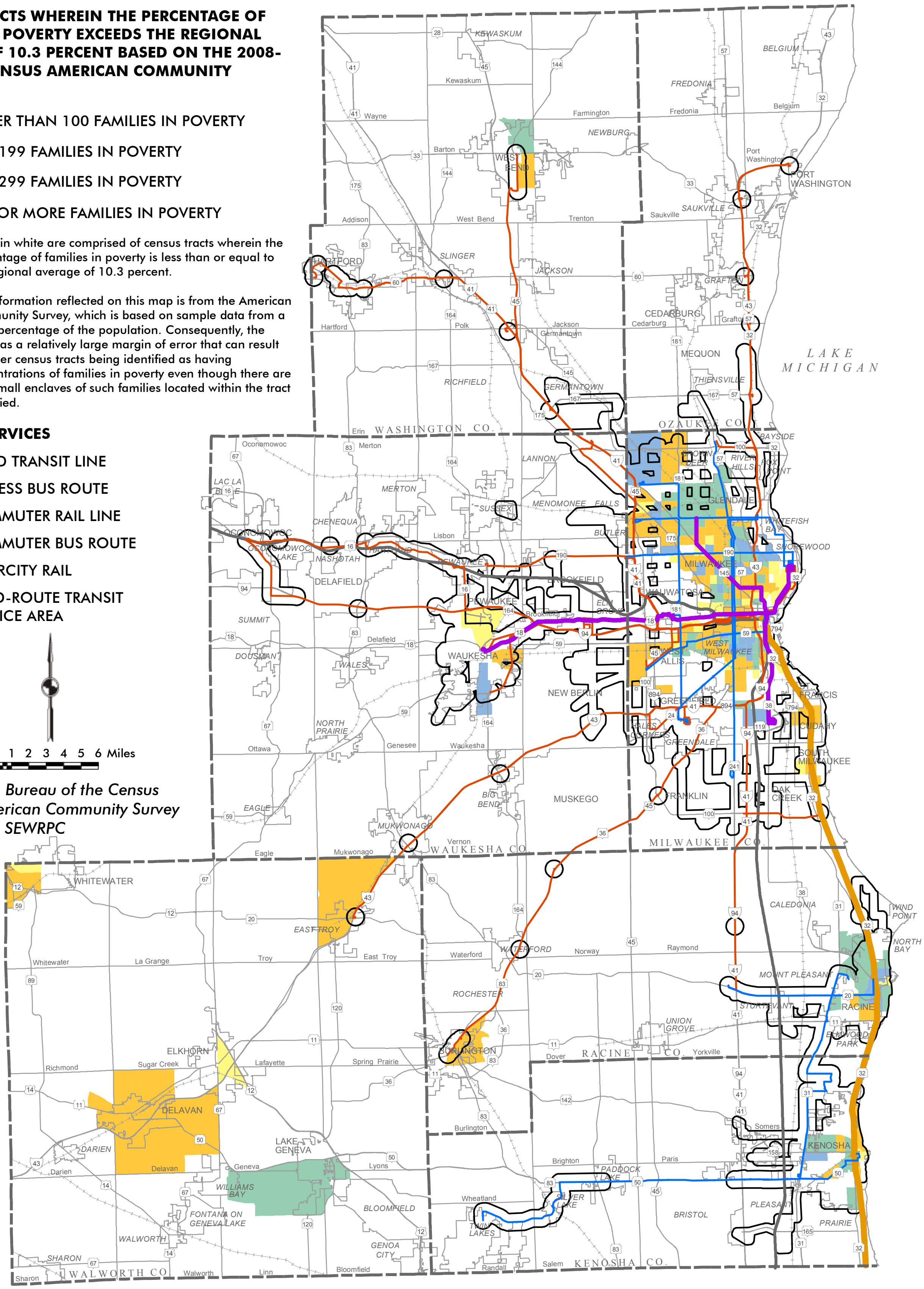
Notes: Areas in white are comprised of census tracts wherein the percentage of families in poverty is less than or equal to the regional average of 10.3 percent.

The information reflected on this map is from the American Community Survey, which is based on sample data from a small percentage of the population. Consequently, the data has a relatively large margin of error that can result in larger census tracts being identified as having concentrations of families in poverty even though there are only small enclaves of such families located within the tract identified.

TRANSIT SERVICES

- RAPID TRANSIT LINE
- EXPRESS BUS ROUTE
- COMMUTER RAIL LINE
- COMMUTER BUS ROUTE
- INTERCITY RAIL
- FIXED-ROUTE TRANSIT SERVICE AREA

0 1 2 3 4 5 6 Miles



Source: U.S. Bureau of the Census American Community Survey and SEWRPC

Map F.37
Comparison of Existing Concentrations of Families in Poverty in the Region to Public Transit Element: Alternative II

CENSUS TRACTS WHEREIN THE PERCENTAGE OF FAMILIES IN POVERTY EXCEEDS THE REGIONAL AVERAGE OF 10.3 PERCENT BASED ON THE 2008-2012 U.S. CENSUS AMERICAN COMMUNITY SURVEY

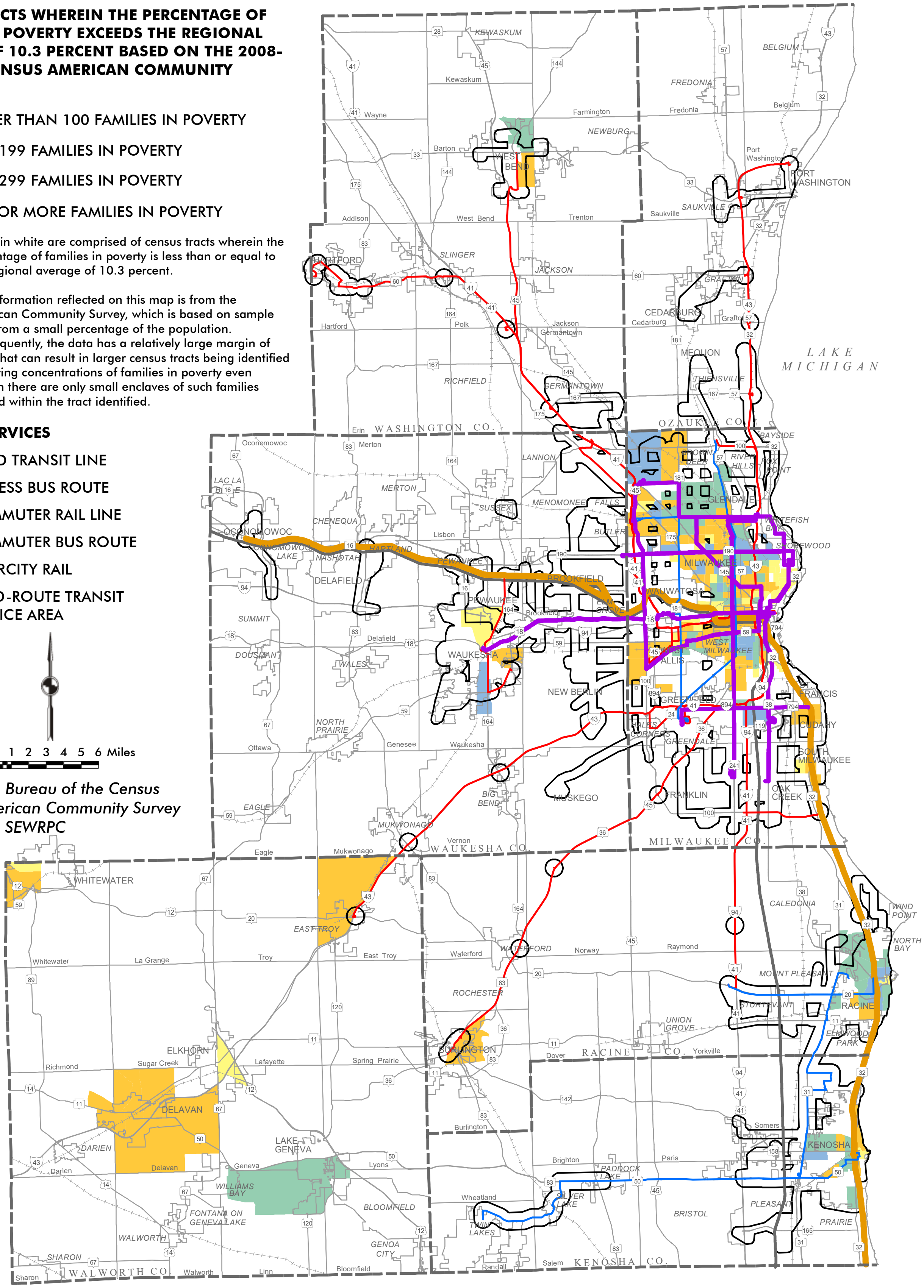
- FEWER THAN 100 FAMILIES IN POVERTY
- 100-199 FAMILIES IN POVERTY
- 200-299 FAMILIES IN POVERTY
- 300 OR MORE FAMILIES IN POVERTY

Notes: Areas in white are comprised of census tracts wherein the percentage of families in poverty is less than or equal to the regional average of 10.3 percent.

The information reflected on this map is from the American Community Survey, which is based on sample data from a small percentage of the population. Consequently, the data has a relatively large margin of error that can result in larger census tracts being identified as having concentrations of families in poverty even though there are only small enclaves of such families located within the tract identified.

TRANSIT SERVICES

- RAPID TRANSIT LINE
- EXPRESS BUS ROUTE
- COMMUTER RAIL LINE
- COMMUTER BUS ROUTE
- INTERCITY RAIL
- FIXED-ROUTE TRANSIT SERVICE AREA



Source: U.S. Bureau of the Census American Community Survey and SEWRPC

Map F.38
Comparison of Concentrations of Year 2010 Races/Ethnicities in the Region to Public Transit Services: Existing

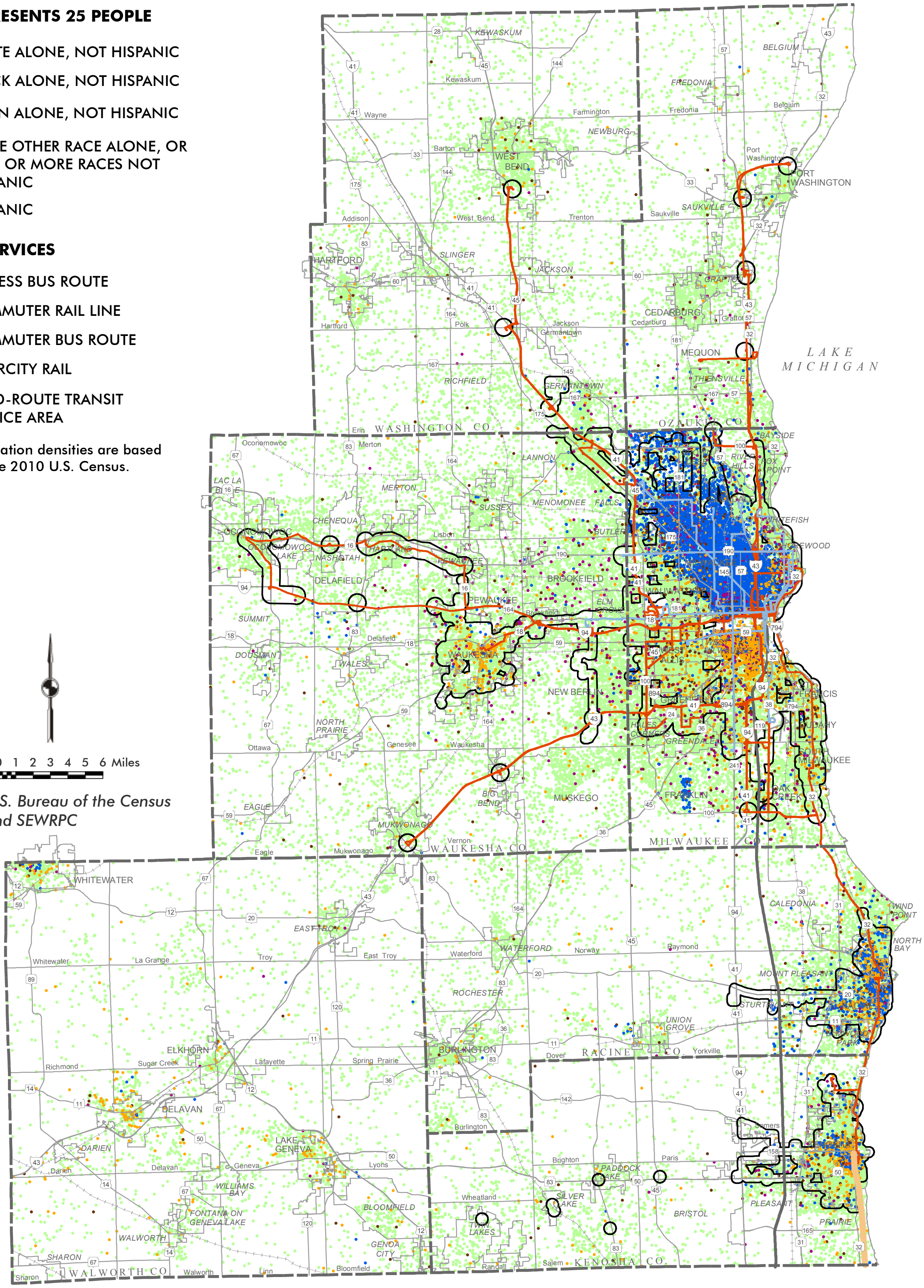
1 DOT REPRESENTS 25 PEOPLE

- WHITE ALONE, NOT HISPANIC
- BLACK ALONE, NOT HISPANIC
- ASIAN ALONE, NOT HISPANIC
- SOME OTHER RACE ALONE, OR TWO OR MORE RACES NOT HISPANIC
- HISPANIC

TRANSIT SERVICES

- EXPRESS BUS ROUTE
- COMMUTER RAIL LINE
- COMMUTER BUS ROUTE
- INTERCITY RAIL
- FIXED-ROUTE TRANSIT SERVICE AREA

Note: Population densities are based on the 2010 U.S. Census.



Source: U.S. Bureau of the Census and SEWRPC

Map F.39
Comparison of Concentrations of Year 2010 Races/Ethnicities in the Region to Public Transit Element: Trend

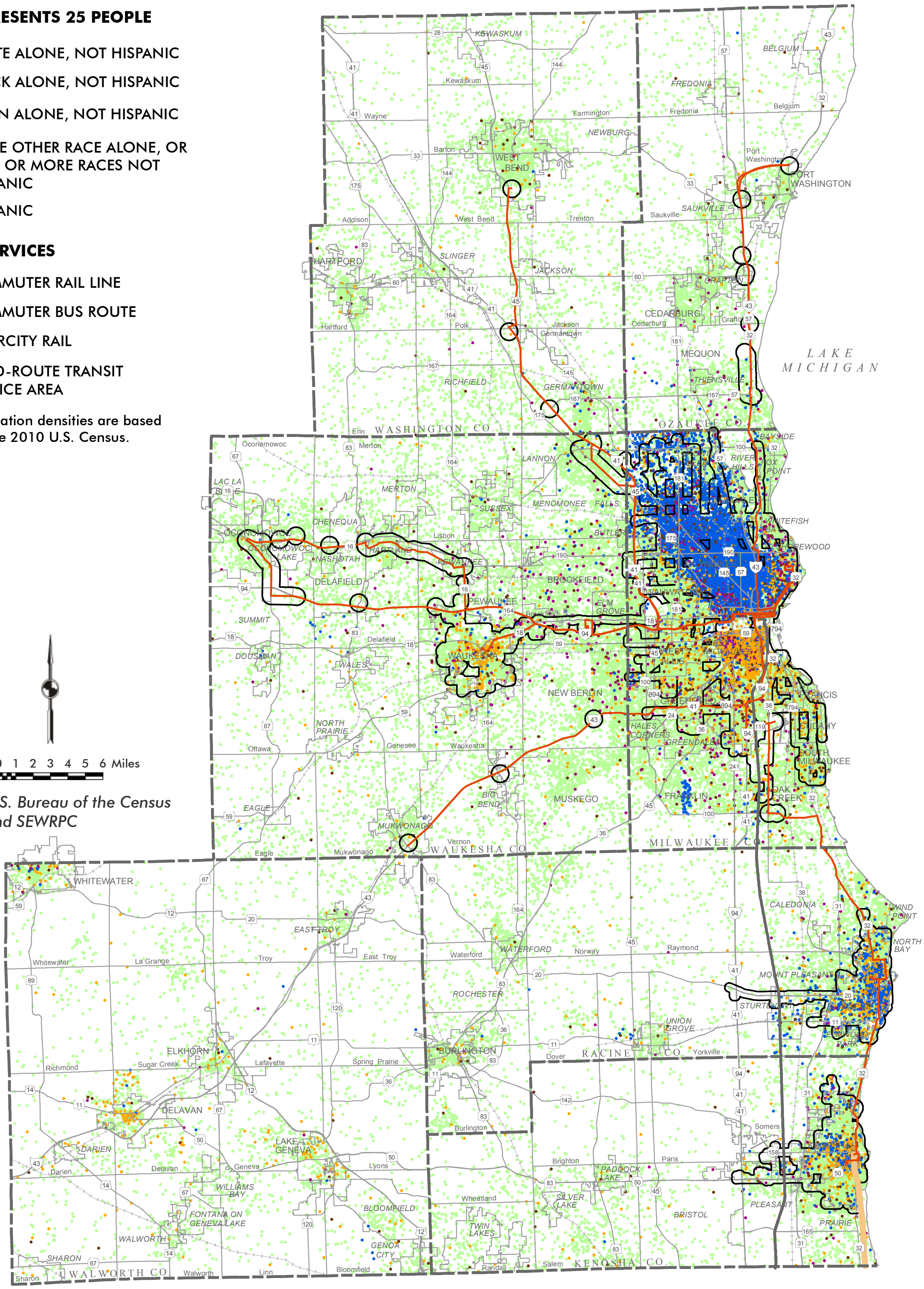
1 DOT REPRESENTS 25 PEOPLE

- WHITE ALONE, NOT HISPANIC
- BLACK ALONE, NOT HISPANIC
- ASIAN ALONE, NOT HISPANIC
- SOME OTHER RACE ALONE, OR TWO OR MORE RACES NOT HISPANIC
- HISPANIC

TRANSIT SERVICES

- COMMUTER RAIL LINE
- COMMUTER BUS ROUTE
- INTERCITY RAIL
- FIXED-ROUTE TRANSIT SERVICE AREA

Note: Population densities are based on the 2010 U.S. Census.



Source: U.S. Bureau of the Census and SEWRPC

Map F.40
Comparison of Concentrations of Year 2010 Races/Ethnicities in the Region to Public Transit Element: Alternative I

1 DOT REPRESENTS 25 PEOPLE

- WHITE ALONE, NOT HISPANIC
- BLACK ALONE, NOT HISPANIC
- ASIAN ALONE, NOT HISPANIC
- SOME OTHER RACE ALONE, OR TWO OR MORE RACES NOT HISPANIC
- HISPANIC

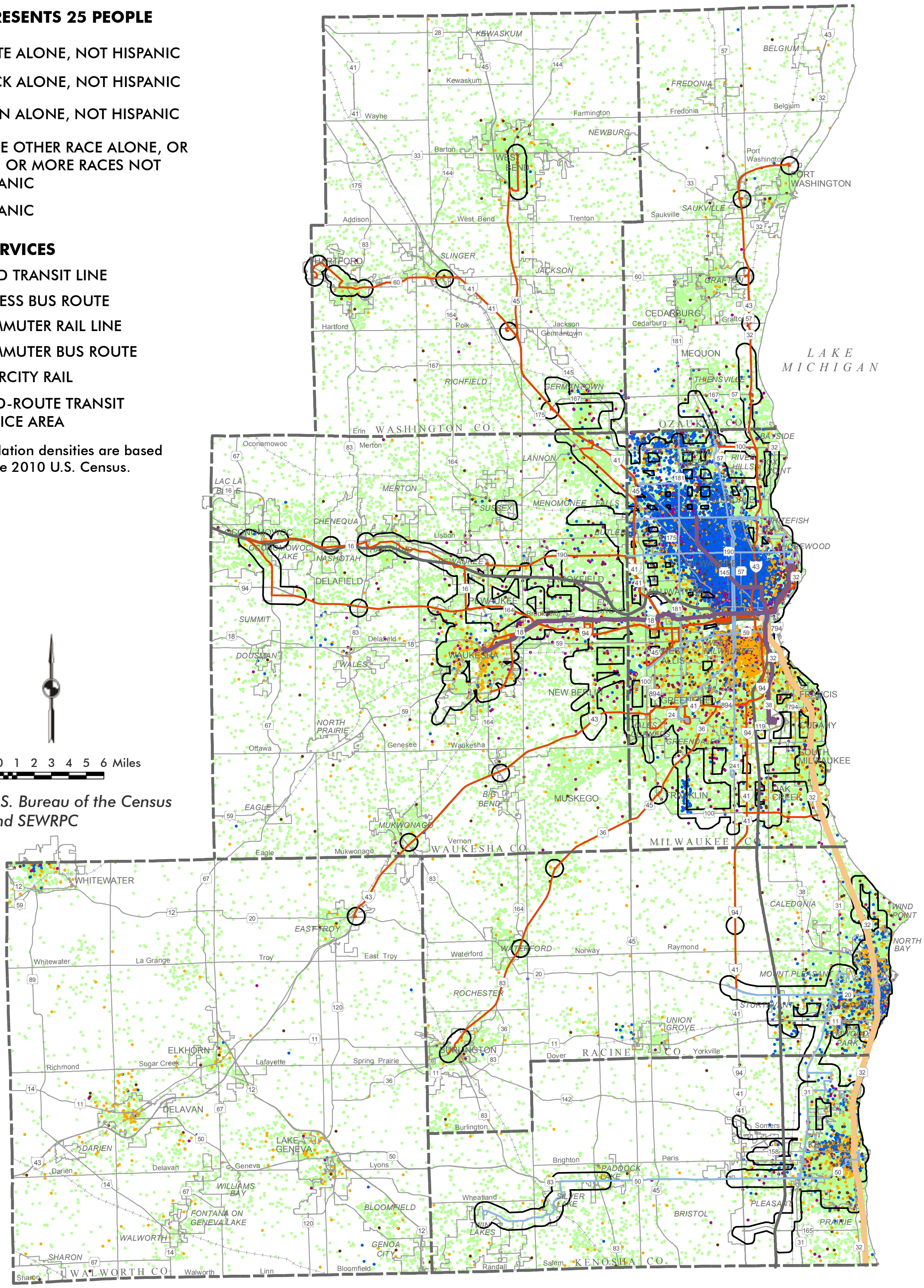
TRANSIT SERVICES

- RAPID TRANSIT LINE
- EXPRESS BUS ROUTE
- COMMUTER RAIL LINE
- COMMUTER BUS ROUTE
- INTERCITY RAIL
- FIXED-ROUTE TRANSIT SERVICE AREA

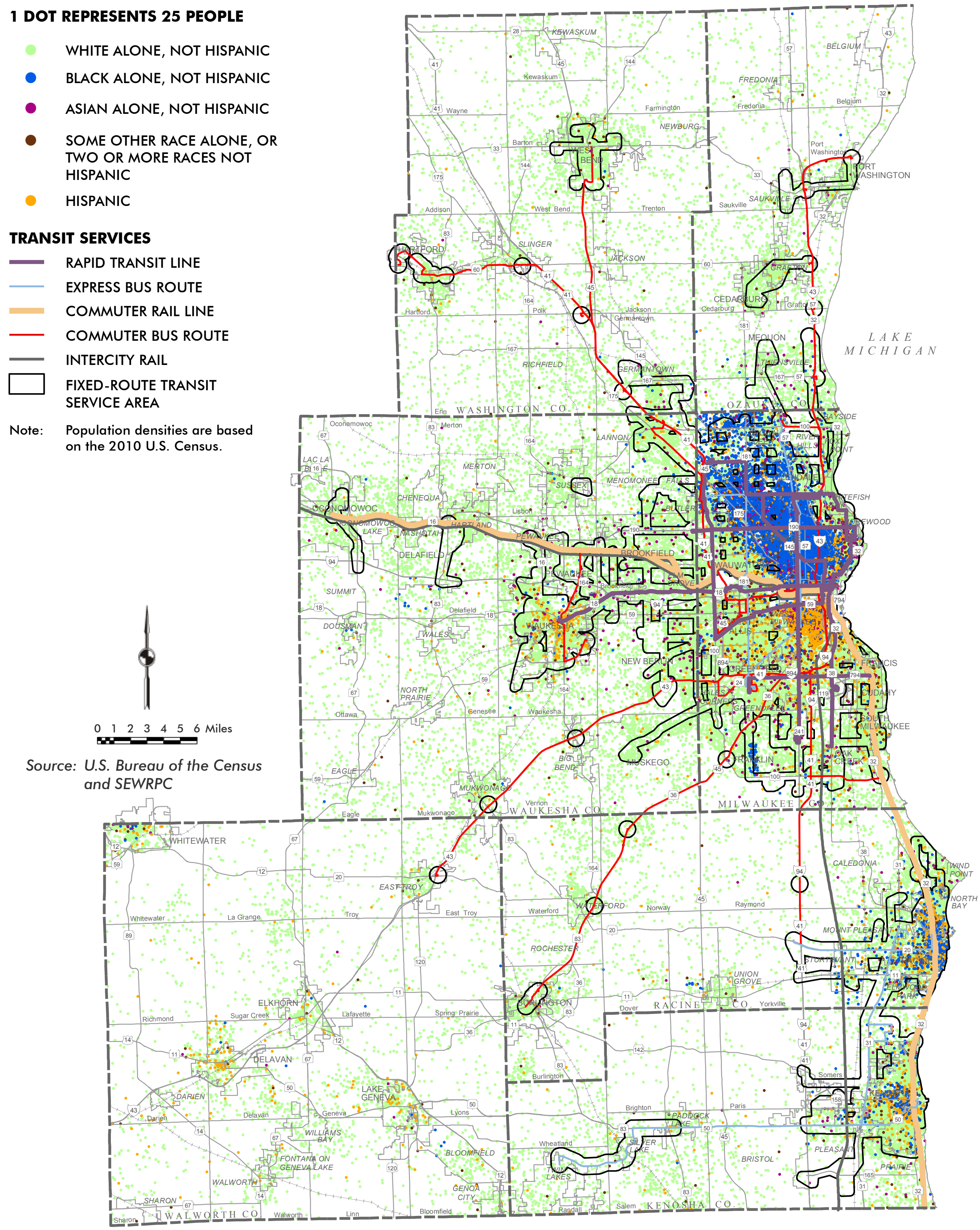
Note: Population densities are based on the 2010 U.S. Census.

0 1 2 3 4 5 6 Miles

Source: U.S. Bureau of the Census and SEWRPC



Map F.41
Comparison of Concentrations of Year 2010 Races/Ethnicities in the Region to Public Transit Element: Alternative II



Source: U.S. Bureau of the Census and SEWRPC

This criterion calculates how many and what percentage of the Region's existing minority populations and low-income populations are within walking distance of transit service under each alternative, and does not attempt to determine the quality—speed, frequency, or usefulness—of that service to reach destinations for these populations. Criterion 2.1.3 (Transit Service Quality for Minority Populations and Low-Income Populations) compares the quality of transit service that would be provided to existing minority populations and low-income populations under each alternative. Criterion 2.1.1 (Level of Accessibility of Jobs and Activity Centers for Minority Populations and Low-Income Populations) includes comparisons of how many jobs, hospitals, parks, colleges, major retail centers, grocery stores, and regional destinations could be reached within 30 minutes via transit by existing minority populations and low-income populations under each alternative.

CRITERION 2.1.3: TRANSIT SERVICE QUALITY FOR MINORITY POPULATIONS AND LOW-INCOME POPULATIONS

KEY CONCLUSIONS

- **There would be substantial increases in the existing minority populations and low-income populations that would be served by high-quality—Excellent or Very Good—transit service under Alternatives I and II compared to existing conditions and the Trend.**
- **Under Alternative II, nearly 45 percent of the existing minority population and families in poverty would have access to Excellent or Very Good transit service, compared to about 40 percent under Alternative I, about 10 percent under existing conditions, and about 3 percent under the Trend.**
- **The minority population represents about half of the population that would be served by Excellent or Very Good transit service under Alternatives I and II, compared to 44 percent under existing conditions and 32 percent under the Trend.**

While Criterion 2.1.2 measured the access that existing minority populations and low-income populations would have to transit service under each alternative, this criterion measures the quality of transit service that would be provided to these populations under each alternative. The quality of transit service that would be provided to the Region's residents is evaluated under Criterion 4.5.3 (Transit Service Quality). Based on the amount and speed of transit service, levels of transit quality—Excellent, Very Good, Good, and Basic—were determined under existing conditions, the Trend, and Alternatives I and II. Based on this analysis, Alternative II was found to provide high-quality—Excellent or Very Good—transit service to the highest number of residents, followed closely by Alternative I. This methodology was used to compare the level of service quality provided under existing conditions and the alternatives (as shown on Maps F.42 through F.45) for existing minority populations and low-income populations. The locations of existing minority populations and low-income populations in the Region are shown on Maps F.46 and F.47. The results of this analysis are presented in Tables F.20 and F.21.

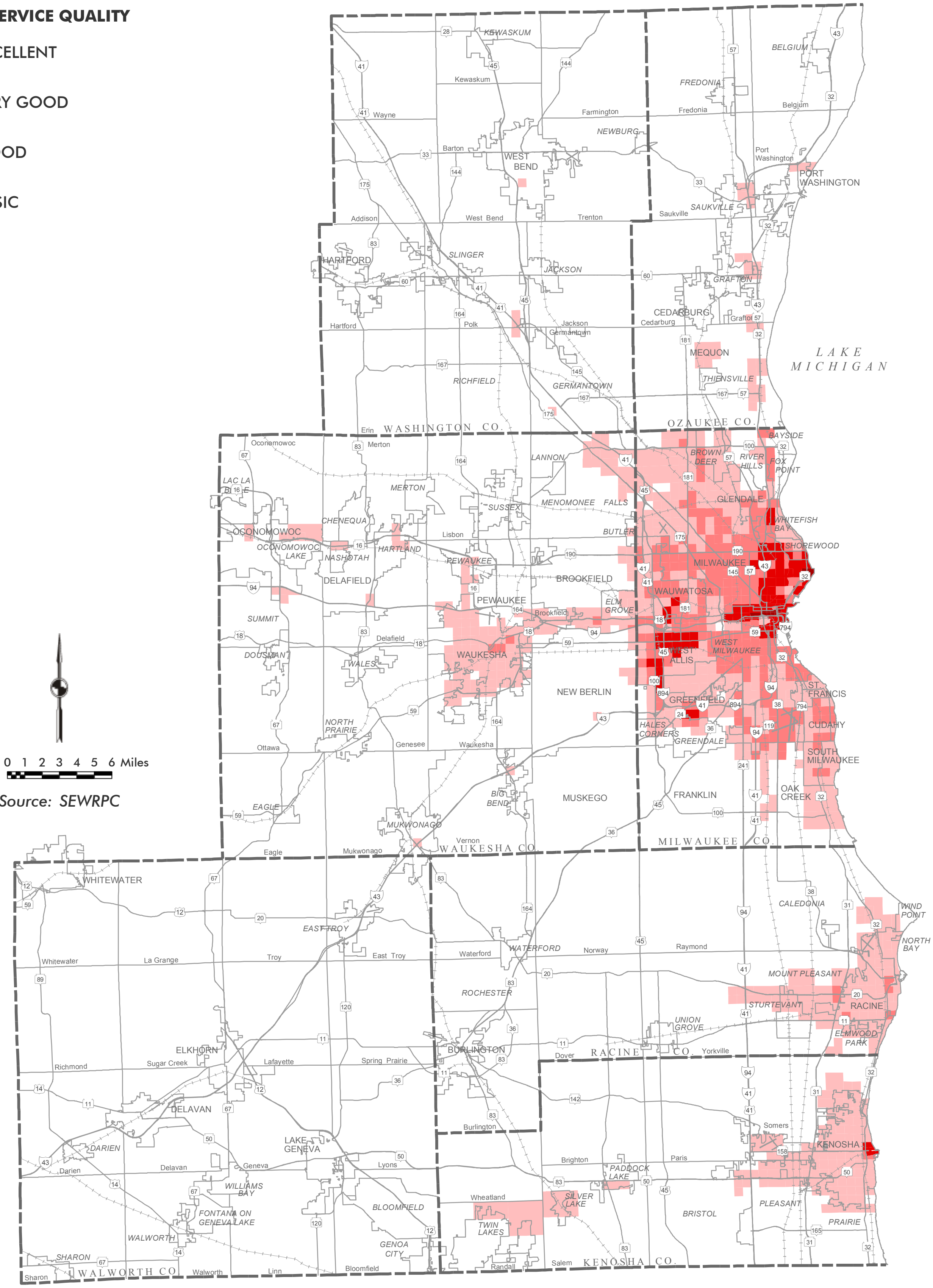
Under Alternative II, nearly 45 percent of the existing minority population and families in poverty, respectively, would have access to high-quality transit service, which is better than the nearly 40 percent having access to such service under Alternative I. Both alternative plans would provide substantial improvement over existing conditions, with only about 9 to 10 percent of the existing minority population and families in poverty currently having access to high-quality transit service. Given the further decline in transit under the Trend, it is expected that only about 3 percent of the existing minority population and families in poverty would be served by high-quality transit service.

Alternatives I and II would improve transit service over existing conditions particularly for existing minority populations and low-income populations. Alternatives I and II, as shown in Table F.22, would result in an additional 29 to 36 percent of the existing minority population and families in poverty receiving high-quality transit service, compared to an additional 10 to 17 percent of the non-minority population and families not in poverty.

Map F.42
Transit Service Quality: Existing

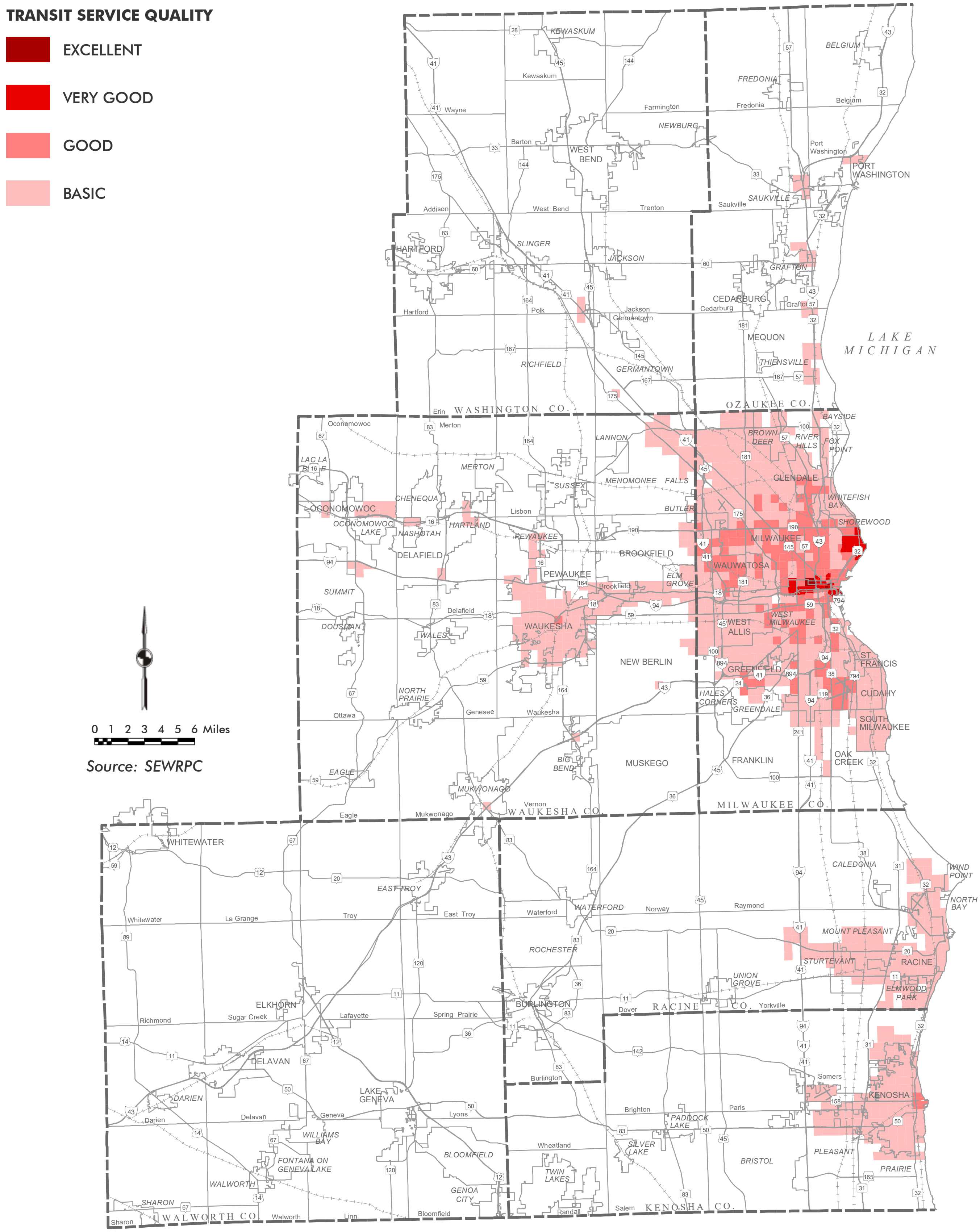
TRANSIT SERVICE QUALITY

- EXCELLENT
- VERY GOOD
- GOOD
- BASIC



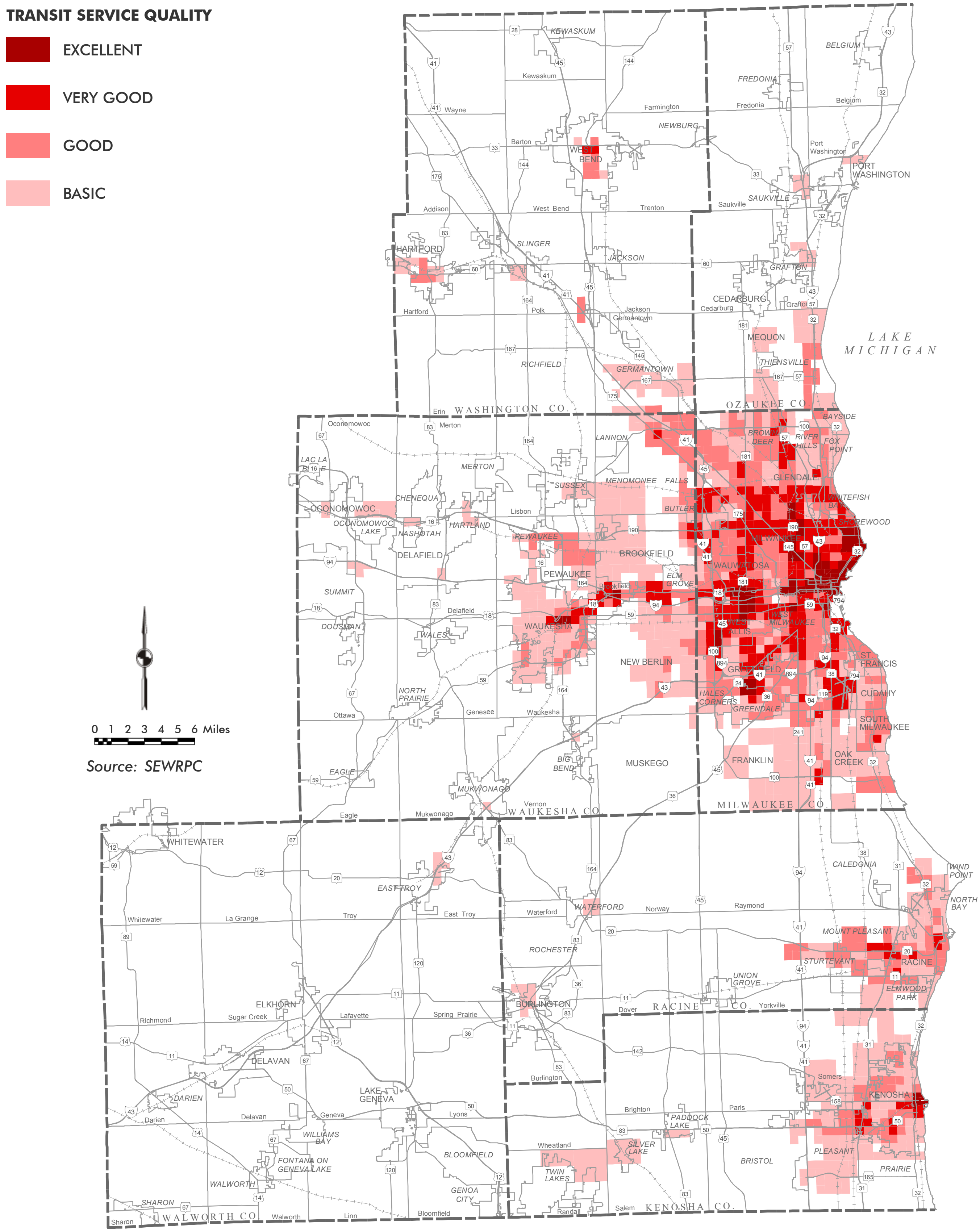
Source: SEWRPC

Map F.43
Transit Service Quality: Trend



Source: SEWRPC

Map F.44
Transit Service Quality: Alternative Plan I

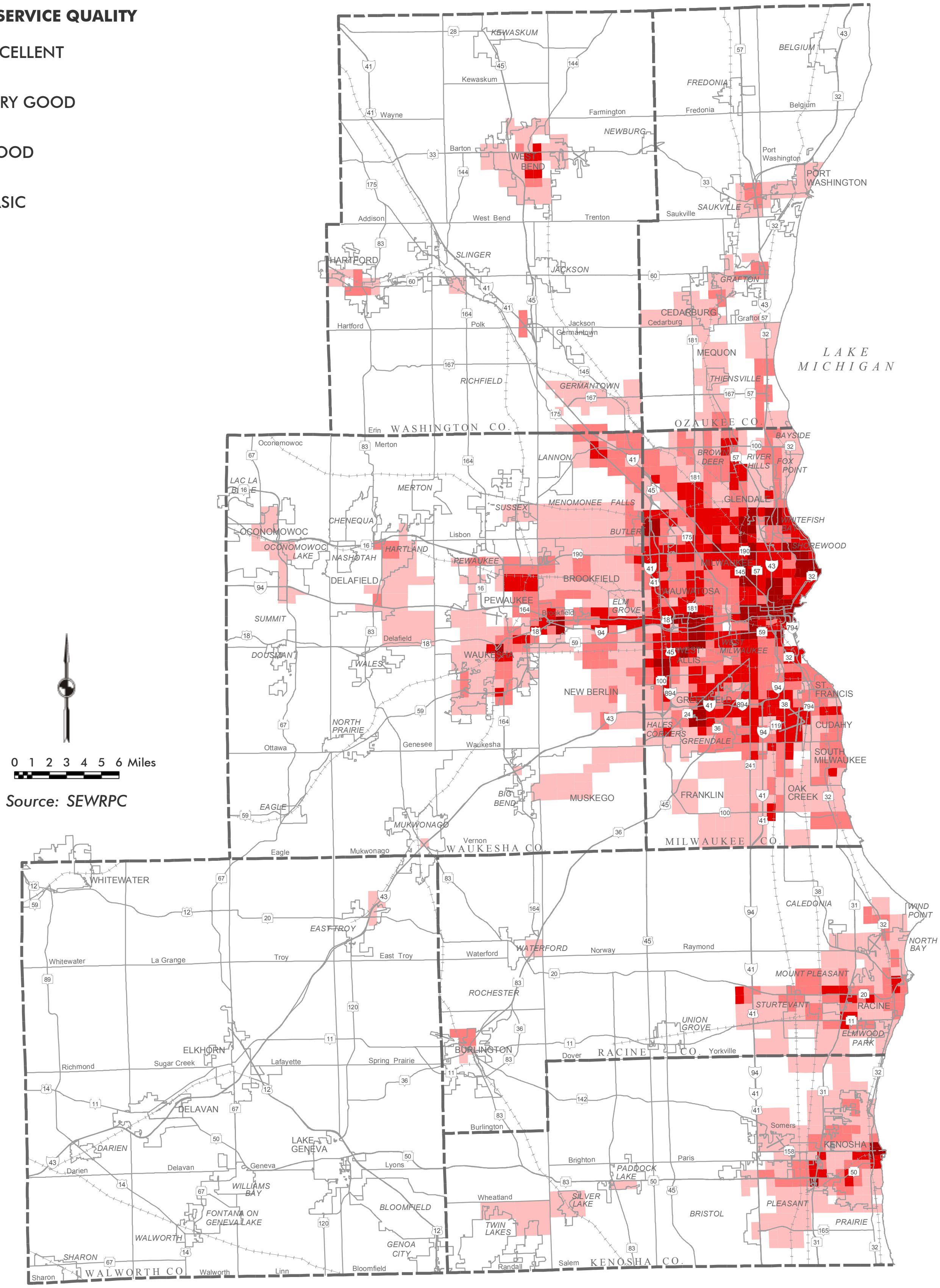


Source: SEWRPC

Map F.45
Transit Service Quality: Alternative Plan II

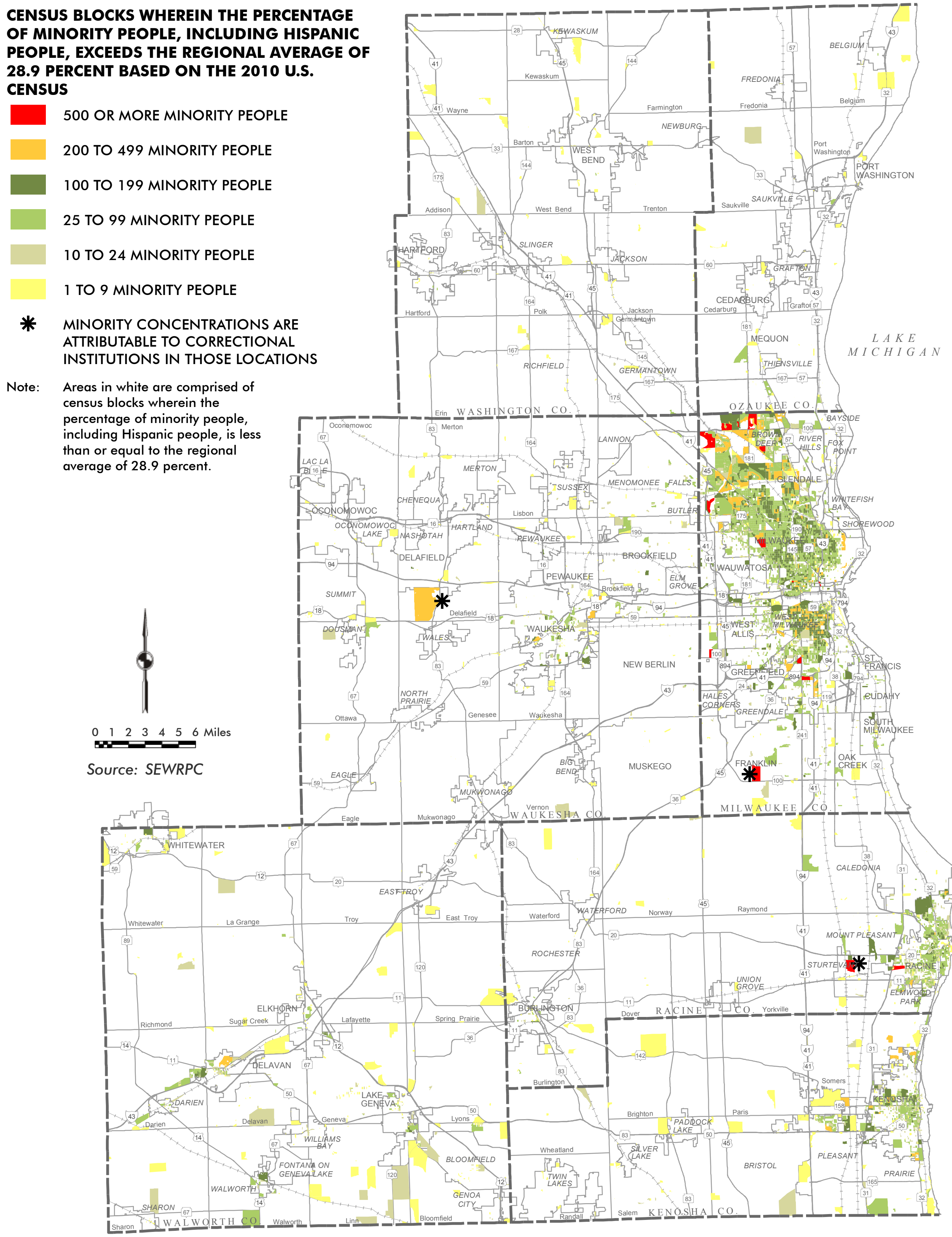
TRANSIT SERVICE QUALITY

- EXCELLENT
- VERY GOOD
- GOOD
- BASIC



Source: SEWRPC

Map F.46
Concentrations of Total Minority Population in the Region: 2010



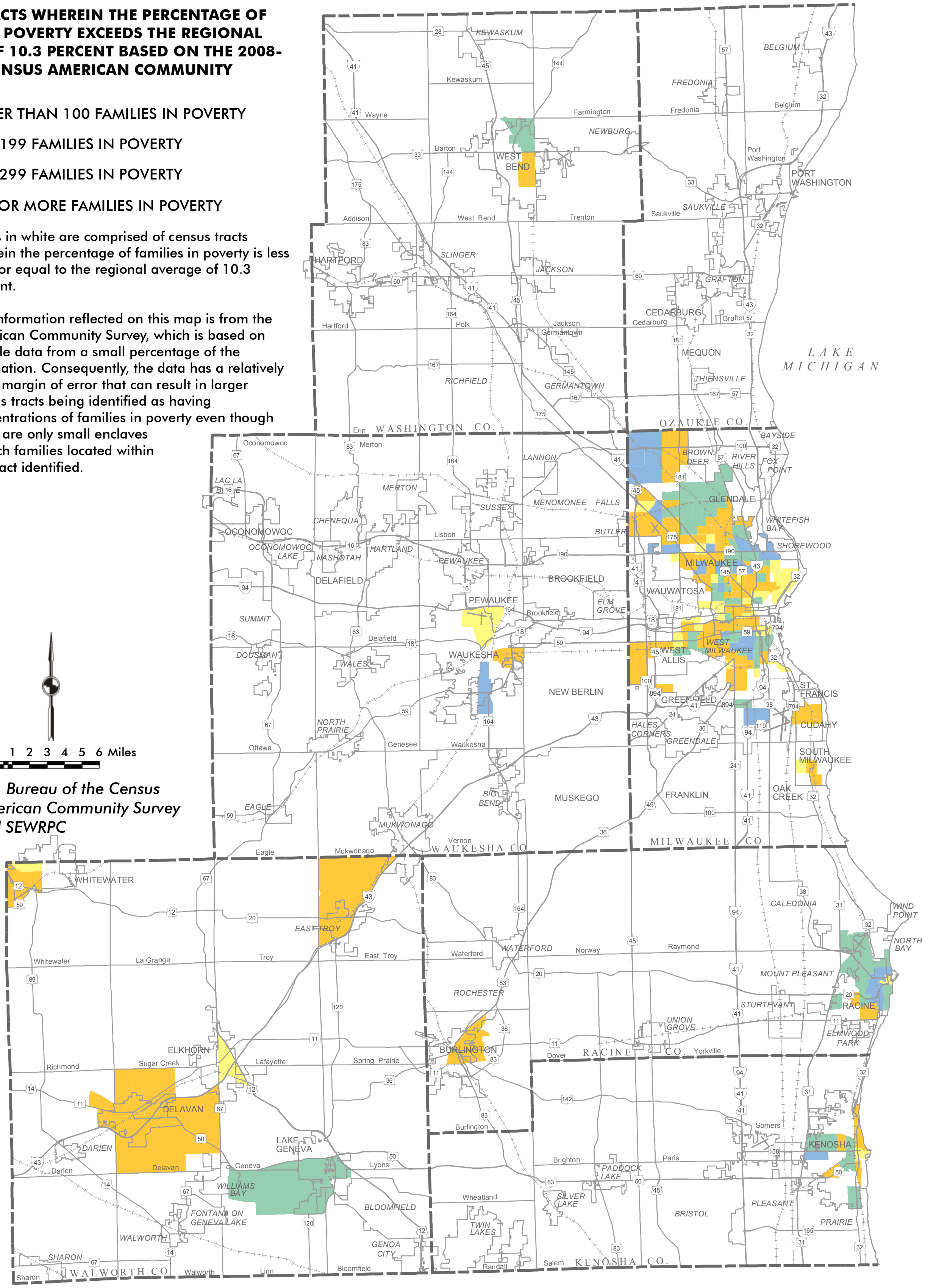
Map F.47
Concentrations of Families in Poverty in the Region: 2008-2012

CENSUS TRACTS WHEREIN THE PERCENTAGE OF FAMILIES IN POVERTY EXCEEDS THE REGIONAL AVERAGE OF 10.3 PERCENT BASED ON THE 2008-2012 U.S. CENSUS AMERICAN COMMUNITY SURVEY

- FEWER THAN 100 FAMILIES IN POVERTY
- 100-199 FAMILIES IN POVERTY
- 200-299 FAMILIES IN POVERTY
- 300 OR MORE FAMILIES IN POVERTY

Notes: Areas in white are comprised of census tracts wherein the percentage of families in poverty is less than or equal to the regional average of 10.3 percent.

The information reflected on this map is from the American Community Survey, which is based on sample data from a small percentage of the population. Consequently, the data has a relatively large margin of error that can result in larger census tracts being identified as having concentrations of families in poverty even though there are only small enclaves of such families located within the tract identified.



0 1 2 3 4 5 6 Miles

Source: U.S. Bureau of the Census American Community Survey and SEWRPC

Table F.20
Transit Service Quality for Minority Populations[a]

Alternative	Excellent		Very Good		Good		Basic		Total Minority Population
	People	Percent	People	Percent	People	Percent	People	Percent	
Existing - 2015	700	0.1	53,100	9.1	237,900	40.8	216,900	37.2	582,900
Trend - 2050	3,100	0.5	13,600	2.3	169,200	29.0	320,500	55.0	582,900
Alt I - 2050	49,400	8.5	183,600	31.5	196,200	33.7	100,700	17.3	582,900
Alt II - 2050	67,500	11.6	193,600	33.2	181,800	31.2	95,200	16.3	582,900

[a] *Minority population is based on the 2010 U.S. Census.*

Source: U.S. Bureau of the Census and SEWRPC

Table F.21
Transit Service Quality for Families in Poverty[a]

Alternative	Excellent		Very Good		Good		Basic		Total Families in Poverty
	Families	Percent	Families	Percent	Families	Percent	Families	Percent	
Existing - 2015	0	0.0	5,200	9.9	20,000	38.2	17,300	33.1	52,300
Trend - 2050	300	0.6	1,100	2.1	14,700	28.1	26,200	50.1	52,300
Alt I - 2050	4,200	8.0	16,200	31.0	15,600	29.8	8,300	15.9	52,300
Alt II - 2050	5,900	11.3	16,900	32.3	14,500	27.7	7,900	15.1	52,300

[a] *Families in poverty are based on the 2008-2012 American Community Survey.*

Source: U.S. Bureau of the Census American Community Survey and SEWRPC

Table F.22
Additional Percent of Total Minority/Non-Minority Population[a] and Families in Poverty/Families Not in Poverty[a] Receiving Excellent or Very Good Transit Service Quality Under Alternatives I and II

Alternative	Minority Population	Non-Minority Population	Families in Poverty	Families Not in Poverty
Alt I	31	10	29	13
Alt II	36	14	34	17

[a] *Minority population and non-minority population are based on the 2010 U.S. Census and families in poverty and families not in poverty are based on the 2008-2012 American Community Survey.*

Source: U.S. Bureau of the Census, U.S. Census and American Community Survey; and SEWRPC

CRITERION 2.1.4: MINORITY POPULATIONS AND LOW-INCOME POPULATIONS BENEFITED AND IMPACTED BY NEW AND WIDENED ARTERIAL STREET AND HIGHWAY FACILITIES

KEY CONCLUSIONS

- **Existing minority populations and low-income populations would be expected to utilize and benefit from the highway improvements—widenings and new facilities—under the Trend and Alternatives I and II.**
- **No area of the Region, or minority or low-income community, would be expected to disproportionately bear the impact of the highway improvements proposed under the alternatives.**
- **Alternative II would have the least number of existing minorities and families in poverty residing in proximity to proposed freeway widenings, with about 27,000 minorities and 2,800 families in poverty within one-half mile (or 12,600 minorities and 1,500 families in poverty within one-quarter mile), compared to the Trend and Alternative I, which would both have about 81,800 minorities and 7,500 families in poverty within one-half mile (or 38,400 minorities and 7,500 families in poverty within one-quarter mile).**

This criterion provides an evaluation as to whether the existing minority populations and low-income populations within the Region would receive a disproportionate share of the impacts—both costs and benefits—of the highway improvements under each plan alternative. Specifically, an analysis was conducted to determine the extent to which the existing minority populations and low-income populations living in impacted areas would receive benefits—such as improved accessibility and improved safety—from the proposed new and widened arterials under each alternative. As part of this analysis, a select link analysis was conducted to determine whether existing minority populations and low-income populations would be expected to utilize the segments of arterial streets and highways that would be improved under each alternative. An analysis was also conducted to determine whether the existing minority populations and low-income populations would disproportionately bear any potential impacts from the new and widened facilities. In addition, an analysis was conducted to determine whether there is an over-representation of existing minority populations and low-income populations along freeways that would be widened.

- **Benefits from Arterial Improvements:** While minority populations and low-income populations utilize public transit at a higher proportion relative to other modes of travel than white and higher-income populations in the Region, the automobile is by far the dominant mode of travel for minority populations and low-income populations. In Milwaukee County, about 81 to 88 percent of travel by minority populations to and from work is by automobile (depending on the race or ethnicity), compared to 88 percent of the white population. Similarly, in Milwaukee County about 70 percent of travel by low-income populations to and from work is by automobile, compared to 89 percent for populations of higher income.

  Maps F.48 through F.53 show the percentage of the automobile trips within each TAZ that would utilize the new or widened surface arterial and freeway segments under each alternative. These maps

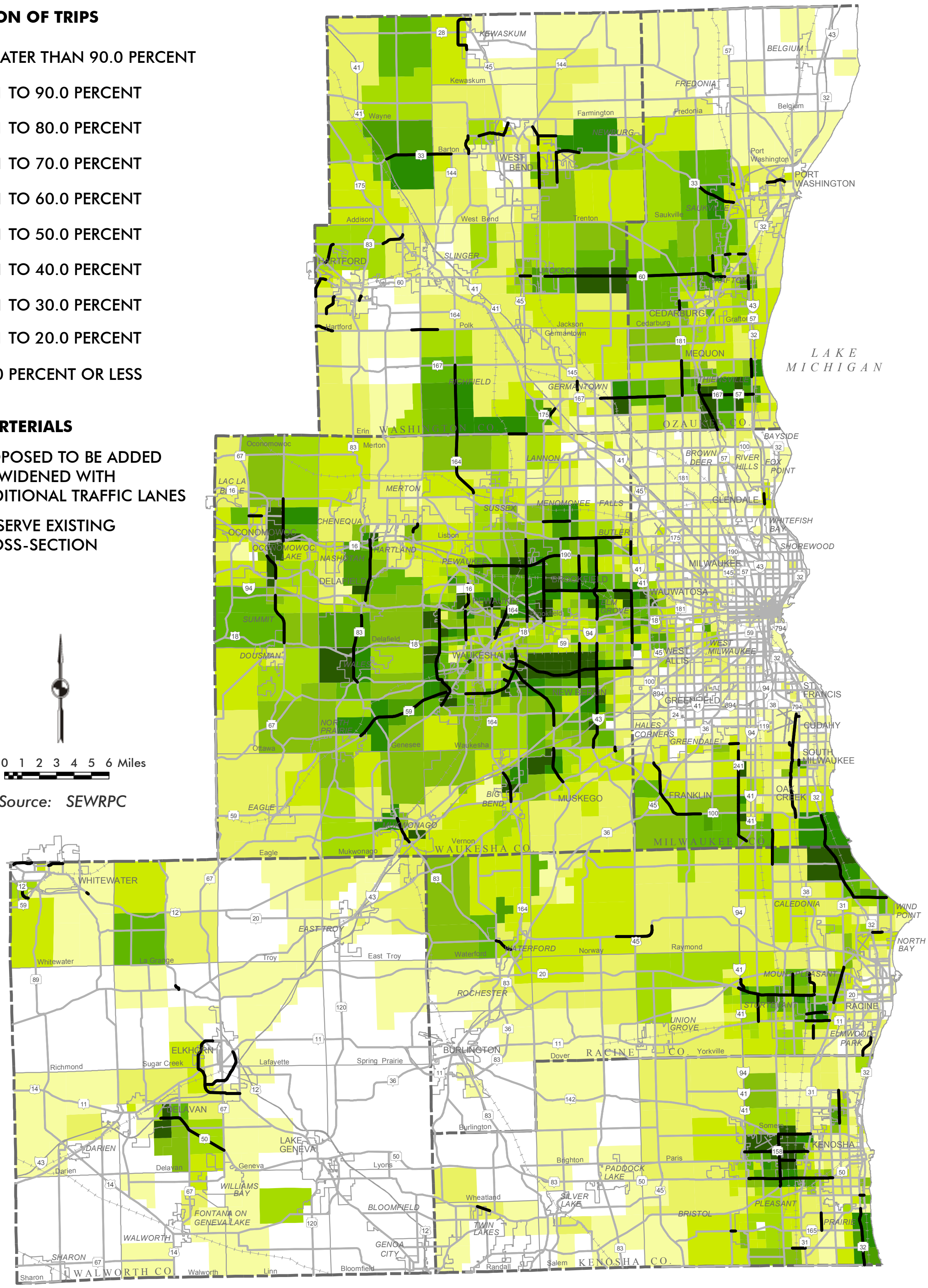
Map F.48
Proportion of Automobile Trips Using the New or Widened Surface Arterial Segments Within Each Traffic Analysis Zone Under the Trend

PROPORTION OF TRIPS

- GREATER THAN 90.0 PERCENT
- 80.1 TO 90.0 PERCENT
- 70.1 TO 80.0 PERCENT
- 60.1 TO 70.0 PERCENT
- 50.1 TO 60.0 PERCENT
- 40.1 TO 50.0 PERCENT
- 30.1 TO 40.0 PERCENT
- 20.1 TO 30.0 PERCENT
- 10.1 TO 20.0 PERCENT
- 10.0 PERCENT OR LESS

SURFACE ARTERIALS

- PROPOSED TO BE ADDED OR WIDENED WITH ADDITIONAL TRAFFIC LANES
- PRESERVE EXISTING CROSS-SECTION



0 1 2 3 4 5 6 Miles

Source: SEWRPC

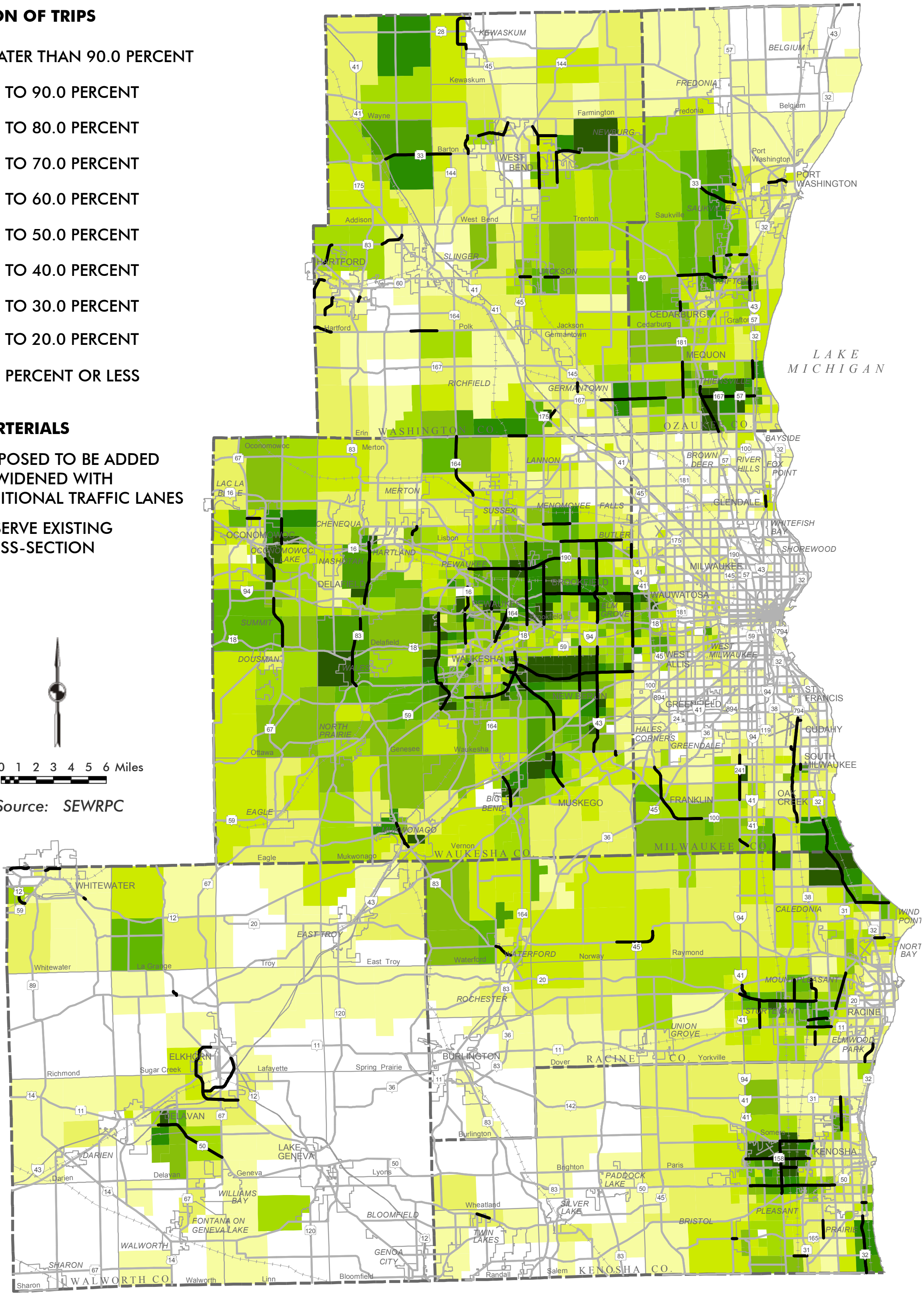
Map F.49
Proportion of Automobile Trips Using the New or Widened Surface Arterial Segments Within Each Traffic Analysis Zone Under Alternative I

PROPORTION OF TRIPS

- GREATER THAN 90.0 PERCENT
- 80.1 TO 90.0 PERCENT
- 70.1 TO 80.0 PERCENT
- 60.1 TO 70.0 PERCENT
- 50.1 TO 60.0 PERCENT
- 40.1 TO 50.0 PERCENT
- 30.1 TO 40.0 PERCENT
- 20.1 TO 30.0 PERCENT
- 10.1 TO 20.0 PERCENT
- 10.0 PERCENT OR LESS

SURFACE ARTERIALS

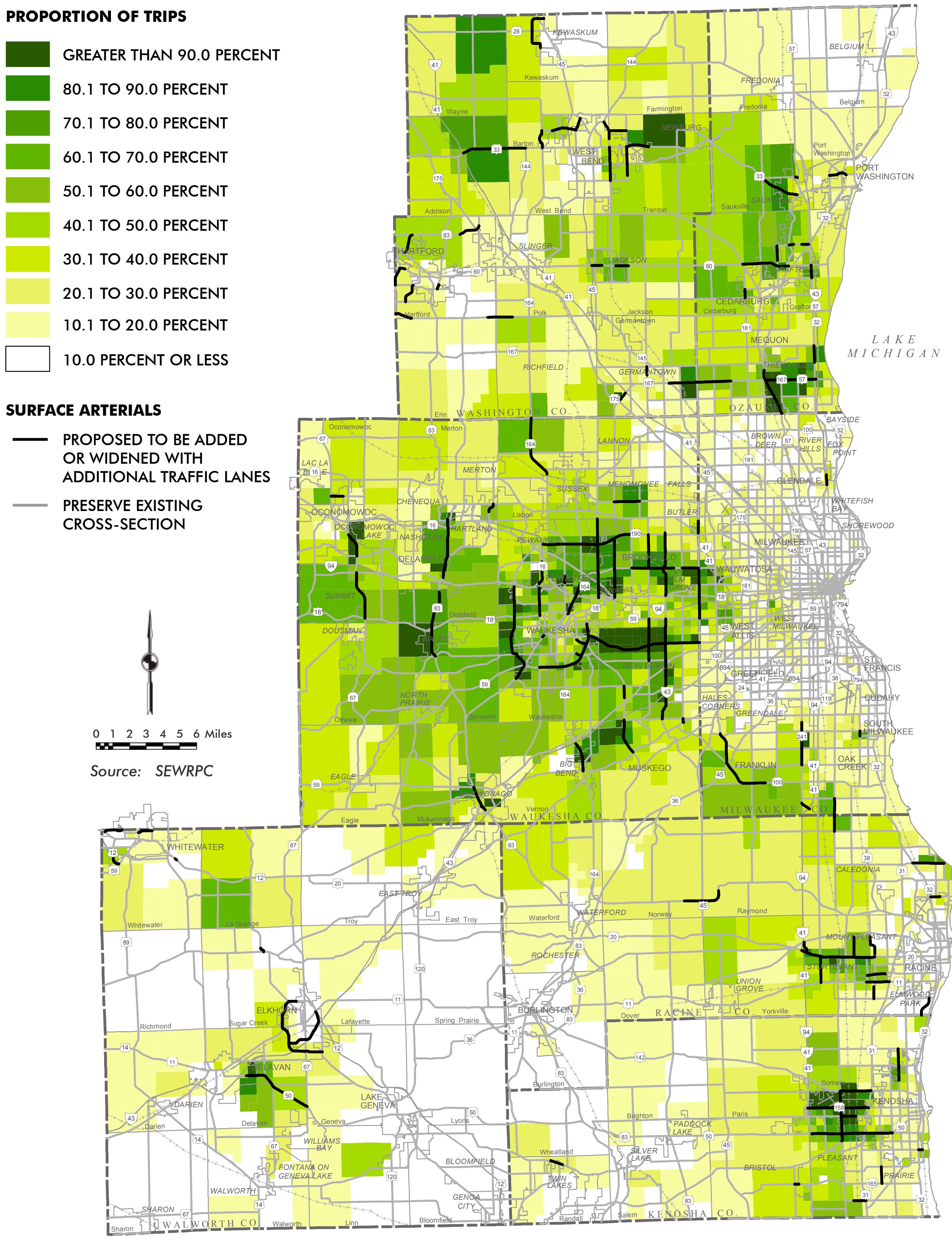
- PROPOSED TO BE ADDED OR WIDENED WITH ADDITIONAL TRAFFIC LANES
- PRESERVE EXISTING CROSS-SECTION



0 1 2 3 4 5 6 Miles

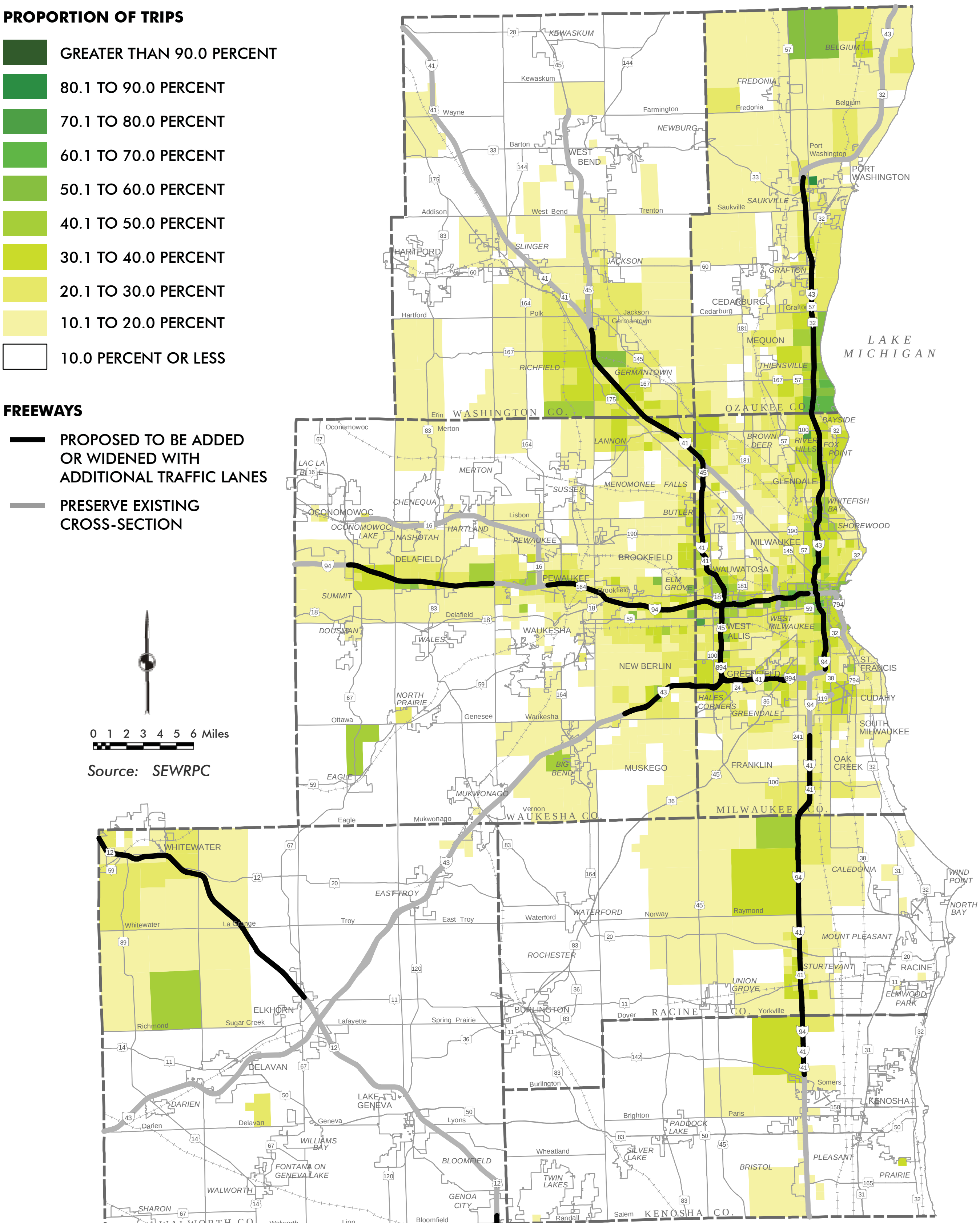
Source: *SEWRPC*

Map F.50
Proportion of Automobile Trips Using the New or Widened Surface Arterial Segments Within Each Traffic Analysis Zone Under Alternative II



Source: SEWRPC

Map F.51
Proportion of Automobile Trips Using the New or Widened Freeway Segments Within Each Traffic Analysis Zone Under the Trend



Source: SEWRPC

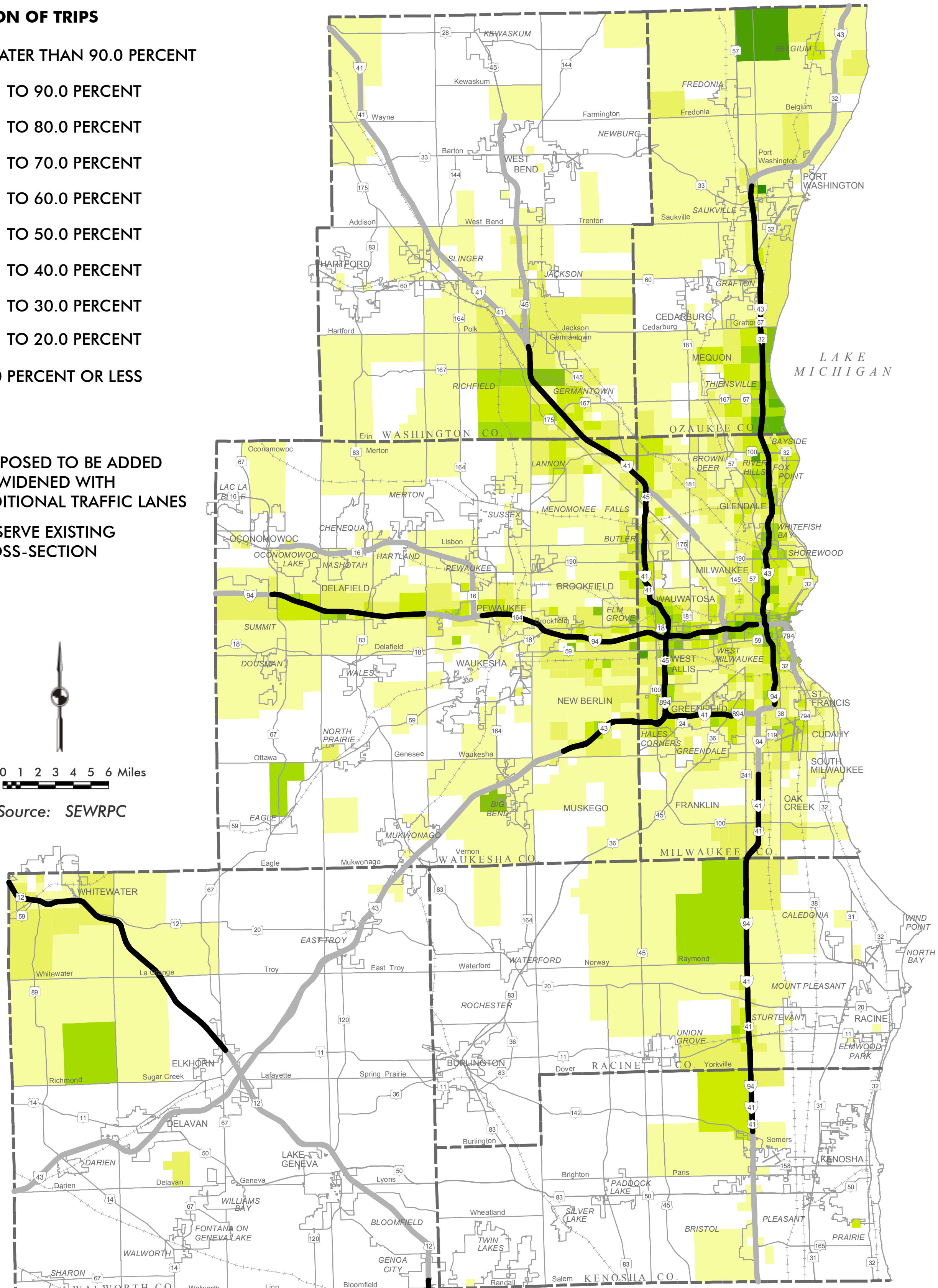
Map F.52
Proportion of Automobile Trips Using the New or Widened Freeway Segments Within Each Traffic Analysis Zone Under Alternative I

PROPORTION OF TRIPS

- GREATER THAN 90.0 PERCENT
- 80.1 TO 90.0 PERCENT
- 70.1 TO 80.0 PERCENT
- 60.1 TO 70.0 PERCENT
- 50.1 TO 60.0 PERCENT
- 40.1 TO 50.0 PERCENT
- 30.1 TO 40.0 PERCENT
- 20.1 TO 30.0 PERCENT
- 10.1 TO 20.0 PERCENT
- 10.0 PERCENT OR LESS

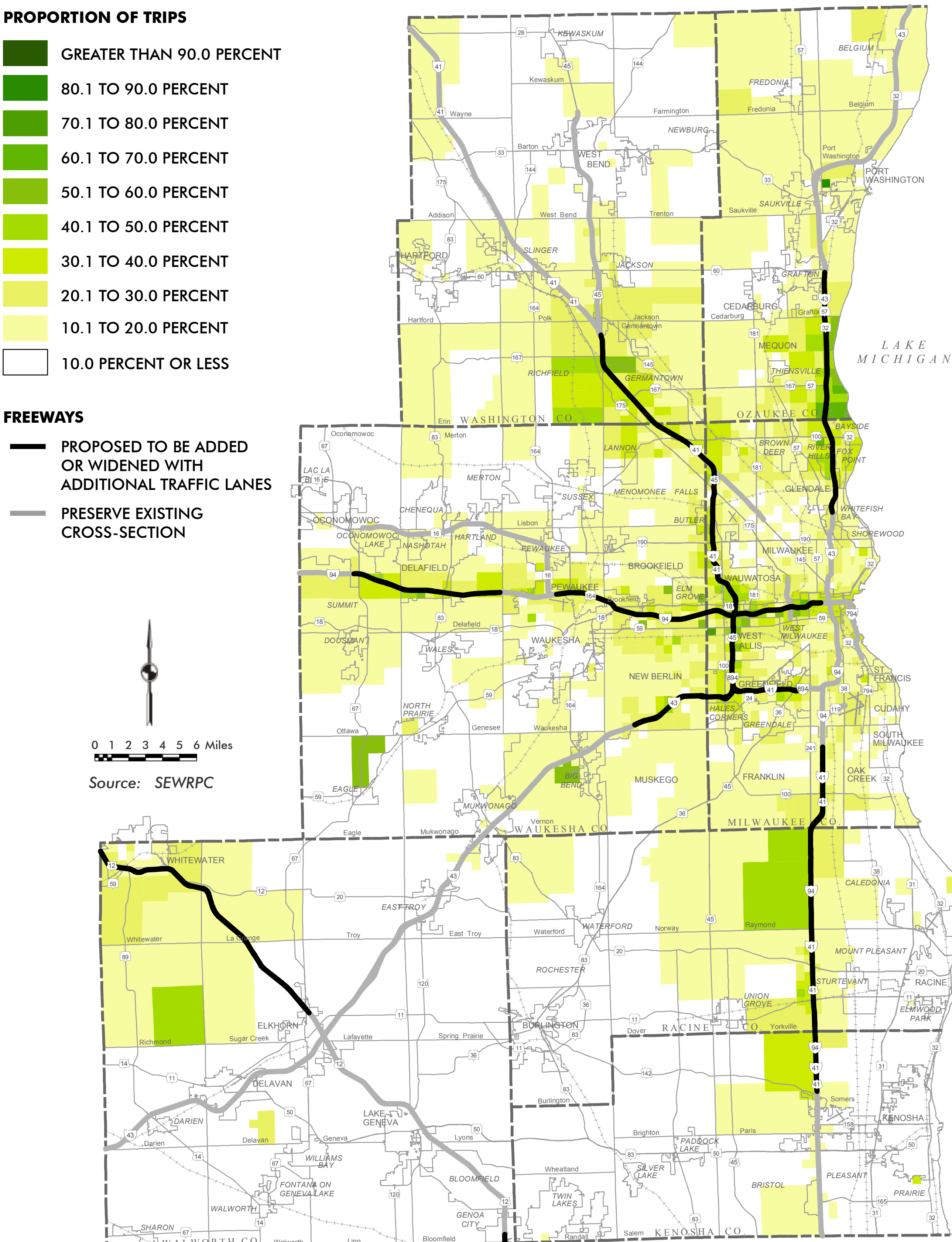
FREEWAYS

- PROPOSED TO BE ADDED OR WIDENED WITH ADDITIONAL TRAFFIC LANES
- PRESERVE EXISTING CROSS-SECTION



Source: SEWRPC

Map F.53
Proportion of Automobile Trips Using the New or Widened Freeway Segments Within Each Traffic Analysis Zone Under Alternative II



Source: SEWRPC

were compared to locations of current concentrations of minority populations and low-income populations (as shown on Maps F.54 and F.55). With respect to surface arterials, the areas that would have the greatest use of these proposed improved arterials are largely adjacent, or near, the proposed new or widened surface arterials. The proposed new and widened surface arterials are largely located outside existing areas of minority population and low-income population. With respect to freeways, the segments of freeway proposed to be widened under the alternatives would directly serve areas of minority population and low-income population, particularly in Milwaukee County. As a result, it is expected that minority populations and low-income populations, particularly those residing adjacent to the freeway widenings, would be utilizing and experiencing benefit from the expected improvement in accessibility associated with the proposed widenings.

Improvements in accessibility to jobs and other activity areas for existing minority populations and low-income populations were analyzed in Criterion 2.1.1 (Level of Accessibility to Jobs and Activity Centers for Minority Populations and Low-Income Populations by Mode). The results of this criterion indicated that, even as traffic volumes increase through the year 2050, the additional arterial street and highway system capacity under the alternatives would modestly improve accessibility to jobs and other activity centers for minority populations and low-income populations. Of the alternatives, Alternative I was found to provide the most benefit in terms of accessibility to jobs and other activity areas by automobile for existing minority populations and low-income populations, followed by the Trend, and then Alternative II.

With respect to safety, rear-end collision rates have historically been 5 to 20 times higher on congested freeways (with the highest rear-end crash rates on the most extremely congested freeways). By improving safety through the reduction in congestion along the freeway segments that would be widened, there would also be direct benefits to the existing minority populations and low-income populations that would use the widened freeway segments under each alternative.

- **Impacts of Widenings and New Facilities:** Maps F.56 through F.64 compare the locations of the highway capacity improvements under each alternative to the areas with current concentrations of minority populations and low-income populations. In general, no area of the Region, or minority or low-income community, would be expected to disproportionately bear the impact of these highway improvements. Proposed surface arterial improvements are largely located outside areas of existing minority populations and low-income populations, and therefore their widening, new construction, and subsequent operation would be expected to have minimal negative impacts on minority populations and low-income populations. With respect to the proposed freeway widenings and new construction, some segments are located adjacent to existing minority populations, but most segments are not.

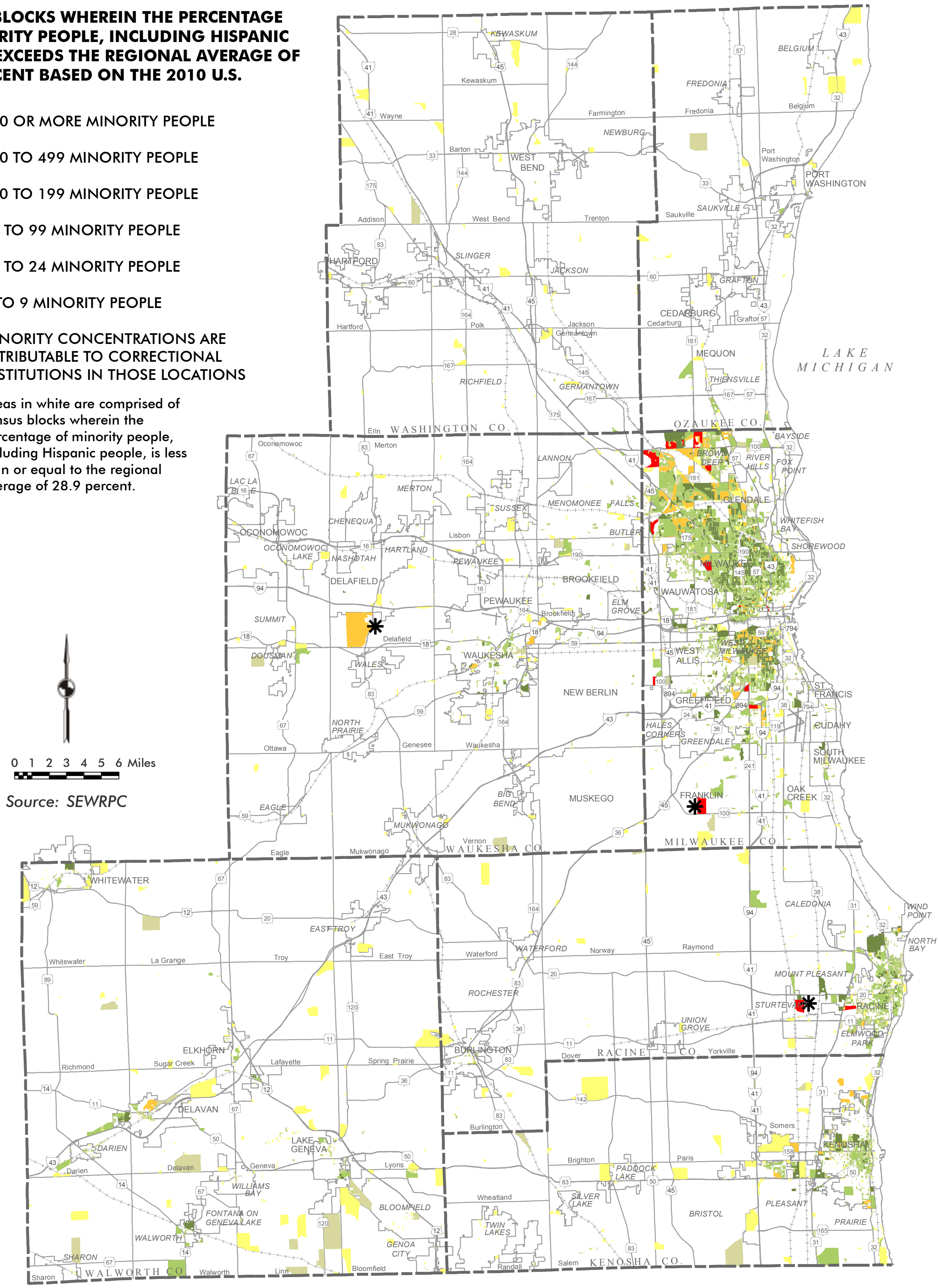
- **Impacts from Freeway Widenings:** Maps F.65 through F.70 show the locations of freeways that would be widened under each alternative compared to the existing locations of areas with concentrations of minority populations and low-income populations. Table F.23 shows the estimated existing minority populations and low-income populations residing in proximity (one-quarter mile to one-half mile)

Map F.54
Concentrations of Total Minority Population in the Region: 2010

CENSUS BLOCKS WHEREIN THE PERCENTAGE OF MINORITY PEOPLE, INCLUDING HISPANIC PEOPLE, EXCEEDS THE REGIONAL AVERAGE OF 28.9 PERCENT BASED ON THE 2010 U.S. CENSUS

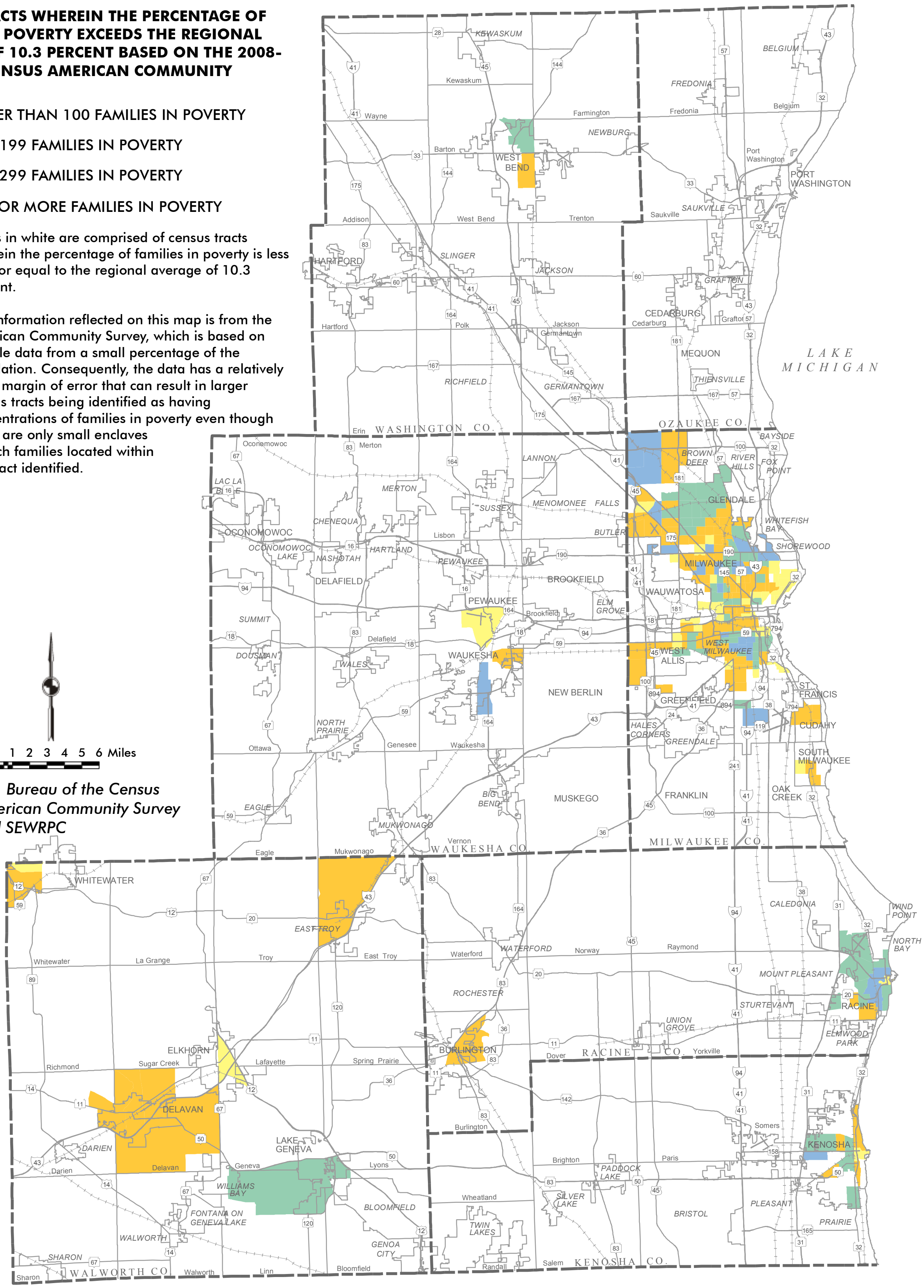
- 500 OR MORE MINORITY PEOPLE
- 200 TO 499 MINORITY PEOPLE
- 100 TO 199 MINORITY PEOPLE
- 25 TO 99 MINORITY PEOPLE
- 10 TO 24 MINORITY PEOPLE
- 1 TO 9 MINORITY PEOPLE
- * MINORITY CONCENTRATIONS ARE ATTRIBUTABLE TO CORRECTIONAL INSTITUTIONS IN THOSE LOCATIONS

Note: Areas in white are comprised of census blocks wherein the percentage of minority people, including Hispanic people, is less than or equal to the regional average of 28.9 percent.



Source: SEWRPC

Map F.55
Concentrations of Families in Poverty in the Region: 2008-2012



CENSUS TRACTS WHEREIN THE PERCENTAGE OF FAMILIES IN POVERTY EXCEEDS THE REGIONAL AVERAGE OF 10.3 PERCENT BASED ON THE 2008-2012 U.S. CENSUS AMERICAN COMMUNITY SURVEY

- FEWER THAN 100 FAMILIES IN POVERTY
- 100-199 FAMILIES IN POVERTY
- 200-299 FAMILIES IN POVERTY
- 300 OR MORE FAMILIES IN POVERTY

Notes: Areas in white are comprised of census tracts wherein the percentage of families in poverty is less than or equal to the regional average of 10.3 percent.

The information reflected on this map is from the American Community Survey, which is based on sample data from a small percentage of the population. Consequently, the data has a relatively large margin of error that can result in larger census tracts being identified as having concentrations of families in poverty even though there are only small enclaves of such families located within the tract identified.

Source: U.S. Bureau of the Census American Community Survey and SEWRPC

Map F.56
Comparison of Existing Concentrations of Total Minority Population in the Region to Highway Element: Trend

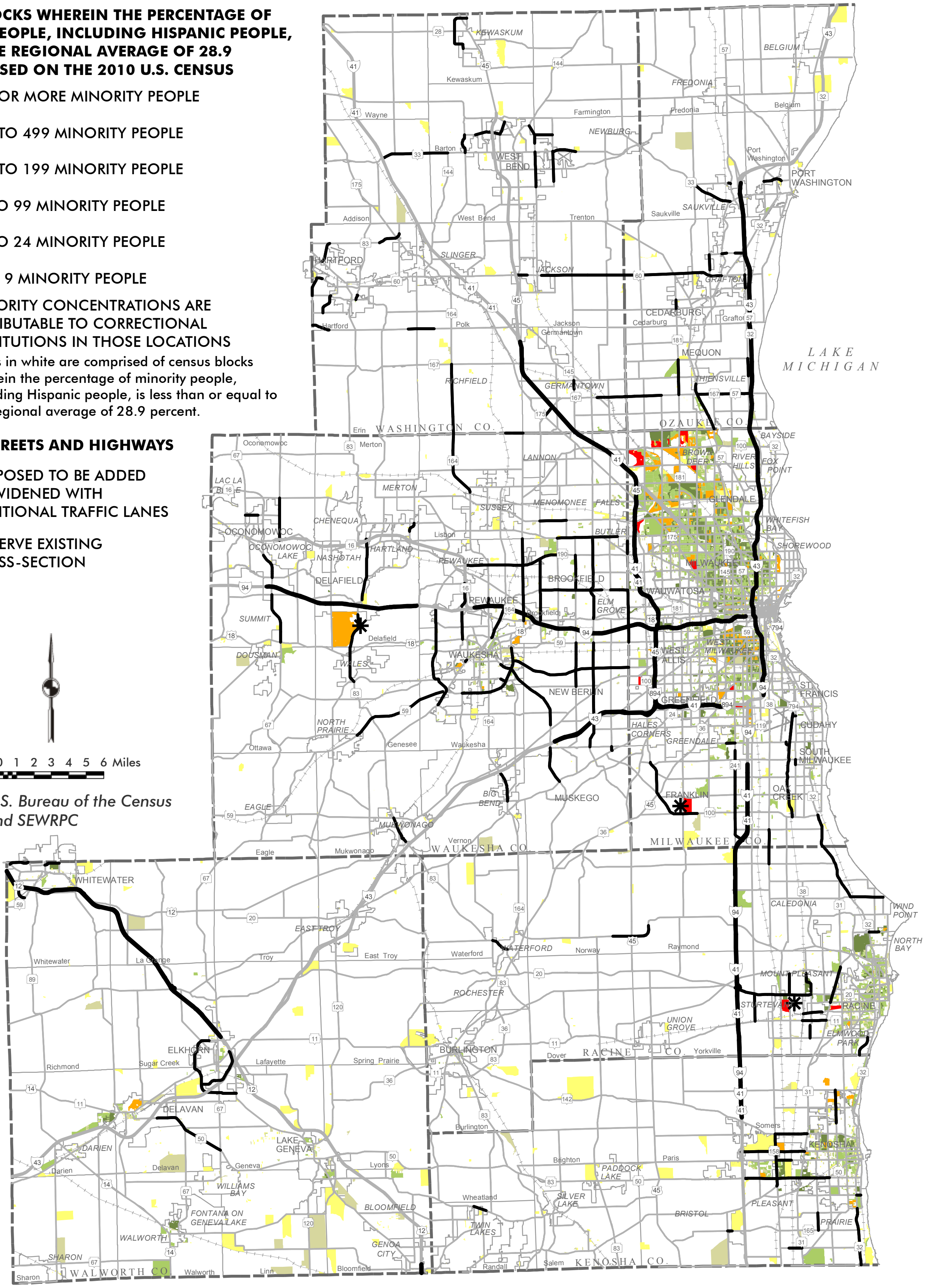
CENSUS BLOCKS WHEREIN THE PERCENTAGE OF MINORITY PEOPLE, INCLUDING HISPANIC PEOPLE, EXCEEDS THE REGIONAL AVERAGE OF 28.9 PERCENT BASED ON THE 2010 U.S. CENSUS

- 500 OR MORE MINORITY PEOPLE
- 200 TO 499 MINORITY PEOPLE
- 100 TO 199 MINORITY PEOPLE
- 25 TO 99 MINORITY PEOPLE
- 10 TO 24 MINORITY PEOPLE
- 1 TO 9 MINORITY PEOPLE
- ✱ MINORITY CONCENTRATIONS ARE ATTRIBUTABLE TO CORRECTIONAL INSTITUTIONS IN THOSE LOCATIONS

Note: Areas in white are comprised of census blocks wherein the percentage of minority people, including Hispanic people, is less than or equal to the regional average of 28.9 percent.

ARTERIAL STREETS AND HIGHWAYS

- PROPOSED TO BE ADDED OR WIDENED WITH ADDITIONAL TRAFFIC LANES
- PRESERVE EXISTING CROSS-SECTION



Source: U.S. Bureau of the Census and SEWRPC

Map F.57
Comparison of Existing Concentrations of Families in Poverty in the Region to Highway Element: Trend

CENSUS TRACTS WHEREIN THE PERCENTAGE OF FAMILIES IN POVERTY EXCEEDS THE REGIONAL AVERAGE OF 10.3 PERCENT BASED ON THE 2008-2012 U.S. CENSUS AMERICAN COMMUNITY SURVEY

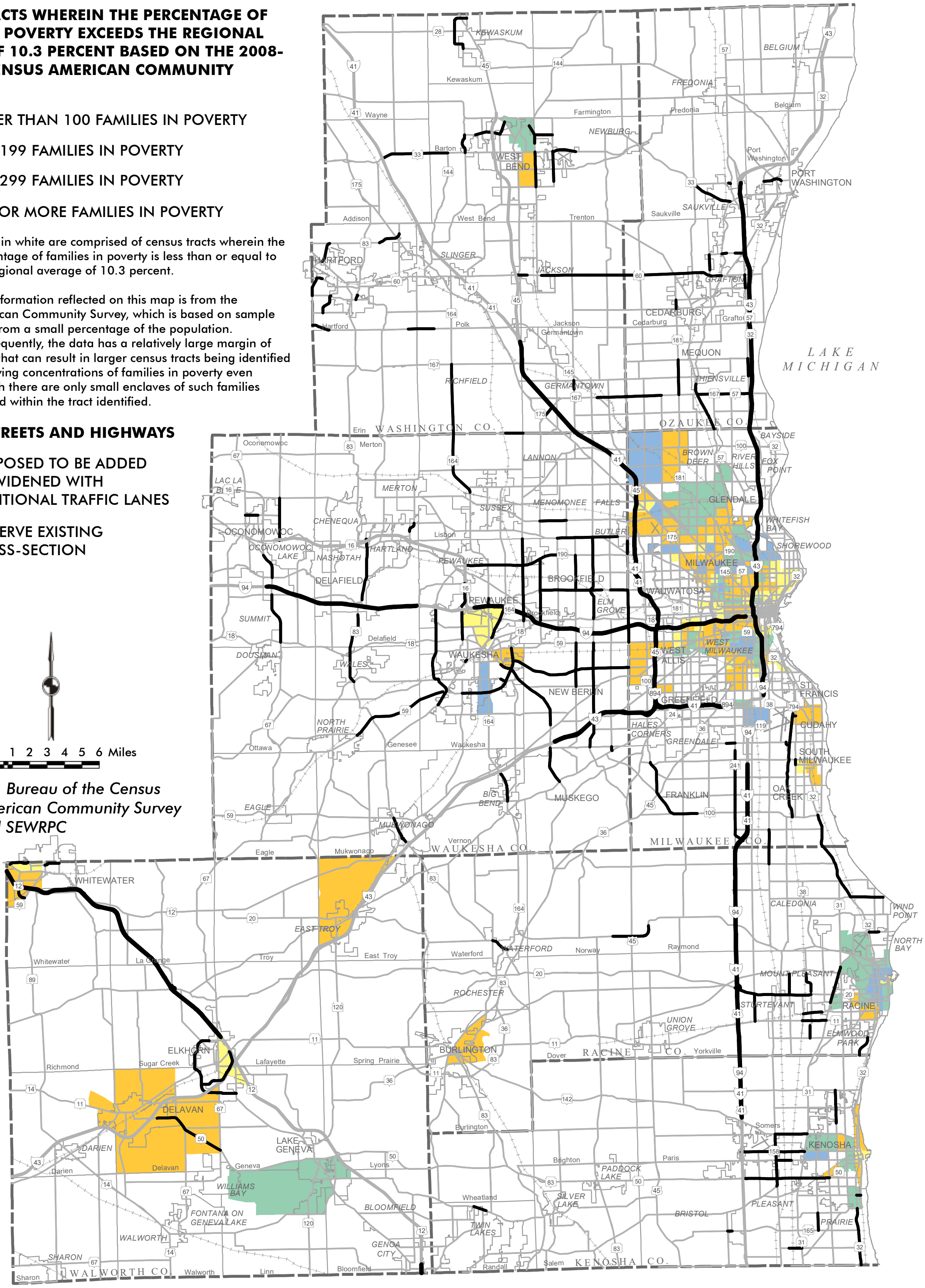
- FEWER THAN 100 FAMILIES IN POVERTY
- 100-199 FAMILIES IN POVERTY
- 200-299 FAMILIES IN POVERTY
- 300 OR MORE FAMILIES IN POVERTY

Notes: Areas in white are comprised of census tracts wherein the percentage of families in poverty is less than or equal to the regional average of 10.3 percent.

The information reflected on this map is from the American Community Survey, which is based on sample data from a small percentage of the population. Consequently, the data has a relatively large margin of error that can result in larger census tracts being identified as having concentrations of families in poverty even though there are only small enclaves of such families located within the tract identified.

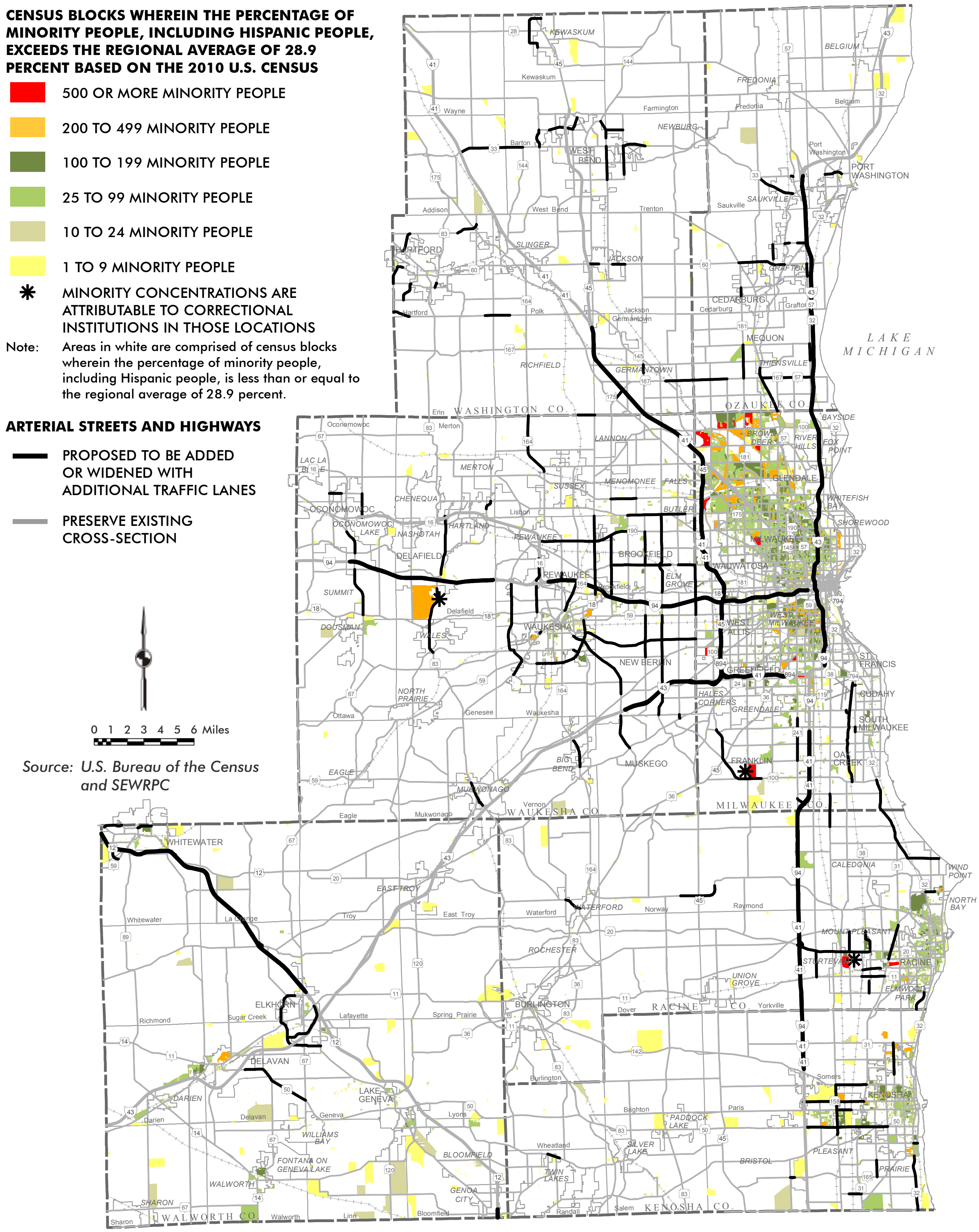
ARTERIAL STREETS AND HIGHWAYS

- PROPOSED TO BE ADDED OR WIDENED WITH ADDITIONAL TRAFFIC LANES
- PRESERVE EXISTING CROSS-SECTION



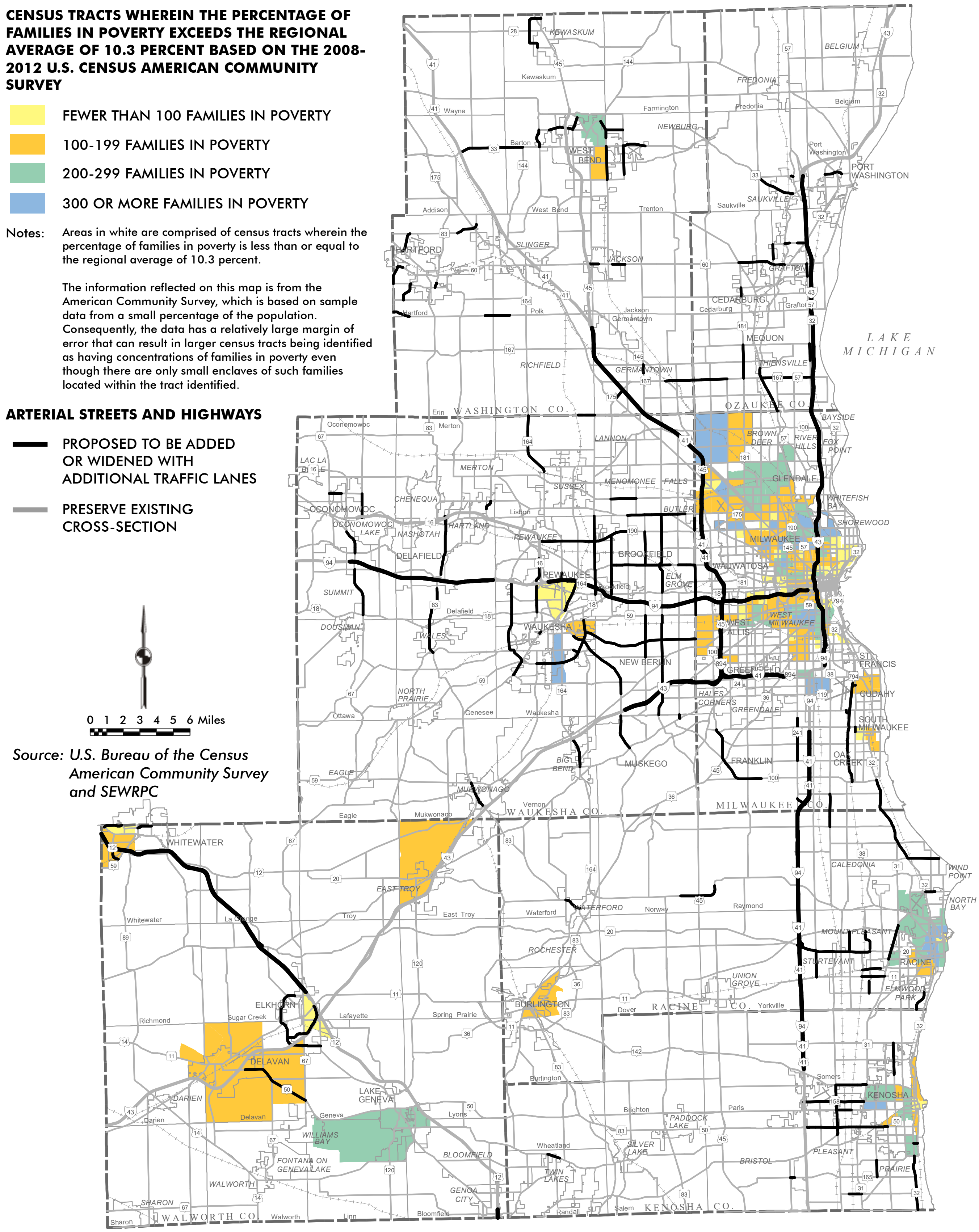
Source: U.S. Bureau of the Census American Community Survey and SEWRPC

Map F.58
Comparison of Existing Concentrations of Total Minority Population in the Region to Highway Element: Alternative I

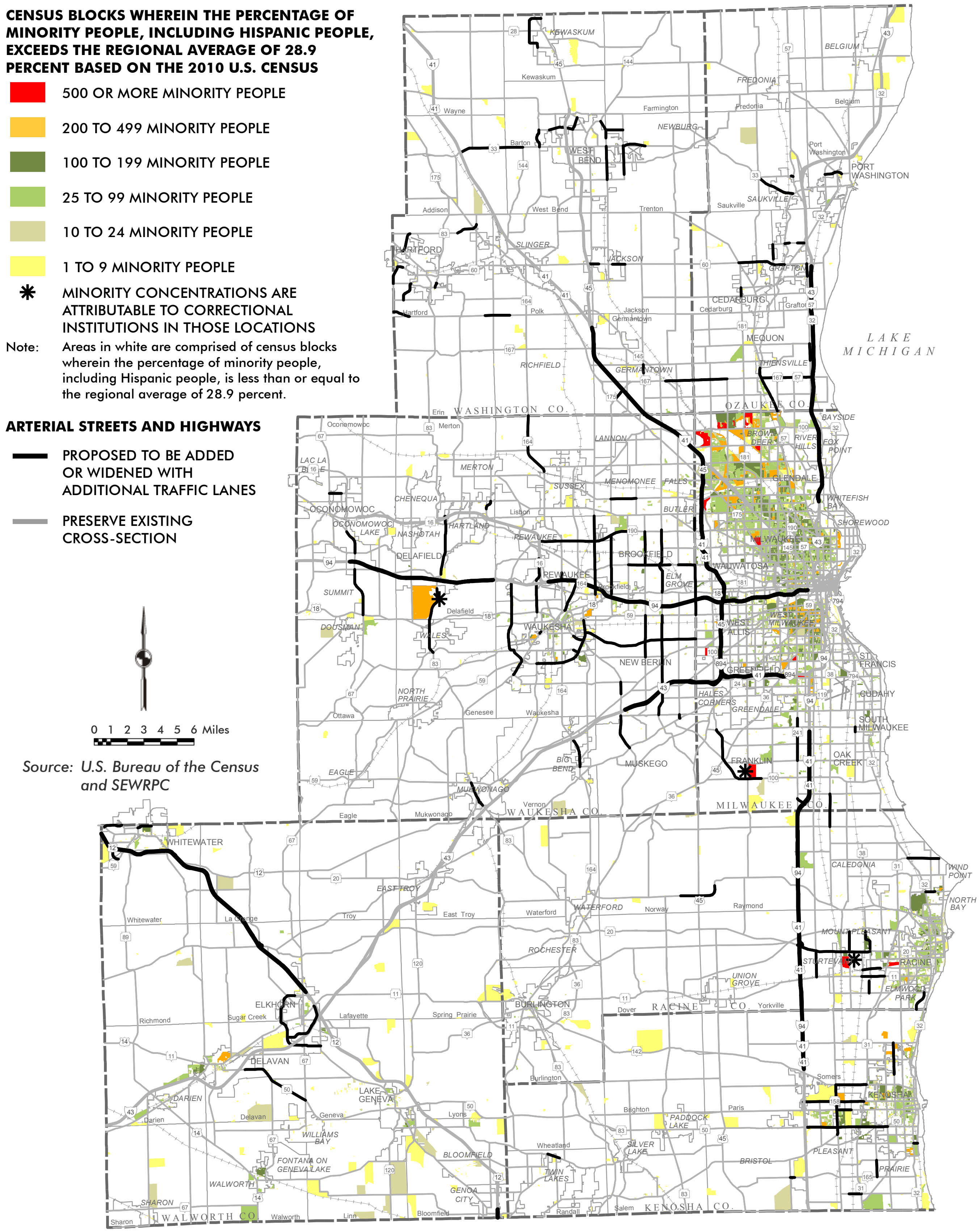


Source: U.S. Bureau of the Census and SEWRPC

Map F.59
Comparison of Existing Concentrations of Families in Poverty in the Region to Highway Element: Alternative I



Map F.60
Comparison of Existing Concentrations of Total Minority Population in the Region to Highway Element: Alternative II



Map F.61
Comparison of Existing Concentrations of Families in Poverty in the Region to Highway Element: Alternative II

CENSUS TRACTS WHEREIN THE PERCENTAGE OF FAMILIES IN POVERTY EXCEEDS THE REGIONAL AVERAGE OF 10.3 PERCENT BASED ON THE 2008-2012 U.S. CENSUS AMERICAN COMMUNITY SURVEY

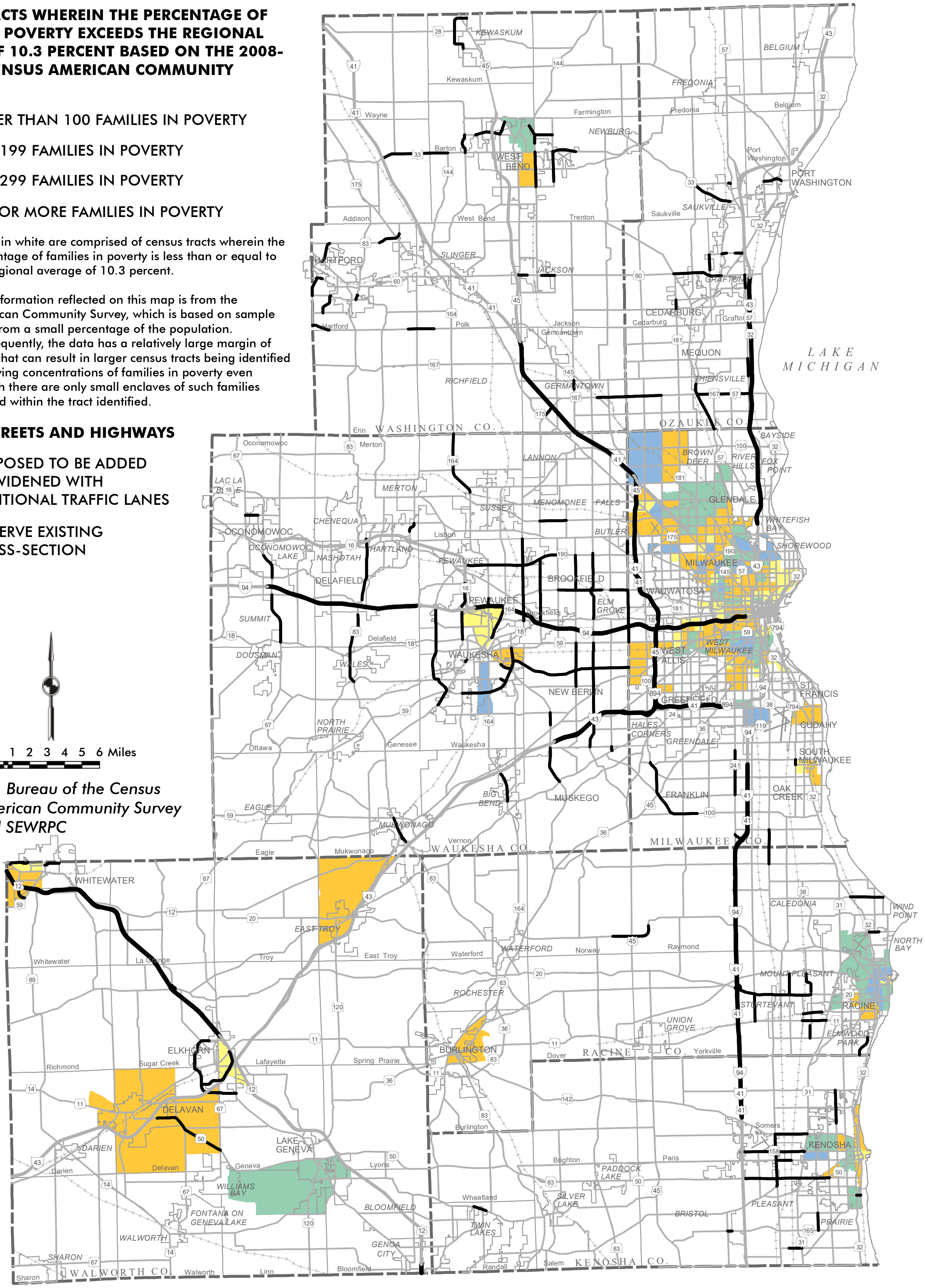
- FEWER THAN 100 FAMILIES IN POVERTY
- 100-199 FAMILIES IN POVERTY
- 200-299 FAMILIES IN POVERTY
- 300 OR MORE FAMILIES IN POVERTY

Notes: Areas in white are comprised of census tracts wherein the percentage of families in poverty is less than or equal to the regional average of 10.3 percent.

The information reflected on this map is from the American Community Survey, which is based on sample data from a small percentage of the population. Consequently, the data has a relatively large margin of error that can result in larger census tracts being identified as having concentrations of families in poverty even though there are only small enclaves of such families located within the tract identified.

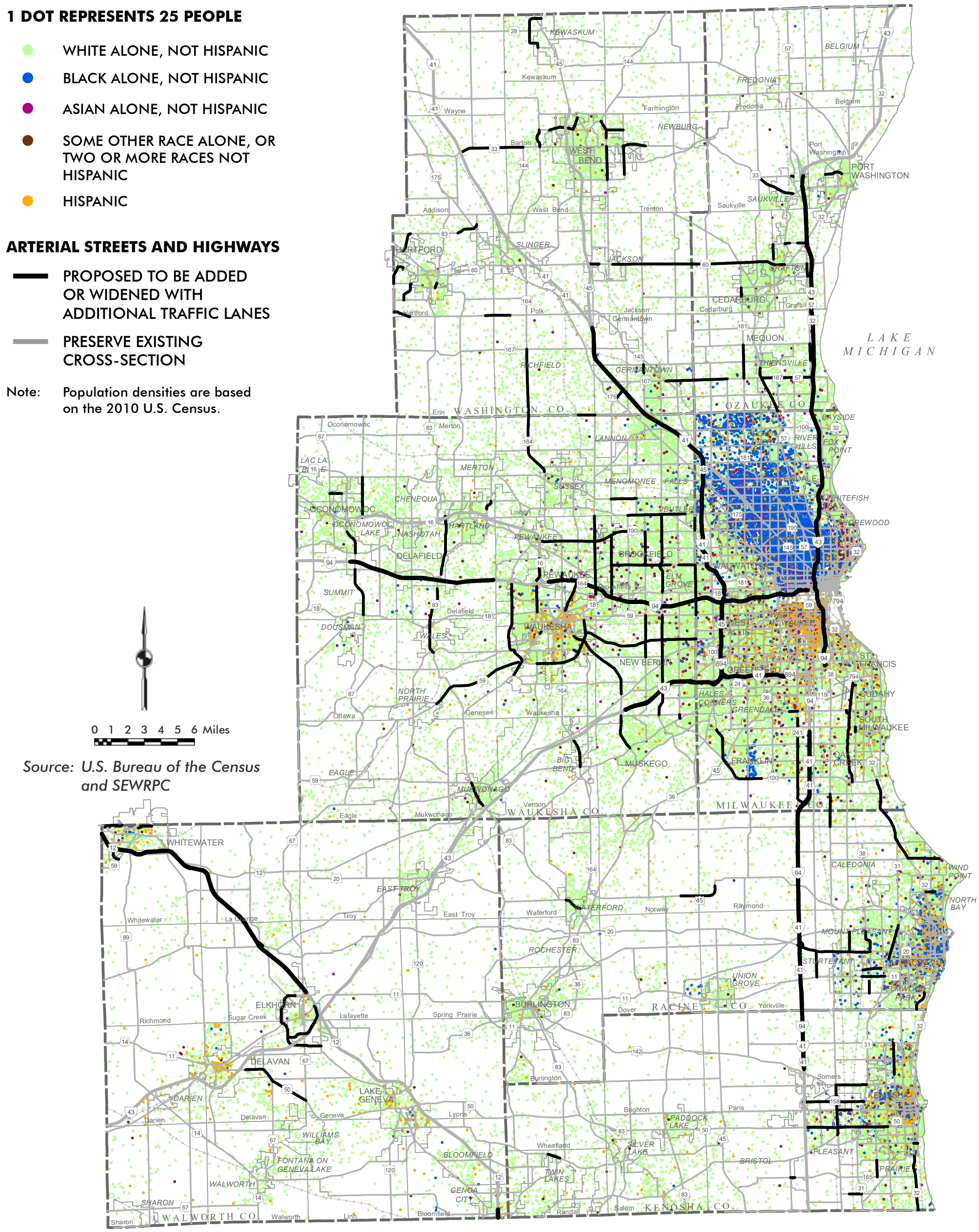
ARTERIAL STREETS AND HIGHWAYS

- PROPOSED TO BE ADDED OR WIDENED WITH ADDITIONAL TRAFFIC LANES
- PRESERVE EXISTING CROSS-SECTION

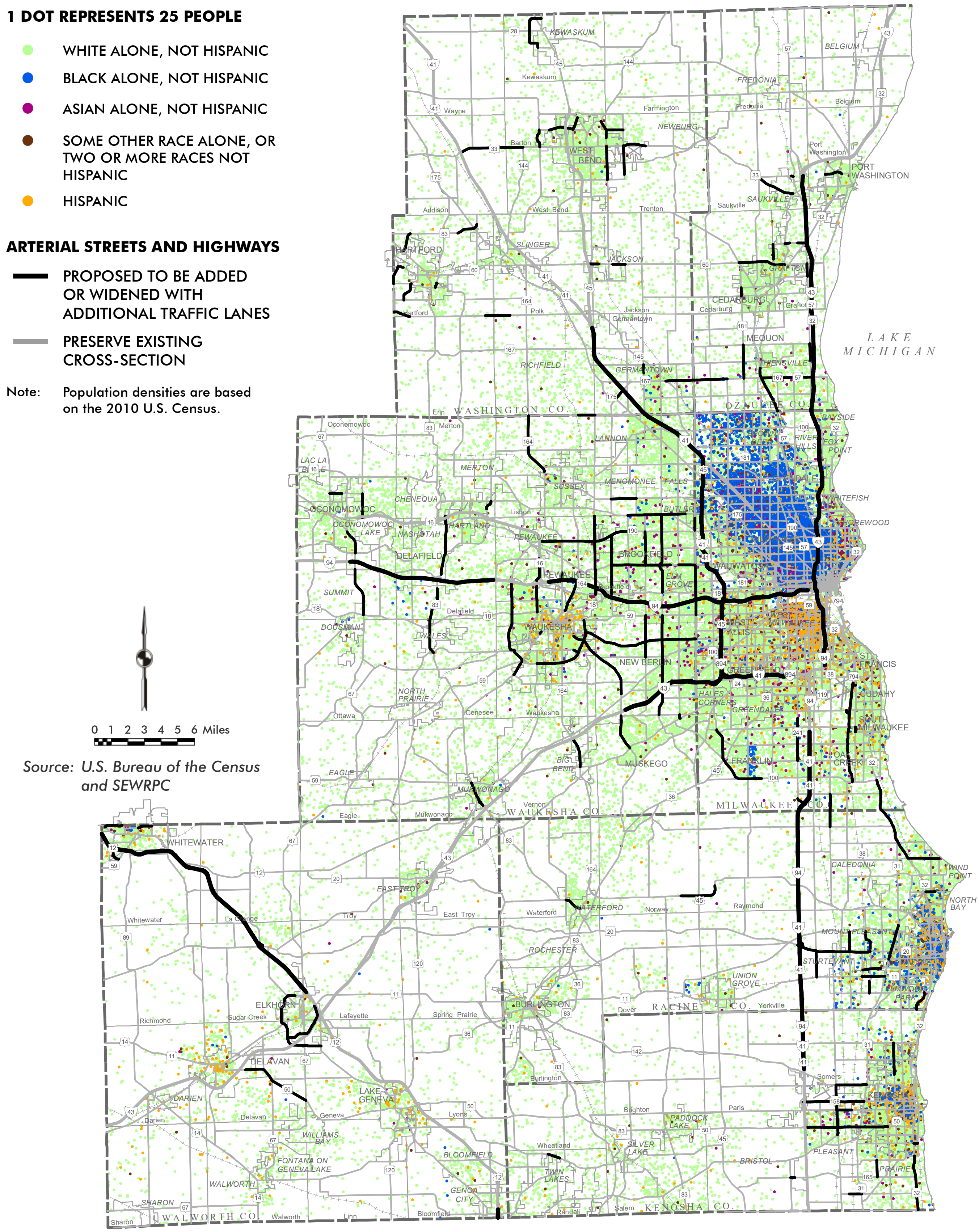


Source: U.S. Bureau of the Census American Community Survey and SEWRPC

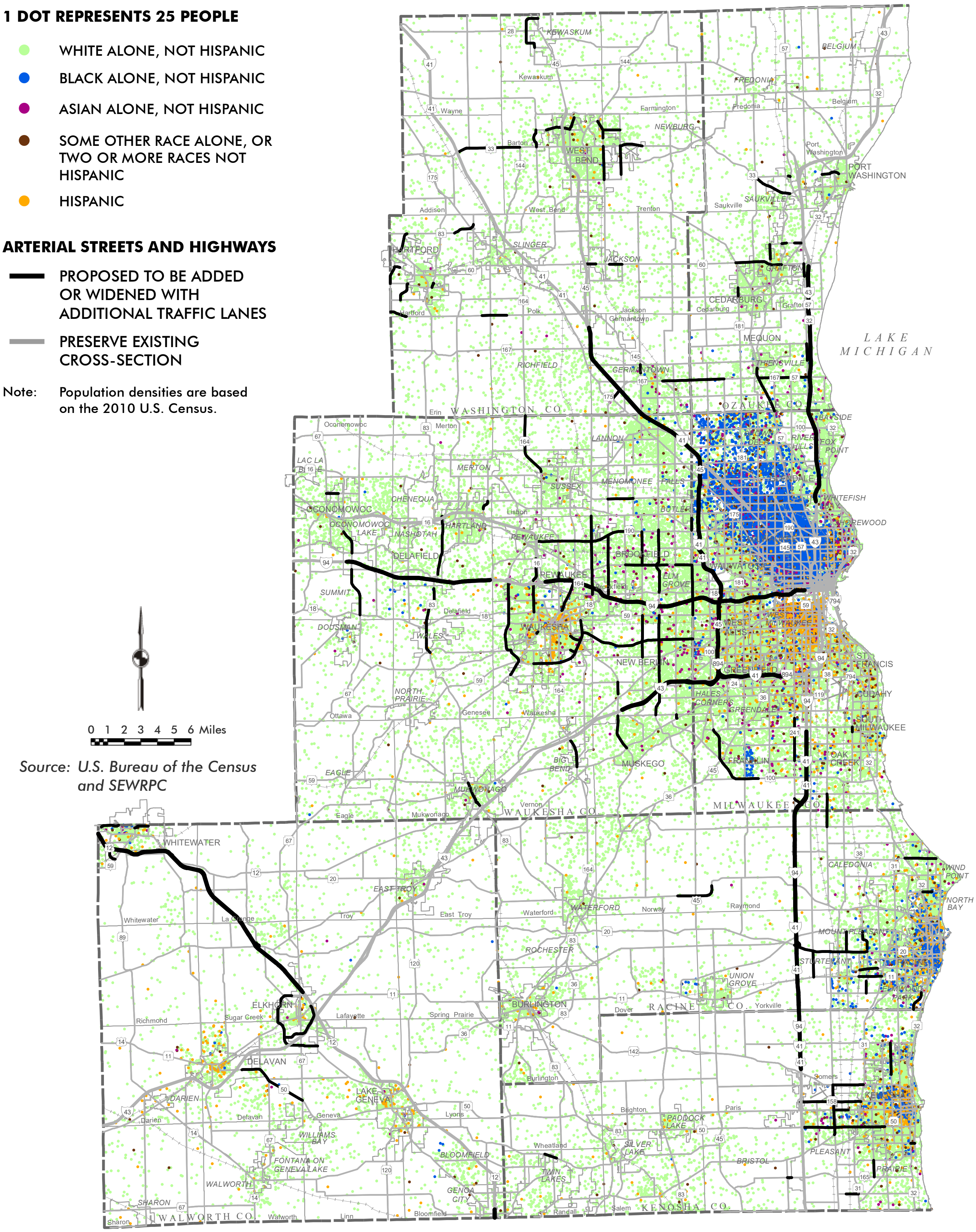
Map F.62
Comparison of Concentrations of Year 2010 Races/Ethnicities in the Region to Highway Element: Trend



Map F.63
Comparison of Concentrations of Year 2010 Races/Ethnicities in the Region to Highway Element: Alternative I



Map F.64
Comparison of Concentrations of Year 2010 Races/Ethnicities in the Region to Highway Element: Alternative II



Source: U.S. Bureau of the Census and SEWRPC

Map F.65
Comparison of Existing Concentrations of Total Minority Population in the Region to Freeways: Trend

CENSUS BLOCKS WHEREIN THE PERCENTAGE OF MINORITY PEOPLE, INCLUDING HISPANIC PEOPLE, EXCEEDS THE REGIONAL AVERAGE OF 28.9 PERCENT BASED ON THE 2010 U.S. CENSUS

- 500 OR MORE MINORITY PEOPLE
- 200 TO 499 MINORITY PEOPLE
- 100 TO 199 MINORITY PEOPLE
- 25 TO 99 MINORITY PEOPLE
- 10 TO 24 MINORITY PEOPLE
- 1 TO 9 MINORITY PEOPLE
- * MINORITY CONCENTRATIONS ARE ATTRIBUTABLE TO CORRECTIONAL INSTITUTIONS IN THOSE LOCATIONS

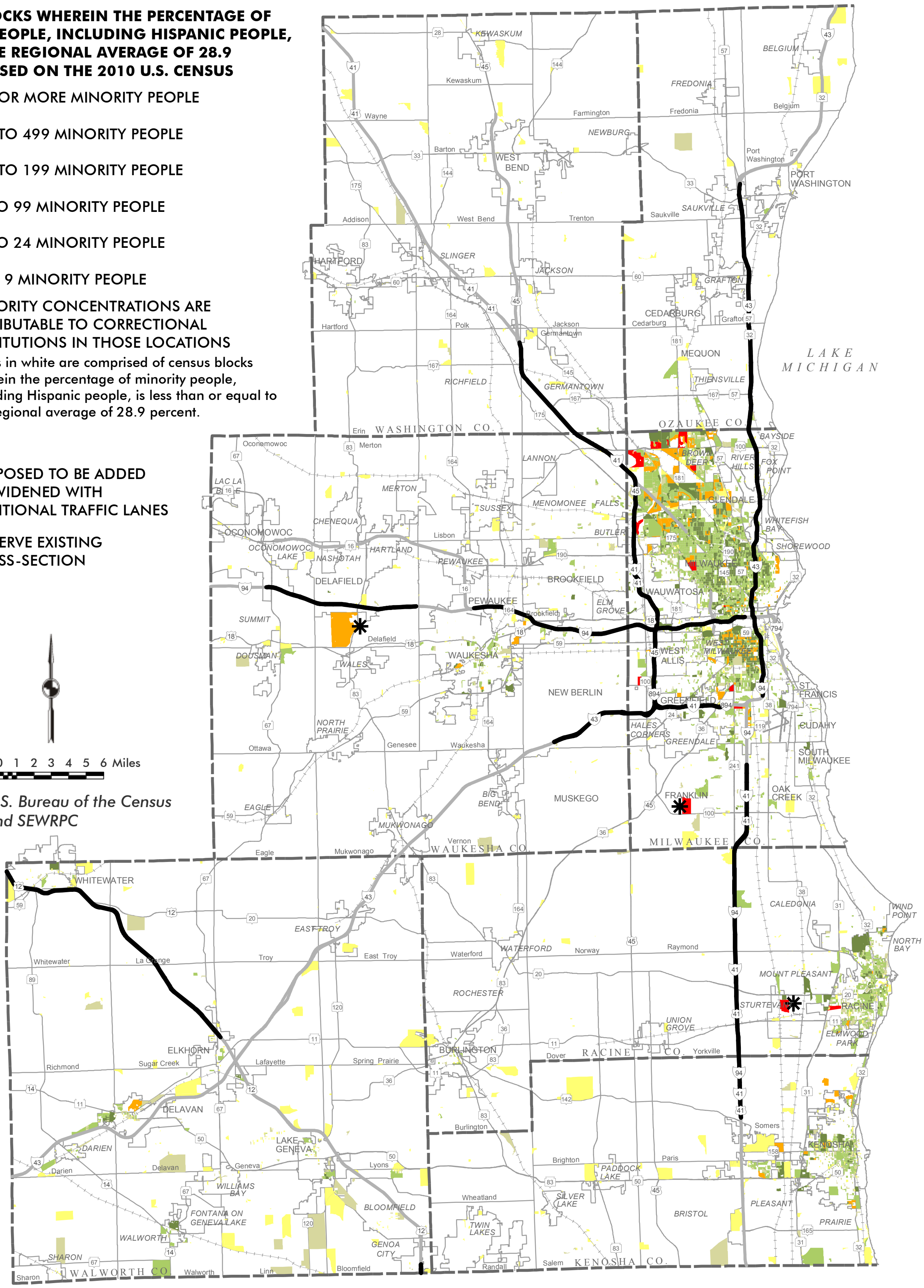
Note: Areas in white are comprised of census blocks wherein the percentage of minority people, including Hispanic people, is less than or equal to the regional average of 28.9 percent.

FREEWAYS

- PROPOSED TO BE ADDED OR WIDENED WITH ADDITIONAL TRAFFIC LANES
- PRESERVE EXISTING CROSS-SECTION

0 1 2 3 4 5 6 Miles

Source: U.S. Bureau of the Census and SEWRPC



Map F.66
Comparison of Existing Concentrations of Families in Poverty in the Region to Freeways: Trend

CENSUS TRACTS WHEREIN THE PERCENTAGE OF FAMILIES IN POVERTY EXCEEDS THE REGIONAL AVERAGE OF 10.3 PERCENT BASED ON THE 2008-2012 U.S. CENSUS AMERICAN COMMUNITY SURVEY

- FEWER THAN 100 FAMILIES IN POVERTY
- 100-199 FAMILIES IN POVERTY
- 200-299 FAMILIES IN POVERTY
- 300 OR MORE FAMILIES IN POVERTY

Notes: Areas in white are comprised of census tracts wherein the percentage of families in poverty is less than or equal to the regional average of 10.3 percent.

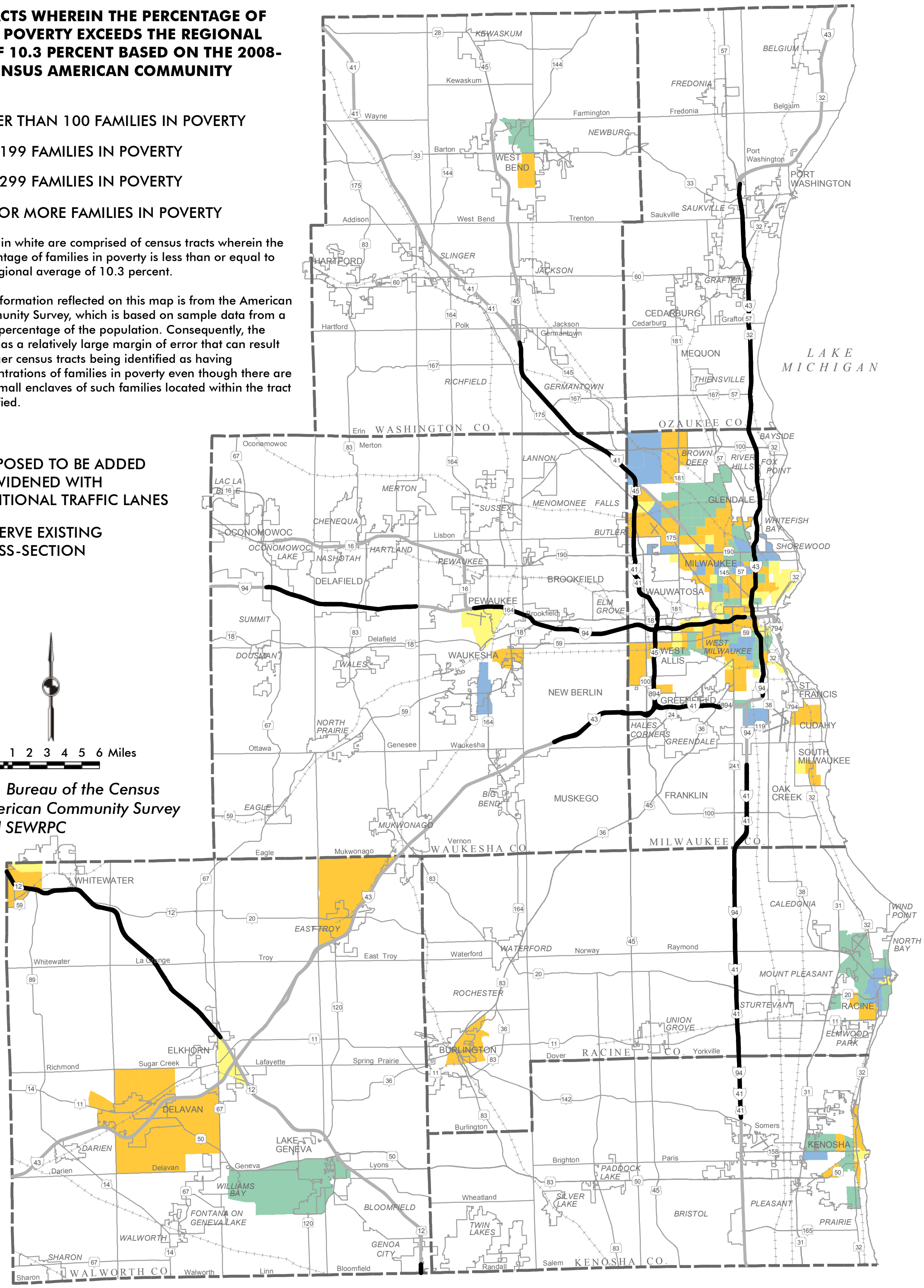
The information reflected on this map is from the American Community Survey, which is based on sample data from a small percentage of the population. Consequently, the data has a relatively large margin of error that can result in larger census tracts being identified as having concentrations of families in poverty even though there are only small enclaves of such families located within the tract identified.

FREEWAYS

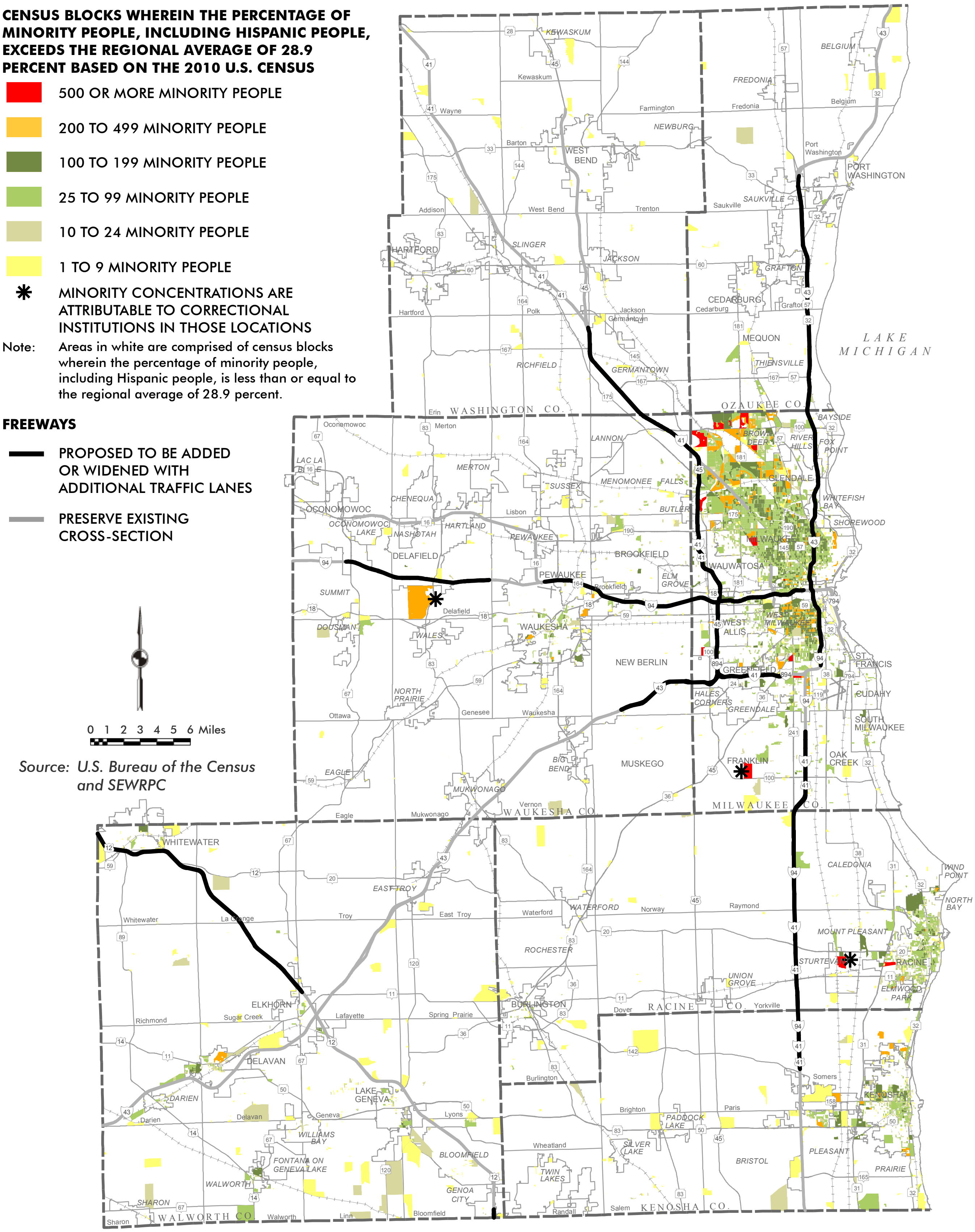
- PROPOSED TO BE ADDED OR WIDENED WITH ADDITIONAL TRAFFIC LANES
- PRESERVE EXISTING CROSS-SECTION

0 1 2 3 4 5 6 Miles

Source: U.S. Bureau of the Census American Community Survey and SEWRPC



Map F.67
Comparison of Existing Concentrations of Total Minority Population in the Region to Freeways: Alternative I



Map F.68
Comparison of Existing Concentrations of Families in Poverty in the Region to Freeways: Alternative I

CENSUS TRACTS WHEREIN THE PERCENTAGE OF FAMILIES IN POVERTY EXCEEDS THE REGIONAL AVERAGE OF 10.3 PERCENT BASED ON THE 2008-2012 U.S. CENSUS AMERICAN COMMUNITY SURVEY

- FEWER THAN 100 FAMILIES IN POVERTY
- 100-199 FAMILIES IN POVERTY
- 200-299 FAMILIES IN POVERTY
- 300 OR MORE FAMILIES IN POVERTY

Notes: Areas in white are comprised of census tracts wherein the percentage of families in poverty is less than or equal to the regional average of 10.3 percent.

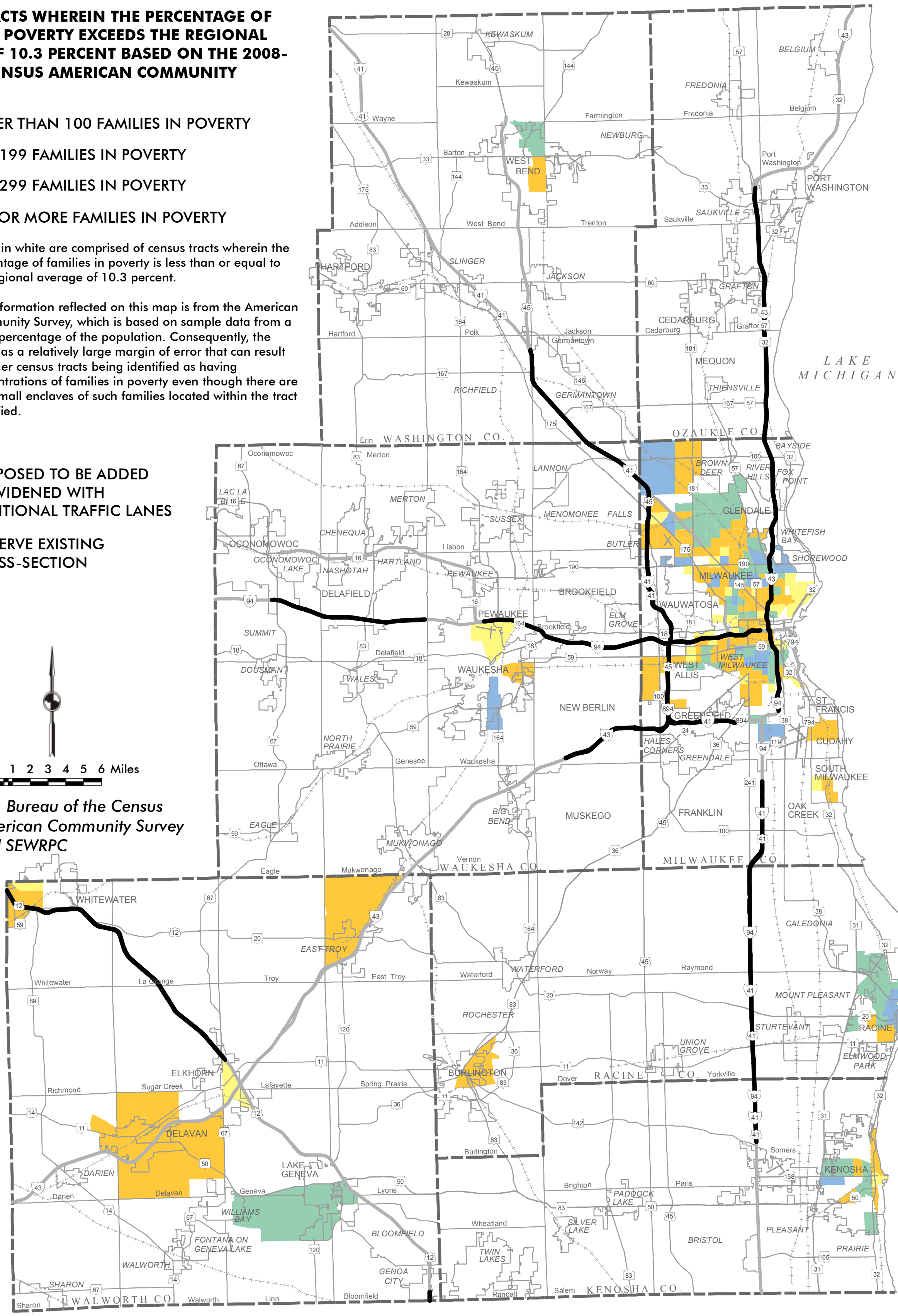
The information reflected on this map is from the American Community Survey, which is based on sample data from a small percentage of the population. Consequently, the data has a relatively large margin of error that can result in larger census tracts being identified as having concentrations of families in poverty even though there are only small enclaves of such families located within the tract identified.

FREEWAYS

- PROPOSED TO BE ADDED OR WIDENED WITH ADDITIONAL TRAFFIC LANES
- PRESERVE EXISTING CROSS-SECTION

0 1 2 3 4 5 6 Miles

Source: U.S. Bureau of the Census American Community Survey and SEWRPC



Map F.69
Comparison of Existing Concentrations of Total Minority Population in the Region to Freeways: Alternative II

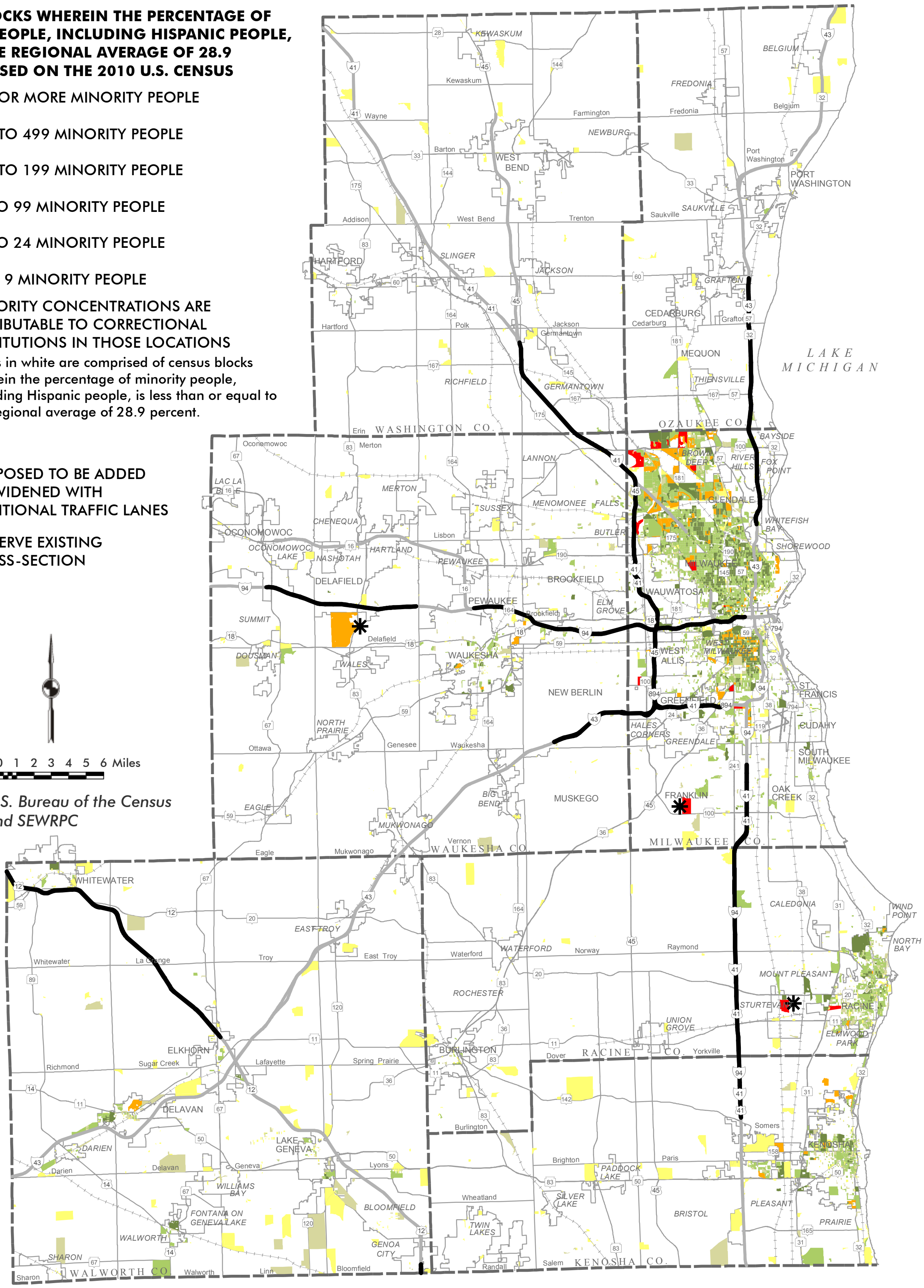
CENSUS BLOCKS WHEREIN THE PERCENTAGE OF MINORITY PEOPLE, INCLUDING HISPANIC PEOPLE, EXCEEDS THE REGIONAL AVERAGE OF 28.9 PERCENT BASED ON THE 2010 U.S. CENSUS

- 500 OR MORE MINORITY PEOPLE
- 200 TO 499 MINORITY PEOPLE
- 100 TO 199 MINORITY PEOPLE
- 25 TO 99 MINORITY PEOPLE
- 10 TO 24 MINORITY PEOPLE
- 1 TO 9 MINORITY PEOPLE
- ✱ MINORITY CONCENTRATIONS ARE ATTRIBUTABLE TO CORRECTIONAL INSTITUTIONS IN THOSE LOCATIONS

Note: Areas in white are comprised of census blocks wherein the percentage of minority people, including Hispanic people, is less than or equal to the regional average of 28.9 percent.

FREEWAYS

- PROPOSED TO BE ADDED OR WIDENED WITH ADDITIONAL TRAFFIC LANES
- PRESERVE EXISTING CROSS-SECTION



Source: *U.S. Bureau of the Census and SEWRPC*

Map F.70
Comparison of Existing Concentrations of Families in Poverty in the Region to Freeways: Alternative II

CENSUS TRACTS WHEREIN THE PERCENTAGE OF FAMILIES IN POVERTY EXCEEDS THE REGIONAL AVERAGE OF 10.3 PERCENT BASED ON THE 2008-2012 U.S. CENSUS AMERICAN COMMUNITY SURVEY

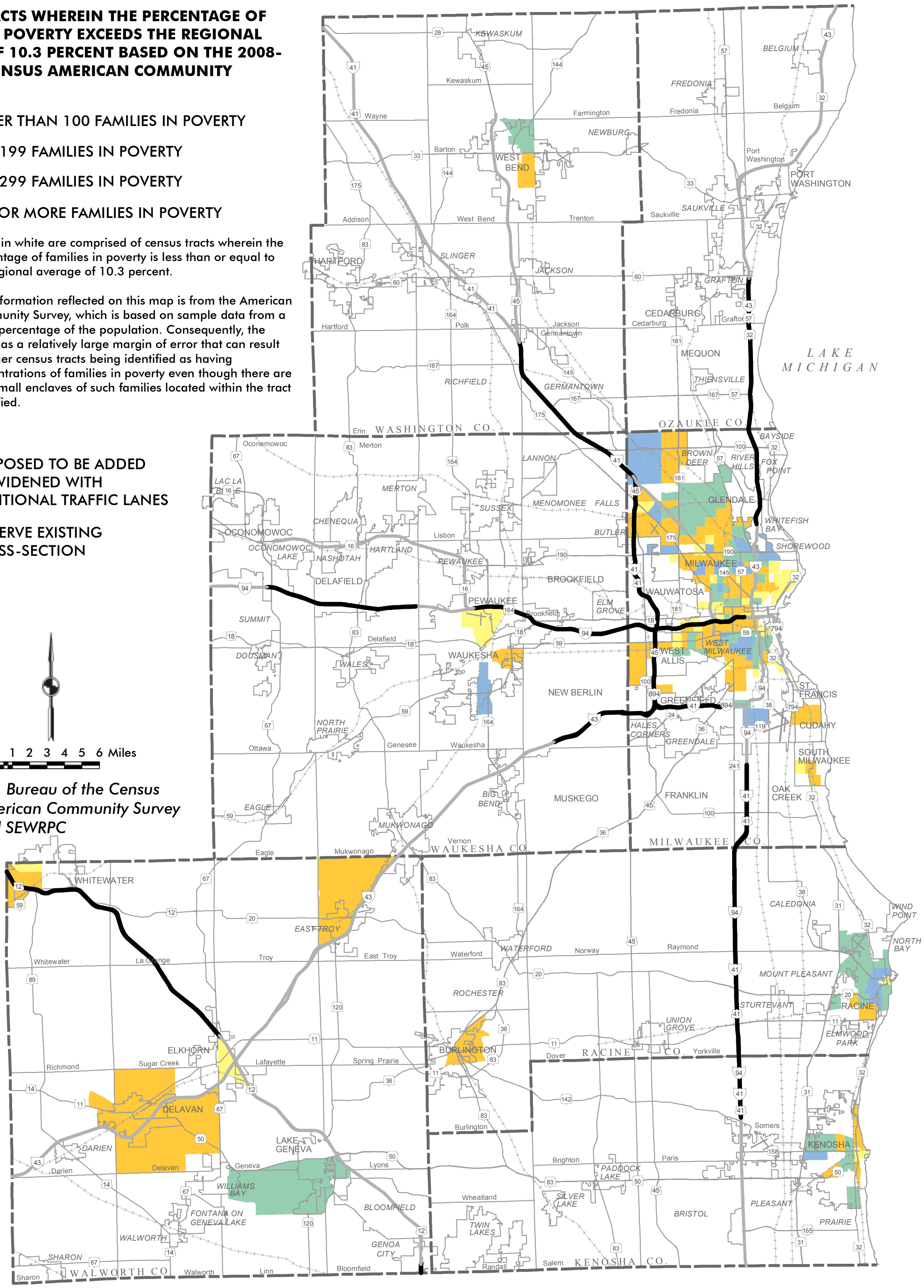
- FEWER THAN 100 FAMILIES IN POVERTY
- 100-199 FAMILIES IN POVERTY
- 200-299 FAMILIES IN POVERTY
- 300 OR MORE FAMILIES IN POVERTY

Notes: Areas in white are comprised of census tracts wherein the percentage of families in poverty is less than or equal to the regional average of 10.3 percent.

The information reflected on this map is from the American Community Survey, which is based on sample data from a small percentage of the population. Consequently, the data has a relatively large margin of error that can result in larger census tracts being identified as having concentrations of families in poverty even though there are only small enclaves of such families located within the tract identified.

FREEWAYS

- PROPOSED TO BE ADDED OR WIDENED WITH ADDITIONAL TRAFFIC LANES
- PRESERVE EXISTING CROSS-SECTION



Source: U.S. Bureau of the Census American Community Survey and SEWRPC

Table F.23
Minority Population and Families in Poverty Residing in Proximity to a Freeway Widening[a]

Population and Families Within One-Half Mile

Alternative	Total Population Near a Freeway Widening	Minority Population: Near a Freeway Widening	Minority Population: Percent of Total	Total Families Near a Freeway Widening	Families in Poverty: Near a Freeway Widening	Families in Poverty: Percent of Total
Trend	208,900	81,800	39.2	48,500	7,500	15.5
Alt I	208,900	81,800	39.2	48,500	7,500	15.5
Alt II	132,083	27,000	20.4	33,900	2,800	8.3

Population and Families Within One-Quarter Mile

Alternative	Total Population Near a Freeway Widening	Minority Population: Near a Freeway Widening	Minority Population: Percent of Total	Total Families Near a Freeway Widening	Families in Poverty: Near a Freeway Widening	Families in Poverty: Percent of Total
Trend	94,200	38,400	40.8	23,600	3,700	15.7
Alt I	94,200	38,400	40.8	23,600	3,700	15.7
Alt II	59,900	12,600	21.0	17,400	1,500	8.6

[a] *Total population and minority population are based on the 2010 U.S. Census and total families and families in poverty are based on the 2008-2012 American Community Survey.*

Source: U.S. Bureau of the Census, U.S. Census and American Community Survey; and SEWRPC

to freeway widenings under each alternative. About 81,800 minority people and 7,500 families in poverty would reside within one-half mile of a freeway widening under the Trend and Alternative I, while 38,400 minorities and 3,700 families in poverty would reside within one-quarter mile. The proportion of the minority population (about 40 percent) and families in poverty (about 16 percent) residing within one-half mile or one-quarter mile would exceed the regional averages of 28.9 percent and 10.3 percent, respectively. This result should be expected, as about 95 percent of the minority populations and low-income populations residing adjacent to the proposed freeway widenings under the Trend and Alternative I are in Milwaukee County, where about 46 percent of the population is minority and about 17 percent of the families are in poverty. Based on the exclusion of some of the freeway widenings proposed in the Trend and Alternative I (principally the widening of IH 94 between Howard Avenue and the Marquette Interchange and IH 43 between the Marquette Interchange and Silver Spring Drive), Alternative II would have the least amount of existing minority population and families in poverty residing near a freeway widening, with about 27,000 minorities and 2,800 families in poverty residing within one-half mile and 12,600 minorities and 1,500 families in poverty residing within one-quarter mile.

Another way of examining the relative impact of freeway widenings is to compare the proportion of the minority population and families in poverty to the non-minority population and families not in poverty that reside in proximity to the freeway widenings, as shown in Table F.24. Under the Trend and Alternative I, the existing minority population and families in poverty that reside within one-half mile of freeway widenings would represent about 14 percent of the total minority population and families in poverty, compared to about 9 percent of the non-minority population and families not in poverty. Similarly, the existing minority population and families in poverty that reside within one-quarter mile of freeway widenings would represent about 7 percent of the total minority population and families in poverty, compared to about 4

Table F.24
Percent of Total Minority/Non-Minority Population and Families in Poverty/Families Not in Poverty Residing in Proximity to a Freeway Widening[a]

Population and Families Within One-Half Mile

Alternative	Minority Population	Non-Minority Population	Families in Poverty	Families Not in Poverty
Trend	14	9	14	9
Alt I	14	9	14	9
Alt II	5	7	5	7

Population and Families Within One-Quarter Mile

Alternative	Minority Population	Non-Minority Population	Families in Poverty	Families Not in Poverty
Trend	7	4	7	4
Alt I	7	4	7	4
Alt II	2	3	3	3

[a] *Minority population and non-minority population are based on the 2010 U.S. Census and families in poverty and families not in poverty are based on the 2008-2012 American Community Survey.*

Source: U.S. Bureau of the Census, U.S. Census and American Community Survey; and SEWRPC

percent of the non-minority population and families not in poverty. Under Alternative II, the existing minority population and families in poverty residing within one-half mile of freeway widenings would represent about 5 percent of the total population, compared to about 7 percent of the non-minority population and families not in poverty, while the existing minority population and families in poverty residing within one-quarter mile of freeway widenings would represent about 2 to 3 percent of the total population, compared to about 3 percent of the non-minority population and families not in poverty.

CRITERION 2.1.5: TRANSPORTATION-RELATED AIR POLLUTION IMPACTS ON MINORITY POPULATIONS AND LOW-INCOME POPULATIONS

KEY CONCLUSIONS

- **Transportation-related air pollutant emissions in 2050 are expected to significantly decline from current levels, even with forecast increases in regional travel, due primarily to current and future Federal fuel and vehicle fuel economy standards.**
- **At the regional level, about 20 percent each of existing minorities and of families in poverty are located within one-half mile of a freeway, while about 10 percent are located within one-quarter mile, compared to about 15 percent each of existing non-minorities and of families not in poverty that reside within one-half mile of a freeway and about 7 percent who are within one-quarter mile of a freeway. Within each county, the percentages of existing total minority population and non-minority population, and the percentages of existing families in poverty and families not in poverty, that reside within one-half mile or one-quarter mile of a freeway are generally similar (equal or within a few percent lower or higher).**

Automobiles and trucks traveling on arterial streets and highways emit air pollutants that generally exist in higher concentrations in the atmosphere near the arterial streets and highways with the most traffic, such as the Region's freeways. The lower speeds and starting/stopping of vehicles associated with congested conditions increases the level of transportation air pollutant emissions. Individuals living in proximity to the Region's freeways may be exposed to higher levels of transportation-related air pollutants.

Due in large part to past, current, and future Federal fuel and vehicle fuel economy standards and improved emission controls, transportation-related air pollutant emissions in the Region have been declining, and are expected to continue to decline in the future. As indicated in Criterion 1.4.4 (Greenhouse Gas Emissions and Other Air Pollutants), this decline is expected to continue through the year 2050, even with the projected 24 to 27 percent increase in vehicle-miles of travel, depending upon the alternative. While the expected reductions in emissions are similar between the alternatives, Alternative II would be expected to result in the lowest levels of transportation-related air pollutant emissions (generally about 1 to 2 percent lower than the Trend), thereby reducing the exposure of residents of the Region to these pollutants, including minority populations and low-income populations. The alternative with the next lowest level of emissions would be Alternative I (generally less than 1 percent lower than the Trend).

Even with the expected significant reductions in transportation-related air pollutant emissions, residents of the Region, including minority populations and families in poverty, living in proximity to roads with higher traffic volumes, such as freeways, may be exposed to higher levels of transportation-related air pollutants. The following is an assessment of whether there would be an expected disproportionate impact on, or over-representation of, existing minority populations and low-income populations residing along existing and new freeways under the alternatives.

Table F.25
Total and Minority Populations Residing in Proximity to a Freeway[a]

Population Within One-Half Mile

	Total and Minority Populations			Total and Minority Populations Within One-Half Mile of Existing Freeways		
		Minority Population			Minority Population	
County	Total Population	Population	Percent of Total	Total Population	Population	Percent of Total
Kenosha	166,426	36,534	22.0	1,550	230	14.8
Milwaukee	947,735	432,777	45.7	239,200	110,400	46.2
Ozaukee	86,395	5,706	6.6	9,500	800	8.4
Racine	195,408	49,994	25.6	1,200	90	7.5
Walworth	102,228	13,538	13.2	16,600	2,400	14.5
Washington	131,887	7,539	5.7	15,200	840	5.5
Waukesha	389,891	36,777	9.4	46,300	4,400	9.5
Region	2,019,970	582,865	28.9	329,550	119,160	36.2

Population Within One-Quarter Mile

	Total and Minority Populations			Total and Minority Populations Within One-Quarter Mile of Existing Freeways		
		Minority Population			Minority Population	
County	Total Population	Population	Percent of Total	Total Population	Population	Percent of Total
Kenosha	166,426	36,534	22.0	520	35	6.7
Milwaukee	947,735	432,777	45.7	109,700	49,900	45.5
Ozaukee	86,395	5,706	6.6	3,400	310	9.1
Racine	195,408	49,994	25.6	530	45	8.5
Walworth	102,228	13,538	13.2	6,100	780	12.8
Washington	131,887	7,539	5.7	7,100	370	5.2
Waukesha	389,891	36,777	9.4	21,300	2,200	10.3
Region	2,019,970	582,865	28.9	148,650	53,640	36.1

[a] *Total population and minority population are based on the 2010 U.S. Census.*

Source: U.S. Bureau of the Census and SEWRPC

- **Evaluation Results:** Tables F.25 and F.26 show the existing total and minority population and the existing total number of families and families in poverty that reside in proximity to the freeway system under the Trend and Alternatives I and II. Maps F.71 through F.76 show the freeway system, including those freeway segments to be widened, under each alternative compared to the existing locations of areas with concentrations of minority populations and low-income populations. While the segments of freeways to be widened differ by alternative, the extent of the freeways would be the same for all three alternatives. The percentages of the total population located in proximity to the freeway system under the alternatives that are minority or low income are either generally similar to (equal or within a few percent lower or higher), or substantially less than, the percentage of the total minority population and low-income population residing within each county. At the regional level, about 36 percent of the existing population residing within one-half mile or one-quarter mile of a freeway are minorities, compared to about 29 percent of the total population of the Region that are minorities. With regard to existing low-income populations, about 14 percent of the families residing within one-half mile or one-quarter mile of a freeway are in poverty, compared to 10 percent of the total families in the Region.

  As shown in Table F.27, at the regional level, about 20 percent each of existing minorities and of families in poverty are located within one-half mile of a freeway, while about 10 percent are located within

Table F.26
Total Families and Families in Poverty Residing in Proximity to a Freeway[a]

Families Within One-Half Mile

County	Total Families and Families in Poverty Within the Region			Total Families and Families in Poverty Within One-Half Mile of Existing Freeways		
		Families in Poverty			Families in Poverty	
	Total Families	Families	Percent of Total	Total Families	Families	Percent of Total
Kenosha	42,167	4,024	9.5	930	30	3.2
Milwaukee	218,244	35,962	16.5	54,000	10,300	19.1
Ozaukee	24,344	642	2.6	2,300	60	2.6
Racine	50,148	4,630	9.2	570	20	3.5
Walworth	26,268	2,102	8.0	4,900	470	9.6
Washington	37,757	1,388	3.7	4,300	120	2.8
Waukesha	108,845	3,586	3.3	13,300	420	3.2
Region	507,773	52,334	10.3	80,300	11,280	14.2

Families Within One-Quarter Mile

County	Total Families and Families in Poverty Within the Region			Total Families and Families in Poverty Within One-Quarter Mile of Existing Freeways		
		Families in Poverty			Families in Poverty	
	Total Families	Families	Percent of Total	Total Families	Families	Percent of Total
Kenosha	42,167	4,024	9.5	470	20	4.3
Milwaukee	218,244	35,962	16.5	25,300	4,800	19.0
Ozaukee	24,344	642	2.6	1,100	30	2.7
Racine	50,148	4,630	9.2	290	10	3.4
Walworth	26,268	2,102	8.0	2,600	250	9.6
Washington	37,757	1,388	3.7	2,100	60	2.9
Waukesha	108,845	3,586	3.3	6,700	210	3.1
Region	507,773	52,334	10.3	38,560	5,380	14.0

[a] *Total families and families in poverty are based on the 2008-2012 American Community Survey.*

Source: U.S. Bureau of the Census American Community Survey and SEWRPC

one-quarter mile, compared to about 15 percent each of existing non-minorities and of families not in poverty that reside within one-half mile of a freeway and about 7 percent of those same categories who are within one-quarter mile of a freeway. Within each county, the percentages of existing total minority populations and non-minority populations, and the percentages of existing families in poverty and families not in poverty, that reside within one-half mile or one-quarter mile of a freeway are generally equal or within several percent lower or higher.

Map F.71
Comparison of Existing Concentrations of Total Minority Population in the Region to Freeways: Trend

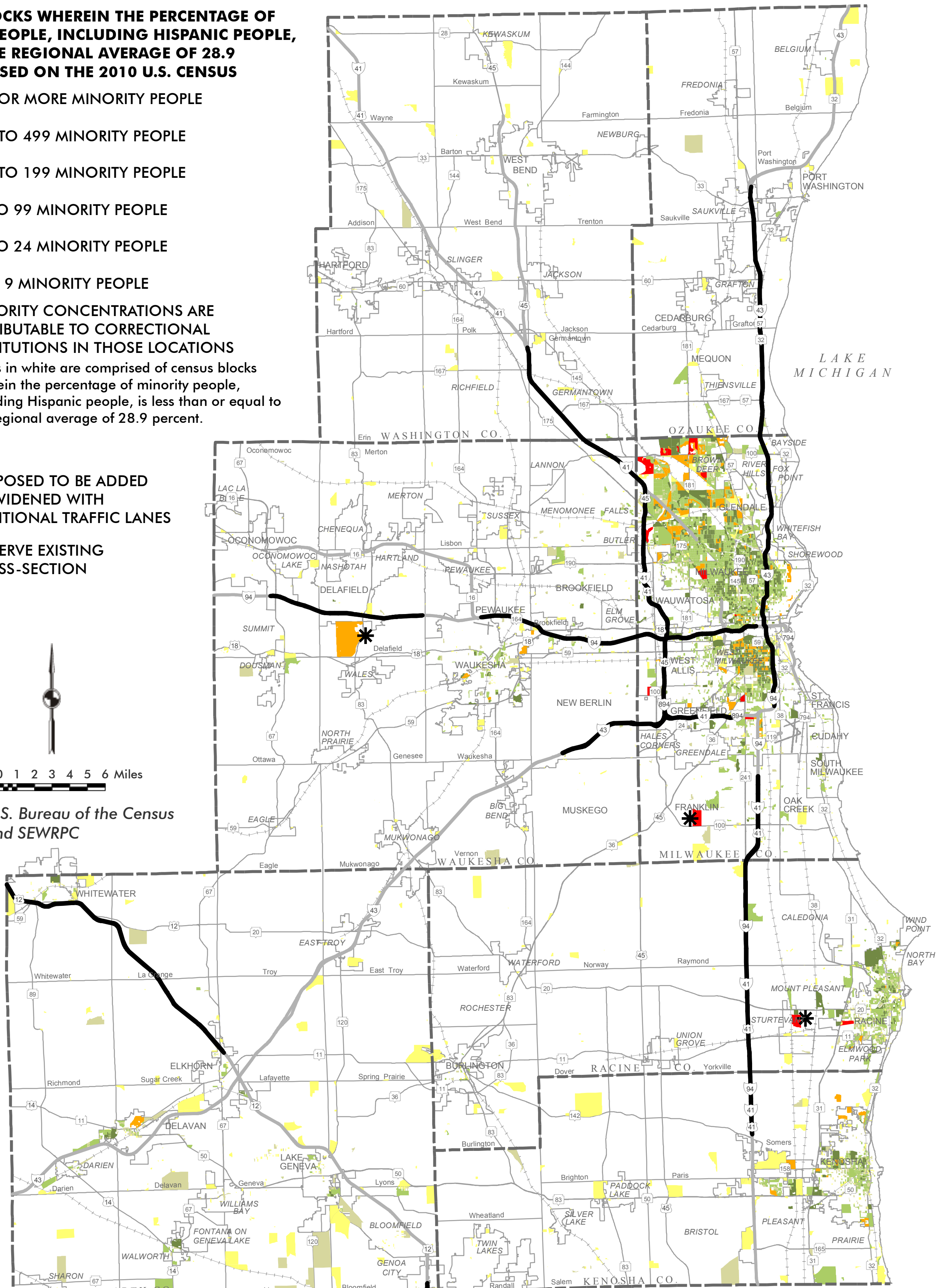
CENSUS BLOCKS WHEREIN THE PERCENTAGE OF MINORITY PEOPLE, INCLUDING HISPANIC PEOPLE, EXCEEDS THE REGIONAL AVERAGE OF 28.9 PERCENT BASED ON THE 2010 U.S. CENSUS

- 500 OR MORE MINORITY PEOPLE
- 200 TO 499 MINORITY PEOPLE
- 100 TO 199 MINORITY PEOPLE
- 25 TO 99 MINORITY PEOPLE
- 10 TO 24 MINORITY PEOPLE
- 1 TO 9 MINORITY PEOPLE
- ✱ MINORITY CONCENTRATIONS ARE ATTRIBUTABLE TO CORRECTIONAL INSTITUTIONS IN THOSE LOCATIONS

Note: Areas in white are comprised of census blocks wherein the percentage of minority people, including Hispanic people, is less than or equal to the regional average of 28.9 percent.

FREEWAYS

- PROPOSED TO BE ADDED OR WIDENED WITH ADDITIONAL TRAFFIC LANES
- PRESERVE EXISTING CROSS-SECTION



0 1 2 3 4 5 6 Miles

Source: U.S. Bureau of the Census and SEWRPC

Map F.72
Comparison of Existing Concentrations of Families in Poverty in the Region to Freeways: Trend

CENSUS TRACTS WHEREIN THE PERCENTAGE OF FAMILIES IN POVERTY EXCEEDS THE REGIONAL AVERAGE OF 10.3 PERCENT BASED ON THE 2008-2012 U.S. CENSUS AMERICAN COMMUNITY SURVEY

- FEWER THAN 100 FAMILIES IN POVERTY
- 100-199 FAMILIES IN POVERTY
- 200-299 FAMILIES IN POVERTY
- 300 OR MORE FAMILIES IN POVERTY

Notes: Areas in white are comprised of census tracts wherein the percentage of families in poverty is less than or equal to the regional average of 10.3 percent.

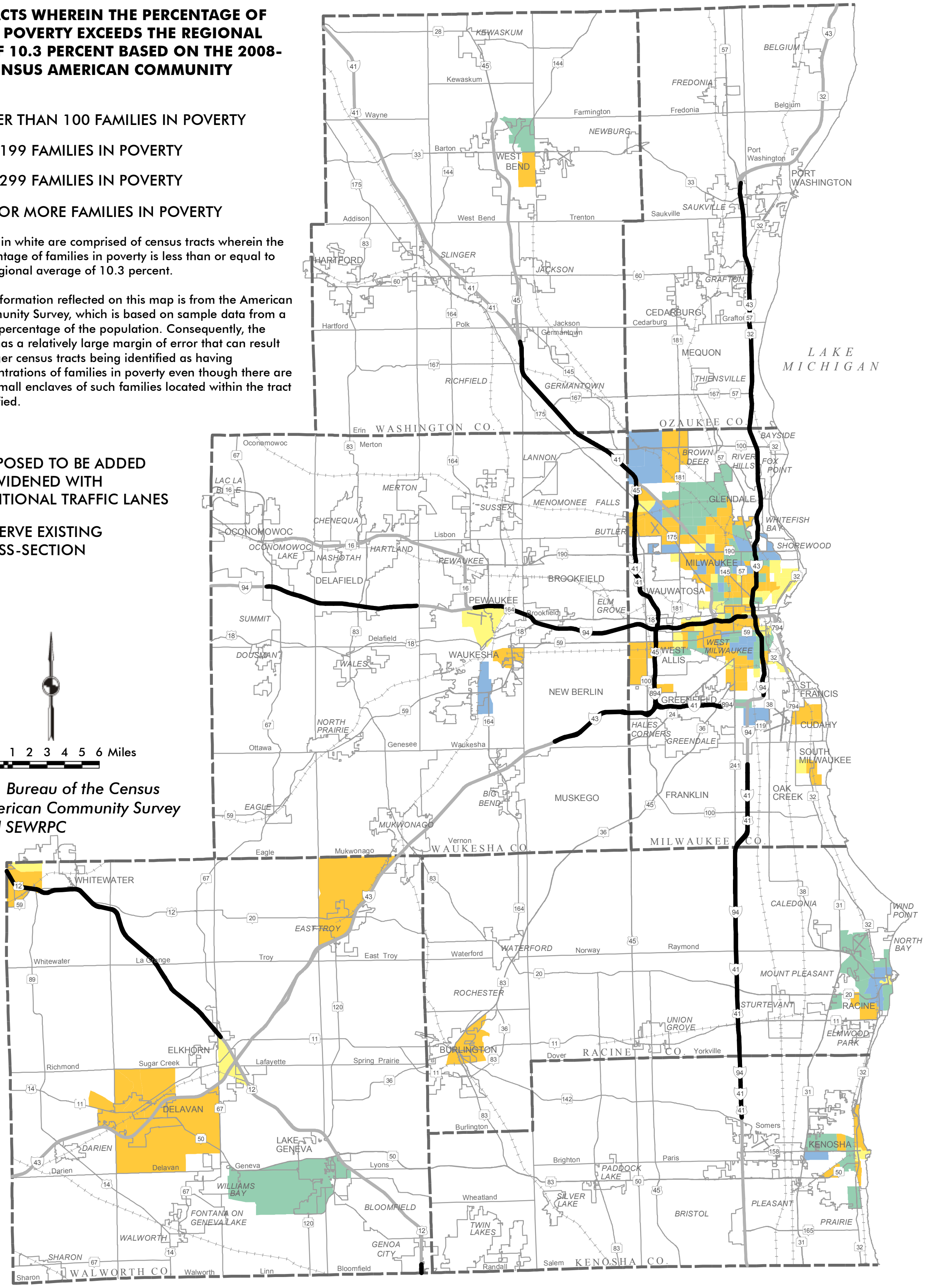
The information reflected on this map is from the American Community Survey, which is based on sample data from a small percentage of the population. Consequently, the data has a relatively large margin of error that can result in larger census tracts being identified as having concentrations of families in poverty even though there are only small enclaves of such families located within the tract identified.

FREEWAYS

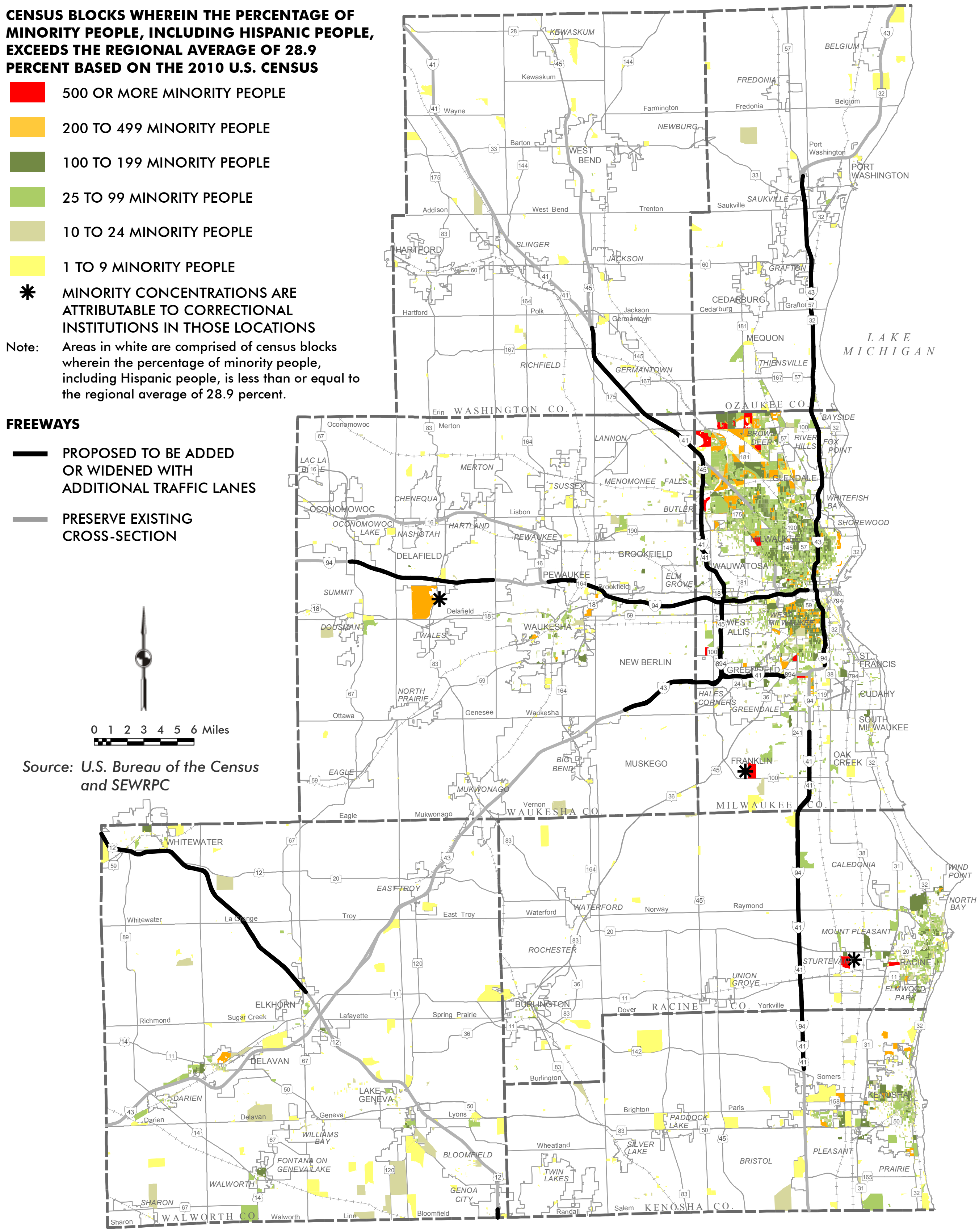
- PROPOSED TO BE ADDED OR WIDENED WITH ADDITIONAL TRAFFIC LANES
- PRESERVE EXISTING CROSS-SECTION

0 1 2 3 4 5 6 Miles

Source: U.S. Bureau of the Census American Community Survey and SEWRPC



Map F.73
Comparison of Existing Concentrations of Total Minority Population in the Region to Freeways: Alternative I



Map F.74
Comparison of Existing Concentrations of Families in Poverty in the Region to Freeways: Alternative I

CENSUS TRACTS WHEREIN THE PERCENTAGE OF FAMILIES IN POVERTY EXCEEDS THE REGIONAL AVERAGE OF 10.3 PERCENT BASED ON THE 2008-2012 U.S. CENSUS AMERICAN COMMUNITY SURVEY

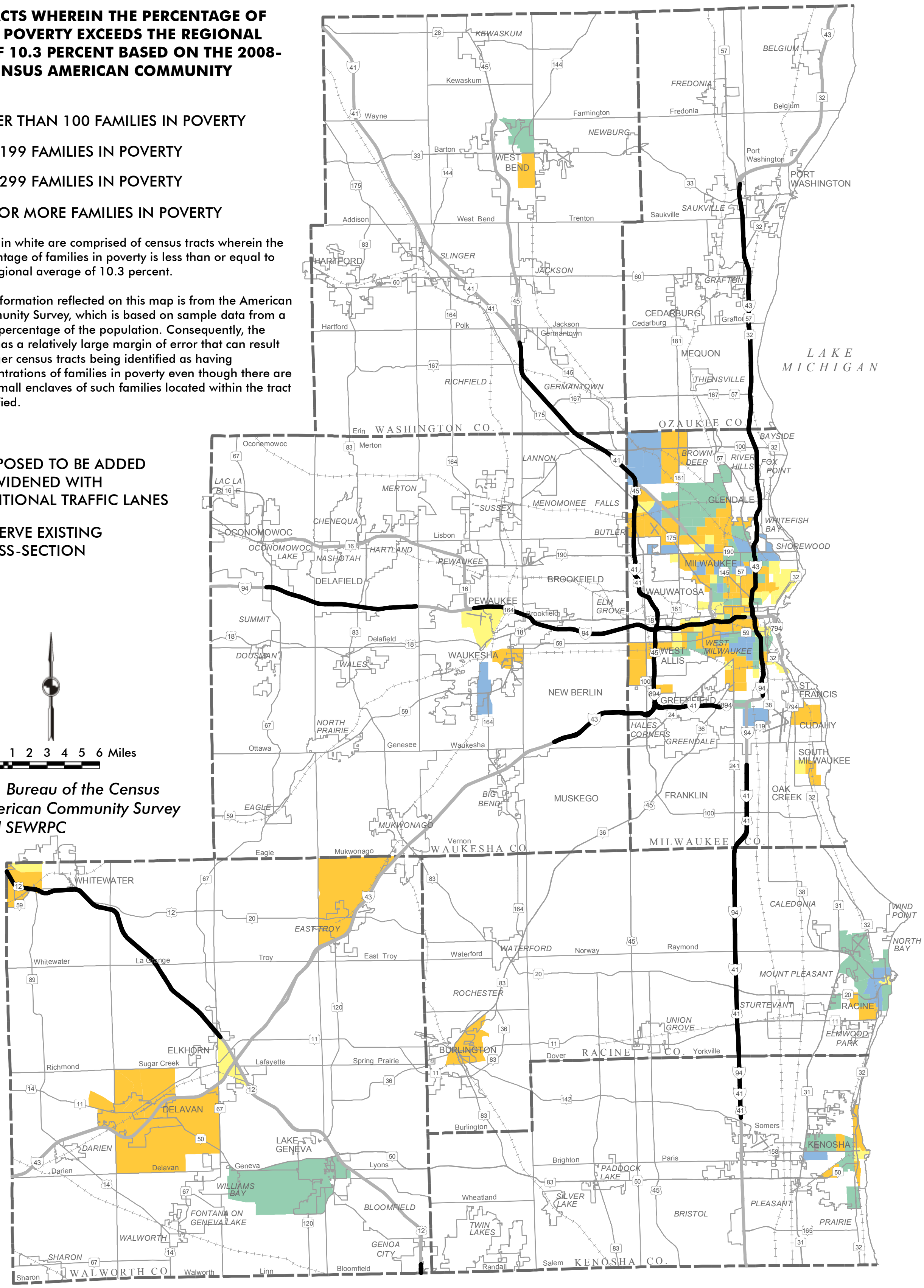
- FEWER THAN 100 FAMILIES IN POVERTY
- 100-199 FAMILIES IN POVERTY
- 200-299 FAMILIES IN POVERTY
- 300 OR MORE FAMILIES IN POVERTY

Notes: Areas in white are comprised of census tracts wherein the percentage of families in poverty is less than or equal to the regional average of 10.3 percent.

The information reflected on this map is from the American Community Survey, which is based on sample data from a small percentage of the population. Consequently, the data has a relatively large margin of error that can result in larger census tracts being identified as having concentrations of families in poverty even though there are only small enclaves of such families located within the tract identified.

FREEWAYS

- PROPOSED TO BE ADDED OR WIDENED WITH ADDITIONAL TRAFFIC LANES
- PRESERVE EXISTING CROSS-SECTION



Source: *U.S. Bureau of the Census American Community Survey and SEWRPC*

Map F.75
Comparison of Existing Concentrations of Total Minority Population in the Region to Freeways: Alternative II

CENSUS BLOCKS WHEREIN THE PERCENTAGE OF MINORITY PEOPLE, INCLUDING HISPANIC PEOPLE, EXCEEDS THE REGIONAL AVERAGE OF 28.9 PERCENT BASED ON THE 2010 U.S. CENSUS

- 500 OR MORE MINORITY PEOPLE
- 200 TO 499 MINORITY PEOPLE
- 100 TO 199 MINORITY PEOPLE
- 25 TO 99 MINORITY PEOPLE
- 10 TO 24 MINORITY PEOPLE
- 1 TO 9 MINORITY PEOPLE
- * MINORITY CONCENTRATIONS ARE ATTRIBUTABLE TO CORRECTIONAL INSTITUTIONS IN THOSE LOCATIONS

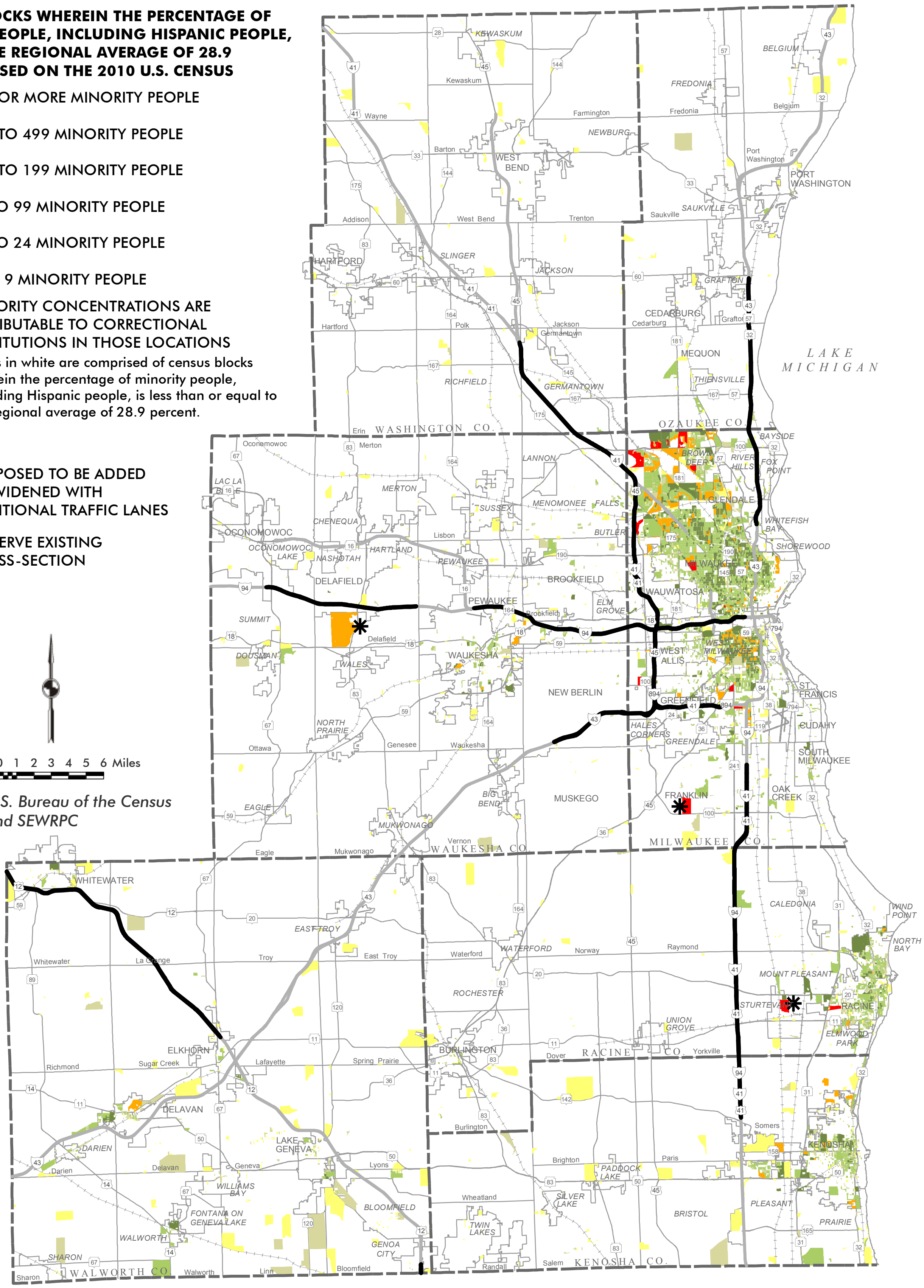
Note: Areas in white are comprised of census blocks wherein the percentage of minority people, including Hispanic people, is less than or equal to the regional average of 28.9 percent.

FREEWAYS

- PROPOSED TO BE ADDED OR WIDENED WITH ADDITIONAL TRAFFIC LANES
- PRESERVE EXISTING CROSS-SECTION

0 1 2 3 4 5 6 Miles

Source: *U.S. Bureau of the Census and SEWRPC*



Map F.76
Comparison of Existing Concentrations of Families in Poverty in the Region to Freeways: Alternative II

CENSUS TRACTS WHEREIN THE PERCENTAGE OF FAMILIES IN POVERTY EXCEEDS THE REGIONAL AVERAGE OF 10.3 PERCENT BASED ON THE 2008-2012 U.S. CENSUS AMERICAN COMMUNITY SURVEY

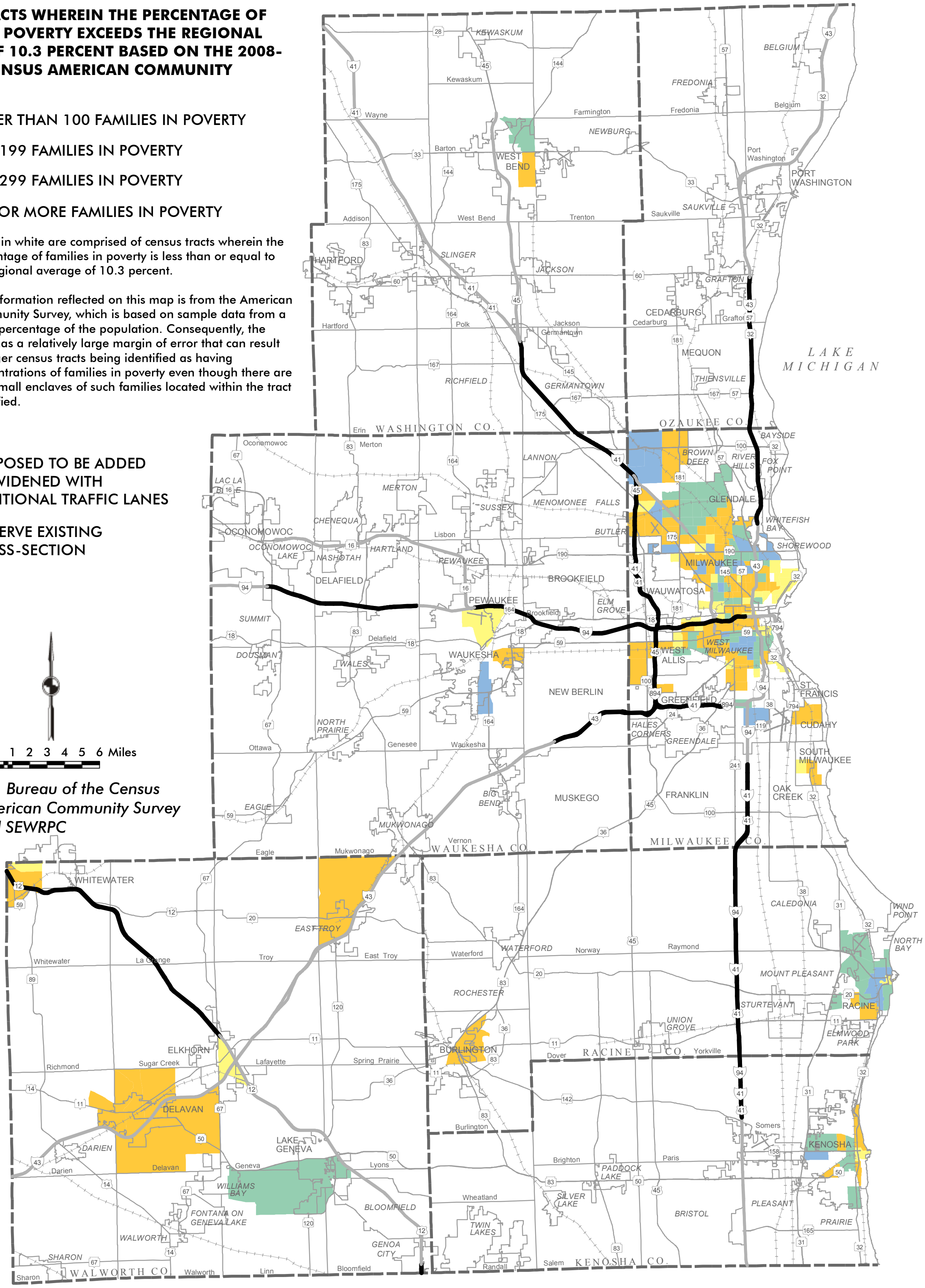
- FEWER THAN 100 FAMILIES IN POVERTY
- 100-199 FAMILIES IN POVERTY
- 200-299 FAMILIES IN POVERTY
- 300 OR MORE FAMILIES IN POVERTY

Notes: Areas in white are comprised of census tracts wherein the percentage of families in poverty is less than or equal to the regional average of 10.3 percent.

The information reflected on this map is from the American Community Survey, which is based on sample data from a small percentage of the population. Consequently, the data has a relatively large margin of error that can result in larger census tracts being identified as having concentrations of families in poverty even though there are only small enclaves of such families located within the tract identified.

FREEWAYS

- PROPOSED TO BE ADDED OR WIDENED WITH ADDITIONAL TRAFFIC LANES
- PRESERVE EXISTING CROSS-SECTION



Source: *U.S. Bureau of the Census American Community Survey and SEWRPC*

Table F.27
Minority/Non-Minority Population and Families in Poverty/ Families Not in Poverty Residing in Proximity to a Freeway[a]

Population and Families Within One-Half Mile

County	Percent of Populations Within One-Half Mile of Existing Freeways		Percent of Families Within One-Half Mile of Existing Freeways	
	Minority Population	Non-Minority Population	Families in Poverty	Families Not in Poverty
Kenosha	0.6	1.0	0.7	2.4
Milwaukee	25.5	25.0	28.6	24.0
Ozaukee	14.0	10.8	9.3	9.5
Racine	0.2	0.8	0.4	1.2
Walworth	17.7	16.0	22.4	18.3
Washington	11.1	11.5	8.6	11.5
Waukesha	12.0	11.9	11.7	12.2
Region	20.4	14.6	21.8	15.1

Population and Families Within One-Quarter Mile

County	Percent of Populations Within One-Quarter Mile of Existing Freeways		Percent of Families Within One-Quarter Mile of Existing Freeways	
	Minority Population	Non-Minority Population	Families in Poverty	Families Not in Poverty
Kenosha	0.1	0.4	0.5	1.2
Milwaukee	11.5	11.6	13.3	11.2
Ozaukee	5.4	3.8	4.7	4.5
Racine	0.1	0.3	0.2	0.6
Walworth	5.8	6.0	11.9	9.7
Washington	4.9	5.4	4.3	5.6
Waukesha	6.0	5.4	5.9	6.2
Region	9.2	6.6	10.3	7.3

[a] *Minority population and non-minority population are based on the 2010 U.S. Census and families in poverty and families not in poverty are based on the 2008-2012 American Community Survey.*

Source: U.S. Bureau of the Census, U.S. Census and American Community Survey; and SEWRPC

CRITERION 2.2.1: HOUSEHOLDS WITH AFFORDABLE HOUSING + TRANSPORTATION COSTS

KEY CONCLUSIONS

- **Determining the affordability of an area can be enhanced by considering transportation costs in addition to housing costs, which have historically been used to determine affordability.**
- **Alternative II would have the most households in areas with affordable H+T costs (386,900)—3 percent more than Alternative I (375,000 households) and 9 percent more than the Trend (353,500 households).**

The conventional standard for housing affordability, used historically by the U.S. Department of Housing and Urban Development (HUD), is defined as a household paying no more than 30 percent of its gross income on housing costs. This standard does not consider transportation costs, which are typically a household's second largest cost. The Center for Neighborhood Technology (CNT) has developed a Housing and Transportation (H+T) Affordability Index for areas throughout the Country, including all seven counties of the Southeastern Wisconsin Region.[20] CNT set an H+T affordability standard at 45 percent of areawide household median income, which combines the housing affordability standard of 30 percent with a transportation affordability goal of 15 percent. CNT found that about 70 percent of communities nationwide are considered affordable under the conventional standard for affordable housing and only about 40 percent are considered affordable under the H+T standard for affordability. The index shows that compact, mixed-use communities with a balance of housing, jobs, and stores and easy access to transit (called location-efficient neighborhoods by CNT) have lower transportation costs because they enable residents to meet daily needs with fewer vehicles, which are the single greatest transportation cost factor for most households. The index also indicates that the transportation cost savings of compact, mixed-use neighborhoods often outweigh the housing savings that may be found in less dense suburban and urban fringe communities.

- **Estimating Housing and Transportation Affordability:** To estimate H+T for the alternative plans, the first step was to estimate existing H+T. Commission staff received existing H+T data directly from CNT for all Census block groups in the Region and spatially assigned them to the 2,374 internal TAZs in the Region. The H+T Index uses a transportation model that considers neighborhood variables, including residential density, block size, transit connectivity, job density, and travel time to work. The model also considers household variables, including household income, household size, and commuters per household.

  The alternatives do not have the detailed data to estimate future H+T in the way that CNT estimates existing H+T, so Commission staff used the variability in household density and private transportation costs to estimate future H+T. The household density variable was

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[20] It should be noted that HUD, along with the U.S. Department of Transportation, developed an alternative method of estimating housing and transportation affordability. The method, launched in November 2013, estimates a Location Affordability Index (LAI), which has some advantages over CNT's H+T Index. The LAI may be used for future analyses, but the nature of the available LAI data made the data impracticable for alternative plan evaluation.

Table F.28
Households with Affordable Housing + Transportation Costs

Alternative	Households with Affordable H+T Costs	Total Households	Percent of Total Households with Affordable H+T Costs
Existing - 2011	299,200	800,100	37.4
Trend - 2050	353,500	972,400	36.4
Alt I - 2050	375,000	972,400	38.6
Alt II - 2050	386,900	972,400	39.8

Source: Center for Neighborhood Technology and SEWRPC

employed by determining the statistical relationship between the existing H+T and existing 2010 household density for each TAZ. The change in household density from 2010 to 2050 for each TAZ for each alternative was then estimated and applied to the existing H+T. The private transportation costs variable was estimated using the relative change in number of trips, trip length, and travel mode for each TAZ. Private transportation costs are also estimated on a regionwide scale in Criterion 3.3.1 (Private Transportation Costs per Capita).

- **Evaluation Results:** Table F.28 and Maps F.77 through F.80 present the estimated H+T under the existing development pattern and transportation system, as well as under the Trend and Alternatives I and II. As noted previously, compact, mixed-use communities with a balance of housing, jobs, and stores and easy access to transit have lower transportation costs because they enable residents to meet daily needs with fewer vehicles, which are the single greatest transportation cost factor for most households. The evaluation shows that the Trend, which includes more lower-density development and significantly less public transit service than Alternatives I and II, is the least H+T-affordable option. Alternative I includes higher-density development and more transit than the Trend and some TOD areas, which tends to improve H+T-affordability. The Trend would have more households in areas with affordable H+T costs (353,500) than under the existing development pattern and transportation system (299,200), although the percent of total households would decline slightly. Alternative I would improve on the Trend, with 375,000 households in areas with affordable H+T costs. Alternative II, with its extensive additional fixed-guideway transit and greater focus on TOD, would have the most households in areas with affordable H+T costs (386,900)—3 percent more than Alternative I and 9 percent more than the Trend.

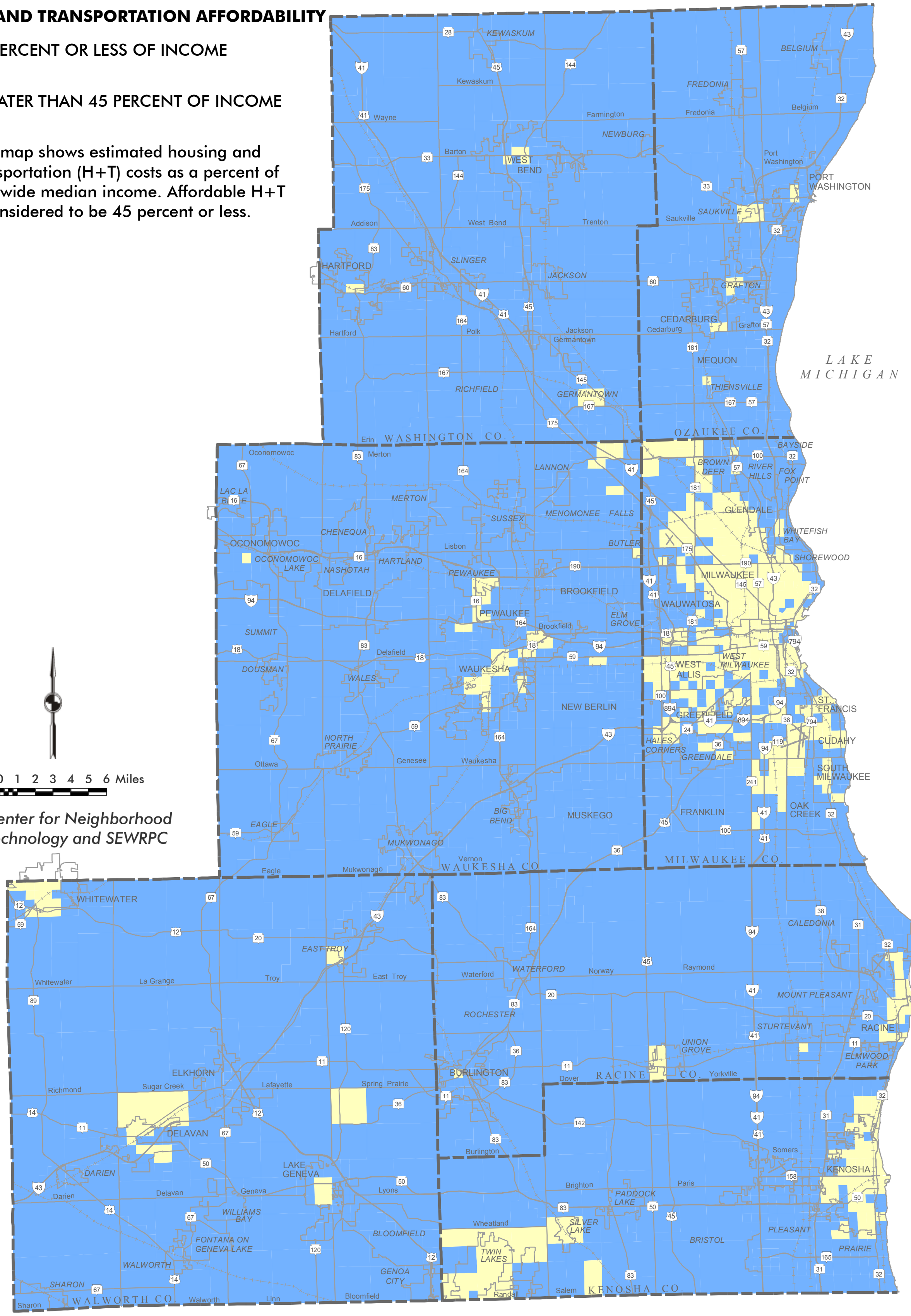
Map F.77
Housing and Transportation Affordability in the Region: Existing

HOUSING AND TRANSPORTATION AFFORDABILITY

45 PERCENT OR LESS OF INCOME

GREATER THAN 45 PERCENT OF INCOME

Note: This map shows estimated housing and transportation (H+T) costs as a percent of areawide median income. Affordable H+T is considered to be 45 percent or less.



0 1 2 3 4 5 6 Miles

Source: Center for Neighborhood Technology and SEWRPC

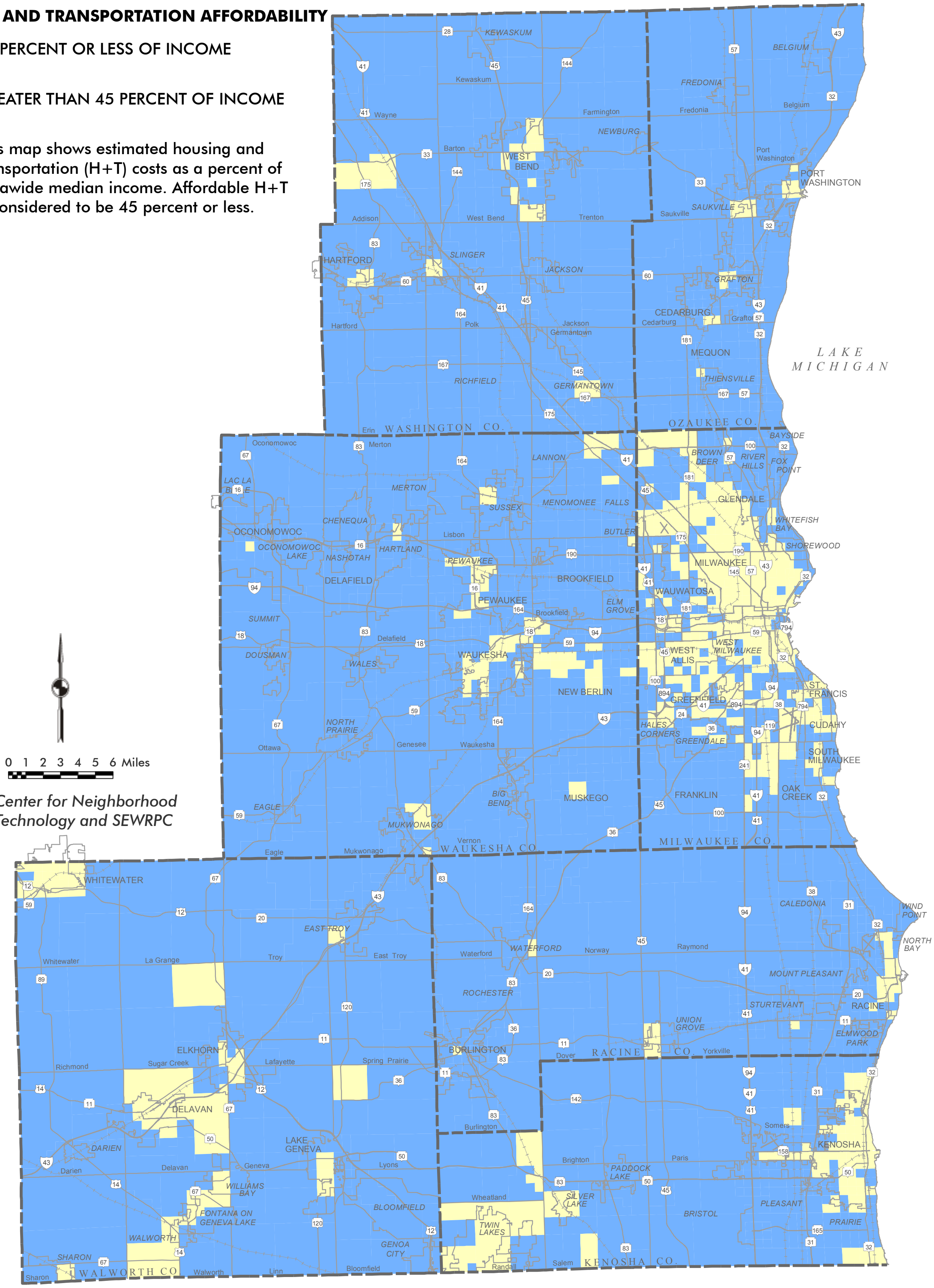
Map F.78
Housing and Transportation Affordability in the Region: Trend

HOUSING AND TRANSPORTATION AFFORDABILITY

45 PERCENT OR LESS OF INCOME

GREATER THAN 45 PERCENT OF INCOME

Note: This map shows estimated housing and transportation (H+T) costs as a percent of areawide median income. Affordable H+T is considered to be 45 percent or less.



Source: *Center for Neighborhood Technology and SEWRPC*

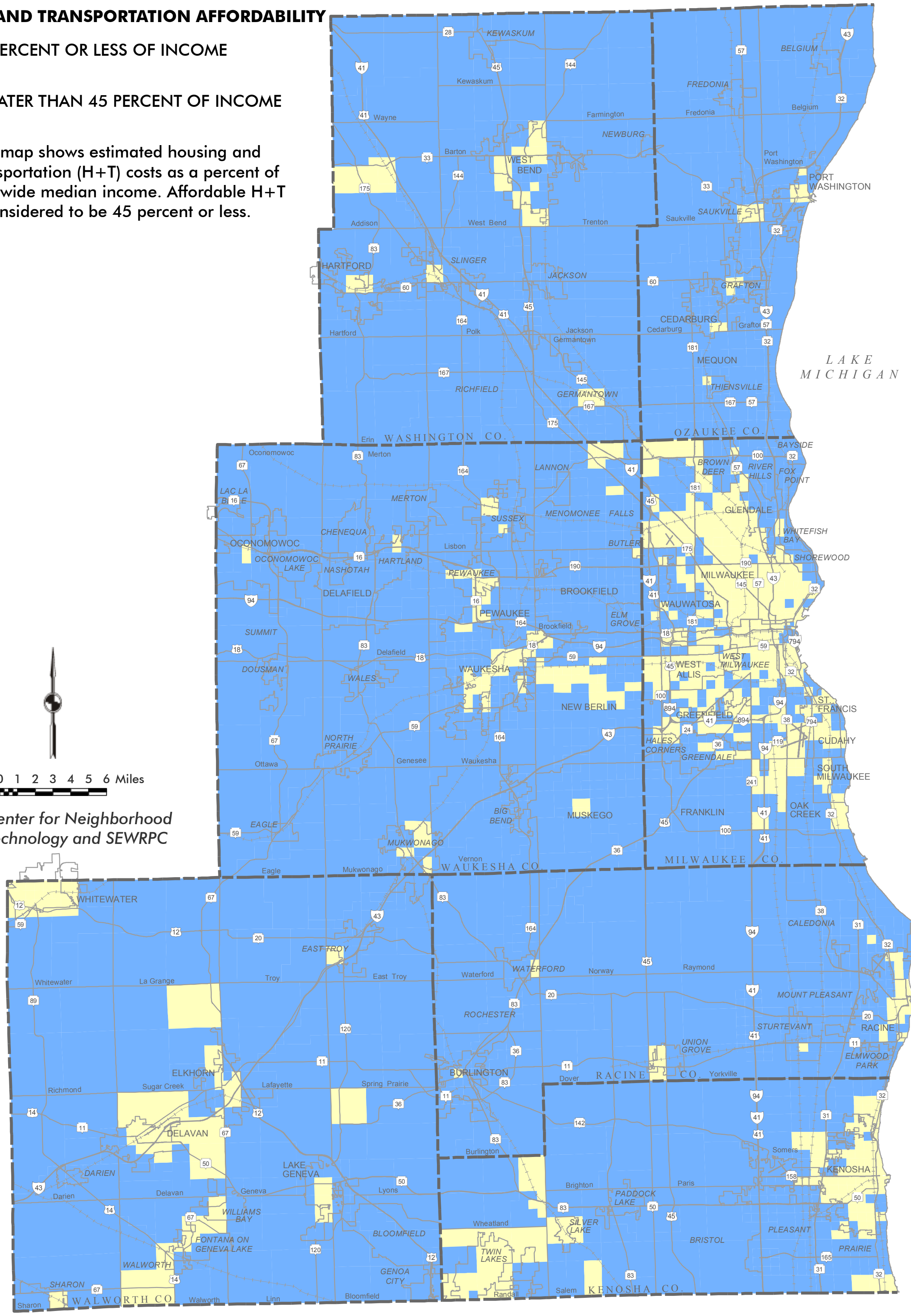
Map F.79
Housing and Transportation Affordability in the Region: Alternative I

HOUSING AND TRANSPORTATION AFFORDABILITY

45 PERCENT OR LESS OF INCOME

GREATER THAN 45 PERCENT OF INCOME

Note: This map shows estimated housing and transportation (H+T) costs as a percent of areawide median income. Affordable H+T is considered to be 45 percent or less.



0 1 2 3 4 5 6 Miles

Source: Center for Neighborhood Technology and SEWRPC

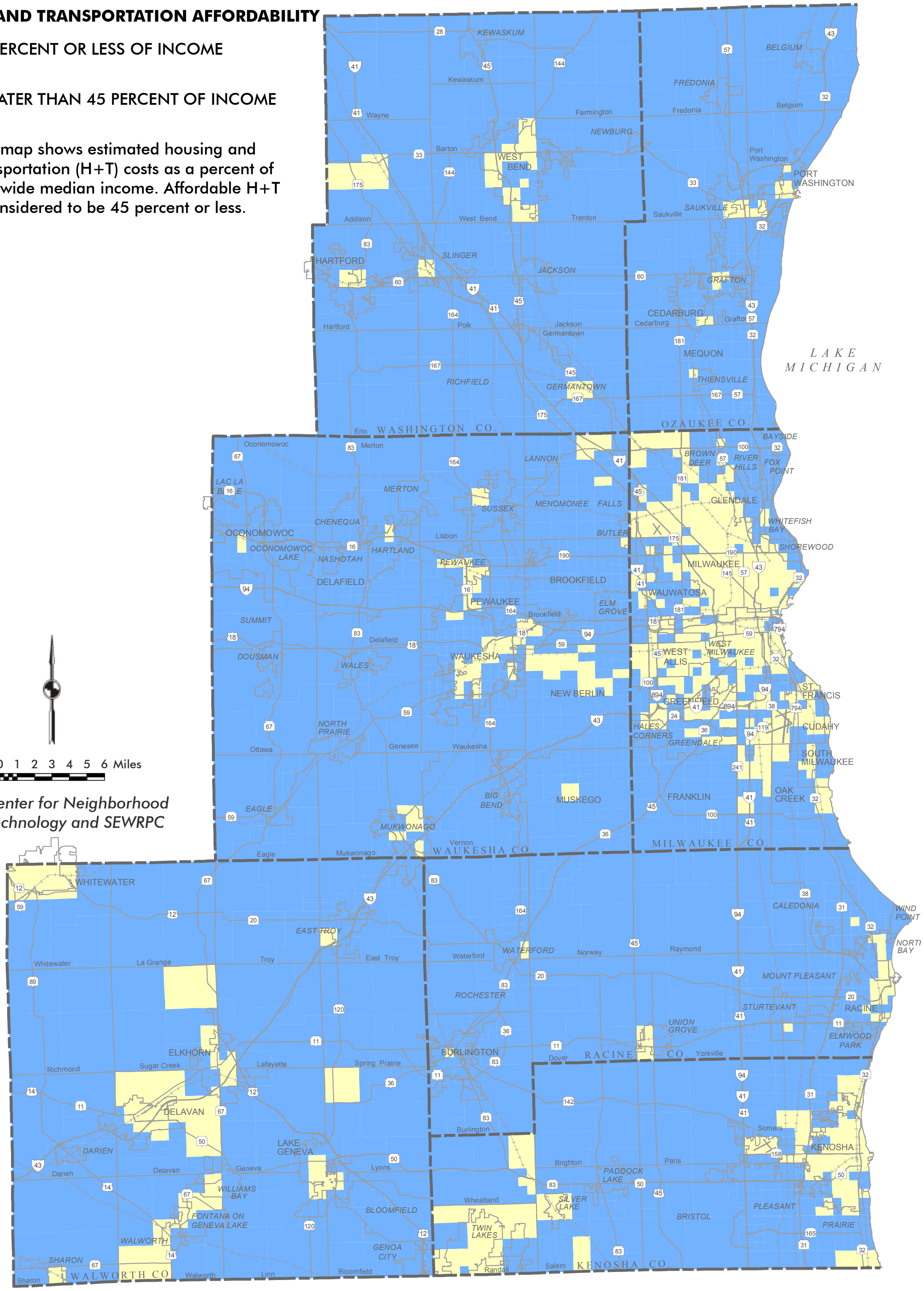
Map F.80
Housing and Transportation Affordability in the Region: Alternative II

HOUSING AND TRANSPORTATION AFFORDABILITY

45 PERCENT OR LESS OF INCOME

GREATER THAN 45 PERCENT OF INCOME

Note: This map shows estimated housing and transportation (H+T) costs as a percent of areawide median income. Affordable H+T is considered to be 45 percent or less.



Source: *Center for Neighborhood Technology and SEWRPC*

CRITERION 2.2.2: ABILITY TO ACCOMMODATE DEMOGRAPHIC SHIFTS

KEY CONCLUSIONS

- **Alternative Plans I and II would provide a variety of housing and transportation options to meet the needs of a diverse population.**
- **Access to community amenities and accessible housing will become increasingly important as the Region's population ages. The compact development proposed under Alternatives I and II will support transit service and walkable neighborhoods.**
- **Mixed-use, high-density transit-oriented developments (TODs) that may appeal to young workers could be developed near BRT, light rail, or commuter rail stations under Alternatives I and II. Alternative II would have more than twice as many stations as Alternative I.**
- **Alternatives I and II would emphasize the provision of housing near jobs. Alternative II would provide more affordable and accessible housing than Alternative I. Transit connections between jobs and housing would be improved under both Alternatives I and II.**

Forecasts prepared for VISION 2050 anticipate continued change in the demographics of the Region. The number of residents age 65 and older is projected to double by 2050 and extrapolation of past trends indicates that the minority share of the Region's population will increase to 45 percent by 2050. The varying development patterns and transportation investments of the Trend and Alternatives I and II impact their ability to meet the changing needs of the Region's population.

- **Workforce:** The projected doubling of residents age 65 and older reflects the aging of the Baby Boomer generation. The entire Baby Boomer population will have reached 65 by the year 2030, creating a need for replacement workers. Employment will only increase in the Region if the Region can attract an in-migration of population and labor force. Housing and transportation options that meet the variety of needs of an increasingly diverse population should be considered. Alternative II would provide the greatest range of housing types and transportation options among the alternatives. Alternative I would provide a greater range of housing types and transportation options than the Trend.

- **Housing:** Demographic shifts in the Region's population may result in changing housing needs. Accessible housing and workforce housing are two key concerns. Demand for accessible housing already exceeds supply. It is estimated there are almost three times as many households reporting at least one member with a disability as there are accessible housing units in the Region. The need for accessible housing is expected to increase in the coming years because there will be significantly more residents in the older age ranges and the likelihood of incurring a disability increases as a person ages.

  Affordable workforce housing is also a concern. Over 46 percent of renters in the Region have a high housing cost burden. In addition, over half of the respondents to a VISION 2050 survey think the Region needs more apartments affordable to lower- and moderate-income households, including 77 percent of minority respondents.

New multifamily housing (apartments) will increase the supply of accessible and affordable housing in the Region. Federal and State fair housing laws require that most new multifamily housing units include basic accessibility features, and multifamily housing tends to be more affordable to a wider range of households than single-family homes. About 46 percent of new housing would be multifamily units under Alternative II, compared to about 39 percent under Alternative I and about 25 percent under the Trend.

- **Transportation:** Transportation systems will also impact the ability of VISION 2050 alternative plans to accommodate changing needs of the Region's population. The demand for reliable and convenient public transit service to shopping, recreation, and health care is expected to grow as the Region's population ages and becomes increasingly reliant on public transit. Walkability is also expected to become increasingly important as the population ages. Studies have determined that neighborhoods with a high level of pedestrian amenities and shorter travel times to shopping and services are desirable features for people with mobility and sensory disabilities. Studies recommend that accessible housing be combined with mixed-use, high-density neighborhoods to maximize accessibility in housing and access to various community amenities. Improved public transit service, including fixed-guideway transit (BRT, light rail, and commuter rail), walkability, and bicycle facilities may also increase the Region's ability to attract young workers who desire a variety of transportation and housing options.

  Alternatives I and II both propose significant increases in local transit service over the Trend. Alternatives I and II also provide fixed-guideway transit service; however, the proposed investment in fixed-guideway service would be significantly greater under Alternative II. The increased density of Alternatives I and II that supports public transit also supports walkable neighborhoods. Alternative II would have 863,000 people living in walkable neighborhoods, 12 percent more than Alternative I (770,000) and 19 percent more than the Trend (725,000). In addition, the fixed-guideway station areas under Alternatives I and II are envisioned to support transit-oriented development (TOD). TODs can provide the high-density, mixed-use, and pedestrian-friendly neighborhoods that would be beneficial to the aging population and may be desirable to young workers. More than twice as many station areas are proposed under Alternative II than Alternative I.

CRITERION 2.3.1: AREAS WITH A JOB-WORKER MISMATCH

KEY CONCLUSIONS

- **More jobs and households are located in areas with a match under Alternative Plans I and II than the Trend.**
- **More development would be focused in TODs with a mix of high-density housing and jobs under Alternative II than Alternative I.**
- **Areas with a shortage of workers typically have concentrations of employers and existing lower-density housing.**
- **There are areas with mismatches under all three alternatives, but Alternatives I and II provide better public transit options than the Trend to areas that may have a shortage of workers.**

It is essential to have the necessary workforce available for existing businesses to maintain their presence and consider expansion, and to attract new business and industry to the Region. An adequate amount of workers in proximity to employers can help ensure workforce availability and reduce the distance workers have to travel to their jobs. Alternative II has the most jobs (936,200) and households (660,700) located in areas of the Region that have a match between jobs and workers. Alternative I has slightly fewer jobs (934,800) and households (659,100) in areas with a match. The Trend has the fewest jobs (866,400) and households (616,400) in areas with a match.

- **Areas with a Match:** The areas of the Region with matches between jobs and workers would be similar between the alternatives, although more areas would have a match under Alternatives I and II than the Trend. Most existing and new employment would be located in areas with public sewer service under the alternatives; however, there would be more new housing outside these areas under the Trend than Alternatives I and II.

  In addition, more jobs and households would be located in Milwaukee County under Alternatives I and II than the Trend. Increased development is anticipated in Milwaukee County under Alternatives I and II to meet anticipated demand created by TOD that may occur near BRT, light rail, and/or commuter rail stations under those alternatives. TODs would include a mix of high-density housing and jobs, which helps to improve job-worker matches under Alternatives I and II. Alternative II could support more than twice as many TODs, which would result in a better job-worker match than Alternative I.

  Alternatives I and II also include fixed-guideway transit service from Milwaukee County to job opportunities in outlying counties. While this may not contribute to job-worker match, the improved transit options increase job opportunities for those without access to a personal vehicle. Alternative I includes a rapid transit line connecting Milwaukee to the City of Waukesha through Brookfield. Alternative I also includes a commuter rail line connecting Milwaukee to Racine and Kenosha. Alternative II incorporates those lines and includes an additional commuter rail line connecting Milwaukee, Oconomowoc, and other Waukesha County communities in between.

- **<u>Areas with a Potential Shortage of Workers:</u>** Areas where there may be a shortage of workers are also similar between the alternatives, although more communities achieve a job-worker match under Alternatives I and II than under the Trend. The communities that may have a shortage of workers tend to have public sewer service, with concentrations of employers and existing lower-density housing. The lower-density housing results in a lower population density and less available workers in proximity to employers. There may also be a lack of existing multifamily housing, which tends to be more affordable to a wider range of workers than single-family housing.

  Several of the communities that may have a shortage of workers under the alternatives are located in Waukesha County. Jobs in Brookfield would be more accessible to Milwaukee County workers through the rapid transit line proposed under Alternative I. This line would be retained under Alternative II, and the commuter rail line proposed under Alternative II would serve additional Waukesha County communities with a mismatch.

- **<u>Areas with a Potential Shortage of Jobs:</u>** Areas where there may be a shortage of jobs are again similar between the alternatives. These are generally outlying residential areas that do not offer the public services needed to support extensive commercial and industrial development, such as public sewer and water supply, or "bedroom communities" that do not include a significant employment base.

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APPENDIX F-3
ALTERNATIVE PLAN EVALUATION FOR COSTS AND FINANCIAL SUSTAINABILITY

CRITERION 3.1.1: IMPACT OF THE DISTRIBUTION OF GROWTH ON PROPERTY VALUES

KEY CONCLUSIONS

- **Areas with TOD and walkable neighborhoods have seen increases in property values in other regions. There would be a significant increase in TODs and walkable areas under Alternative Plans I and II over the Trend. Alternative II could have more than twice as many TODs as Alternative I.**
- **Increased property values can result in increased housing costs.**
- **The public service costs of farmland are low compared to scattered lower-density residential development.**
- **Compact development or redevelopment provides an opportunity for communities with little developable land to increase their tax base.**

The alternatives are designed to accommodate the year 2050 population, household, and employment projected by the Commission. While the alternatives accommodate the same amount of growth regionwide, the development patterns and transportation systems designed to serve this growth vary between alternatives. The Trend represents a continuation of overall decline in density across the Region. Alternatives I and II include more compact, walkable development than the Trend, with a focus on TOD around fixed-guideway transit stations. Alternative II includes more than twice as many station areas as Alternative I.

- **Development in Urban Areas:** The change in TODs and walkable areas under Alternatives I and II is expected to impact property values in those areas. There would be very few areas that could support TOD under the Trend. In addition, fewer of the Region's residents (724,600) would live in walkable neighborhoods under the Trend than Alternatives I and II. There would be 65 rapid transit stations and nine commuter rail stations that could potentially support TOD under Alternative I, and 769,500 residents would live in walkable neighborhoods. There would be 185 rapid transit stations and 18 commuter rail stations that could potentially support TOD under Alternative Plan II, and 863,100 residents would live in walkable neighborhoods.

  Studies acknowledge that it is difficult to determine the exact impact of transit stations on development potential and property values within a station area in light of other factors, such as the overall strength of the local and regional real estate market; strength of the economy/job market; and other planning and development initiatives. Despite this uncertainty, a number of previous studies in metropolitan areas with fixed-guideway transit networks have shown a range of property value increases in station areas. Three examples include:

  - 2 to 18 percent for condominiums within one-half mile of a station (San Diego)
  - 15 percent for office development within one-half mile of a station (Santa Clara County)
  - 30 percent for retail development within one-quarter mile of a station (Dallas)

Studies have also found that walkable neighborhoods have a positive impact on residential property values. A 2009 CEOs for Cities study of 15 metropolitan areas found that homes in areas with above average walkscores sell for $4,000 (Dallas) to $34,000 (Sacramento) more than comparable homes in areas with average walkscores.

- **Challenges:** Housing costs may increase as a result of increased property values. This increase is of particular concern for redevelopment in areas with concentrations of low-income households, as it may lead to the displacement of existing residents of a neighborhood if it becomes unaffordable for them to stay. Displacement may be one of the elements of a phenomenon commonly referred to as gentrification, which has been studied in detail by many experts for decades.

  The conclusions of those decades of research are mixed, and occasionally contradictory. Some studies indicate displacement due to housing in a neighborhood becoming unaffordable is relatively rare, occurring at a rate of about 1 percent of longtime residents per year,[21] while others find a displacement rate of up to 10 percent each year in some cities with significant economic growth and high demand for urban living.[22] In addition, there is some evidence that in certain areas of high demand where local governments relax limitations on the height and density of new developments, nearby neighborhoods experience less gentrification, new development, and displacement.

  Some strategies for encouraging mixed-income housing in compact, walkable redevelopment areas include:

  - Density bonus and reduced parking requirements as incentives for affordable housing

  - Incentives to use Low-Income Housing Tax Credits in TODs

  - Public/private partnerships through options including acquiring and assembling land, streamlining rezoning and permitting processes, and assistance with brownfield mitigation grants

  - Developing enough new housing and preserving existing affordable housing to meet the potential demand (a review of nationwide studies conducted for the FTA estimates that demand for housing in transit station areas could grow 150 percent by 2030)

- **Development in Rural Areas:** The public service costs of farmland are low compared to scattered lower-density residential development. In general, the tax returns to a community from farms are greater than the public service and facilities costs that farms require. Costs to provide public services and facilities to scattered residential development generally exceed tax revenues. Converting productive farmland

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[21] *Newman, S. J. and Owen, M. S. (1982),* Residential Displacement: Extent, Nature, and Effects. *Journal of Social Issues, 38: 135–148. doi: 10.1111/j.1540-4560.1982.tb01775.x and Freeman, Lance (2005),* Displacement or Succession? Residential Mobility in Gentrifying Neighborhoods. *Urban Affairs Review, vol. 40, no. 4: 463-491. doi: 10.1177/1078087404273341.*

[22] *Newman, Kathe and Wyly, Elvin K. (2006),* The Right to Stay Put, Revisited: Gentrification and Resistance to Displacement in New York City. *Urban Studies, vol. 43, no. 1: 23-57. doi: 10.1080/00420980500388710.*

can increase the cost of public services and impact a community's character. There would be significantly more farmland converted to urban development under the Trend (77 square miles) than Alternative I (32 square miles) or Alternative II (26 square miles).

- **Levy Limits:** The emphasis on compact development in Alternatives I and II may also have a positive impact on community property tax revenues, particularly in communities that have very little developable land. A community is allowed to increase its levy over the amount it levied in the prior year by the percentage of increase in equalized value from net new construction, with few exceptions. If no new construction occurred in a community, then the allowable tax levy increase is 0 percent.[23] Compact development or redevelopment provides an opportunity for communities, with otherwise very little developable land, to maximize the amount of new construction that may occur.

[23] *League of Wisconsin Municipalities.*

CRITERION 3.1.2: RETURN ON INVESTMENT

KEY CONCLUSIONS

- **Return on investment predicts the net benefit or cost of a particular investment decision, and can be used to compare the alternatives' expected benefits to their costs.**
- **Alternatives I and II would require considerably more investment than the Trend in terms of needed tax revenues, but would likely result in significant benefits—both economic and quality of life—that need to be weighed against those costs.**

Return on investment is most typically used in business cases to predict the net benefit or cost of a company or organization's investment in equipment, software, or employees. An analysis of return on investment attempts to measure what is gained from making a particular expenditure. In the case of choices in land development patterns and transportation systems, there are numerous quality of life and fiscal benefits discussed throughout the evaluation of the alternatives. Those quality of life and fiscal benefits are compared under this criterion to the costs associated with building the land development pattern and transportation system included in each alternative.

Below is a series of short discussions on the costs and benefits associated with each alternative:

- **Tax Revenue Required for Transportation Investment:** Criterion 3.2.1 (Average Annual Transportation System Investment) discusses the amount of tax revenue that would be needed to construct, operate, and maintain the transportation system included in each alternative. Alternative Plan II would require 46 percent more tax revenue ($369.4 million more annually) to construct, operate, and maintain the Region's transportation system than the Trend, and Alternative Plan I would require 40 percent more tax revenue ($320.9 million more annually) than the Trend. The tax revenue required to support these alternative transportation systems would need to be raised from the Region's residents and/or businesses, and would impact their household and corporate budgets.

- **Impacts of the Transportation System on Homes, Businesses, Land, Parkland, and Natural Resource Areas:** In addition to the needed additional tax revenue to fund the transportation systems proposed under Alternatives I and II, transportation system expansion (in particular, new and widened arterial streets and highways) would negatively impact natural resource areas and require some relocations or acquisitions of homes, businesses, and parkland in Alternatives I and II and the Trend. Although it is difficult, and in some cases, not desirable, to monetize these impacts from transportation system expansion, there is certainly a non-monetary cost associated with these impacts. Under all alternatives, impacts to natural resource areas would be relatively minor, with 199.0 acres (out of 311,900 existing acres) of primary environmental corridors impacted by transportation system expansion under Alternative II. Alternative I would impact 215.2 acres of primary environmental corridors, and the Trend would impact 224.9 acres. Impacts to a number of other natural resources areas, including wetlands and critical species habitats, are summarized in Criterion 1.3.2 (Impacts to Natural Resource Areas).

As described in Criterion 1.5.1 (Homes, Businesses, Land, and Parkland Acquired), the Trend would have the greatest impact on homes, businesses, land, and parkland, with expansion of the transportation system requiring 414 homes or businesses to be relocated and 116.1 acres of parkland to be acquired. Alternative I would have a slightly smaller impact with 358 homes or businesses relocated and 115.8 acres of parkland to be acquired, and Alternative II would have the smallest impact with 272 homes or businesses relocated and 95.0 acres of parkland acquired. Home and business relocation can have a negative impact on the local economy, and acquiring parkland can negatively impact quality of life, in the neighborhoods adjacent to transportation system expansion.

- **Private Costs of Using the Transportation System:** As discussed in Criterion 3.3.1 (Private Transportation Costs per Capita), an expanded transit system that provides more frequent and faster service to more destinations has the ability to decrease the overall amount residents of the Region spend on transportation. Under Alternatives I and II, more residents are projected to live in households with fewer cars than under the Trend, with many of their journeys instead being taken on transit. Even with only a modestly higher transit mode share compared to the Trend under Alternative II, the Region's residents would spend $255 million less annually directly on transportation. Under Alternative I, $185 million less would be spent annually directly on transportation.

- **Improvements in Housing + Transportation Affordability:** Partially due to the decrease in private costs of transportation, Criterion 2.2.1 (Households with Affordable Housing + Transportation Costs) estimates that under Alternative II, compared to the Trend, 33,400 more households would be located in H+T-affordable areas (defined as areas with estimated housing and transportation costs that are 45 percent or less of the areawide household median income), and therefore would potentially have more income to save or spend on other needs. Under Alternative I, 21,500 more households would be located in H+T-affordable areas than the Trend.

- **Benefits of Decreased Crash Rates:** Crashes contribute to overall transportation costs by causing delay and unreliability on the transportation network; they increase public costs for police and emergency medical services; and, if they result in injury, increase medical costs and can lead to a heavy toll in life, property damage, and human suffering. One of the causes of crashes is poor or unsafe roadway design, and improving the roadway network, as would be done under all alternatives, would result in reductions in crash rates and their negative effects. As can be seen in Criterion 1.6.1 (Crashes by Mode), the total number of crashes on the transportation system would be lowest under Alternative II (1,300 fewer crashes annually than under the Trend), due primarily to the decrease in vehicle-miles traveled in private automobiles. For the same reason, Alternative I would have fewer crashes than the Trend (1,000 fewer annually). FHWA has provided estimates of total societal costs of $3,200 to $290,000 per nonfatal crash (depending on severity) and $4,200,000 for the average crash resulting in a fatality. Applying these costs, Alternative II would save between $4.2 million and $377.0 million annually over the Trend, with an additional $4 million saved for each of those crashes that would have been fatal. Alternative I would save between $3.2

million and $290.0 million, with an additional $4 million saved for each of those crashes that would have been fatal.

- **Costs of Travel Delay:** As discussed in Criterion 3.3.2 (Per Household Cost of Delay), when people are stuck in traffic—either in a car, bus, or truck—they are prevented from doing more productive things with their time. Valuing the costs associated with traffic delays can be challenging, as estimates of the value of a person's time while they are stuck in traffic vary widely. Using guidance from USDOT, it is estimated that the total cost of delay in the Region would be highest under Alternative II ($22.3 million more per year than under the Trend), and lowest under Alternative I ($4.4 million less per year than under the Trend). This is due to Alternative I providing a robust transit network while also providing highway capacity improvements to address congestion, resulting in the least amount of congestion.

- **Costs of Infrastructure and Services to Local Governments:** Significant research has been done nationally on the costs to local governments to maintain the public infrastructure associated with serving homes and businesses, but costs can vary widely across different parts of the country depending on construction and maintenance needs and practices. Criterion 3.4.1 (Supportive Infrastructure Costs) uses local information to estimate costs for providing sewer, water, and local roads to the new development under each alternative. The cost of building this infrastructure is frequently borne by developers, rather than cities, villages, and towns. However, local governments are often left with the long-term maintenance and replacement costs associated with this infrastructure, and national data indicate that the per capita cost of maintaining roads, water mains, and sewer pipes, and providing fire protection, school transportation, and solid waste collection, all decrease as density increases. In addition—all else being equal—walkable neighborhoods have higher per unit housing values, and retain those values better in the face of a real estate slowdown. Therefore, walkable, dense neighborhoods offer local governments not only lower costs per capita, but higher and more stable property tax revenues per unit.

- **Benefits to the Environment:** As covered extensively in Criterion 1.4.7 (Overall Environmental Sustainability), Alternative II would have the lowest impact and the greatest benefit to the environment, with Alternative I also performing better than the Trend. Alternative II would preserve 0.5 percent more of the Region's total land area as pervious surface than the Trend (Alternative I would preserve 0.4 percent more), resulting in less ecological damage and flooding. About 23 fewer square miles of areas with high groundwater recharge potential would be developed under Alternative II than the Trend, and 19 fewer square miles would be developed under Alternative I. Transportation-related greenhouse gas emissions and other air pollutants would be lowest under Alternative II (1 to 2 percent lower than the Trend), and also better than the Trend under Alternative I (generally slightly less than 1 percent lower than the Trend). Although it is difficult to monetize many of these benefits, they can have a direct impact on the Region's ability to prepare for an uncertain climate future, and therefore are essential to the future economic competitiveness of the Region.

- **<u>Benefits to Public Health:</u>** Alternatives I and II both would improve public health by making active transportation (such as biking and walking) easier through increased density and enhanced bicycle facilities, and having lower overall air pollutant levels than the Trend, as discussed in Criterion 1.2.3 (Benefits and Impacts to Public Health). As active transportation increases, public health tends to improve and obesity-linked conditions tend to decline. As a result, the costly expenditures related to caring for these conditions may be reduced, which would lessen the healthcare costs to individuals and society as a whole. Following this logic, Alternative Plans I and II would have a greater potential to reduce healthcare costs than the Trend.

CRITERION 3.1.3: ABILITY TO CONNECT TO NEARBY METRO AREAS AND LEVERAGE THE VALUE OF THOSE AREAS

KEY CONCLUSIONS

- **Alternative Plan II provides the highest level of regional access to the Region's commercial air service, intercity bus service, intercity passenger rail service, commuter rail service, and Lake Michigan ferry service, followed by Alternative Plan I, then the Trend. These services provide connections to nearby metro areas and beyond.**
- **Access to neighboring cities and metropolitan areas via the Region's freeway system is best provided by Alternative I, which would result in the lowest level of congestion on the Region's freeway system, followed by Alternative II, then the Trend.**

As described in the Comprehensive Economic Development Strategy (CEDS)[24] for the Region, the role of transportation infrastructure—facilitating the efficient movement of people and goods into, out of, and within the Region—is critical for moving the Region forward on a path to new economic growth. High-quality, well-designed transportation infrastructure connecting the Region to nearby economic hubs, particularly the Chicago metropolitan region, is important to enable the flow of people and goods. Southeastern Wisconsin's existing transportation connections to neighboring cities and metro areas outside the Region rely heavily on the Region's freeway system as well as intercity travel options including commercial air service, intercity passenger rail, intercity bus, commuter rail, and Lake Michigan ferry service.

The importance of connecting the Region with neighboring cities and metropolitan areas is illustrated by the Organisation for Economic Cooperation and Development (OECD) in its review of the Chicago metropolitan region.[25] The OECD describes the "Chicago Tri-State Metro-Region"—comprised of 14 counties in Illinois, Indiana, and Southeastern Wisconsin (Kenosha County)—as has having one the largest regional economies in the United States and in the world. The OECD notes that a larger 21-county "Chicago Tri-State Region"—including five additional Southeastern Wisconsin counties (Milwaukee, Ozaukee, Racine, Washington, and Waukesha counties)—increasingly is viewed as having one interconnected regional economy.

Each alternative plan's transportation system differs in how it addresses congestion on Southeastern Wisconsin's freeway system as well as regional connections to the airport, train stations, intercity bus stops, and ferry terminal that are used by people traveling to and from neighboring cities and metro areas. The impacts of each alternative's transportation system on the movement of freight to, from, and within the Region is discussed in Criterion 4.6.3 (Impacts to Freight Traffic).

- **Southeastern Wisconsin Freeways:** The Region's freeways provide critical connections in the Region for people traveling by car and bus to and from neighboring cities and metro areas, including Chicago,

[24] *The Southeastern Wisconsin Regional Planning Commission, the Milwaukee 7 Regional Economic Development Partnership, and the Southeast Wisconsin Regional Economic Partnership,* Comprehensive Economic Development Strategy for Southeastern Wisconsin: 2015, Public Review Draft, *February 2015.*

[25] *OECD Publishing,* OECD Territorial Reviews: The Chicago Tri-State Metropolitan Area, United States, *2012.*

Rockford, Beloit, Madison, La Crosse, Eau Claire, Minneapolis-St. Paul, Fond du Lac, Oshkosh, Appleton, Sheboygan, Manitowoc, and Green Bay. In particular, the Region's freeways play a vital role in connecting business travelers and commuters with neighboring cities and metro areas. According to WisDOT, approximately 25,000 businesses are currently located within two miles of key freeway segments in the Region, including IH 41, IH 43, IH 94, and IH 894, and additional business development adjacent to the Region's freeways is expected to continue through the year 2050.

As described in Criterion 4.4.1 (Congestion on Arterial Streets and Highways), Alternative Plan I would result in the least congested freeway system in the Region, with 26.7 percent (76.6 miles) of the system operating over its design capacity (moderate, severe, or extreme congestion) on an average weekday. The congested freeway miles under Alternative I would be expected to be about 1.1 percent less than Alternative II (79.8 miles) and 2.4 percent less than the Trend (83.7 miles).

- **General Mitchell International Airport:** General Mitchell International Airport (GMIA) currently provides access to commercial air service, intercity bus service, and intercity passenger rail service, connecting the Region to both nearby regions and other metropolitan areas across the nation and world. Commercial airlines serving GMIA provided daily non-stop flights to 39 domestic and international destinations as of August 2015. Intercity bus companies stopping at GMIA provide daily service to nearby cities, including Chicago, Madison, La Crosse, Wisconsin Rapids, Stevens Point, Wausau, Fond du Lac, Oshkosh, Appleton, Sheboygan, Manitowoc, and Green Bay. Amtrak's Hiawatha Service trains stop at GMIA and provide daily service to Chicago.

  Under the Trend, regional access to GMIA would be provided by the arterial street and highway system, local bus transit service, and a commuter bus route operating between Kenosha and Milwaukee. Alternative I would improve regional access to GMIA by providing a rapid transit line connecting the Airport with downtown Milwaukee and a commuter rail line operating between Kenosha and downtown Milwaukee that would serve the Airport. Alternative II would provide regional access to GMIA similar to Alternative Plan I, with the rapid transit line connecting the Airport to downtown Milwaukee extended south into Oak Creek.

- **Milwaukee Intermodal Station:** The Milwaukee Intermodal Station (MIS) in downtown Milwaukee provides access to intercity bus service and intercity passenger rail service connecting Southeastern Wisconsin to nearby cities and metro areas. Intercity bus companies stopping at MIS currently provide daily service to nearby cities, including Chicago, Sheboygan, Manitowoc, Green Bay, Marinette, Escanaba, Marquette, Fond du Lac, Oshkosh, Appleton, Madison, Wisconsin Rapids, Stevens Point, Wausau, La Crosse, Eau Claire, and Minneapolis-St. Paul. Amtrak's Hiawatha Service and Empire Builder trains stop at MIS and provide daily service to nearby cities, including Chicago, La Crosse, Winona, and Minneapolis-St. Paul.

  Under the Trend, regional access to MIS would be directly provided by the arterial street and highway system, local bus transit service, the downtown Milwaukee streetcar line, and a commuter bus route operating between Kenosha and Milwaukee. Alternative I would improve local bus transit service to MIS and replace the commuter bus route with a commuter rail line connecting Kenosha and downtown Milwaukee. Alternative II would greatly enhance transit access to MIS, with two rapid transit corridors connecting downtown Milwaukee with northwestern Milwaukee and with Milwaukee's East Side and Bayshore Town Center. In addition, Alternative II would provide a second commuter rail line operating between Oconomowoc and downtown Milwaukee.

- **Other Intercity Bus Stops, Train Stations, and Ferry Terminals:** Several other locations in the Region provide access to intercity bus service, intercity passenger rail service, commuter rail service, and Lake Michigan ferry service. The Goerke's Corners park-ride lot in Brookfield provides access to daily intercity bus service connecting Waukesha County with Madison, Wisconsin Rapids, and Stevens Point. The Sturtevant Amtrak station provides access to daily intercity passenger rail service connecting Racine County with the Chicago metro area. The Kenosha Metra station provides access to daily commuter rail service connecting the City of Kenosha with the Chicago metro area. Finally, the Lake Express ferry terminal in Milwaukee provides access to daily Lake Michigan ferry service in the spring, summer, and fall connecting Milwaukee with Muskegon.

  Under the Trend, regional access to the Goerke's Corners park-ride lot would be provided by the arterial street and highway system, local bus transit service, and commuter bus routes connecting downtown Milwaukee with both Oconomowoc and Waukesha. Alternatives I and II would improve access by providing a rapid transit line connecting Goerke's Corners to downtown Waukesha and downtown Milwaukee.

  Under the Trend, regional access to the Sturtevant Amtrak station would be provided by the arterial street and highway system and by local bus transit service. Alternatives I and II would improve access by providing improved local bus transit service and by providing an express bus route connecting the station to the Ives Grove park-ride lot and the Corinne Reid Owens Transit Center in downtown Racine.

  Under the Trend, regional access to the Kenosha Metra station would be provided by the arterial street and highway system, by local bus transit service, and by the Kenosha streetcar line. Alternatives I and II would improve access by providing improved local bus transit service; by providing an express bus route connecting the station to Paddock Lake, Silver Lake, and Twin Lakes; and by providing a commuter rail line connecting the station with downtown Milwaukee.

  Under the Trend, regional access to the Lake Express ferry terminal in Milwaukee would be provided by the arterial street and highway system. Alternatives I and II would improve access by connecting it to the transit network with local bus transit service.

CRITERION 3.1.4: POTENTIAL FOR ATTRACTING RESIDENTS AND BUSINESSES

KEY CONCLUSIONS

- **The Region's land development pattern and its transportation system can be important factors in attracting residents and businesses. Transportation access, traffic congestion, travel time reliability, transit quality, walkable areas, and bicycle accommodations are specific factors directly impacted by the alternatives.**
- **Alternative I would perform best in terms of traffic congestion and travel time reliability on the arterial street and highway system, while Alternative II would perform best in terms of transit access and quality, as well as walkable areas and housing options.**
- **Both Alternatives I and II would have the most significant improvements to bicycle infrastructure.**

Attracting businesses and residents is a primary focus of economic development efforts. In Southeastern Wisconsin, as in many other regions, this will be even more important in the future as there will be a need to in-migrate population to grow businesses and jobs in the long-term. For most communities, attraction means capitalizing on what currently exists and improving the things that prospective businesses and residents find important. For VISION 2050, the focus on attracting businesses and residents, as well as improving quality of life for existing businesses and residents, relate to the Region's future land development pattern and transportation system.

- **Attraction Factors:** There are many factors that affect where a business decides to locate or expand and where an individual or family decides to make their home. Many of these factors are unique to the particular business or individual, and would not directly be impacted by VISION 2050. For example, if a business relies on abundant fresh water for its operations, it may find Southeastern Wisconsin particularly attractive given its ready access to Lake Michigan's water supply. Businesses also tend to look at factors such as the cost to acquire land, education and skills of potential employees, tax structure, and customer base. For individuals or families, they may move to an area for a new job, a better school, or to be closer to family, among other factors. While the development pattern and transportation system can have an indirect impact on these factors, the alternative plan evaluation focuses on the factors that would be more directly impacted by the alternatives.

  Primary factors significantly impacted by the alternatives are transportation infrastructure and housing. Many businesses in particular look at transportation access and housing opportunities as critical location factors, whether that means locating near a freeway interchange or locating in an area with robust transit service and housing options available to its employees. Individuals and families also tend to consider how they would commute to work or school, or make trips to stores and restaurants, for example. When it comes to transportation, some people and businesses perceive excessive traffic and long commutes to be a deterrent to improving their quality of life and will choose to locate in an area with less traffic congestion and shorter commute times. For some, other factors may be more important, and relatively high congestion levels are tolerable as long as they coincide with reliable travel times from day to day. Travel time reliability, described in more detail in Criterion 4.6.1 (Transportation Reliability), is particularly important to businesses that need to ship their goods.

More and more people—and the businesses that employ them—are also looking for areas with a fast, reliable, and well-connected transit system. Access to robust transit services allows them to avoid the need to drive a car, which tends to be far more expensive than using public transit. Related to this factor, there are also growing numbers of people who are looking for areas where they can walk to different destinations, such as jobs, restaurants, grocery stores, parks, and schools. Still others want to see an emphasis on bicycle accommodations and the infrastructure that allows bicycling to be a viable alternative to driving, as well as provides recreational opportunities by bicycle.

- **How the Alternatives Perform:** While location decisions are clearly individual choices, the alternatives include elements that may make the Region more (or less) attractive to potential businesses and residents. In terms of traffic congestion, Alternative Plan I would perform slightly better than the Trend and Alternative Plan II given the additional capacity to address congestion on the arterial street and highway system and significant improvements to the transit system to provide alternatives to congested roads. Despite the most significant improvements to transit in Alternative II, congestion would be slightly higher than Alternative I because highway capacity expansions for Alternative II would only be located in the rural and low-density suburban areas not served by fixed-guideway transit. The additional traffic congestion in the Trend and Alternative II would mean slightly longer travel times, and a higher chance of crashes that would reduce transportation reliability.

  For people looking to avoid the need to drive, and for businesses looking for robust transit service and housing options for their employees, Alternative II would perform the best. More people under Alternative II would have access to transit, and more people would have access to higher-quality, fixed-guideway transit, than under the Trend or Alternative I. Alternative II would also have the most walkable areas, providing prospective residents with the opportunity to walk to many destinations, and the greatest variety of housing options of the alternatives. While the Trend would improve the bicycle network, Alternatives I and II envision further improvements to the bicycle network through the provision of enhanced bicycle facilities (such as protected bike lanes or buffered bike lanes) in key regional corridors.

CRITERION 3.2.1: AVERAGE ANNUAL TRANSPORTATION SYSTEM INVESTMENT

KEY CONCLUSIONS

- **Alternative II would require the most public investment ($1,177.2 million annually, or 46 percent more than the Trend), as it includes significantly increased investment in transit and bicycle facilities, while still adding arterial street and highway capacity, primarily in the rural and suburban parts of the Region.**
- **Alternative I would be the next most expensive ($1,128.7 million annually, or 40 percent more than the Trend), followed by the Trend ($807.8 million annually).**
- **Implementing Alternatives I or II without highway improvements would reduce annual alternative plan costs by approximately $43 to $50 million, or about 4 percent.**

The transportation systems included in Alternative Plans I and II would require additional revenues beyond what is currently available for transportation from Federal, State, and local taxes. Additional revenues could come from many sources, and could mean increased gas taxes, a vehicle mileage traveled fee, or increased county sales taxes, among other options. Possible sources for these additional revenues are not identified in this stage of the planning process, but will be part of the development of a preliminary recommended plan.

- **Evaluation Results:** Considered solely based on the amount of tax dollars required to provide each transportation system, the Trend is less expensive than either alternative plan. Even with the reduction in public investment that would be possible if arterial streets and highways were reconstructed without additional capacity, the expanded transit systems included under Alternatives I and II would require more public investment than the Trend. In addition, the transit systems under Alternatives I and II would be slightly more expensive to construct and operate if additional capacity is not added to arterial streets and highways, as the additional congestion would result in more buses being required to provide the same frequencies on transit services that operate in mixed traffic.

  Alternative II would require the least amount of investment in arterial streets and highways, while requiring the most investment in transit service. The Trend would be the least expensive, with Alternative I being nearly as expensive as Alternative II.

  Overall, Alternative II would require the most public investment ($1,177.2 million annually, or 46 percent more than the Trend), as it includes significantly increased investment in transit and bicycle facilities, while still adding arterial street and highway capacity, primarily in the rural and suburban parts of the Region. Alternative I with would be the next most expensive ($1,128.7 million annually, or 40 percent more than the Trend), followed by the Trend ($807.8 million annually). Implementing Alternatives I or II without highway improvements would reduce annual expenditures by approximately $43 to $50 million, or 4 percent.

Table F.29
Average Annual Transportation System Investment (in Millions of 2015 Dollars)

	Arterial Streets and Highways			Transit Services			Bicycle Facilities	
Alternative	Construction	Operations & Maintenance	Subtotal	Construction & Vehicles	Operations & Maintenance	Subtotal	Construction	**Annual Total**
Existing - 2015	--	--	--	$30.1	$133.0	$163.1	--	--
Trend - 2050	$618.4	$84.3	$702.7	$21.1	$82.4	$103.5	$1.7	$807.8
Alt I With Highway Improvements - 2050	$616.9	$84.3	$701.2	$90.6	$330.5	$421.1	$6.4	$1,128.7
Alt I Without Highway Improvements - 2050	$565.0	$84.3	$649.3	$91.3	$331.8	$423.1	$6.4	$1,078.8
Alt II With Highway Improvements - 2050	$593.8	$83.2	$677.0	$125.0[a]	$368.7[a]	$493.8	$6.4	$1,177.2
Alt II Without Highway Improvements - 2050	$550.1	$83.2	$633.3	$125.4[a]	$369.3[a]	$494.7	$6.4	$1,134.4

[a] *The rapid transit corridors included in Alternative II are assumed to be median or center-lane running bus rapid transit for the purposes of estimating the investment required to implement Alternative II. In general, median-running light rail construction costs are approximately $63.5 million per mile, while median-running bus rapid transit construction costs are approximately $12.8 million per mile. Operating costs per service hour are also higher for light rail than bus rapid transit, although the greater capacity of light rail vehicles can result in a lower operating cost per passenger than bus rapid transit.*

Source: SEWRPC

CRITERION 3.3.1: PRIVATE TRANSPORTATION COSTS PER CAPITA

KEY CONCLUSIONS

- **Alternative Plan II would save the Region's residents approximately $185 million annually by the year 2050 compared to the Trend, while Alternative Plan I would save the Region's residents approximately $130 million annually by the year 2050 compared to the Trend.**
- **On average, each resident of the Region would save approximately $80 a year under Alternative II and $55 a year under Alternative I when compared to the Trend.**

In addition to measuring public expenditures on transportation infrastructure (see Criterion 3.2.1 – Average Annual Transportation System Investment), it is important to consider the amount of money that residents would spend on transportation directly. Measured in this criterion, these personal costs for transportation include the costs of owning and operating a private vehicle and the costs of fares to ride public transportation. In the case of a car, these costs include fuel; tires; maintenance; insurance; purchasing, leasing, or financing; and depreciation. The average vehicle in Southeastern Wisconsin costs its owner approximately $5,500 per year, while an annual transit pass in Southeastern Wisconsin ranges from $300 to $1,000, depending on the transit system and whether or not the rider qualifies for discounted fares. Therefore, the availability of transit—and whether or not it provides a convenient, attractive service—can have a significant effect on the amount of money residents of the Region are spending on transportation. The effect of transportation costs on household budgets is further discussed in Criterion 2.2.1 (Households with Affordable Housing + Transportation Costs).

- **Evaluation Results:** The regional private cost of driving was calculated by first multiplying the projected number of personal vehicles under each alternative by the fixed costs of owning a vehicle (such as depreciation, insurance, and the purchase cost). This sum was then added to the sum of the vehicle-miles of travel projected under each alternative multiplied by the variable costs of owning a vehicle (including fuel, tires, and maintenance). The regional private cost of using transit was calculated by multiplying the projected number of transit trips under each alternative by the average fare paid per transit trip.

  The results of this analysis are shown in Table F.30, and indicate that due to the increase in walking, biking, and transit trips caused by a more compact development pattern and expanded transit services, Alternative Plan II would save the Region's residents approximately $185 million annually by the year 2050 compared to the Trend, and Alternative Plan I would save the Region's residents approximately $130 million annually by the year 2050 compared to the Trend. Approximately $80 per year would be saved on a per person basis under Alternative II and approximately $55 per year per person under Alternative I, although the savings would be distributed based on which households decided to replace one or more vehicles with walking, biking, and taking transit. The Trend would result in the average resident's and the entire Region's direct transportation costs increasing significantly compared to current costs.

Table F.30
Private Transportation Costs per Capita

Alternative	Regional Private Cost of Driving (Average Annual in 2015 Dollars)	Regional Private Cost of Using Transit (Average Annual in 2015 Dollars)	Combined Average Private Transportation Cost per Capita (Average Annual in 2015 Dollars)
Existing - 2011	$6,170,000,000	$58,205,000	$3,083
Trend - 2050	$7,354,000,000	$53,205,000	$3,147
Alt I With Highway Improvements - 2050	$7,171,000,000	$105,512,000	$3,091
Alt I Without Highway Improvements - 2050	$7,171,000,000	$105,977,000	$3,091
Alt II With Highway Improvements - 2050	$7,099,000,000	$123,131,000	$3,068
Alt II Without Highway Improvements - 2050	$7,098,000,000	$123,651,000	$3,068

Source: SEWRPC

CRITERION 3.3.2: PER HOUSEHOLD COST OF DELAY

KEY CONCLUSIONS

- **The cost of travel time delay represents an estimate of the value of time lost due to delay.**
- **The total cost of delay to the Region would be highest under Alternative II ($463.5 million per year)—6 percent more than Alternative I ($438.2 million) and 4 percent more than the Trend ($443.9 million). All three alternatives would have higher costs than under existing conditions ($434.4 million).**
- **Per household cost of delay would be less than existing under each alternative, with Alternative II ($289 per household per year) being 5 percent higher than Alternative I ($276) and 4 percent higher than the Trend ($277).**
- **The total cost of delay in the absence of highway capacity expansions (except for committed expansion projects) would be about 41 percent higher under Alternative I and 32 percent higher under Alternative II.**

As discussed in Criterion 4.4.2 (Travel Time Delay), congested roadway conditions increase the time it takes to travel, resulting in lost time for drivers and transit riders. When people are stuck in traffic—be it in a car, bus, or truck—the delay they experience means they have less time to do other potentially more productive and enjoyable activities. Their travel is also more stressful. However, measuring the value of people's time is a challenging and complex endeavor, and some of the more widely publicized estimates have been criticized for exaggerating the cost of delay. The USDOT has provided guidance on estimating the value of travel time savings, which acknowledges the challenges associated with estimating the value of time.[26] The purpose of the USDOT guidance is to aid USDOT staff in the evaluation of actions that could result in either increased or reduced travel time, with the guidance to be applied to benefit-cost or cost-effectiveness analyses of projects. Recognizing that it is difficult to quantify the value of people's time when it comes to time lost traveling on congested roadways, this criterion examines the expected delay on the transportation system under each alternative and makes an attempt to monetize the time lost due to that delay for auto, transit, and commercial truck travel.

- **Estimating Cost of Delay:** To estimate the cost of travel time delay for auto, transit, and commercial truck travel under the alternatives, the minutes of travel time delay[27] from Criterion 4.4.2 were multiplied by an approximated value of time for each type of travel.[28] The value of time on a per hour basis is considerably higher for commercial travel

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[26] *Office of Transportation Policy, U.S. Department of Transportation,* The Value of Travel Time Savings: Departmental Guidance for Conducting Economic Evaluations, Revision 2 (2014 Update), *July 9, 2014.*

[27] *Travel time delay is defined as the difference in travel time between congested and uncongested conditions.*

[28] *The value of time assumed for the cost of delay estimates was broken into travel by personal automobile ($12.25 per hour), transit ($12.25 per hour), light-duty commercial truck ($40 per hour), medium-duty commercial truck ($45 per hour), and heavy-duty commercial truck ($50 per hour). The automobile and transit value of time estimates are based on the previously cited US DOT guidance, while the commercial truck estimates were based on estimates from: Puget Sound Regional Council,* Planning for Freight in the Central Puget Sound Region, Travel Model Improvements for the Congestion Management Process and Long Range Transportation Plan Update, *July 2009.*

than for personal travel (auto and transit) largely due to the fact that the person whose time is affected is being paid to transport goods. Some goods require faster shipping and have a correspondingly higher value placed on the shipping time. Cost of delay was estimated both on an average weekday and on an average annual basis.[29] Cost of delay for personal travel was also estimated on a per household basis.

- **Evaluation Results:** Table F.31 presents a comparison of the estimated cost of delay on an average weekday and on an average annual basis for existing conditions, the Trend, and Alternatives I and II. The total cost of delay (personal and commercial) to the Region would be highest under Alternative II ($463.5 million per year)—6 percent more than under Alternative I ($438.2 million), and 4 percent more than under the Trend ($443.9 million). The higher cost of delay under Alternative II is a result of fewer highway capacity expansions to address traffic congestion. The total cost of delay would be higher under all three alternatives than under existing conditions ($434.4 million); however, per household cost of delay would be less as an additional 172,300 households are projected to be added to the Region through the year 2050. Similar to the minutes of delay discussed in Criterion 4.4.2, the total cost of delay in the absence of highway capacity expansions (except for committed expansion projects and freeway modernization) would be about 41 percent higher under Alternative I and 32 percent higher under Alternative II.

  On a per household basis for personal travel, Alternative II (about $289 per household per year) would have the highest cost of delay, about 5 percent higher than Alternative I ($276) and 4 percent higher than the Trend ($277). However, per household cost of delay would be lower under all three alternatives than existing conditions ($338).

  It should be noted that the cost of delay (total and per household) for transit is higher under Alternatives I and II than the Trend, largely due to the expected increases in transit use under the two alternative plans, which is further discussed under Criterion 4.1.1 (Trips per Day by Mode). The increased transit travel under Alternatives I and II would utilize both transit service operating in mixed traffic and fixed-guideway transit service operating in medians, transit-only lanes, or rail corridors. The transit travel in mixed traffic would be subject to traffic congestion and associated travel time delay, while fixed-guideway transit would mostly be unaffected by traffic congestion.

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[29] *Average annual delay is based on average weekday delay multiplied by the number of weekdays in a year.*

Table F.31
Per Household Cost of Delay

Alternative	Cost of Delay on an Average Weekday ($ millions)			
	Personal Travel		Commercial Travel	Total
	Automobile	Transit		
Existing - 2011	$1.01	$0.06	$0.63	$1.70
Trend - 2050	$1.01	$0.05	$0.67	$1.73
Alt I With Highway Improvements - 2050	$0.97	$0.08	$0.65	$1.70
Alt I Without Highway Improvements - 2050	$1.38	$0.10	$0.93	$2.41
Alt II With Highway Improvements - 2050	$1.04	$0.07	$0.70	$1.81
Alt II Without Highway Improvements - 2050	$1.37	$0.07	$0.93	$2.37

Alternative	Average Annual Cost of Delay ($ millions)			
	Personal Travel		Commercial Travel	Total
	Automobile	Transit		
Existing - 2011	$257.0	$13.5	$163.9	$434.4
Trend - 2050	$258.0	$11.2	$174.7	$443.9
Alt I With Highway Improvements - 2050	$247.9	$20.1	$170.2	$438.2
Alt I Without Highway Improvements - 2050	$352.6	$23.8	$243.4	$619.8
Alt II With Highway Improvements - 2050	$264.7	$16.3	$182.5	$463.5
Alt II Without Highway Improvements - 2050	$350.1	$17.9	$242.9	$610.9

Alternative	Per Household Cost of Delay for Personal Travel ($)	
	Average Weekday	Average Annual
Existing - 2011	$1.34	$338.08
Trend - 2050	$1.09	$276.84
Alt I With Highway Improvements - 2050	$1.08	$275.61
Alt I Without Highway Improvements - 2050	$1.52	$387.08
Alt II With Highway Improvements - 2050	$1.14	$289.98
Alt II Without Highway Improvements - 2050	$1.48	$378.45

[a] *Average annual delay is based on average weekday delay multiplied by the number of weekdays in a year.*

Source: U.S. Department of Transportation, Puget Sound Regional Council, and SEWRPC

CRITERION 3.3.3: RESILIENCE IN ADAPTING TO CHANGING FUEL PRICES

KEY CONCLUSIONS

- **Testing the alternatives under higher and lower fuel prices, indicates that VMT and trips per day by mode would be expected to change to adapt to the higher cost of driving.**
- **Alternative Plans I and II propose significantly improved and expanded transit infrastructure, with Alternative II proposing the most, which increases the capacity of the transportation system to handle more travel by alternative modes to the automobile. This increased capacity would make the system more resilient should the long-term fuel price significantly increase beyond what is expected.**

One of the major unknowns in planning for the Region's transportation system is the future availability and cost of fuel. As noted in Criterion 3.3.1 (Private Transportation Costs per Capita), the cost of fuel is only one element of the cost to owning a car. However, the long-term cost of fuel can be a factor in whether a person buys a more fuel-efficient car and in whether a person decides to drive as opposed to use transit, bicycle, or walk. This criterion tests the alternatives' performance given two opposite assumptions related to fuel prices. The first assumes the expected long-term fuel price would approximately double (about $7.50 per gallon), while the second assumes fuel price would approximately halve ($1.75 per gallon).[30]

- **Vehicle-Miles of Travel:** Recognizing the difficulty in predicting how significant an impact a fuel price increase or decrease would have on the amount of driving in the long term, the Commission's travel demand models were used to estimate how much VMT might be expected to fluctuate if fuel prices were to be doubled or halved, as presented in Table F.32. Under the higher fuel price, VMT under the Trend would be 10 percent lower than under the expected fuel price. It would be 9 percent lower under Alternative I, and 8 percent lower under Alternative II. Under the lower fuel price, VMT would be 5 percent higher under the Trend, Alternative I, and Alternative II. The fluctuations in VMT indicate that some residents of the Region would shift their travel behavior based on changes to the long-term price, although the changes would be relatively modest.

Table F.32
Vehicle-Miles of Travel Under Different Fuel Prices

	Average Weekday VMT (millions)		
Alternative	Expected Fuel Price	Double the Fuel Price	Half the Fuel Price
Trend - 2050	52.1	48.2	54.6
Alt I - 2050	51.1	46.3	53.7
Alt II - 2050	50.7	45.6	53.3

Source: SEWRPC

[30] *The projected fuel price in the year 2050 is estimated to be about $3.64 per gallon in year 2015 dollars.*

Table F.33
Trips per Day by Mode Under Different Fuel Prices

Alternative	Trips on an Average Weekday Under the Expected Fuel Price			
	Automobile	Transit	Non-Motorized	Total
Trend - 2050	6,573,000	130,000	571,000	7,274,000
Alt I - 2050	6,496,000	191,000	587,000	7,274,000
Alt II - 2050	6,458,000	211,000	597,000	7,266,000

Alternative	Trips on an Average Weekday Under a Doubling of the Expected Fuel Price			
	Automobile	Transit	Non-Motorized	Total
Trend - 2050	6,448,000	175,000	651,000	7,274,000
Alt I - 2050	6,311,000	297,000	666,000	7,274,000
Alt II - 2050	6,256,000	332,000	678,000	7,266,000

Alternative	Trips on an Average Weekday Under a Halving of the Expected Fuel Price			
	Automobile	Transit	Non-Motorized	Total
Trend - 2050	6,622,000	116,000	536,000	7,274,000
Alt I - 2050	6,559,000	164,000	551,000	7,274,000
Alt II - 2050	6,524,000	181,000	561,000	7,266,000

Source: SEWRPC

- **Trips per Day by Mode:** Part of one's mode choice is dependent on the perceived cost of using that mode, which can be impacted by fuel prices. Fuel price is particularly significant because a person filling up their car's gas tank immediately notices when they are saving or spending more on fuel. The Commission's travel demand models were used to estimate how mode choice could change if the expected fuel price were to be doubled or halved, as presented in Table F.33. Under the Trend, where transit service would decline from existing levels, transit trips would increase by 35 percent under the higher fuel price and decrease by 11 percent under the lower fuel price. Under Alternative I, where transit service would be significantly improved and expanded, transit trips would increase by 55 percent under the higher fuel price and decrease by 14 percent under the lower fuel price. Under Alternative II, where transit service would be improved and expanded even more than Alternative I, transit trips would increase by 57 percent under the higher fuel price and decrease by 14 percent under the lower fuel price. Non-motorized trips based on the different fuel price assumptions would vary between alternatives similar to transit trips, although to a lesser degree. Similar to the fluctuations in VMT, the change in the number of trips by mode shows that some residents of the Region would shift their travel behavior based on changes to the long-term fuel price.

- **Alternative Transportation Options:** Alternative Plans I and II both propose significantly improved and expanded transit infrastructure, with Alternative II proposing the most improvement and expansion. Under the expected fuel price, projected increases in transit ridership and non-motorized travel may be relatively modest with respect to their effect on total regional travel, as discussed in Criterion 4.1.1 (Trips per Day by Mode). Similarly, as shown in testing the impact of a higher fuel price, the projected increases in trips by alternative modes may also be relatively modest. However, the significantly improved and expanded transit infrastructure under Alternative Plans I and II, with Alternative

II proposing the most improvement and expansion, would provide the capacity to carry even more of the Region's residents. By increasing the capacity of the transportation system to handle more travel by alternative modes to the automobile, the system would be even more resilient should the long-term fuel price significantly increase beyond what is expected.

- **Transit System Operating Costs:** Lower fuel prices in the long term would reduce transit system operating costs, while higher fuel prices would increase those costs. However, fuel costs are a relatively small proportion of total operating costs, with salaries and benefits for drivers and other staff usually accounting for the majority of total operating costs.

CRITERION 3.4.1: SUPPORTIVE INFRASTRUCTURE COSTS

KEY CONCLUSION

- **The overall cost of extending supportive infrastructure (sewer, water, and local roads) to new development would be about $6.9 billion under the Trend, $5.5 billion under Alternative Plan I, and $5.0 billion under Alternative Plan II.**

Density, building type, and location affect the cost of extending supportive infrastructure to new development, including sewer, water, and local roads. Infrastructure can be extended to compact development in a more efficient and cost-effective manner than to lower-density development. It is even more cost effective to extend infrastructure to redevelopment/infill development in urban areas that can take advantage of existing infrastructure. Alternatives I and II perform better than the Trend because they feature more compact development patterns. Alternative II performs the best because it includes the most redevelopment and compact development.

- **Sewer and Water:**[31] The cost of extending public sewer and water to new development typically increases with larger lots and more single-family homes. As single-family lot sizes increase, so does the frontage of each lot along the street. This results in longer sewer and water mains. For example, a single-family lot less than one-quarter acre in size typically has a frontage of 75′ or less. A single-family lot of one-half acre or more in size typically has a frontage of 100′ or more. The cost of service laterals from the sewer and water mains to the homes also increases as lot sizes increase. The home on the smaller lot would typically be 25′ or less from the road right-of-way where the mains are located. The home on the larger lot would typically be 40′, 50′, or more from the road right-of-way.

  It costs less to extend public sewer and water to multifamily development per unit than single-family development. The frontage per housing unit may be expected to decrease dramatically compared to single-family housing. In addition, multiple housing units can be served by one sewer service lateral and one water service lateral, although the service laterals may need to be larger than those connecting a single-family home.

  The location of development also affects the cost of extending public sewer and water infrastructure. Sewer and water mains are extended a shorter distance if new development occurs immediately at the edges of cities and villages compared to more scattered development. Redevelopment and infill development reduce the costs of extending public sewer and water even more because existing mains could be used.

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[31] *For the purposes of this criterion: the cost of sewer mains is $82 per linear foot, including manholes and laterals to the ROW (66′). The cost of water mains is $80 per linear foot, including hydrants, valves, and service to ROW (66′). Redevelopment areas and vacant lots located on existing streets are excluded from the cost of extending sewer and water mains. 4″ service laterals are $40 per linear foot for sewer and $25 per linear foot for water. 6″ laterals are $50 per linear foot for sewer and $35 per linear foot for water. Sewer and water connection fees are estimated at $3,000 and $2,100 per housing unit, respectively. Private onsite wastewater treatment system (POWTS) and private well costs are included in the sewer and water figures for those lots without public service. POWTS installation and fees are $10,900 and private well installation and fees are $9,050.*

Table F.34
Supportive Infrastructure Costs

Alternative	Sewer Infrastructure (billions of $)	Water Infrastructure (billions of $)	Local Roads (billions of $)	Total Supportive Infrastructure (billions of $)
Trend	$1.65	$1.39	$3.89	$6.93
Alt I	$1.26	$1.04	$3.21	$5.50
Alt II	$1.18	$0.96	$2.86	$5.00

Source: SEWRPC

Public sewer and water infrastructure is typically not extended to large lots of 1.5 to five acres or more in size that are scattered in exurban and rural areas. This type of development is supported by private onsite wastewater treatment systems (POWTS) and wells.

Table F.34 shows the Trend has the highest cost for extending sewer and water infrastructure to new development. This is because the Trend has the least compact development pattern, redevelopment/infill development, and multifamily development of the alternatives. The cost is significantly reduced under Alternative I, and the cost is the lowest under Alternative II. Alternatives I and II both have compact development patterns with the majority of new development occurring as redevelopment/infill development, or at the edge of existing cities and villages. Alternative II has a greater focus on redevelopment/infill development.

- **Roads:**[32] The cost of extending local roads is also affected by the density and location of development. Higher-density development with less frontage reduces the distance local roads need to be extended; however, local roads in higher-density areas are more costly per lane mile than in lower-density areas. This is because local roads in higher-density areas may include features such as wider travel and parking/auxiliary lanes, and pedestrian/streetscape amenities that may not be present in lower-density development. In addition, local roads in multifamily development and single-family developments of lot sizes of one-quarter acre or less would include curb and gutter, which would not generally be present in development with lot sizes of one-half acre or more. Redevelopment/infill development may be able to take advantage of existing streets.

  Table F-34 shows the cost of extending local roads to new development is greater under the Trend than Alternatives I and II despite the higher construction cost per mile. Alternatives I and II have similar compact development patterns; however, there is more multifamily development and redevelopment/infill development under Alternative II. This results in more new frontage under Alternative I.

[32] *For the purposes of this criterion: local roads serving new multifamily and single-family development with lot sizes of one-quarter acre or less are $1,970,000 per lane mile, excluding public sewer and water infrastructure. Local roads serving new single-family development with lot sizes of about 15,000 square feet are $1,510,000 per lane mile, excluding public sewer and water. Local roads serving new single-family development with lot sizes of about one-half acre are $1,050,000 per lane mile, excluding public sewer and water infrastructure. Local roads serving new single-family development with lot sizes of more than one-half acre are $790,000 per lane mile (no public sewer and water infrastructure in these areas). Redevelopment areas and vacant lots located on existing streets are excluded from the cost of extending local roads.*

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CRITERION 4.1.1: TRIPS PER DAY BY MODE

KEY CONCLUSIONS

- **The vast majority of personal travel by residents of the Region would continue to be by car in the future—regardless of the alternative—but Alternatives I and II would be expected to significantly increase the number of people that use alternative modes of transportation.**
- **Alternative II would have the most transit trips (211,000)—10 percent more than Alternative I (191,000) and 62 percent more than the Trend (130,000).**
- **Alternative II would have the most non-motorized trips (597,000)—2 percent more than Alternative I (587,000) and 5 percent more than the Trend (571,000).**

The vast majority of travel currently made in the Region by residents of the Region is by car, and is likely to continue be by car in the future. However, improvements to public transit and bicycling, which provide alternatives to driving, can significantly increase the number of people that are able and choose to use these alternative modes.

- **Evaluation Results:** Table F.35 presents the total number of person trips by mode for residents of the Region on an average weekday within the Region under the existing transportation system and development pattern, as well as under the Trend and Alternatives I and II. The Commission's travel demand models forecast a continuing, though modest, increase of 18 percent in travel through the year 2050, given projected increases in population, households, and employment. Under the three alternatives, automobile travel is expected to increase by between 17 to 19 percent over the next 35 years, or about 0.4 percent per year. It is expected to continue to account for the vast majority of trips, regardless of the alternative's development pattern, arterial improvements, transit improvements, or bicycle improvements.

  The Trend would be expected to have the most automobile trips and the fewest transit and non-motorized trips. The Trend would have 19 percent more automobile trips than under existing conditions, with 3 percent fewer transit trips and 9 percent more non-motorized trips. Under the Trend, automobile trips would be about 1 percent higher than Alternative I and 2 percent higher than Alternative II. Alternative I would have 48 percent more transit trips and 3 percent more non-motorized trips than the Trend. Alternative II would have the highest number of transit and non-motorized trips, with 62 percent more transit trips and 5 percent more non-motorized trips than the Trend.

Table F.35
Trips per Day by Mode Within the Region by Residents of the Region

	Trips on an Average Weekday			
Alternative	Automobile	Transit	Non-Motorized	Total
Existing - 2011	5,521,000	134,000	524,000	6,179,000
Trend - 2050	6,573,000	130,000	571,000	7,274,000
Alt I With Highway Improvements - 2050	6,496,000	191,000	587,000	7,274,000
Alt I Without Highway Improvements - 2050	6,495,000	192,000	587,000	7,274,000
Alt II With Highway Improvements - 2050	6,458,000	211,000	597,000	7,266,000
Alt II Without Highway Improvements - 2050	6,457,000	212,000	597,000	7,266,000

Source: SEWRPC

CRITERION 4.1.2: VEHICLE-MILES OF TRAVEL

KEY CONCLUSIONS

- **The Trend would have the highest VMT on an average weekday (52.1 million)—2 percent more than Alternative I (51.1 million) and 3 percent more than Alternative II (50.7 million).**
- **The Trend would also have the highest VMT per capita (7,600 miles per year)—3 percent more than Alternative I (7,400) and Alternative II (7,400).**

Vehicle-miles of travel (VMT)—the number of miles traveled by vehicles in a specified region for a specified time period—is often used to indicate the amount of driving occurring in a region. There has been a substantial amount of research on local and national VMT trends and numerous predictions regarding whether and by how much VMT will increase in the future. Similarly, VMT per capita has been focused on as a way of estimating whether people are driving more or less on average. VMT and VMT per capita generally vary depending on trip lengths and whether trips can be made by an alternative mode such as transit, biking, or walking. Reducing trip lengths and providing improved alternative transportation options tend to reduce VMT and VMT per capita. This criterion compares both total VMT and VMT per capita.

- **Evaluation Results:** Table F.36 presents total VMT and VMT per capita on an average weekday and on an average annual basis under the existing transportation system and development pattern, as well as under the Trend and Alternatives I and II. The Commission's travel demand models forecast a continuing, though modest, increase in overall travel through the year 2050, given projected increases in population, households, and employment. Under the three alternatives, VMT is expected to increase by between 24 and 27 percent over the next 35 years, or about 0.6 percent per year. It should be noted that total VMT includes both personal and commercial vehicle travel, as well as travel through the Region. Commercial vehicle travel and vehicle travel through the Region have been increasing faster than personal travel, and this is projected to continue. As a result, projected future increases in commercial and through vehicle travel are likely causing the VMT per capita estimates to be higher under each alternative compared to existing, rather than residents driving more on average.

  The Trend would be expected to have the highest total VMT, with about 27 percent more VMT than under existing conditions. Under the Trend, VMT would be 2 percent higher than Alternative I and 3 percent higher than Alternative II. The Trend would also have the highest VMT per capita—3 percent higher than Alternatives I and II.

Table F.36
Vehicle-Miles of Travel in the Region

Alternative	Average Weekday		Average Annual	
	Total VMT (millions)	VMT per Capita	Total VMT (billions)	VMT per Capita
Existing - 2011	40.9	20.2	13.7	6,800
Trend - 2050	52.1	22.1	17.8	7,600
Alt I With Highway Improvements - 2050	51.1	21.7	17.4	7,400
Alt I Without Highway Improvements - 2050	50.9	21.6	17.4	7,400
Alt II With Highway Improvements - 2050	50.7	21.6	17.3	7,400
Alt II Without Highway Improvements - 2050	50.6	21.5	17.2	7,300

Source: SEWRPC

CRITERION 4.1.3: IMPACTS OF TECHNOLOGY CHANGES

KEY CONCLUSIONS

- **Mobile app technology and car/bike sharing may increase transit use, reduce greenhouse gas emissions and, due to increased bike share usage, improve public health.**
- **Alternative Plans I and II would support the growth of car and bike sharing by improving transit service, enhancing bicycle facilities and creating more dense, walkable areas in the Region.**
- **Autonomous cars may improve road safety and increase mobility for those currently unable to drive, while their impact on congestion may be positive or negative. The future of autonomous cars hinges on the ability to develop advanced artificial intelligence to sense rapidly changing road and weather conditions, making the timing for widespread implementation of autonomous cars uncertain.**
- **More fuel-efficient vehicles will reduce future greenhouse gas emissions caused by transportation in the Trend and Alternative Plans I and II.**

Emerging technologies and the magnitude to which they will affect future land use patterns and transportation infrastructure are difficult to predict. Many technological advances that could significantly impact the way we travel are in their infancy and there is some disagreement among experts about how to prepare for any changes. The following are a few emerging technologies that could impact the performance of the alternatives.

- **Car and Bike Sharing:** Car and bike sharing companies in Milwaukee, like Zipcar (car share) and Bublr (bike share), operate differently than traditional rental services. Traditional rental services charge per day, regardless of the amount of time spent driving a vehicle or riding a bike. Zipcar and Bublr members pay an annual or monthly membership fee and a low hourly rate for a vehicle or bike while it is in the members' possession. For Zipcar, this hourly rate covers gas, insurance, and mileage up to a set amount. Each company has fixed stations for pick-up and drop-off of vehicles/bicycles. However, Bublr allows one-way point-to-point service, whereas Zipcar currently only accommodates round-trip service in the Region.

  Car sharing companies are growing rapidly in cities where the cost of car ownership is exacerbated by high insurance rates and parking fees, and are especially effective at replacing personal automobile ownership in areas with robust rapid transit. A report by AlixPartners states that the average car sharing service had about 66 members for every car in its fleet in 2013, but predicts that this number will grow to 81 members per car by 2050.[33] According to the report, 48 percent of car sharing service members have chosen to forego the purchase of a replacement vehicle, resulting in 500,000 fewer new car sales since 2006 in the U.S. than there would have been if car sharing services were not available. As Zipcar and other car sharing companies continue to expand services, this number may increase to 1.2 million fewer car sales by 2020. The reduction in personal vehicle ownership expected under Alternative Plans I and II could be

[33] *AlixPartners,* AlixPartners Car Sharing Outlook. *February 5, 2014.*

enhanced by increased availability of car share, helping to increase transit ridership and reduce GHG emissions if overall VMT is reduced.

Bike sharing programs tend to attract people who would not typically consider riding a bicycle—short-distance commuters, people running errands, and tourists—as well as those who would prefer to commute via bicycle without worrying about maintaining and securing their own bicycle. Potential benefits of bike sharing programs include a reduction in personal automobile trips and an increase in transit trips, leading to reductions in traffic congestion and an improvement in public health. Successful programs, like Denver's B-Cycle sharing program, attracted 102,000 rides in the first 7 months, with 43 percent of those riders reporting that they were replacing car trips with bicycle trips.[34] The British Medical Journal studied the health impacts of London's Santander Cycle Hire program, showing that members of the program experienced a reduction in obesity, heart disease, type II diabetes, and other diseases typically caused by sedentary lifestyles.[35]

Alternative Plans I and II envision developing enhanced bicycle facilities, which would aid in addressing the needs of the growing bike sharing industry. The envisioned land development patterns under Alternatives I and II are at higher densities in the urban areas of the Region than under the Trend, with the urban areas in the Region envisioned as being more walkable and bicycle-friendly.

- **Mobile App Innovation in Transportation:** Uber, Lyft and other ridesharing companies can provide taxi services at a lower cost than traditional taxi services by utilizing mobile app technology to rapidly connect freelance drivers to potential consumers. The mobile app allows users to request a ride by entering their intended destination and payment information into the app. Users are then shown a map indicating the number and location of drivers in the area, a profile of the driver, the driver's approval rating, a picture of the driver's vehicle, and the estimated arrival time. The mobile app technology tends to result in a more efficient taxi system, utilizing drivers only when needed and providing drivers with the flexibility to work when they want.

  Uber and Lyft have also started carpooling programs in select cities, such as San Francisco, New York, and Los Angeles. UberPool and Lyft Line utilize mobile app technology to connect passengers who are traveling a similar route. When there is a match, the passengers split the ride fare. As of January 2015, one-third of Lyft rides in San Francisco were carpools.[36]

  The expansion of ridesharing services in the United States has sometimes encountered opposition. A number of communities have deemed ridesharing services as deceptive and unsafe for consumers because ridesharing companies operate outside of established local regulations by labeling themselves as "technology" companies and not "transportation" companies. They further evade local regulations by maintaining that their employees are not employees, but rather,

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[34] *Osterweil, William,* What are the Economic Effects of Bike Sharing? *May 28, 2013.*

[35] *British Medical Journal,* Health Effects of the London Bicycle Sharing System: Health Impact Modelling Study. *February 13, 2014.*

[36] *Stone, Brad,* The Future of Uber and Lyft: A Crowded Back Seat. *Bloomberg Businessweek, January 29, 2015.*

independent contractors. Traditional taxi services are required to insure their fleet, perform background checks on drivers, and have their vehicles inspected on a regular basis. In contrast, ridesharing companies only require drivers to meet their minimum age requirement, maintain a regular driver's license, and have a fully functional vehicle. Local regulations require transportation companies to adhere to a strict pricing model and driver pay-scale. However, the misclassifications used by ridesharing companies provide the freedom to base their pricing model according to the demand for drivers, make the drivers responsible for their own insurance, and not comply with established pay-scales for transportation workers. Legal battles are playing out across the country in an attempt to bring the ridesharing companies into compliance with local regulations, making the future form of ridesharing uncertain.

Some experts believe that, if ridesharing companies can continue to expand, ridesharing technology will serve as a solution to transit's "last mile" problem and result in an increase in transit ridership. Others hypothesize that Uber and Lyft could replace low-ridership transit routes in the future. Alternatives I and II would accommodate emerging mobile app technology in transportation by providing flexibility in mode choice with significantly greater options for transit use, increasing the likelihood some individuals may choose to replace private automobile ownership with Uber or Lyft in combination with relying more on public transit.

- **Autonomous Cars:** Autonomous cars, also known as driverless or self-driving cars, are vehicles that replace human operators with advanced control systems capable of sensing appropriate navigation paths, signage, obstacles, and changing road conditions. While human drivers possess limited situation awareness, the wide range of sensors aboard autonomous cars are expected to be able to quickly identify a potential hazard and react sooner, and more safely, than a human driver. The autonomous car's ability to react more quickly—and perhaps communicate with other autonomous cars—may result in the vehicle's ability to travel at a higher rate of speed and closer to other vehicles in controlled-access areas such as a freeway, increasing roadway capacity.

  The future of autonomous cars and their impact on the way we travel is uncertain. Navigating our streets and highways is complex and often times an unpredictable endeavor for human drivers. In order for autonomous cars to be widely implemented, advanced artificial intelligence may need to be developed to accurately and efficiently traverse a challenging environment where random human movements and rapidly changing road and weather conditions occur. If autonomous cars are able to eliminate the need for human input while driving, one of their great potential benefits may be to increase the mobility of individuals who currently are unable to drive.

  Should autonomous car technology advance and become a viable form of transportation, accommodations would need to be made for the transition period between the sole use of all traditional cars to autonomous cars. During this transition period, which may take many years, if not decades, autonomous cars may need to have a lower speed limit and/or larger safety gaps to anticipate unpredictable human movements. Separate "autonomous car only" traffic lanes may be needed to allow the autonomous cars to move at higher speeds and with a greater level of safety.

Some experts foresee a merging of autonomous cars and the mobile app technologies used by Uber and Lyft to create a low-cost, self-driving taxi service, making independent car ownership and low-ridership transit routes virtually obsolete. Currently, the average car remains idle approximately 96 percent of the day. The reduction in personal car ownership through sharing of self-driving cars could increase the time an average vehicle is in use from 4 percent to approximately 75 percent. Some experts think this collective ownership model will reduce the number of vehicles in the nation by as much as 30 percent as the amount of time a vehicle is in use is increased.[37] This model would reduce congestion only if some portion of trips would be shared, similar to Lyft Line and UberPool.

Alternatively, others foresee a continuation of private ownership of automobiles, even while automated. Continuing our existing automobile ownership model could lead autonomous cars to having negative overall effects on congestion, perhaps resulting in cars driving without any passengers in them while being instructed by their owners to go park in a free parking space far from the owner's destination, or the car being sent to run an errand without a human being riding inside, increasing demand on the Region's roadways.

Autonomous cars will most likely not eliminate the need for transit in areas where streets could not be widened adequately to carry all travelers in private automobiles. Even if all traditional cars were eliminated and all residents participated in autonomous shared-ride taxi services, there would likely not be enough capacity available to allow all of these vehicles to use the roadway network simultaneously. The Region would still require the use of some form of high-capacity transit, such as bus or passenger train service, which would also likely be automated in this scenario.

The aforementioned factors make it difficult to fully incorporate autonomous car technology into the development of the VISION 2050 alternatives. Given that it is unknown whether autonomous cars will increase or decrease congestion, it cannot be conclusively stated that one alternative performs better than the others in a future with autonomous cars. If widespread, autonomous cars could reduce or eliminate the need for the roadway widenings as included in the alternatives, or could increase the demand on the Region's roadways to such a level that additional widenings may be necessary.

- **<u>Fuel-Efficient Vehicles:</u>** The Energy Information Administration (EIA) predicts, and Federal Corporate Average Fuel Economy (CAFE) standards mandate, that the fuel efficiency of vehicles will nearly double by the year 2050. As discussed under Criterion 1.4.3 (Energy Use), the average fuel economy of the Region's vehicle fleet is anticipated to increase from 23.4 mpg in 2015 to 43.5 mpg by 2050. A mix of more advanced internal combustion engine technologies, like direct injection and turbochargers, or hybrid-electric technology and electric cars, will help automakers meet the mandated standards.

[37] *The Economist,* If Autonomous Vehicles Rule the World: From Horseless to Driverless. *July 1, 2015*

The improvement in fuel economy may reduce the cost of travel via private automobile, which could have a negative impact on transit ridership as costs to take transit become less competitive with the costs to drive a car. Criterion 1.4.4 (Greenhouse Gas Emissions and Other Air Pollutants) presents existing and future levels of GHG emissions and other air pollutants.

Although increasing average fuel economy is desirable for many reasons—including reducing the environmental impacts of driving—it is expected to result in declining transportation revenues from fuel sales. Fuel tax revenues are used to fund a large portion of the Region's and the nation's transportation system. How to fund the transportation system proposed under each alternative has not been explicitly analyzed, but declining revenues due, in part, to improvements in fuel economy were considered during the development of the preliminary and final recommended plans.

CRITERION 4.2.1: TRAVEL TIME TO IMPORTANT PLACES BY MODE

KEY CONCLUSIONS

- **The proportion of the Region's population within a reasonable travel time by auto to a major activity center or regional destination would remain about the same under each alternative.**
- **Alternatives I and II would result in significantly more of the Region's population living within a reasonable travel time by transit to a major activity center or regional destination, while the Trend would reduce the number of people with reasonable access by transit.**

This criterion compares average travel times to major activity centers and regional destinations by automobile and by transit under each of the alternatives. Major activity centers analyzed include retail centers, major parks, public technical colleges/universities, health care facilities, and grocery stores. Major regional destinations analyzed include the Milwaukee Regional Medical Center (MRMC), General Mitchell International Airport (GMIA), and downtown Milwaukee. The population within a reasonable auto or transit travel time to each activity center and regional destination is also estimated for each alternative.[38]

A significant portion of the Region's residents do not own a car to drive to a major activity center or regional destination,[39] and others would prefer to use transit rather than drive. For those residents, access to transit that provides reasonable travel times to major activity centers and regional destinations is essential.

This criterion uses overall travel time, which is defined as the total door-to-door time for traveling between a trip origin and destination. For transit travel, overall travel time includes the over-the-road travel time in the transit vehicle as well as the time spent out of the transit vehicle in walking to a transit stop; waiting for the first transit vehicle; transferring between routes, including waiting for each subsequent vehicle needed; and walking to a trip destination. For auto travel, travel time includes time spent walking to the car and walking to a trip destination.

For this analysis, the transit travel times assumed that the waiting time for the first route used would not exceed 15 minutes, but the waiting time for subsequent routes transferred to would be equal to one-half the headway on the route being transferred to. Depending on the location, transferring between routes would also entail one to two minutes of time for walking to the boarding location for the transfer route.

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[38] Auto and transit access for this criterion is defined as being within 30 minutes of a major activity center, within 30 minutes of downtown Milwaukee, and within 60 minutes of the Milwaukee Regional Medical Center or General Mitchell International Airport.

[39] About 6 percent of the Region's residents, 10 percent of Milwaukee County residents, and 12 percent of City of Milwaukee residents do not own a car.

Table F.37
Population Within 30 Minutes of a Retail Center

Alternative	Total Population Within a 30-Minute Transit Trip of a Retail Center		Total Population Within a 30-Minute Drive of a Retail Center	
	Population with Access	Percent of Total Population	Population with Access	Percent of Total Population
Existing - 2011	285,400	14.1	1,849,900	91.6
Trend - 2050	223,600	9.5	2,127,200	90.4
Alt I with Highway Improvements - 2050	686,100	29.1	2,141,500	91.0
Alt I Without Highway Improvements - 2050	671,900	28.5	2,124,400	90.2
Alt II with Highway Improvements - 2050	903,100	38.4	2,147,900	91.2
Alt II Without Highway Improvements - 2050	875,800	37.2	2,132,500	90.6

Source: SEWRPC

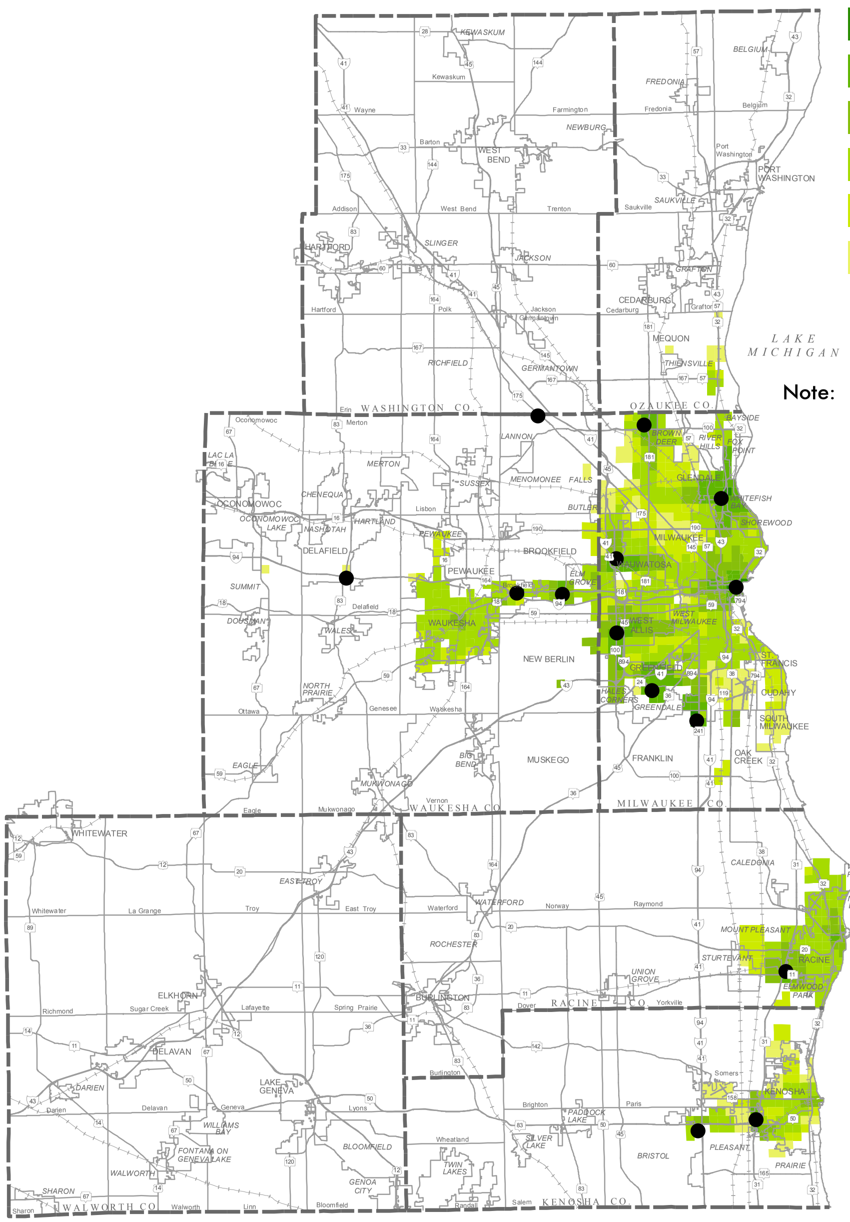
- **<u>Transportation Access to Retail Centers:</u>** Maps F.81 through F.86 show drive and transit trip times to one of the Region's existing 14 retail centers, and Table F.37 presents the population that would be within 30 minutes.[40] About 92 percent of the Region's population is currently within a 30-minute drive of one of the Region's existing retail centers. This proportion would remain at about 90 to 91 percent under the alternatives, with Alternatives I and II slightly higher than the Trend primarily due to the more compact development patterns envisioned under the two alternative plans compared to the Trend. Depending on the location, drive time to a retail center would slightly increase or decrease based on the alternative's traffic congestion levels and locations of arterial improvements. Not including highway improvements (except for currently committed highway expansion projects and freeway modernization) under Alternatives I and II would slightly lower the percent of the population within a 30-minute drive.

  Due to the declines in transit service levels expected under the Trend, approximately 60,000 fewer residents (22 percent) would be within a 30-minute transit trip of a retail center compared to today, despite a projected increase in the Region's total population of about 334,000 (17 percent). Compared to the Trend, Alternative I would provide transit service within 30 minutes of a retail center to about 460,000 additional residents (207 percent more) and under Alternative II this increase would be about 680,000 additional residents (304 percent more). Not including highway improvements under Alternatives I and II would reduce these numbers by about 20,000 and 30,000, respectively.

[40] For this criterion, only retail and retail/office centers having at least 2,000 retail jobs or 3,500 total jobs were analyzed.

Map F.81
Average Peak Travel Time to Major Retail Centers: Existing

Transit



TRAVEL TIME (MINUTES)

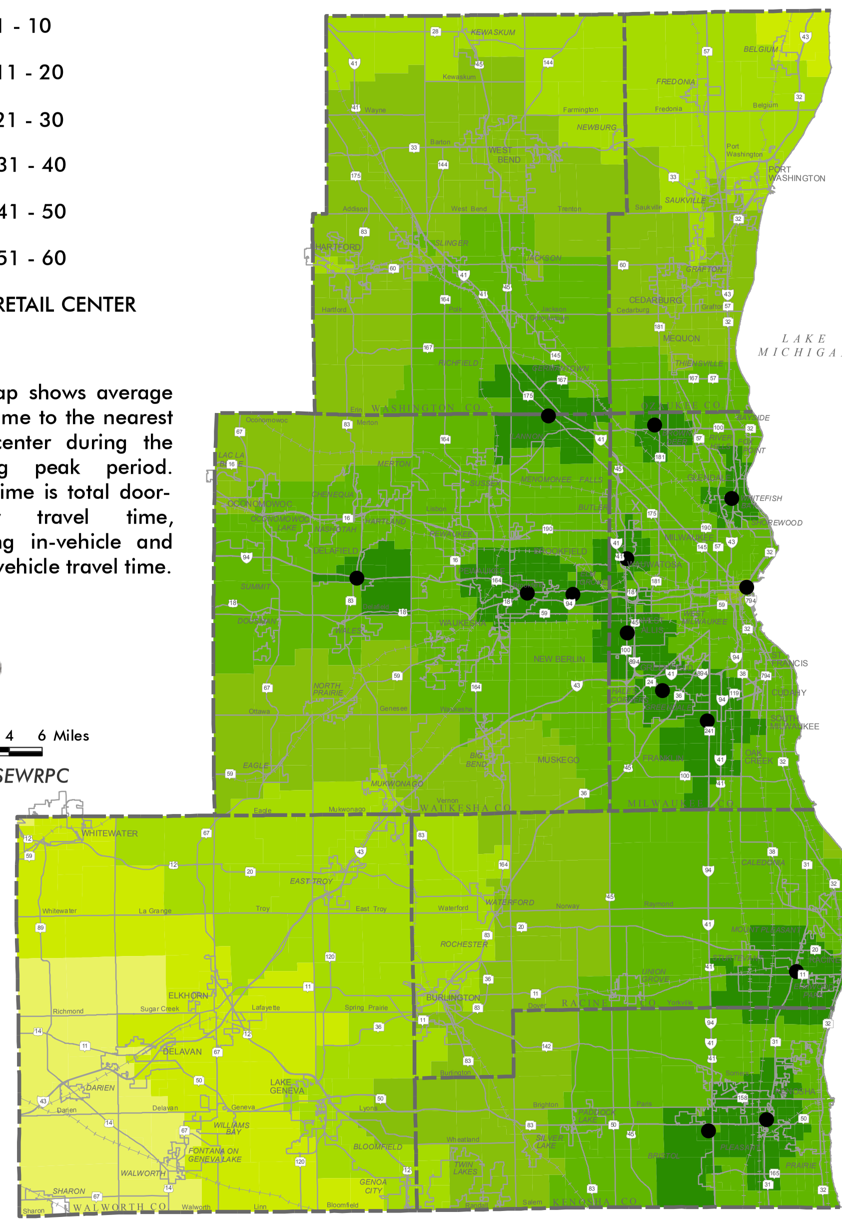
- 1 - 10
- 11 - 20
- 21 - 30
- 31 - 40
- 41 - 50
- 51 - 60
- ● RETAIL CENTER

Note: This map shows average travel time to the nearest retail center during the morning peak period. Travel time is total door-to-door travel time, including in-vehicle and out-of-vehicle travel time.

0 2 4 6 Miles

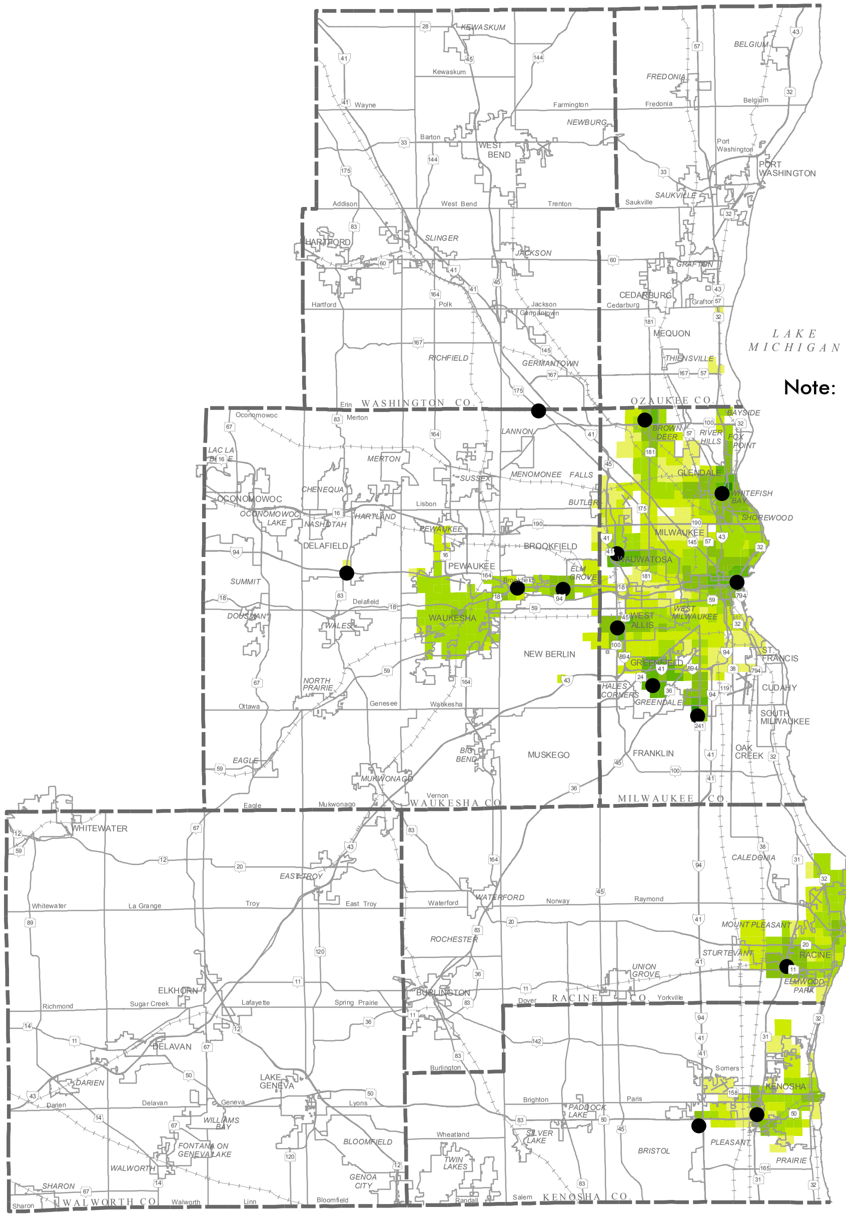
Source: *SEWRPC*

Auto



Map F.82
Average Peak Travel Time to Major Retail Centers: Trend

Transit



TRAVEL TIME (MINUTES)

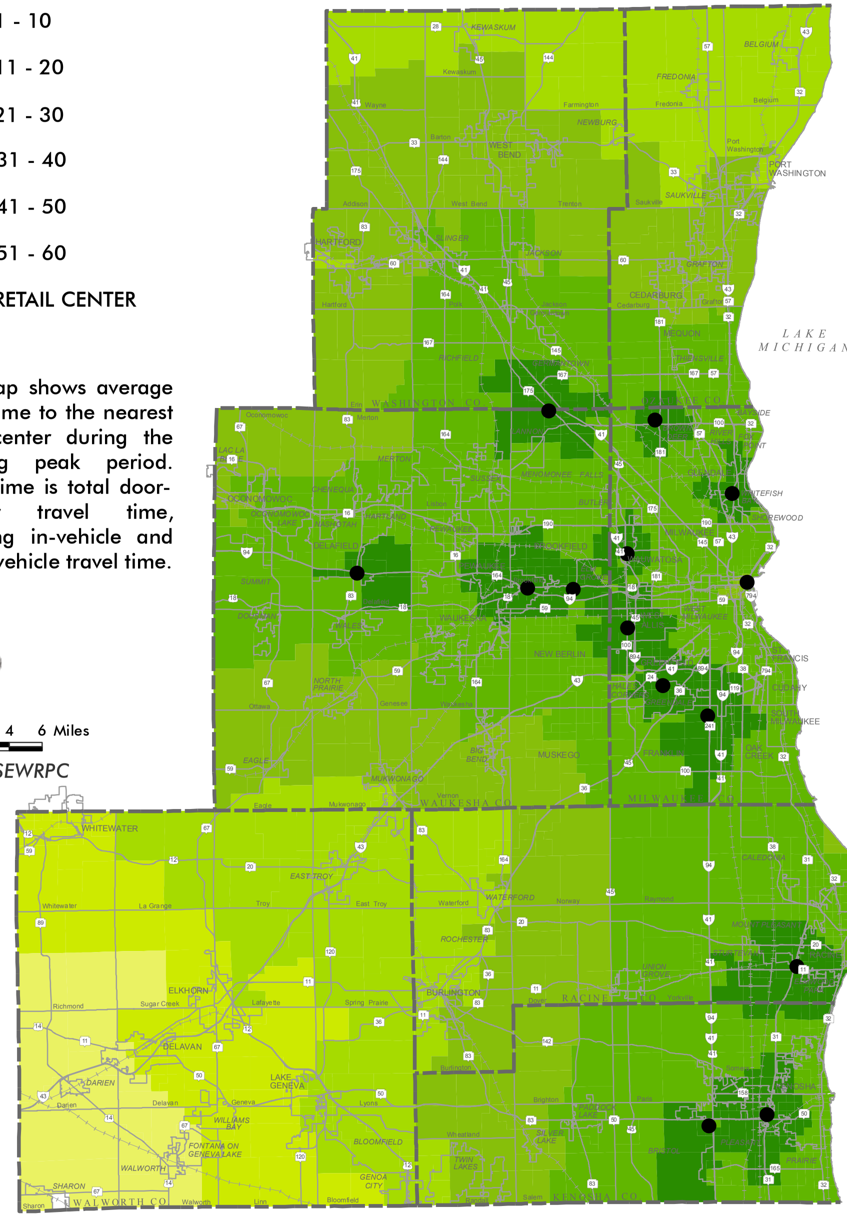
- 1 - 10
- 11 - 20
- 21 - 30
- 31 - 40
- 41 - 50
- 51 - 60
- ● RETAIL CENTER

Note: This map shows average travel time to the nearest retail center during the morning peak period. Travel time is total door-to-door travel time, including in-vehicle and out-of-vehicle travel time.

0 2 4 6 Miles

Source: SEWRPC

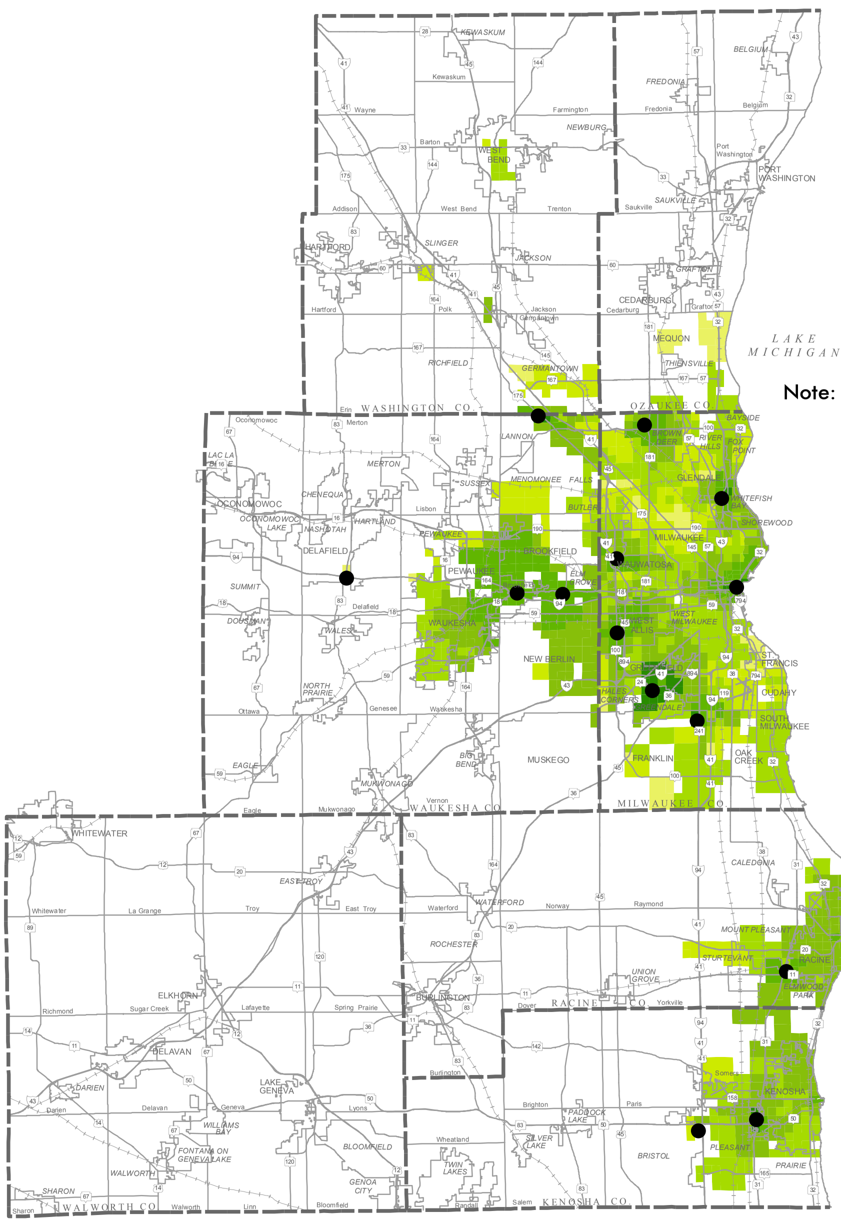
Auto



Map F.83

Average Peak Travel Time to Major Retail Centers: Alternative I with Highway Improvements

Transit



TRAVEL TIME (MINUTES)

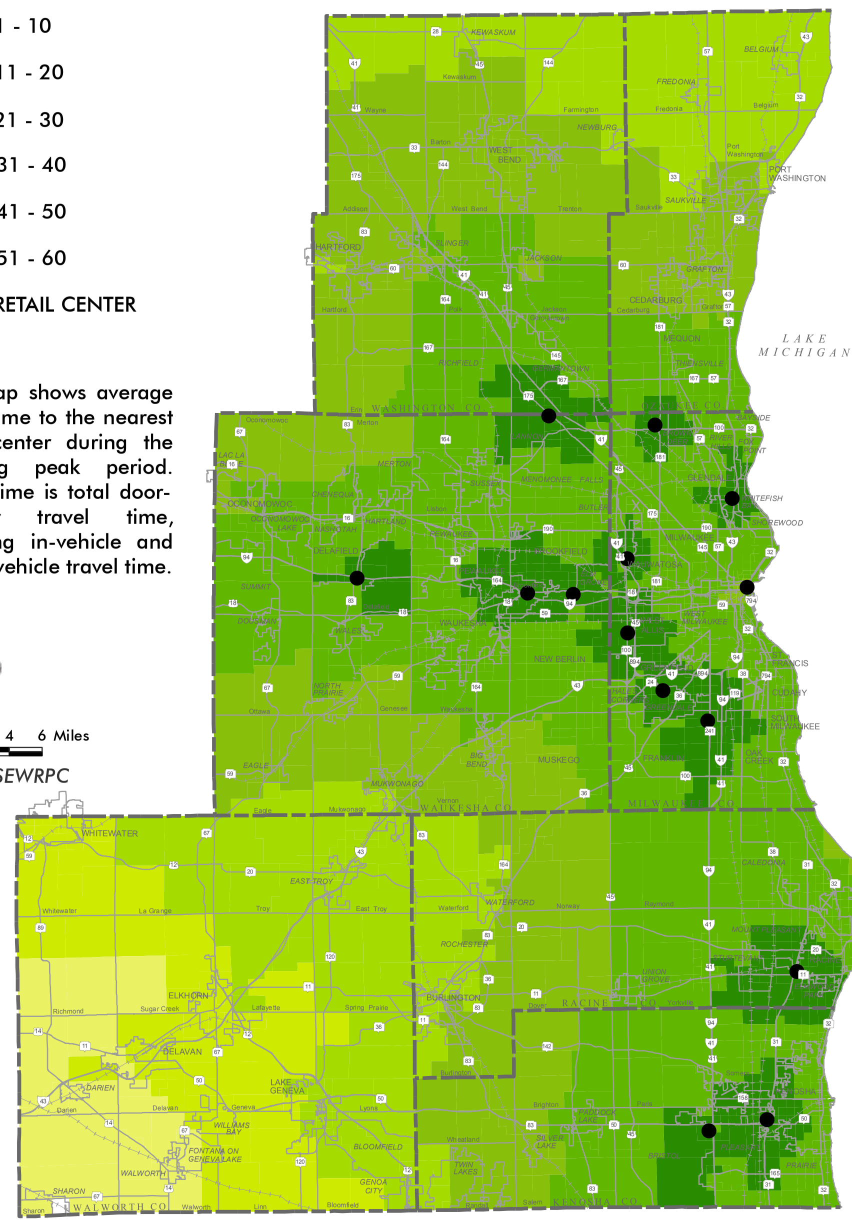
- 1 - 10
- 11 - 20
- 21 - 30
- 31 - 40
- 41 - 50
- 51 - 60
- RETAIL CENTER

Note: This map shows average travel time to the nearest retail center during the morning peak period. Travel time is total door-to-door travel time, including in-vehicle and out-of-vehicle travel time.

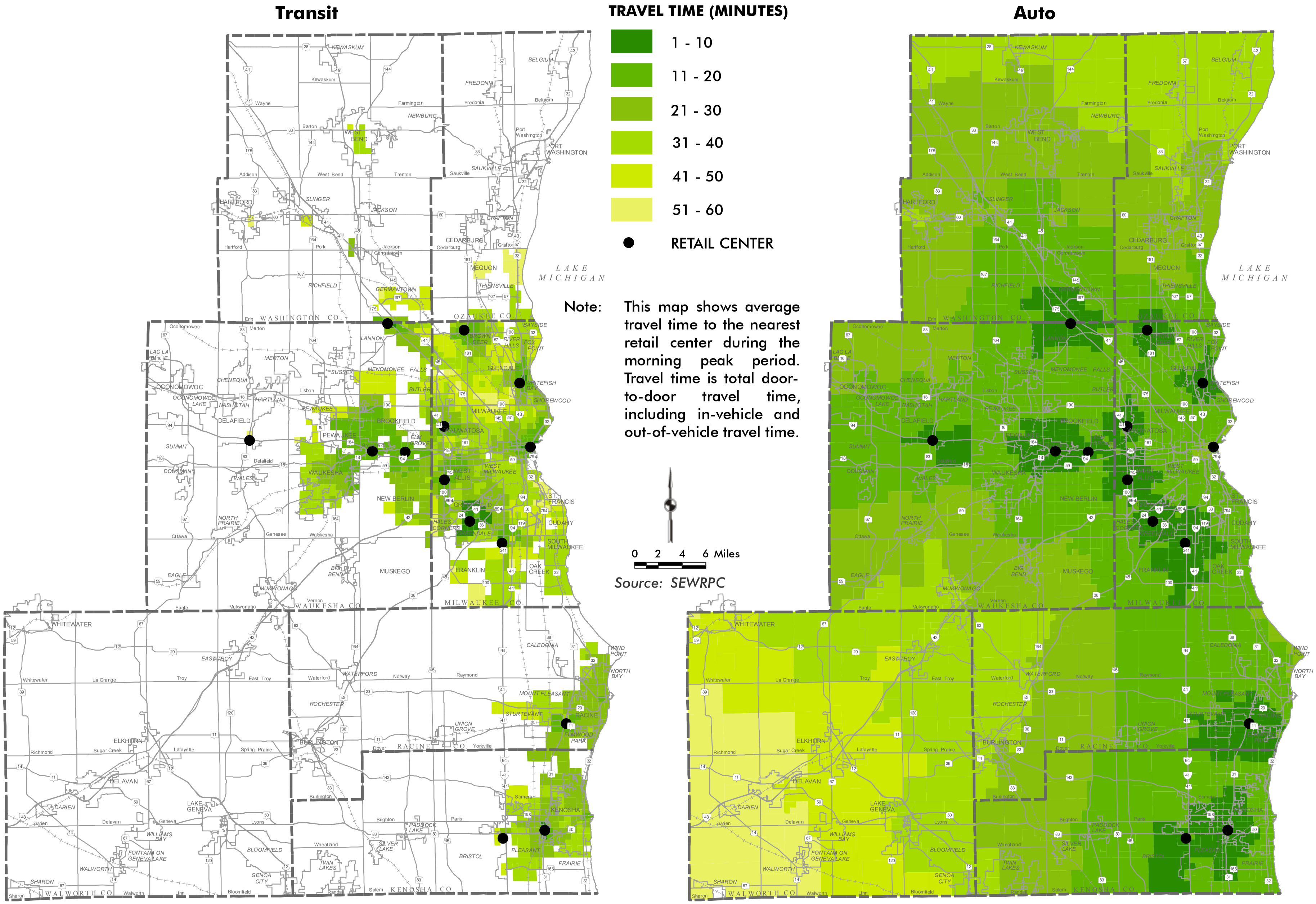
0 2 4 6 Miles

Source: SEWRPC

Auto

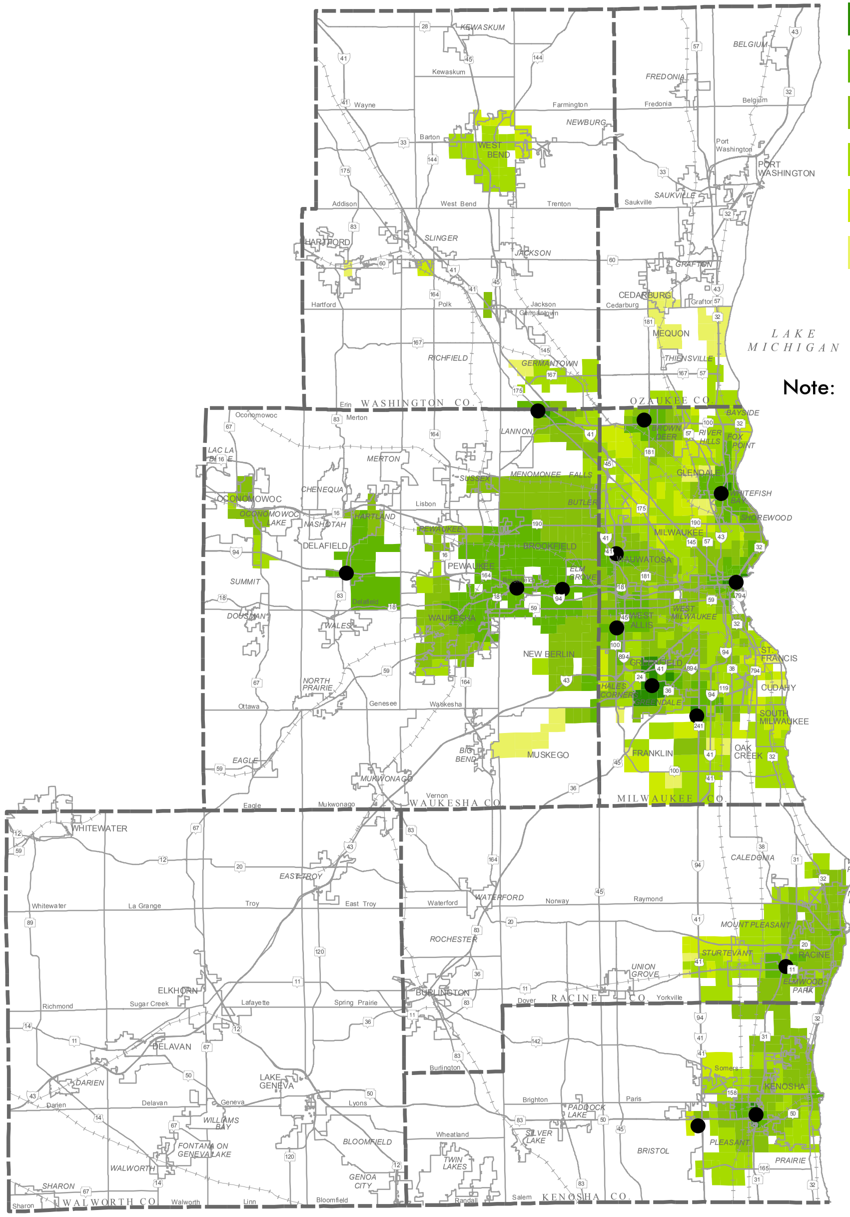


Map F.84
Average Peak Travel Time to Major Retail Centers: Alternative I Without Highway Improvements



Map F.85
Average Peak Travel Time to Major Retail Centers: Alternative II with Highway Improvements

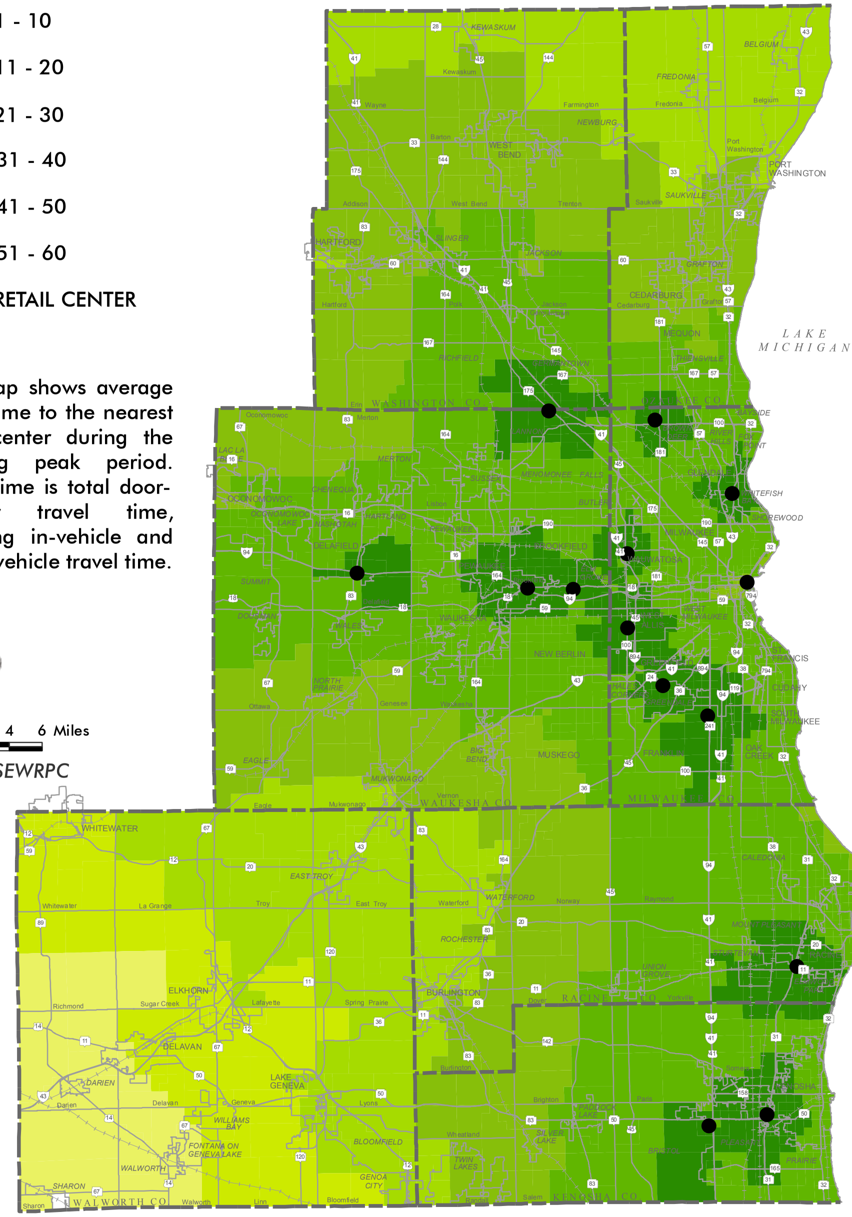
Transit



TRAVEL TIME (MINUTES)

1 - 10
11 - 20
21 - 30
31 - 40
41 - 50
51 - 60
● RETAIL CENTER

Auto



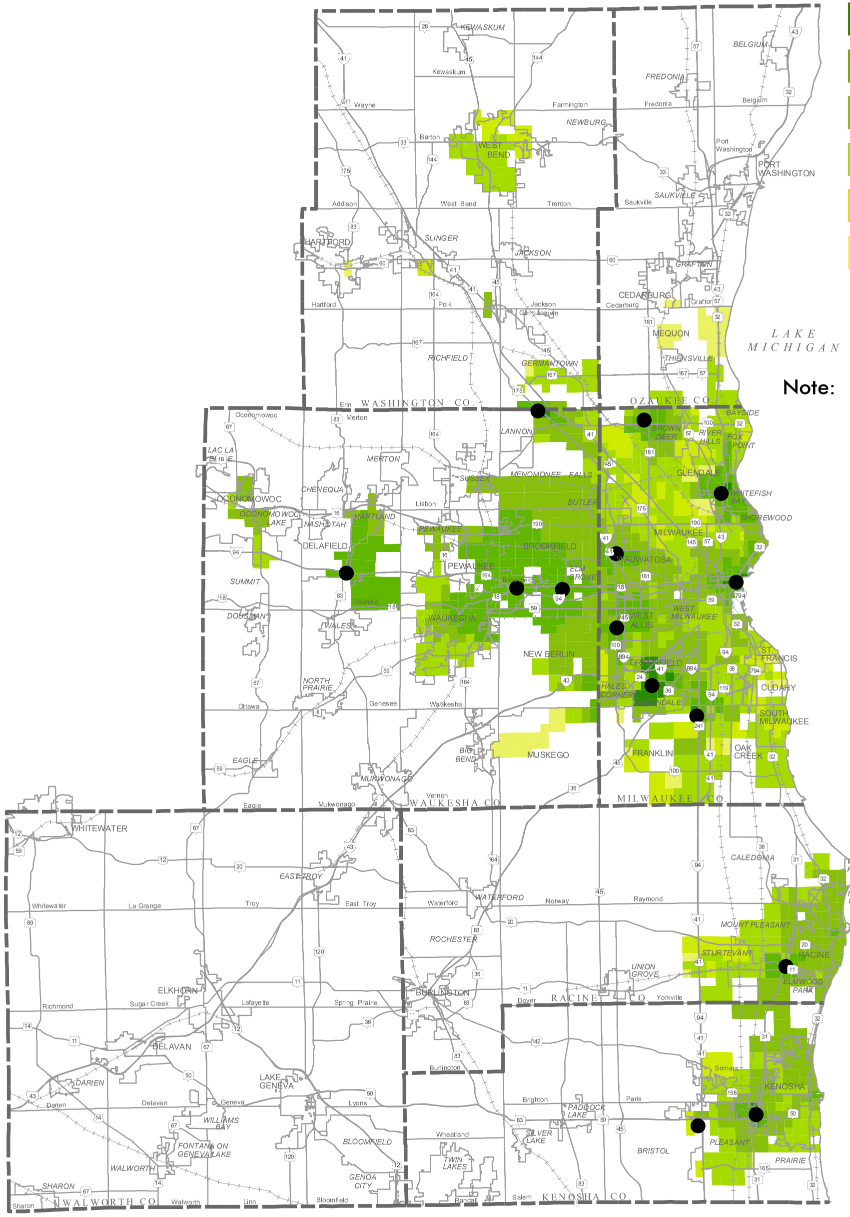
Note: This map shows average travel time to the nearest retail center during the morning peak period. Travel time is total door-to-door travel time, including in-vehicle and out-of-vehicle travel time.

0 2 4 6 Miles

Source: SEWRPC

Map F.86
Average Peak Travel Time to Major Retail Centers: Alternative II Without Highway Improvements

Transit



TRAVEL TIME (MINUTES)

- 1 - 10
- 11 - 20
- 21 - 30
- 31 - 40
- 41 - 50
- 51 - 60
- ● RETAIL CENTER

Note: This map shows average travel time to the nearest retail center during the morning peak period. Travel time is total door-to-door travel time, including in-vehicle and out-of-vehicle travel time.

0 2 4 6 Miles

Source: SEWRPC

Auto

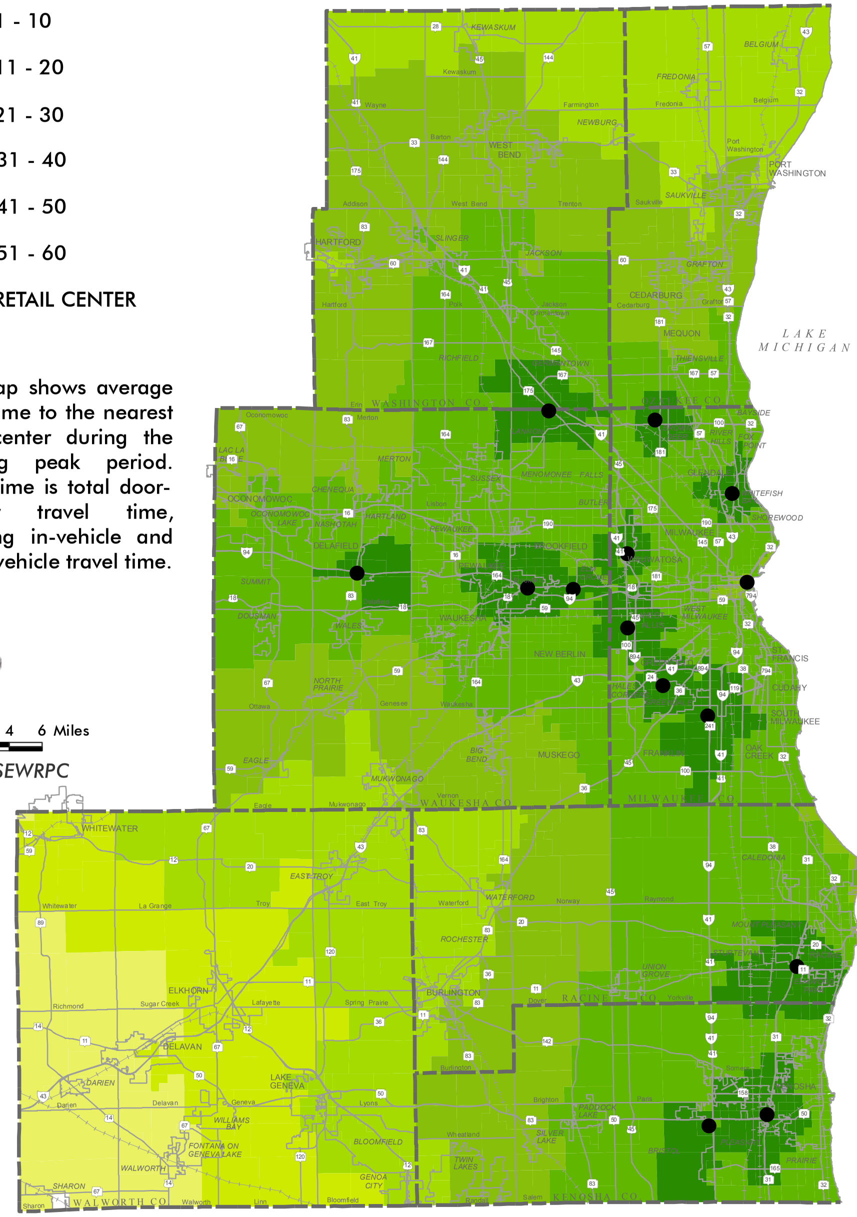


Table F.38
Population Within 30 Minutes of a Major Park

	Total Population Within a 30-Minute Transit Trip of a Major Park		Total Population Within a 30-Minute Drive of a Major Park	
Alternative	Population with Access	Percent of Total Population	Population with Access	Percent of Total Population
Existing - 2011	162,200	8.0	2,020,000	100.0
Trend - 2050	124,600	5.3	2,354,000	100.0
Alt I with Highway Improvements - 2050	425,300	18.1	2,354,000	100.0
Alt I Without Highway Improvements - 2050	389,700	16.6	2,354,000	100.0
Alt II with Highway Improvements - 2050	634,100	26.9	2,354,000	100.0
Alt II Without Highway Improvements - 2050	600,600	25.5	2,354,000	100.0

Source: SEWRPC

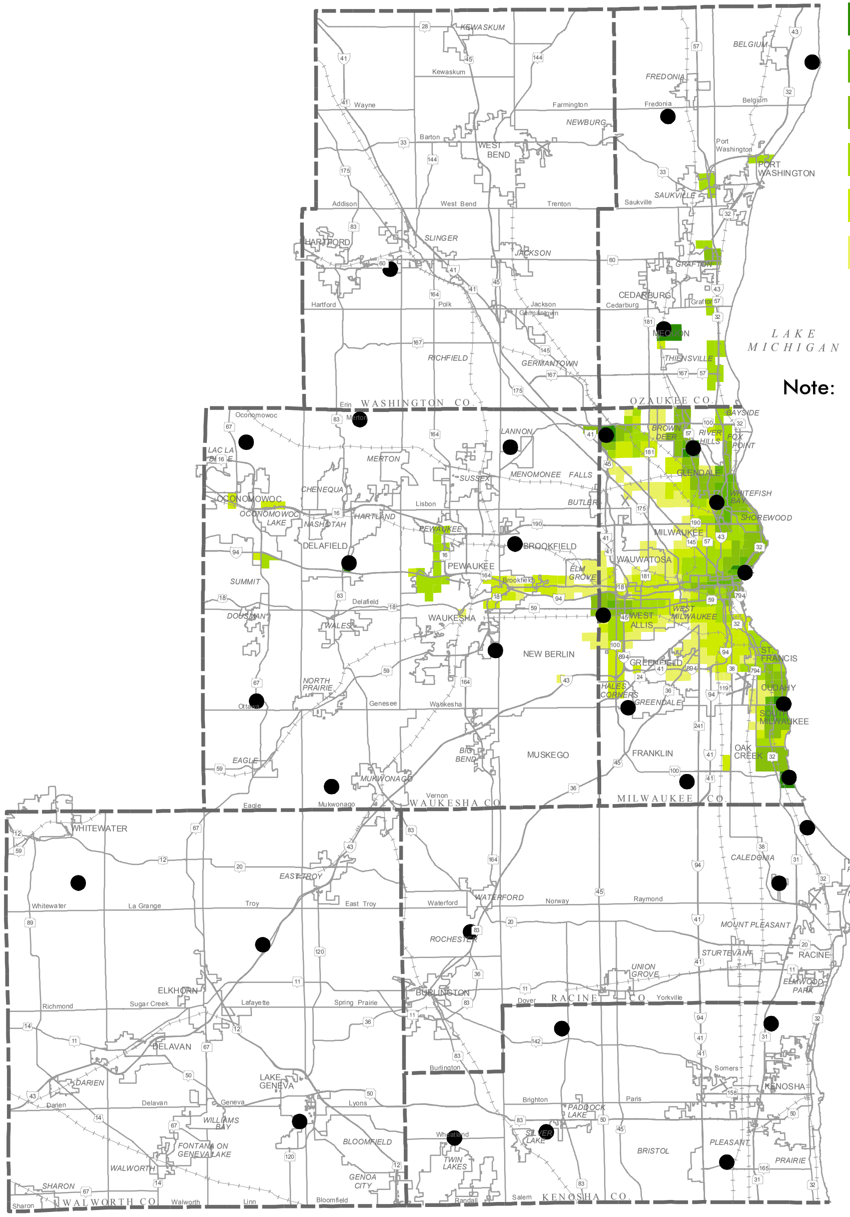
- **Transportation Access to Major Parks:** Maps F.87 through F.92 show drive and transit trip times to one of the Region's existing 32 major parks, and Table F.38 presents the population that would be within 30 minutes.[41] The entire population of the Region is currently within a 30-minute drive of one of the Region's existing major parks. Under all three alternatives, including under Alternatives I and II without highway improvements, the entire population would remain within a 30-minute drive. Depending on the location, drive time to a major park would slightly increase or decrease based on the alternative's traffic congestion levels and locations of arterial improvements.

  Due to the declines in transit service levels expected under the Trend, approximately 40,000 fewer residents (23 percent) would be within a 30-minute transit trip of a major park compared to today, despite a projected increase in the Region's total population of about 334,000 (17 percent). Compared to the Trend, Alternative I would provide transit service within 30 minutes of a major park to about 300,000 additional residents (241 percent more) and under Alternative II this increase would be about 510,000 additional residents (409 percent more). Not including highway improvements under Alternatives I and II would reduce these numbers by about 40,000 and 30,000, respectively.

[41] *For this criterion, only parks having an area of at least 250 acres were analyzed.*

Map F.87
Average Peak Travel Time to Major Parks: Existing

Transit



TRAVEL TIME (MINUTES)

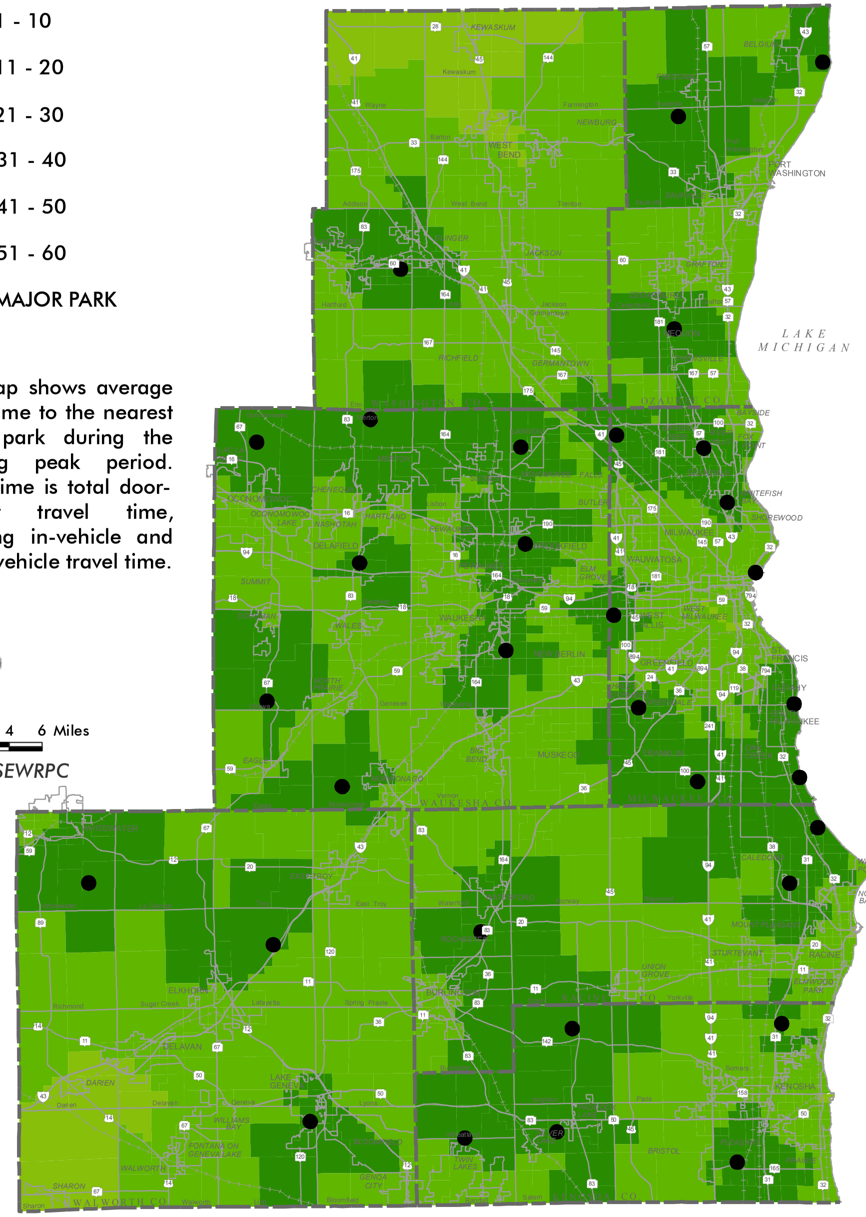
- 1 - 10
- 11 - 20
- 21 - 30
- 31 - 40
- 41 - 50
- 51 - 60
- MAJOR PARK

Note: This map shows average travel time to the nearest major park during the morning peak period. Travel time is total door-to-door travel time, including in-vehicle and out-of-vehicle travel time.

0 2 4 6 Miles

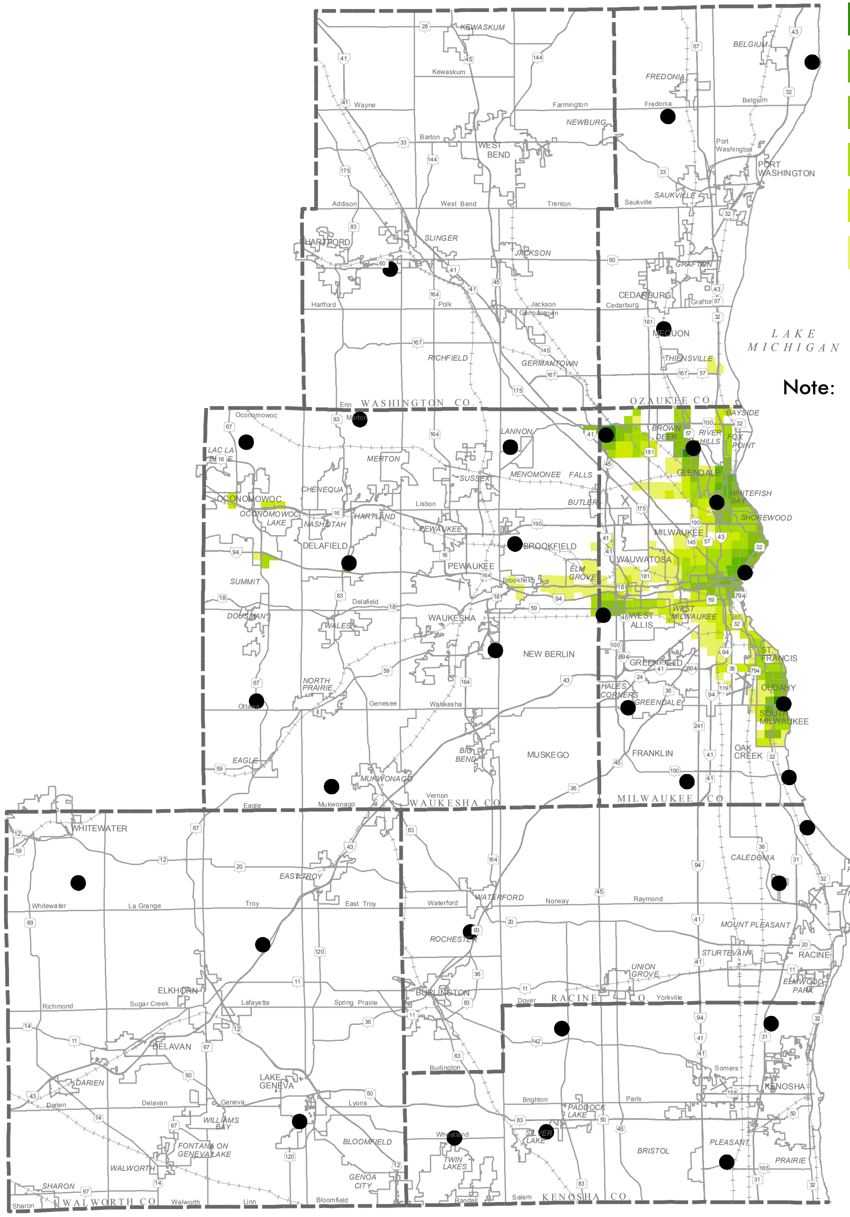
Source: SEWRPC

Auto



Map F.88
Average Peak Travel Time to Major Parks: Trend

Transit



TRAVEL TIME (MINUTES)

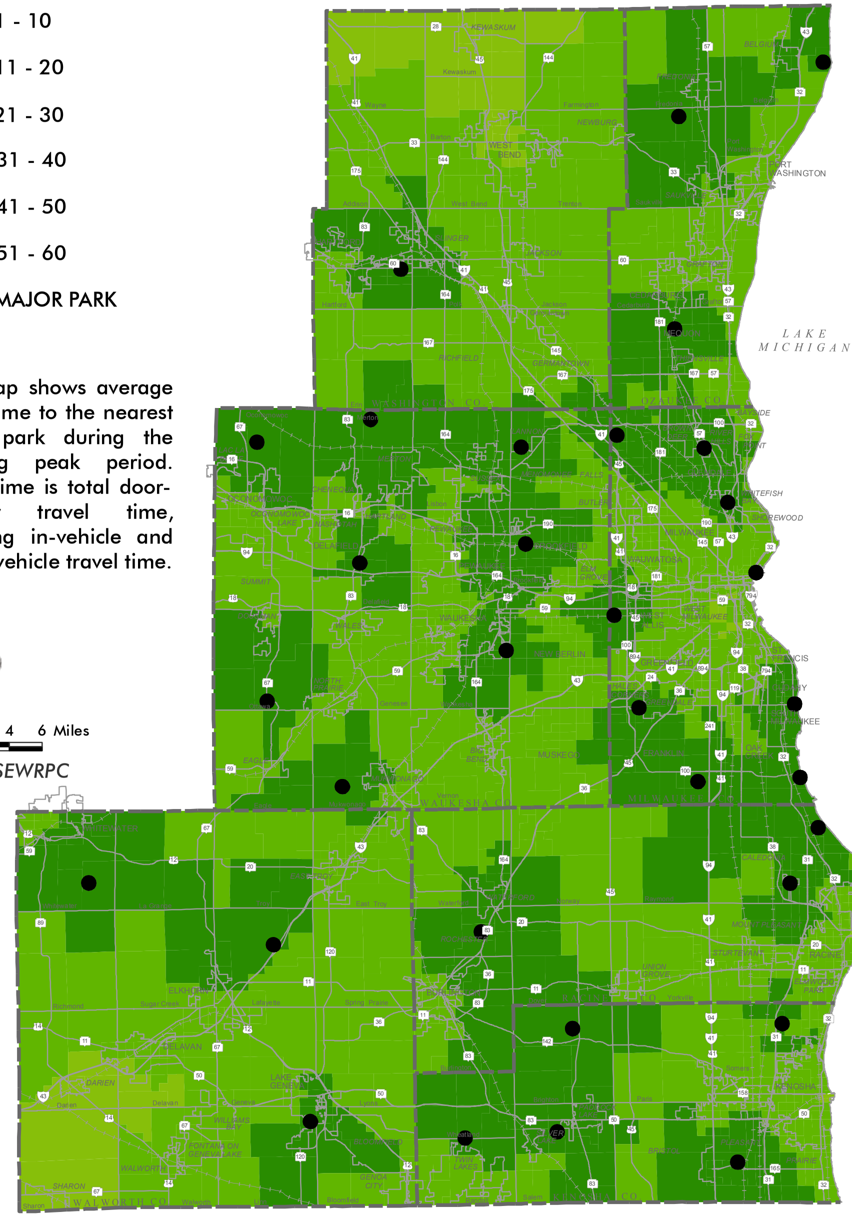
- 1 - 10
- 11 - 20
- 21 - 30
- 31 - 40
- 41 - 50
- 51 - 60
- ● MAJOR PARK

Note: This map shows average travel time to the nearest major park during the morning peak period. Travel time is total door-to-door travel time, including in-vehicle and out-of-vehicle travel time.

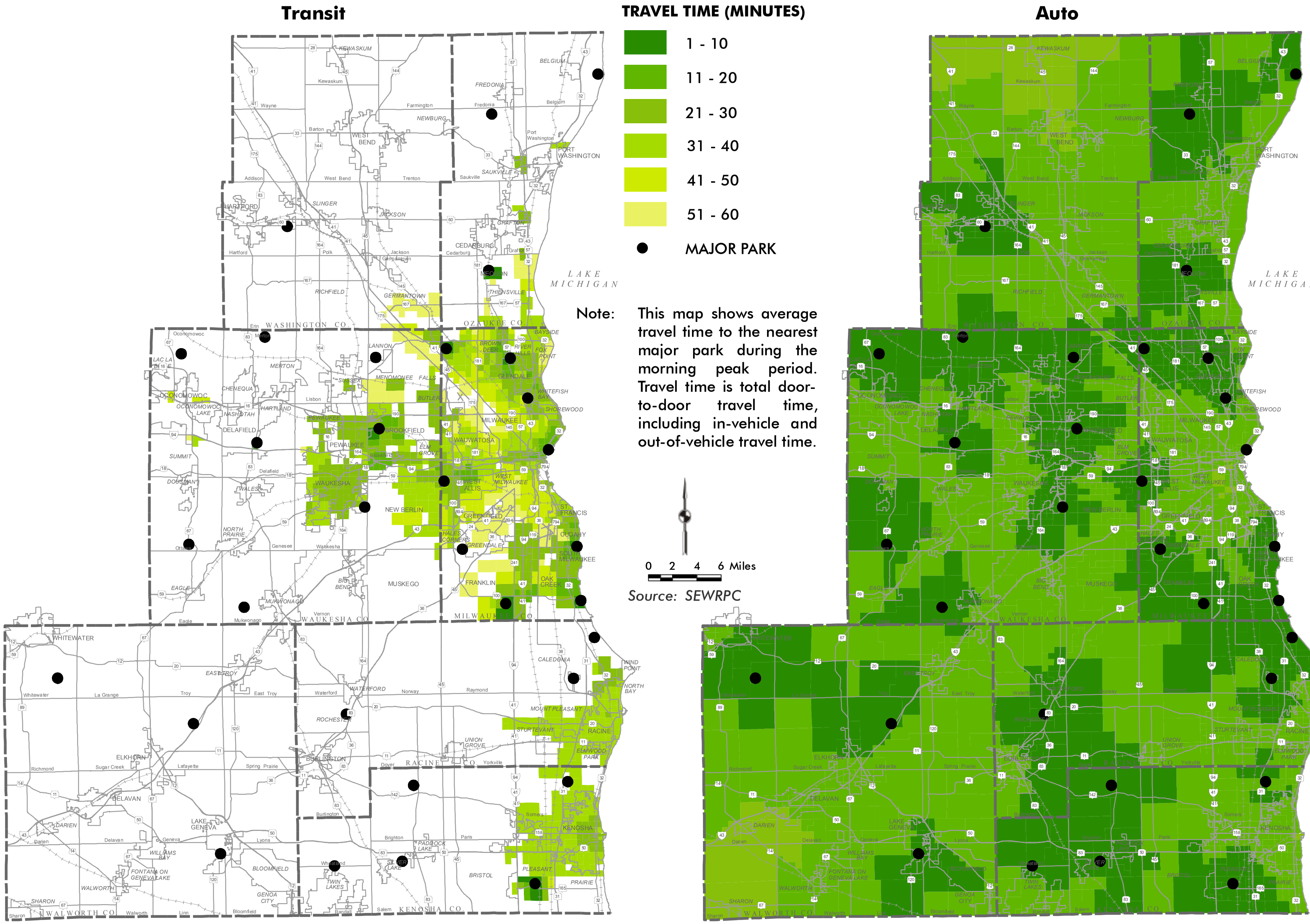
0 2 4 6 Miles

Source: SEWRPC

Auto



Map F.89
Average Peak Travel Time to Major Parks: Alternative I with Highway Improvements

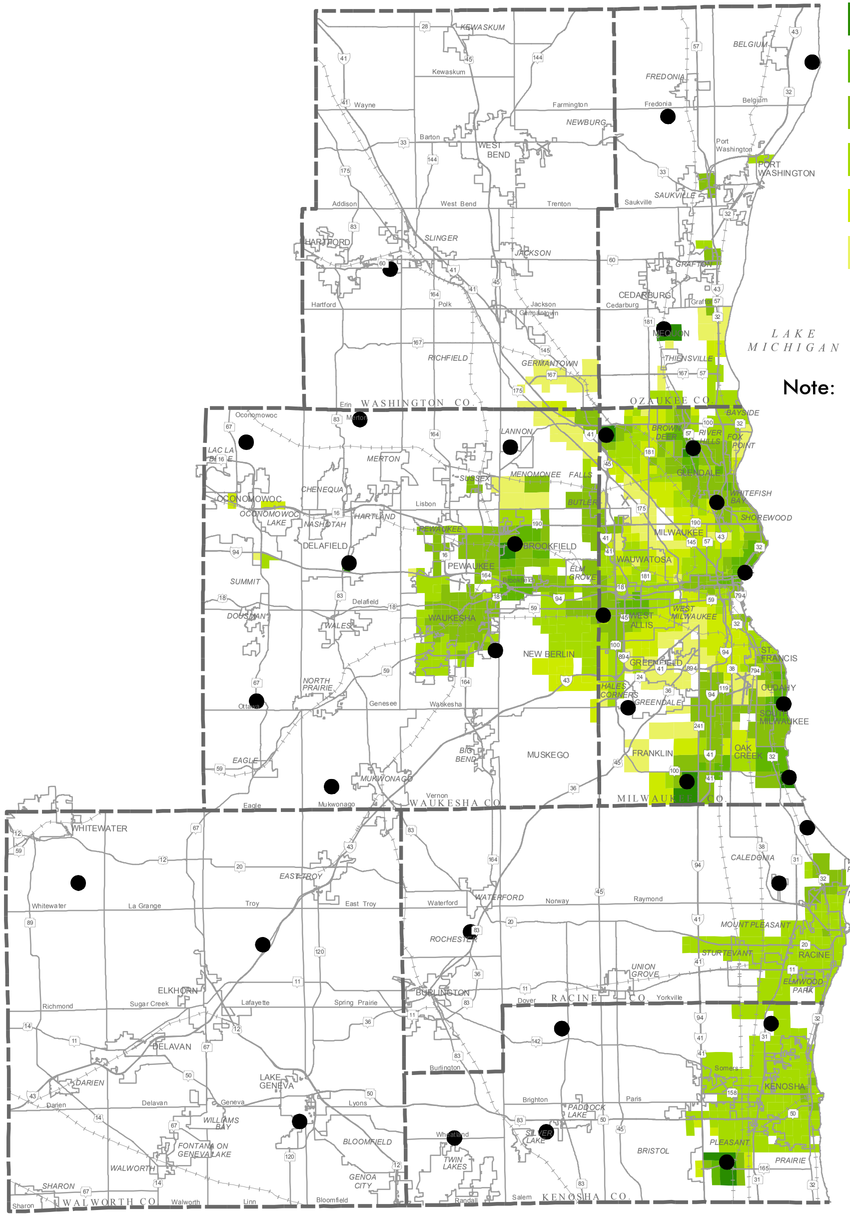


Note: This map shows average travel time to the nearest major park during the morning peak period. Travel time is total door-to-door travel time, including in-vehicle and out-of-vehicle travel time.

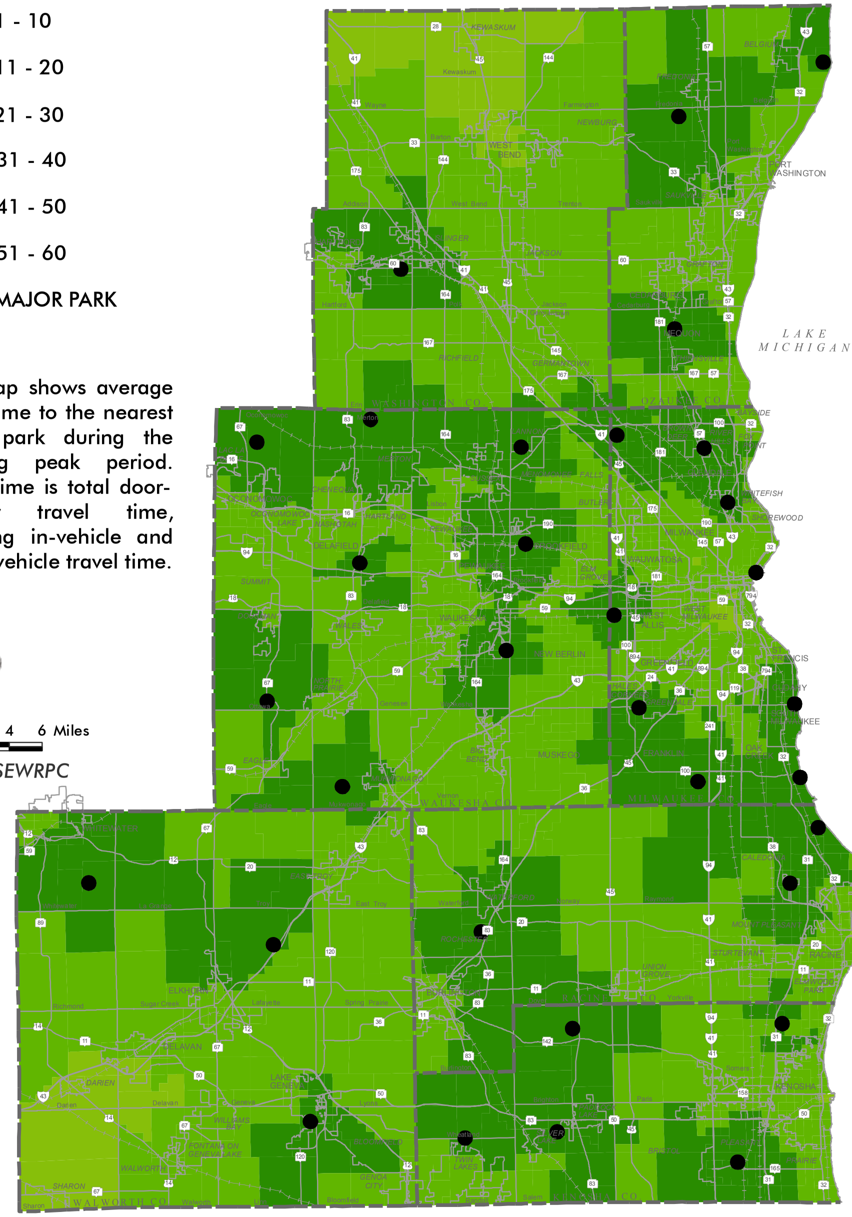
Source: SEWRPC

Map F.90
Average Peak Travel Time to Major Parks: Alternative I Without Highway Improvements

Transit



Auto



TRAVEL TIME (MINUTES)

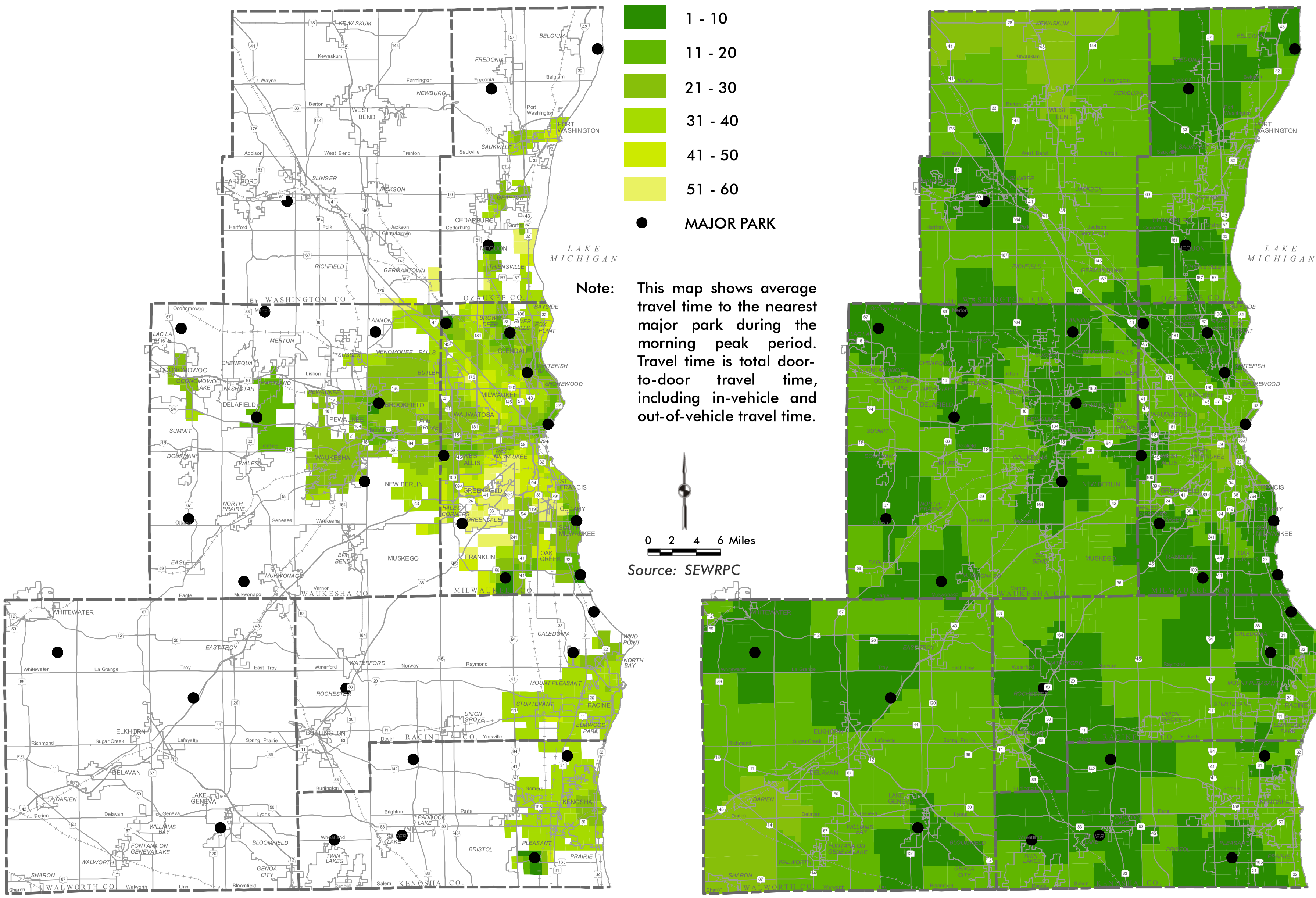
- 1 - 10
- 11 - 20
- 21 - 30
- 31 - 40
- 41 - 50
- 51 - 60
- ● MAJOR PARK

Note: This map shows average travel time to the nearest major park during the morning peak period. Travel time is total door-to-door travel time, including in-vehicle and out-of-vehicle travel time.

0 2 4 6 Miles

Source: SEWRPC

Map F.91
Average Peak Travel Time to Major Parks: Alternative II with Highway Improvements



TRAVEL TIME (MINUTES)

- 1 - 10
- 11 - 20
- 21 - 30
- 31 - 40
- 41 - 50
- 51 - 60
- MAJOR PARK

Note: This map shows average travel time to the nearest major park during the morning peak period. Travel time is total door-to-door travel time, including in-vehicle and out-of-vehicle travel time.

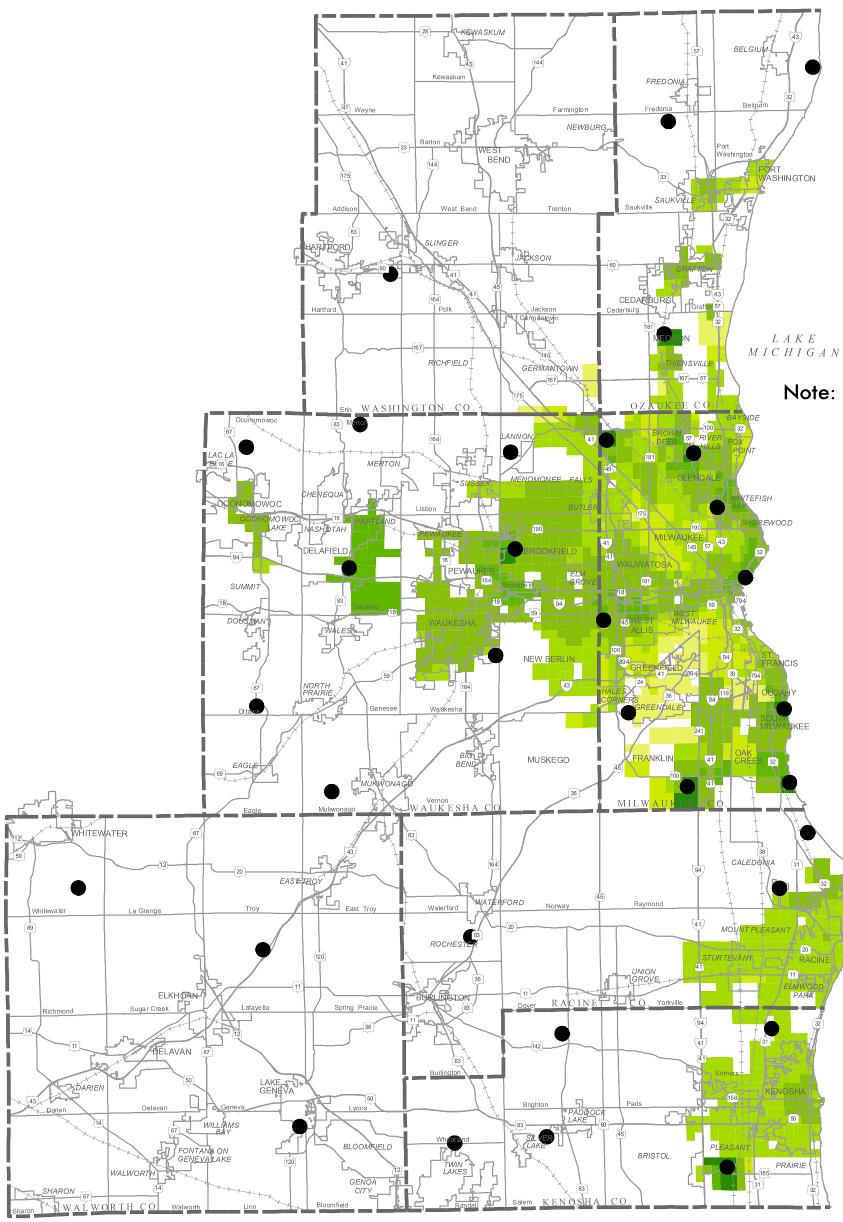
0 2 4 6 Miles

Source: SEWRPC

Map F.92

Average Peak Travel Time to Major Parks: Alternative II Without Highway Improvements

Transit



TRAVEL TIME (MINUTES)

- 1 - 10
- 11 - 20
- 21 - 30
- 31 - 40
- 41 - 50
- 51 - 60
- ● MAJOR PARK

Note: This map shows average travel time to the nearest major park during the morning peak period. Travel time is total door-to-door travel time, including in-vehicle and out-of-vehicle travel time.

0 2 4 6 Miles

Source: SEWRPC

Auto

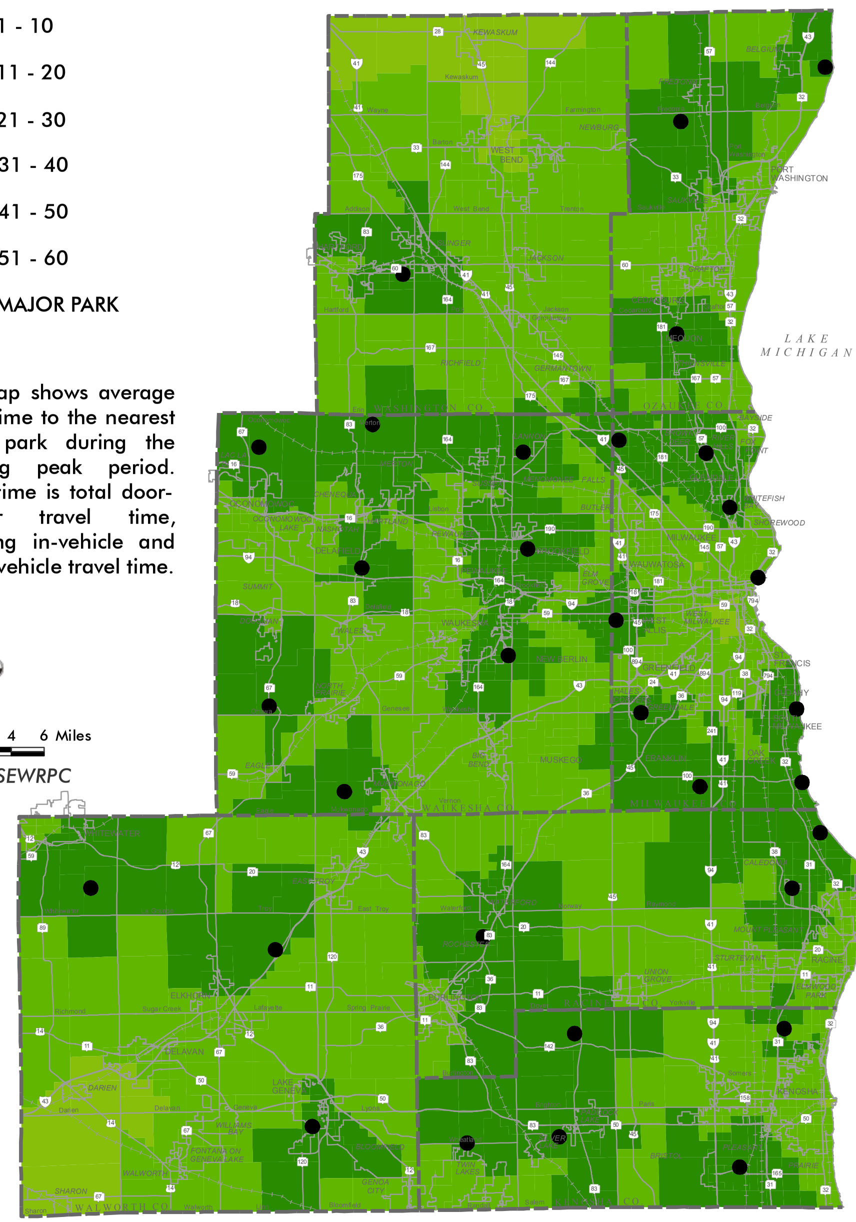


Table F.39
Population Within 30 Minutes of a College or University

Alternative	Total Population Within a 30-Minute Transit Trip of a College or University		Total Population Within a 30-Minute Drive of a College or University	
	Population with Access	Percent of Total Population	Population with Access	Percent of Total Population
Existing - 2011	368,200	18.2	2,018,700	99.9
Trend - 2050	331,400	14.1	2,352,200	99.9
Alt I with Highway Improvements - 2050	697,000	29.6	2,352,400	99.9
Alt I Without Highway Improvements - 2050	687,100	29.2	2,351,500	99.9
Alt II with Highway Improvements - 2050	902,500	38.3	2,352,500	99.9
Alt II Without Highway Improvements - 2050	902,000	38.3	2,352,500	99.9

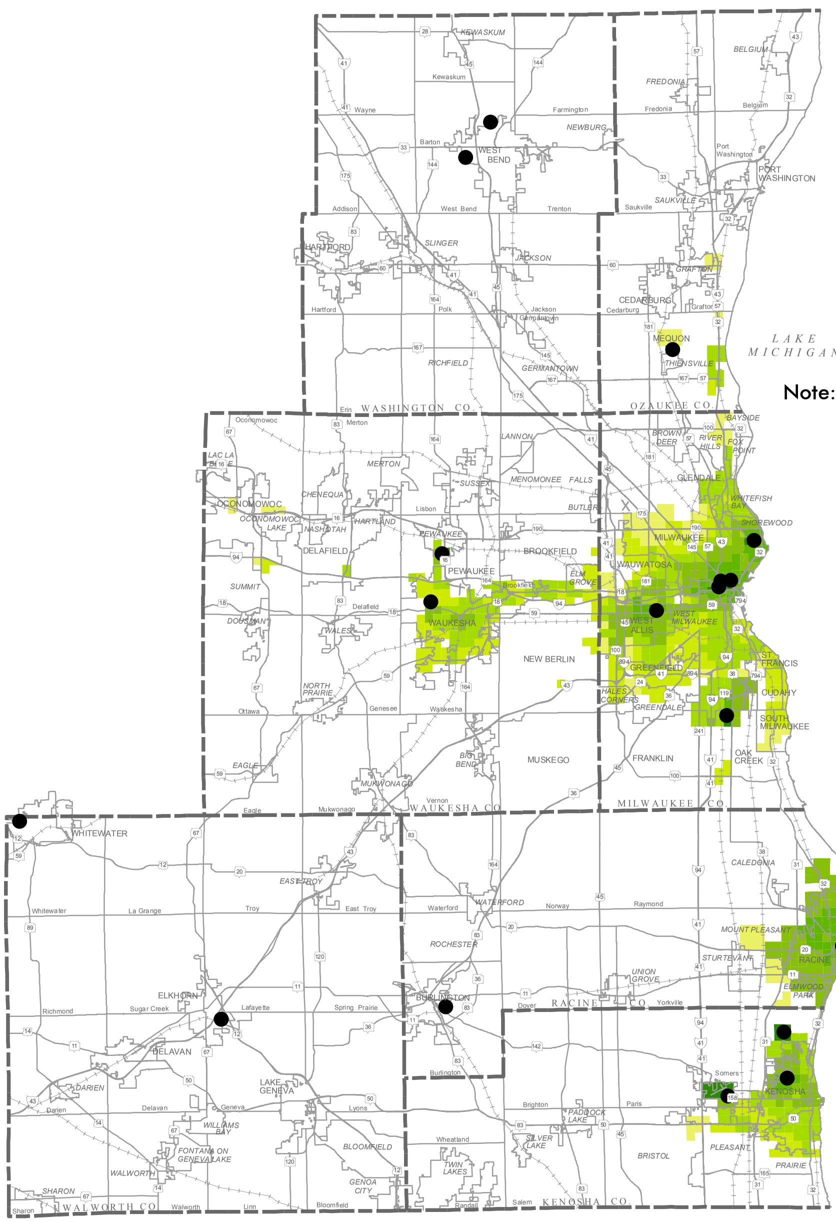
Source: SEWRPC

- **Transportation Access to Public Technical Colleges and Universities:** Maps F.93 through F.98 show drive and transit trip times to one of the Region's existing 18 public technical colleges or universities, and Table F.39 presents the population that would be within 30 minutes. Almost the entire population of the Region is currently within a 30-minute drive of one of the Region's existing colleges or universities. Under all three alternatives, including under Alternatives I and II without highway improvements, almost the entire population would remain within a 30-minute drive. Depending on the location, drive time to a college or university would slightly increase or decrease based on the alternative's traffic congestion levels and locations of arterial improvements.

  Due to the declines in transit service levels expected under the Trend, approximately 40,000 fewer residents (10 percent) would be within a 30-minute transit trip of a college or university compared to today, despite a projected increase in the Region's total population of about 334,000 (17 percent). Compared to the Trend, Alternative I would provide transit service within 30 minutes of a college or university to about 370,000 additional residents (110 percent more) and under Alternative II this increase would be about 570,000 additional residents (172 percent more). Not including highway improvements under Alternatives I and II would slightly reduce these numbers.

Map F.93
Average Peak Travel Time to Public Technical Colleges and Universities: Existing

Transit



TRAVEL TIME (MINUTES)

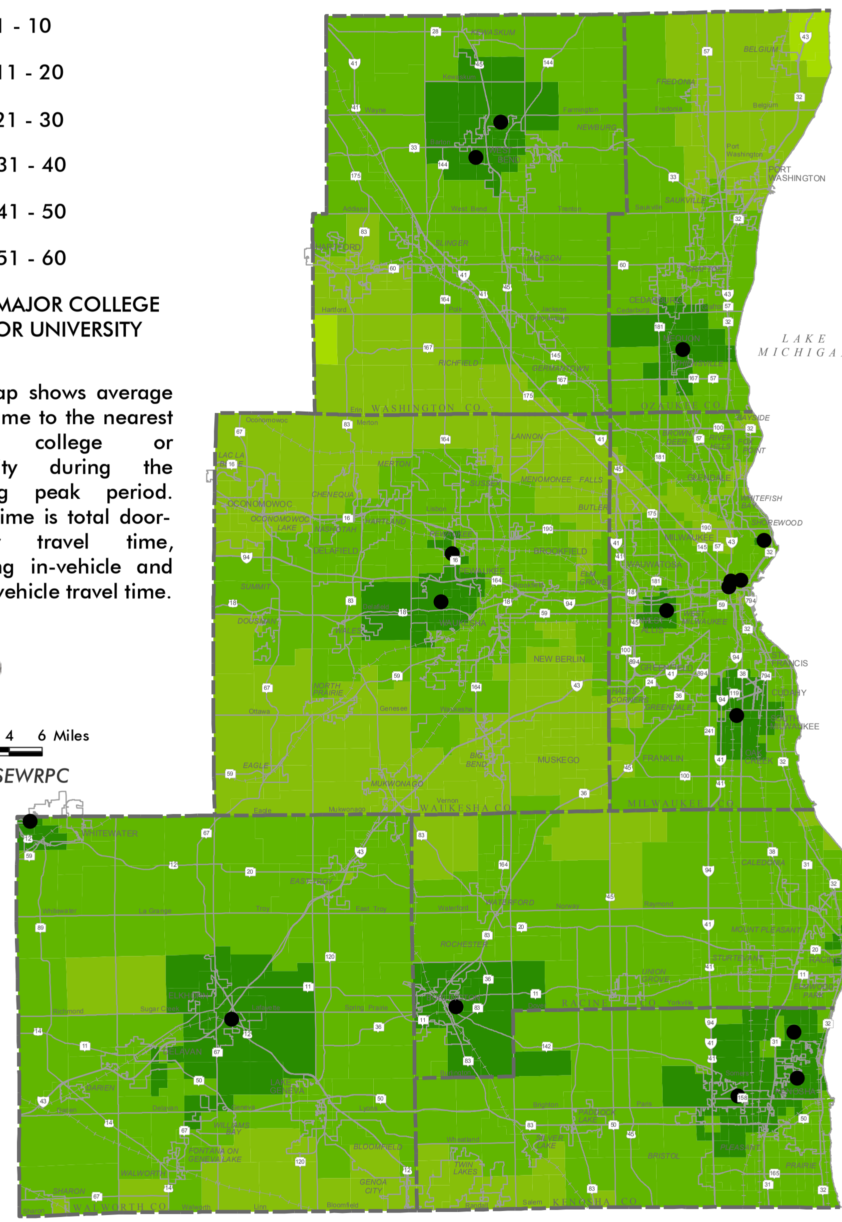
- 1 - 10
- 11 - 20
- 21 - 30
- 31 - 40
- 41 - 50
- 51 - 60
- ● MAJOR COLLEGE OR UNIVERSITY

Note: This map shows average travel time to the nearest major college or university during the morning peak period. Travel time is total door-to-door travel time, including in-vehicle and out-of-vehicle travel time.

0 2 4 6 Miles

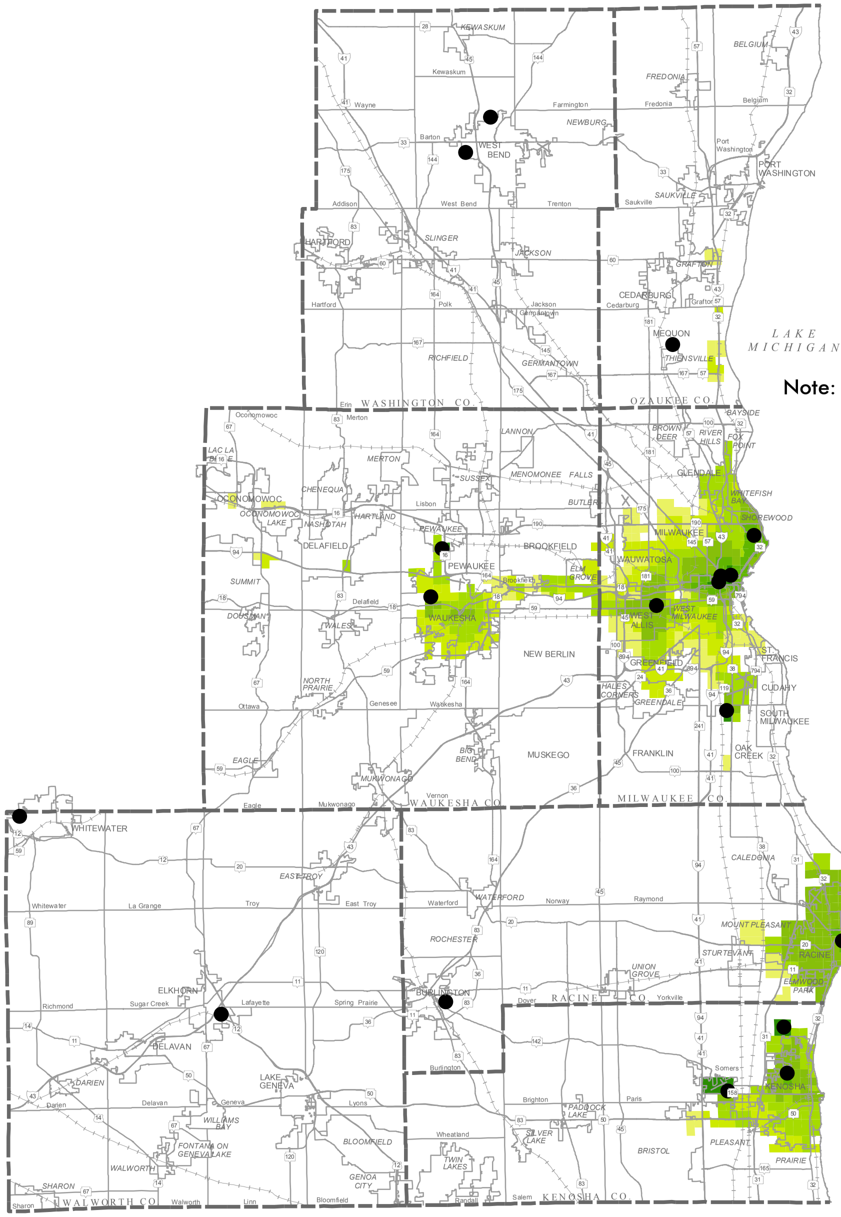
Source: SEWRPC

Auto

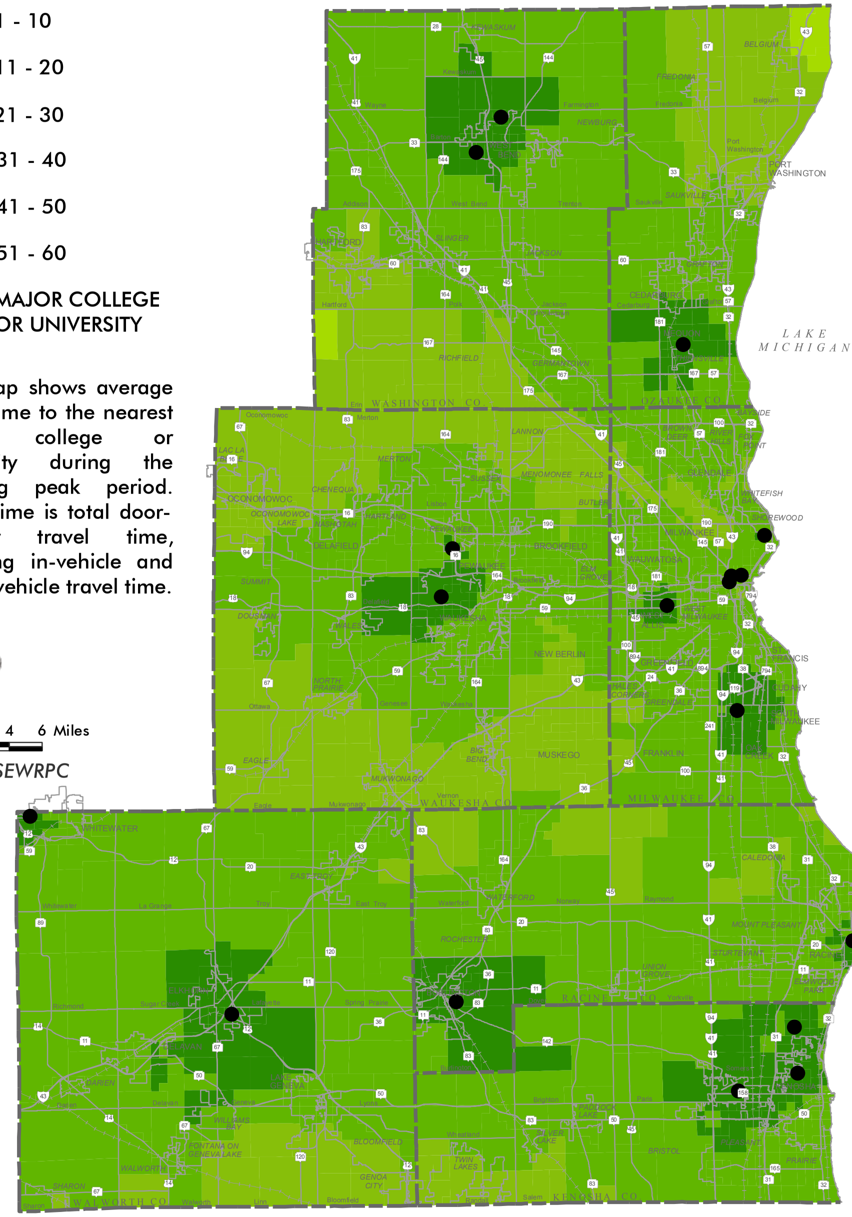


Map F.94
Average Peak Travel Time to Public Technical Colleges and Universities: Trend

Transit



Auto



TRAVEL TIME (MINUTES)

- 1 - 10
- 11 - 20
- 21 - 30
- 31 - 40
- 41 - 50
- 51 - 60
- ● MAJOR COLLEGE OR UNIVERSITY

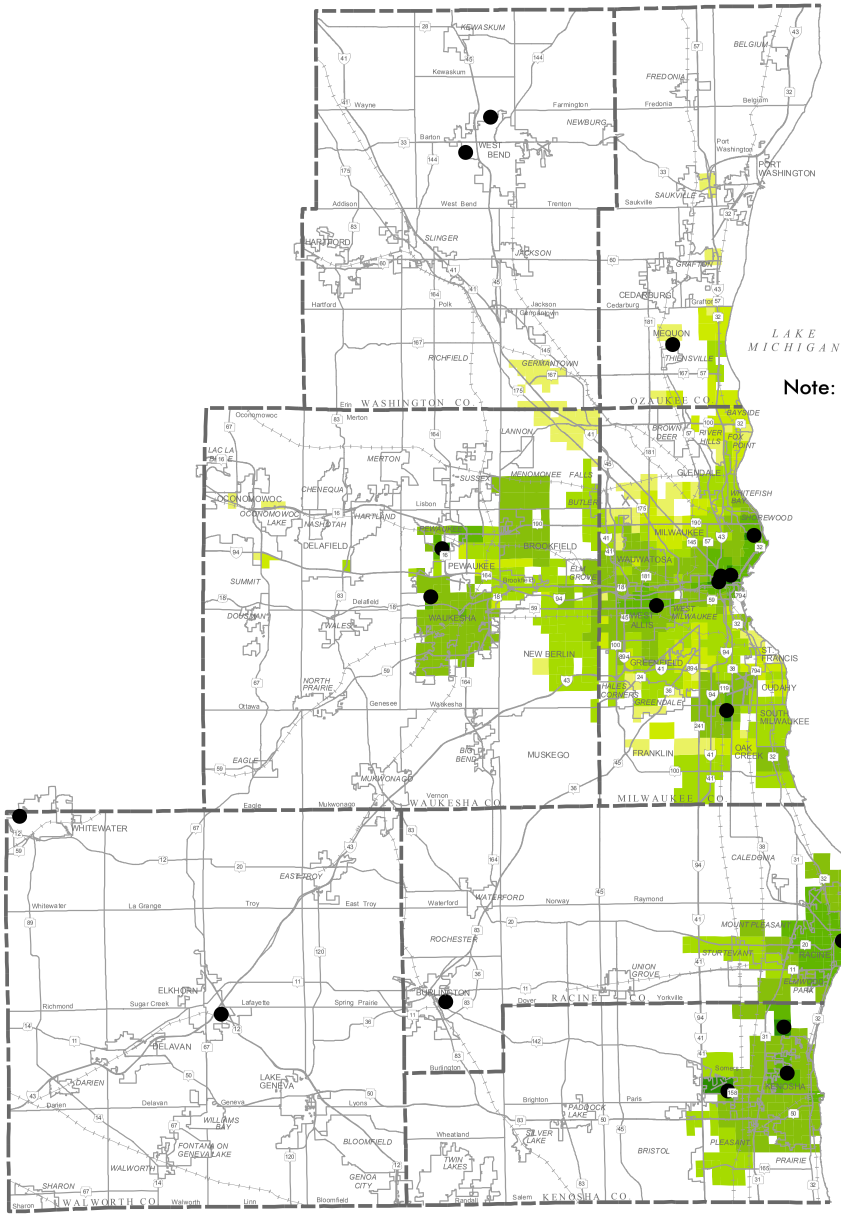
Note: This map shows average travel time to the nearest major college or university during the morning peak period. Travel time is total door-to-door travel time, including in-vehicle and out-of-vehicle travel time.

0 2 4 6 Miles

Source: SEWRPC

Map F.95
Average Peak Travel Time to Public Technical Colleges and Universities: Alternative I with Highway Improvements

Transit



TRAVEL TIME (MINUTES)

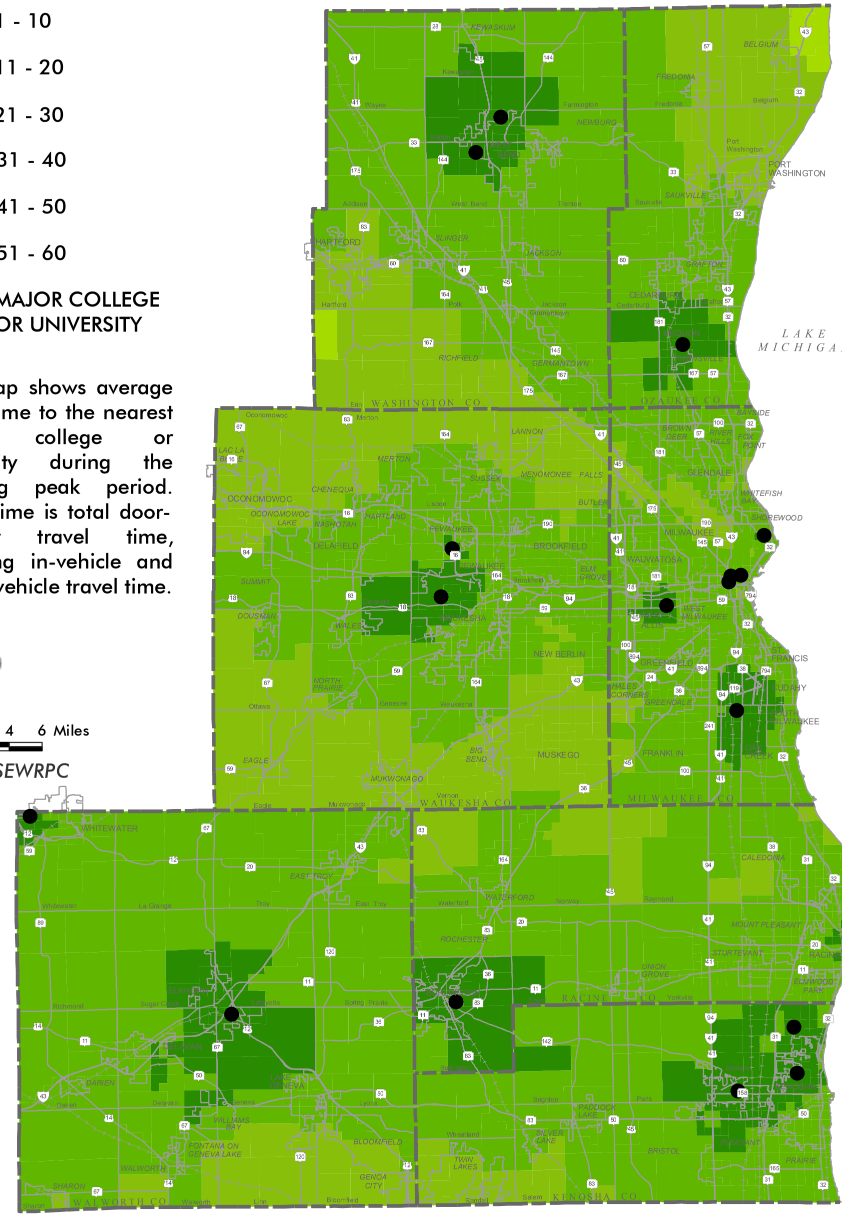
- 1 - 10
- 11 - 20
- 21 - 30
- 31 - 40
- 41 - 50
- 51 - 60
- ● MAJOR COLLEGE OR UNIVERSITY

Note: This map shows average travel time to the nearest major college or university during the morning peak period. Travel time is total door-to-door travel time, including in-vehicle and out-of-vehicle travel time.

0 2 4 6 Miles

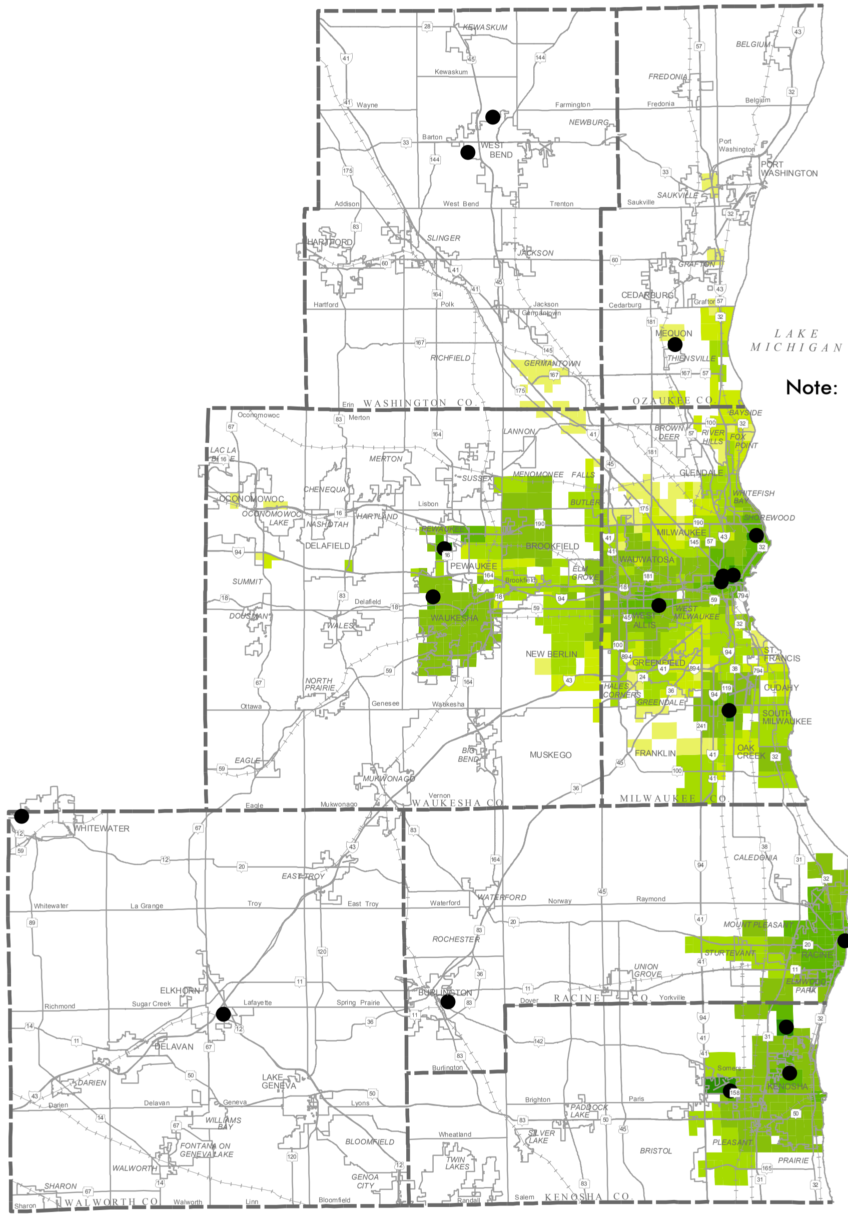
Source: SEWRPC

Auto

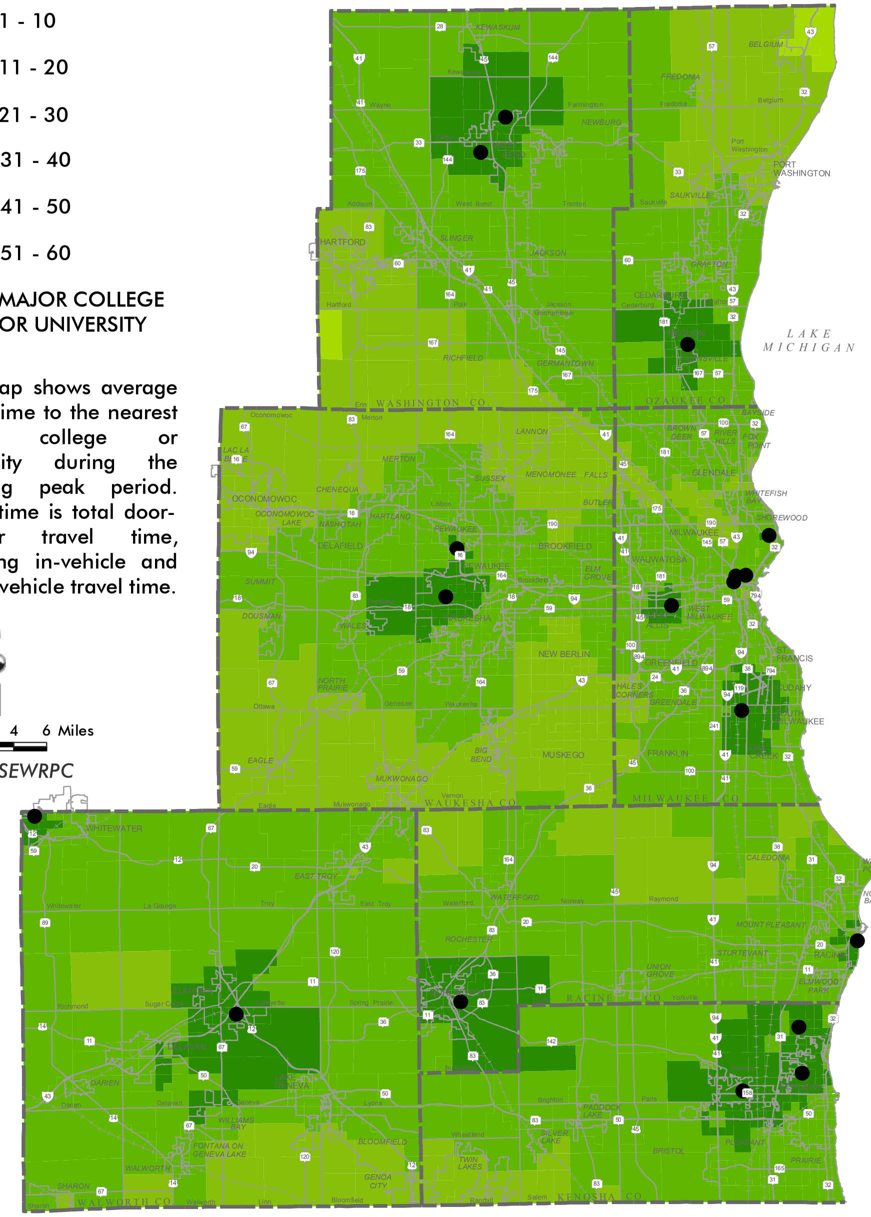


Map F.96
Average Peak Travel Time to Public Technical Colleges and Universities: Alternative I Without Highway Improvements

Transit



Auto



TRAVEL TIME (MINUTES)

- 1 - 10
- 11 - 20
- 21 - 30
- 31 - 40
- 41 - 50
- 51 - 60
- ● MAJOR COLLEGE OR UNIVERSITY

Note: This map shows average travel time to the nearest major college or university during the morning peak period. Travel time is total door-to-door travel time, including in-vehicle and out-of-vehicle travel time.

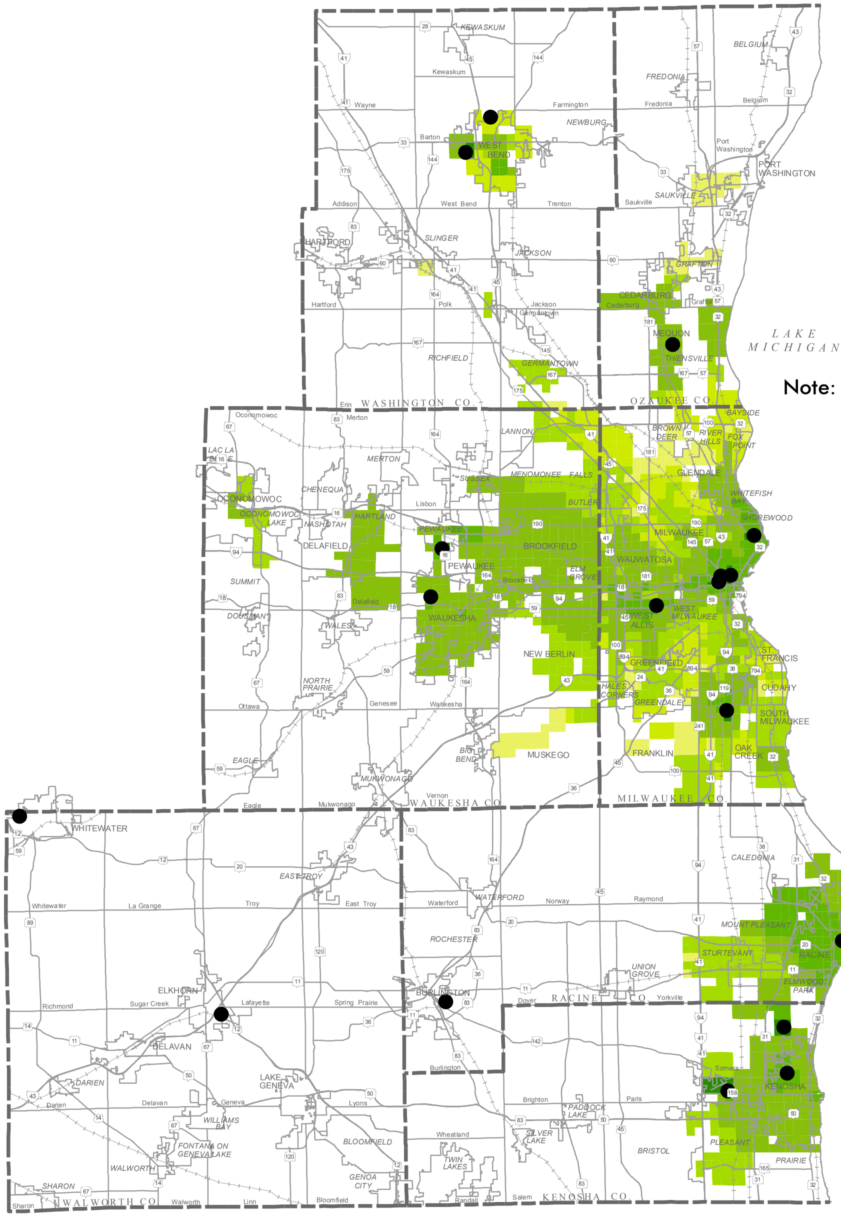
0 2 4 6 Miles

Source: SEWRPC

Map F.97

Average Peak Travel Time to Public Technical Colleges and Universities: Alternative II with Highway Improvements

Transit



TRAVEL TIME (MINUTES)

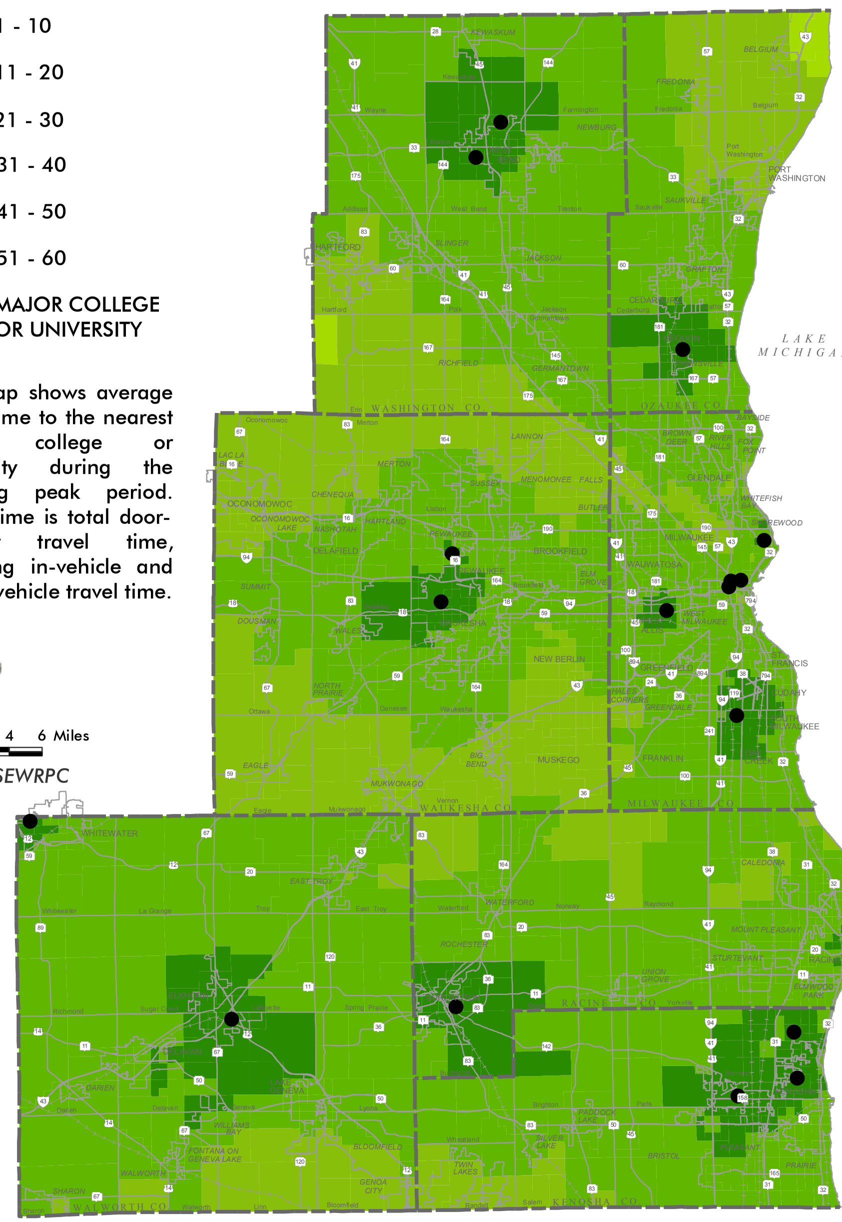
- 1 - 10
- 11 - 20
- 21 - 30
- 31 - 40
- 41 - 50
- 51 - 60
- ● MAJOR COLLEGE OR UNIVERSITY

Note: This map shows average travel time to the nearest major college or university during the morning peak period. Travel time is total door-to-door travel time, including in-vehicle and out-of-vehicle travel time.

0 2 4 6 Miles

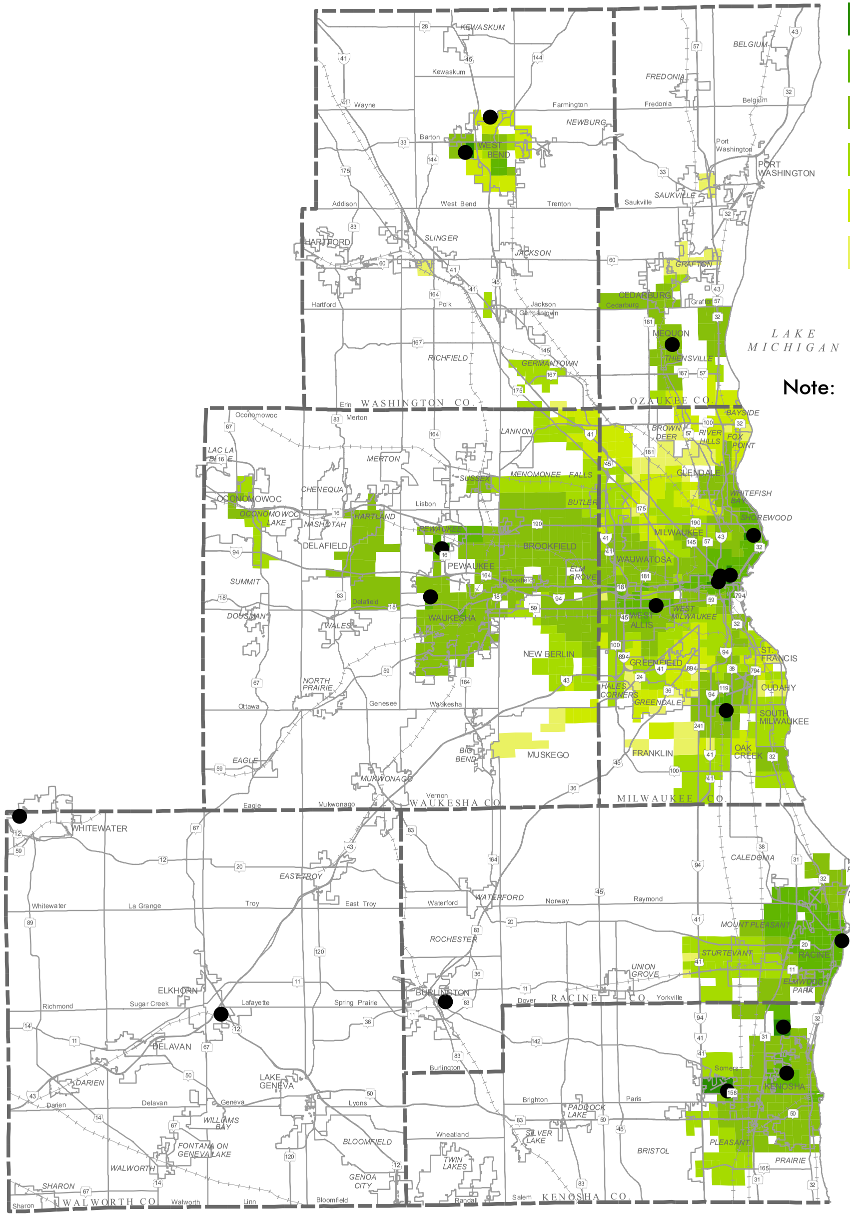
Source: SEWRPC

Auto



Map F.98
Average Peak Travel Time to Public Technical Colleges and Universities: Alternative II Without Highway Improvements

Transit



TRAVEL TIME (MINUTES)

- 1 - 10
- 11 - 20
- 21 - 30
- 31 - 40
- 41 - 50
- 51 - 60
- ● MAJOR COLLEGE OR UNIVERSITY

Note: This map shows average travel time to the nearest major college or university during the morning peak period. Travel time is total door-to-door travel time, including in-vehicle and out-of-vehicle travel time.

0 2 4 6 Miles

Source: SEWRPC

Auto

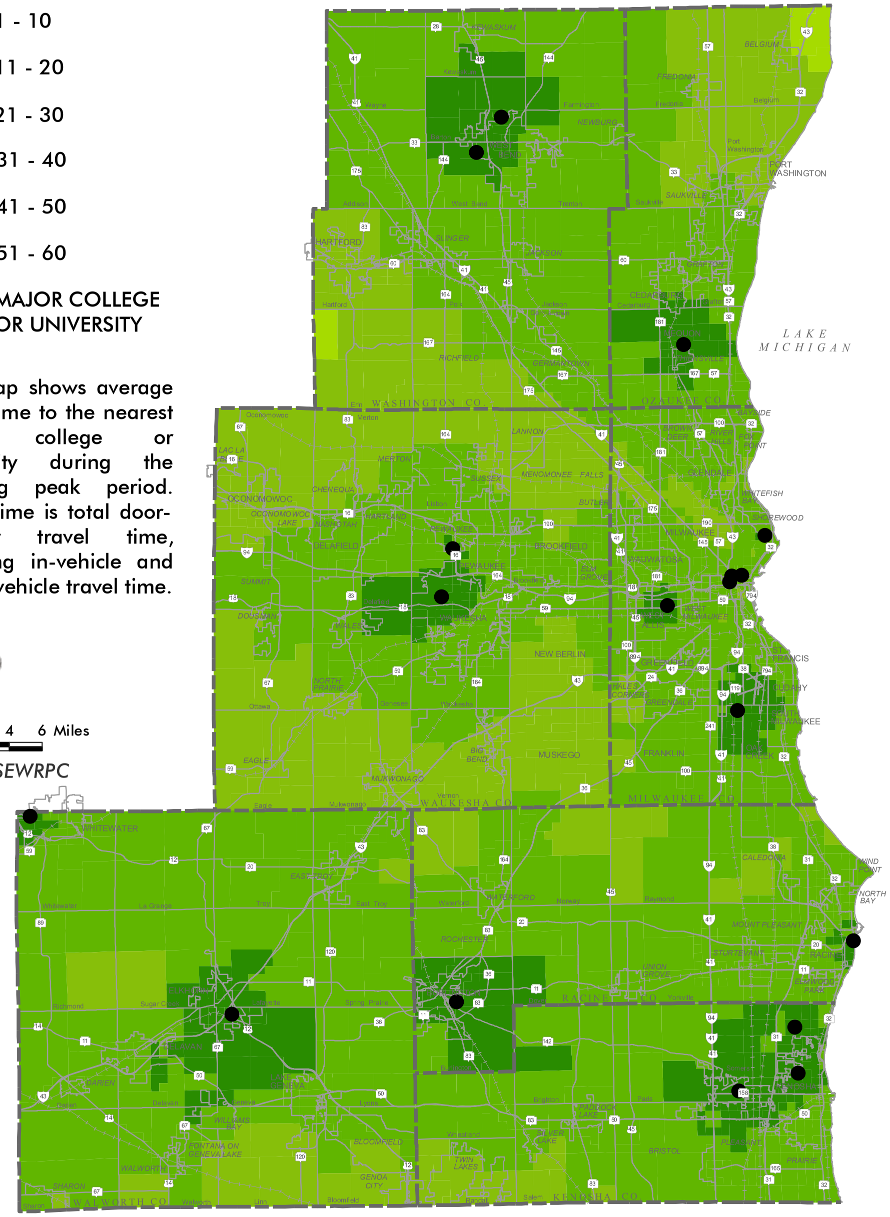


Table F.40
Population Within 30 Minutes of a Health Care Facility

Alternative	Total Population Within a 30-Minute Transit Trip of a Health Care Facility		Total Population Within a 30-Minute Drive of a Health Care Facility	
	Population with Access	Percent of Total Population	Population with Access	Percent of Total Population
Existing - 2011	655,700	32.5	2,016,400	99.8
Trend - 2050	566,700	24.1	2,354,000	100.0
Alt I with Highway Improvements - 2050	960,400	40.8	2,354,000	100.0
Alt I Without Highway Improvements - 2050	954,500	40.5	2,342,900	99.5
Alt II with Highway Improvements - 2050	1,168,300	49.6	2,354,000	100.0
Alt II Without Highway Improvements - 2050	1,166,200	49.5	2,343,000	99.5

Source: SEWRPC

- **Transportation Access to Health Care Facilities:** Maps F.99 through F.104 show drive and transit trip times to one of the Region's existing 26 major hospitals, and Table F.40 presents the population that would be within 30 minutes.[42] Essentially the entire population of the Region is currently within a 30-minute drive of one of the Region's existing hospitals.[43] Under all three alternatives, the entire population would be within a 30-minute drive. Depending on the location, drive time to a hospital would slightly increase or decrease based on the alternative's traffic congestion levels and locations of arterial improvements. Not including highway improvements under Alternatives I and II would result in the same small area of the Region not being within a 30-minute drive that exists today.

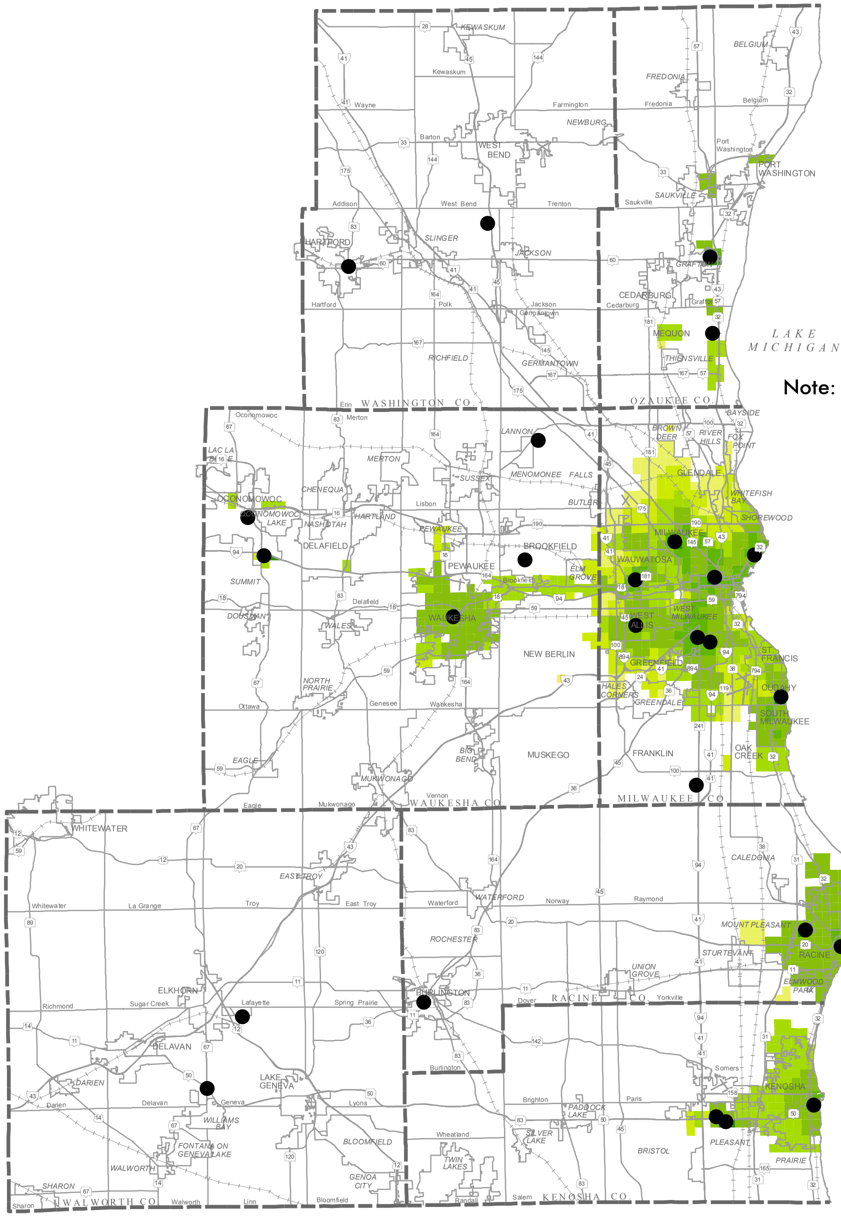
  Due to the declines in transit service levels expected under the Trend, approximately 90,000 fewer residents (14 percent) would be within a 30-minute transit trip of a hospital compared to today, despite a projected increase in the Region's total population of about 334,000 (17 percent). Compared to the Trend, Alternative I would provide transit service within 30 minutes of a hospital to about 390,000 additional residents (69 percent more) and under Alternative II this increase would be about 600,000 additional residents (106 percent more). Not including highway improvements under Alternatives I and II would slightly reduce these numbers.

[42] *For this criterion, only major hospitals for the general population were analyzed (other health care facilities were excluded, such as specialty hospitals, urgent care facilities, facilities requiring referrals, and veterans-only facilities).*

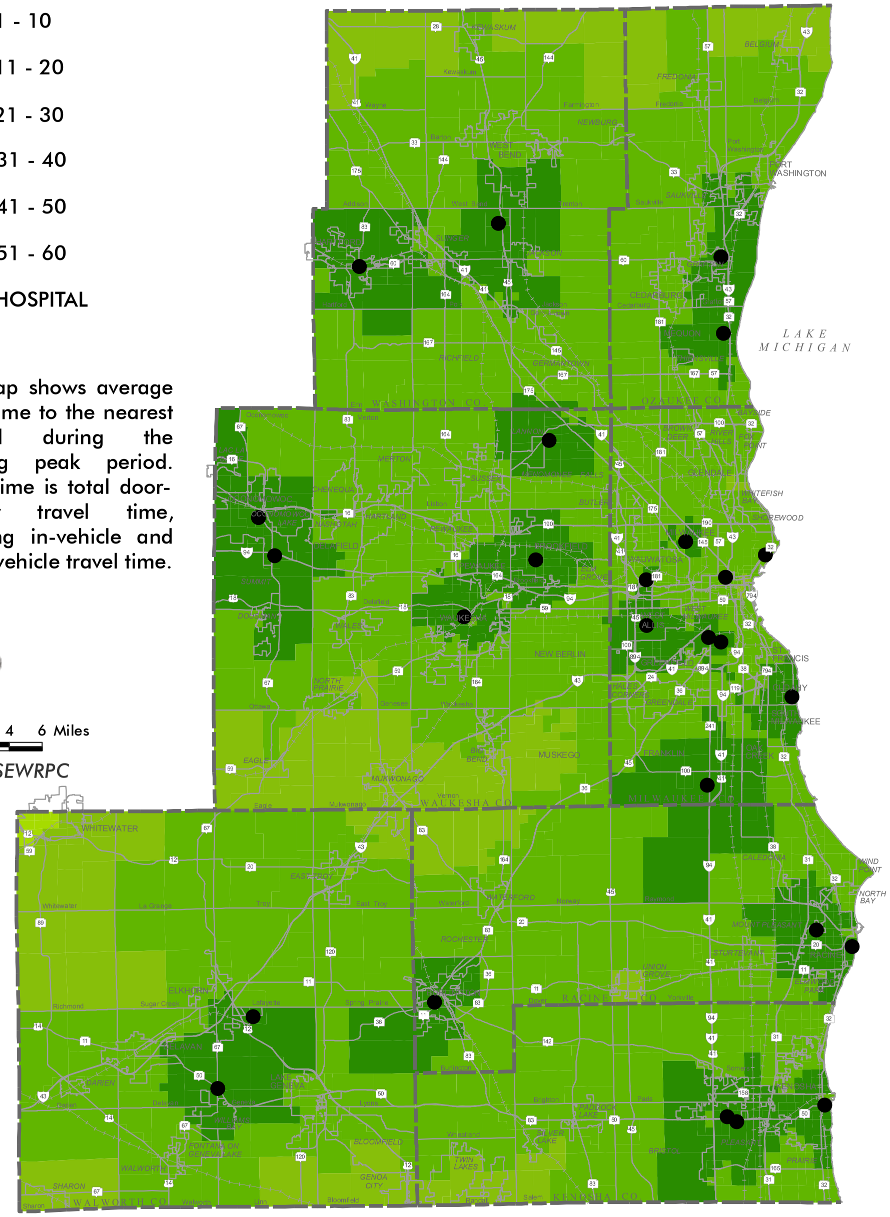
[43] *The only area not currently within a 30-minute drive of a Region hospital is in the northwest corner of Walworth County. This small area is, however, currently within a 30-minute drive of Fort Memorial Hospital, a major general-population hospital located outside the seven-county Region.*

Map F.99
Average Peak Travel Time to Health Care Facilities: Existing

Transit



Auto



TRAVEL TIME (MINUTES)

- 1 - 10
- 11 - 20
- 21 - 30
- 31 - 40
- 41 - 50
- 51 - 60
- HOSPITAL

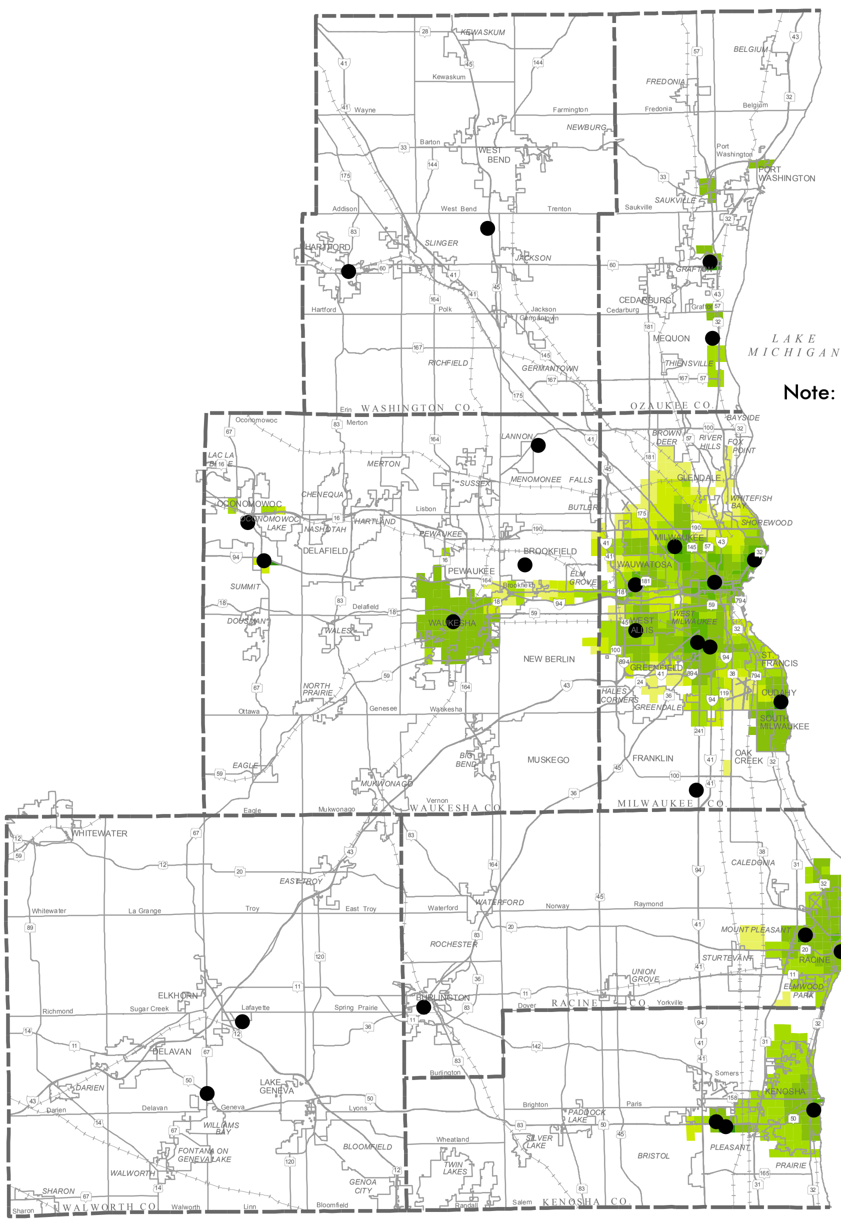
Note: This map shows average travel time to the nearest hospital during the morning peak period. Travel time is total door-to-door travel time, including in-vehicle and out-of-vehicle travel time.

0 2 4 6 Miles

Source: SEWRPC

Map F.100
Average Peak Travel Time to Health Care Facilities: Trend

Transit



TRAVEL TIME (MINUTES)

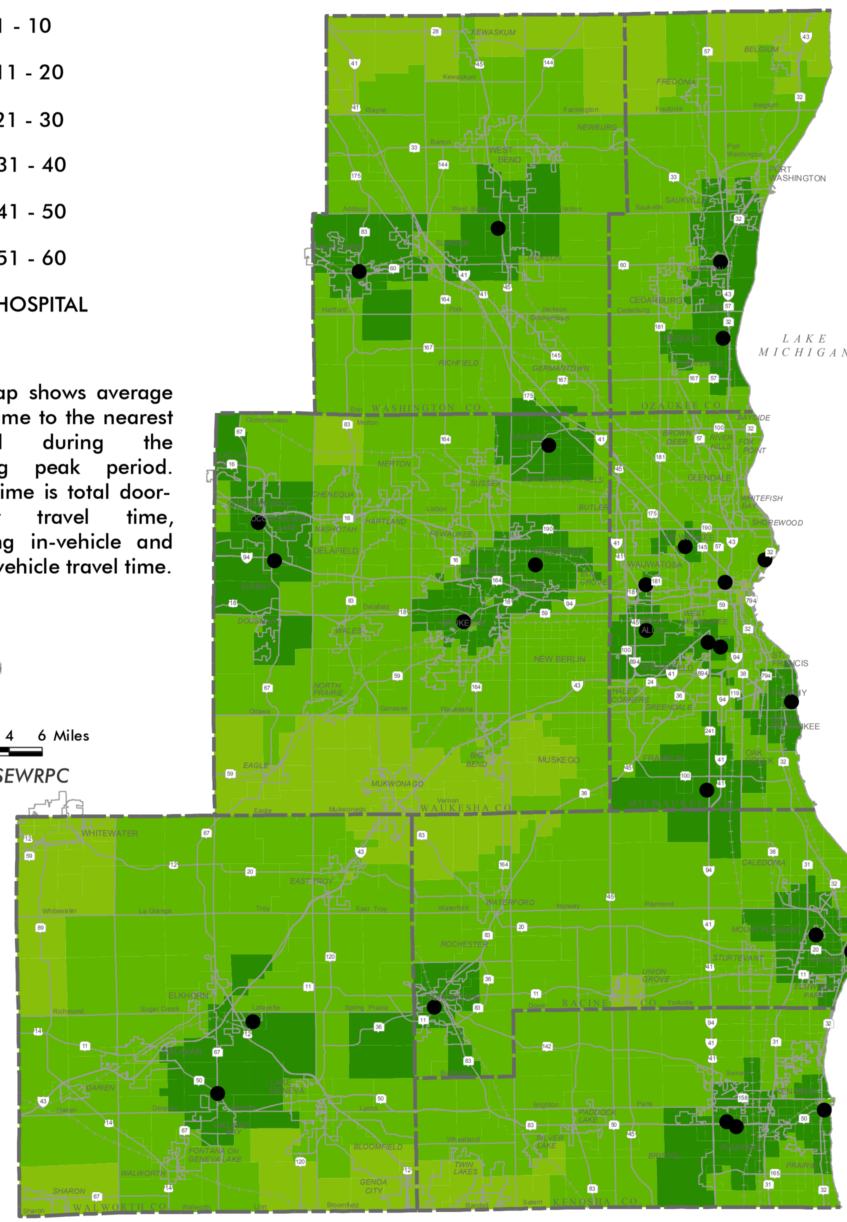
- 1 - 10
- 11 - 20
- 21 - 30
- 31 - 40
- 41 - 50
- 51 - 60
- ● HOSPITAL

Note: This map shows average travel time to the nearest hospital during the morning peak period. Travel time is total door-to-door travel time, including in-vehicle and out-of-vehicle travel time.

0 2 4 6 Miles

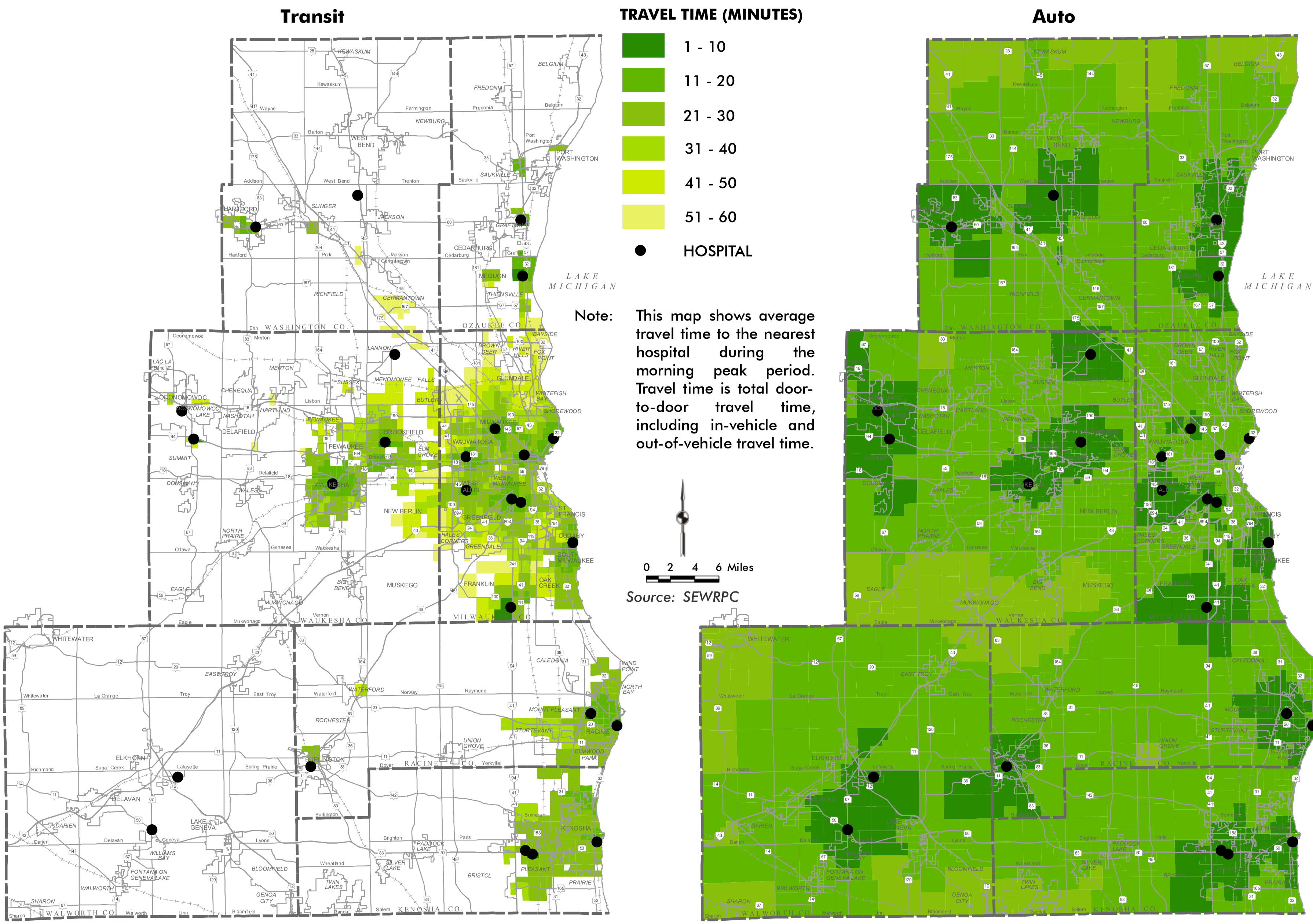
Source: SEWRPC

Auto



Map F.101

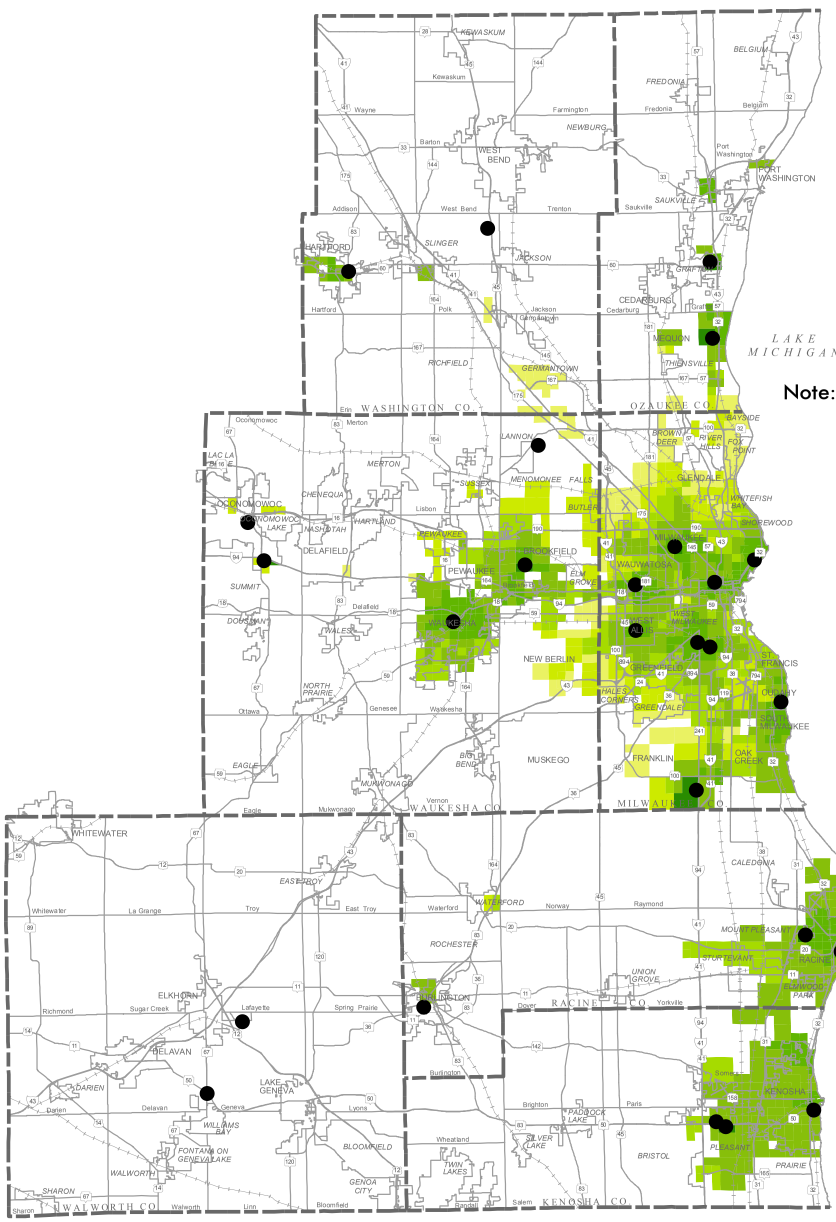
Average Peak Travel Time to Health Care Facilities: Alternative I with Highway Improvements



Map F.102

Average Peak Travel Time to Health Care Facilities: Alternative I Without Highway Improvements

Transit



TRAVEL TIME (MINUTES)

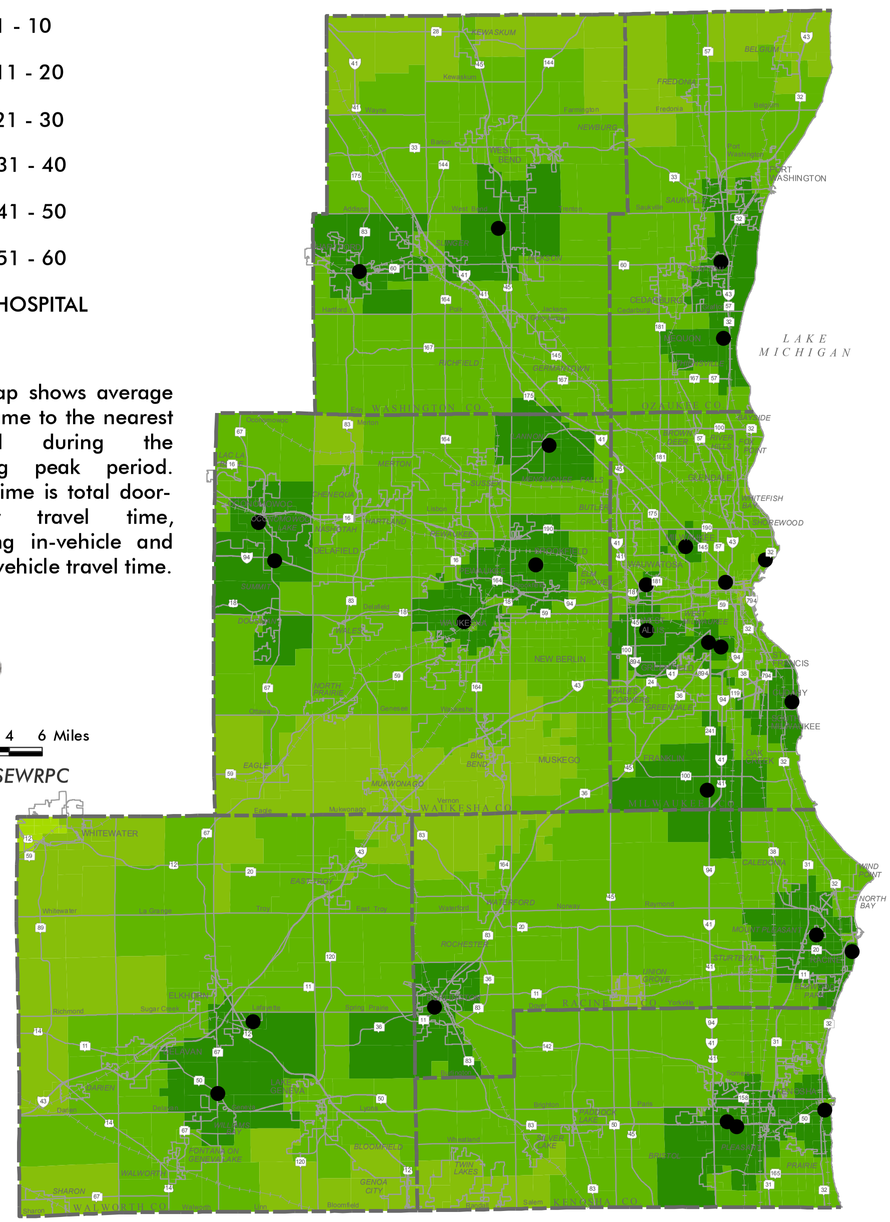
- 1 - 10
- 11 - 20
- 21 - 30
- 31 - 40
- 41 - 50
- 51 - 60
- ● HOSPITAL

Note: This map shows average travel time to the nearest hospital during the morning peak period. Travel time is total door-to-door travel time, including in-vehicle and out-of-vehicle travel time.

0 2 4 6 Miles

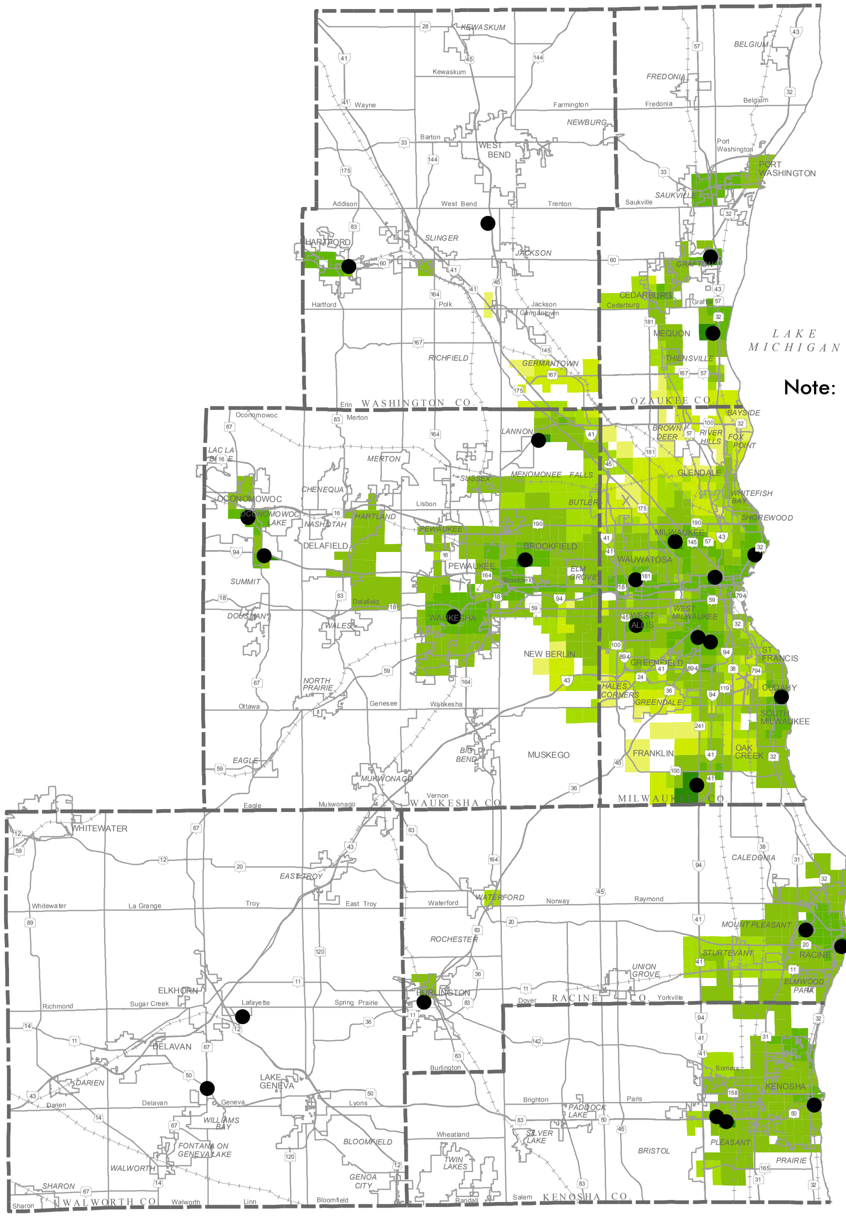
Source: SEWRPC

Auto



Map F.103
Average Peak Travel Time to Health Care Facilities: Alternative II with Highway Improvements

Transit



TRAVEL TIME (MINUTES)

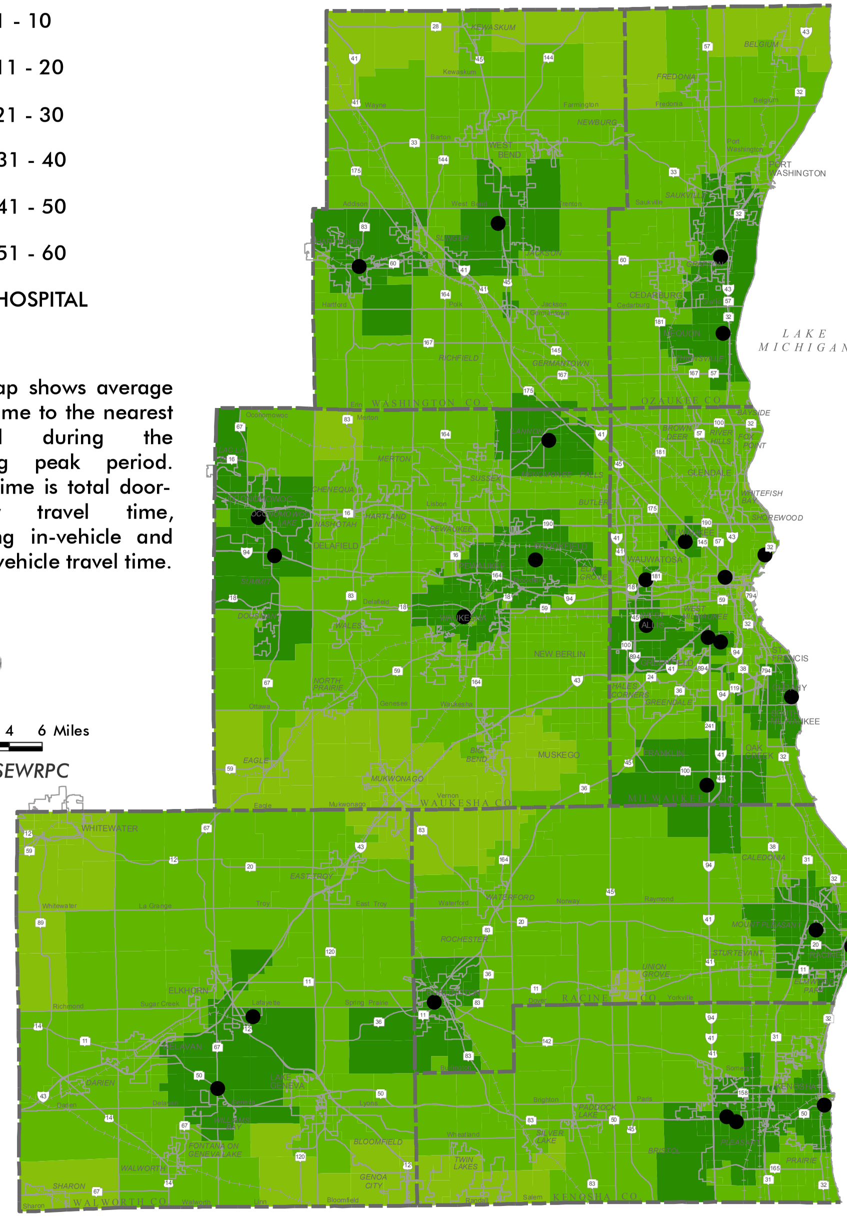
- 1 - 10
- 11 - 20
- 21 - 30
- 31 - 40
- 41 - 50
- 51 - 60
- ● HOSPITAL

Note: This map shows average travel time to the nearest hospital during the morning peak period. Travel time is total door-to-door travel time, including in-vehicle and out-of-vehicle travel time.

0 2 4 6 Miles

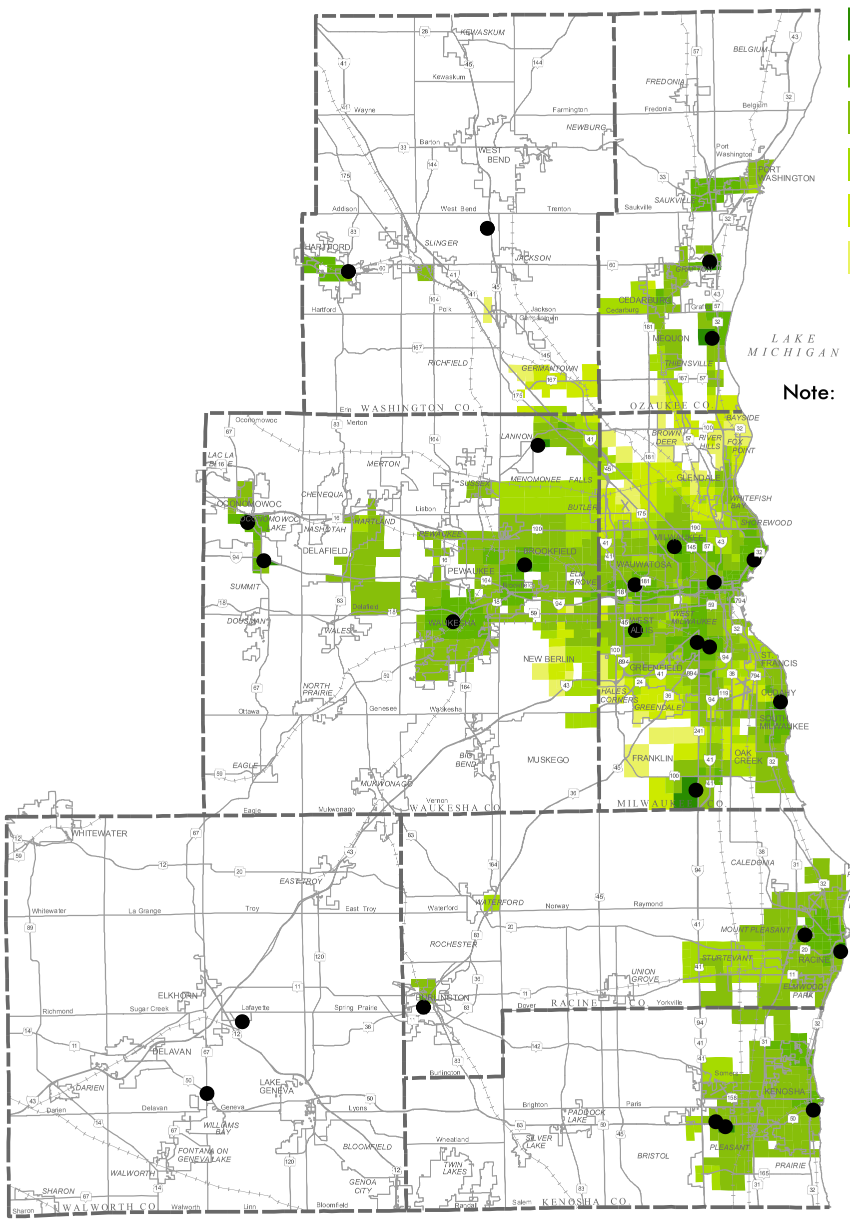
Source: SEWRPC

Auto

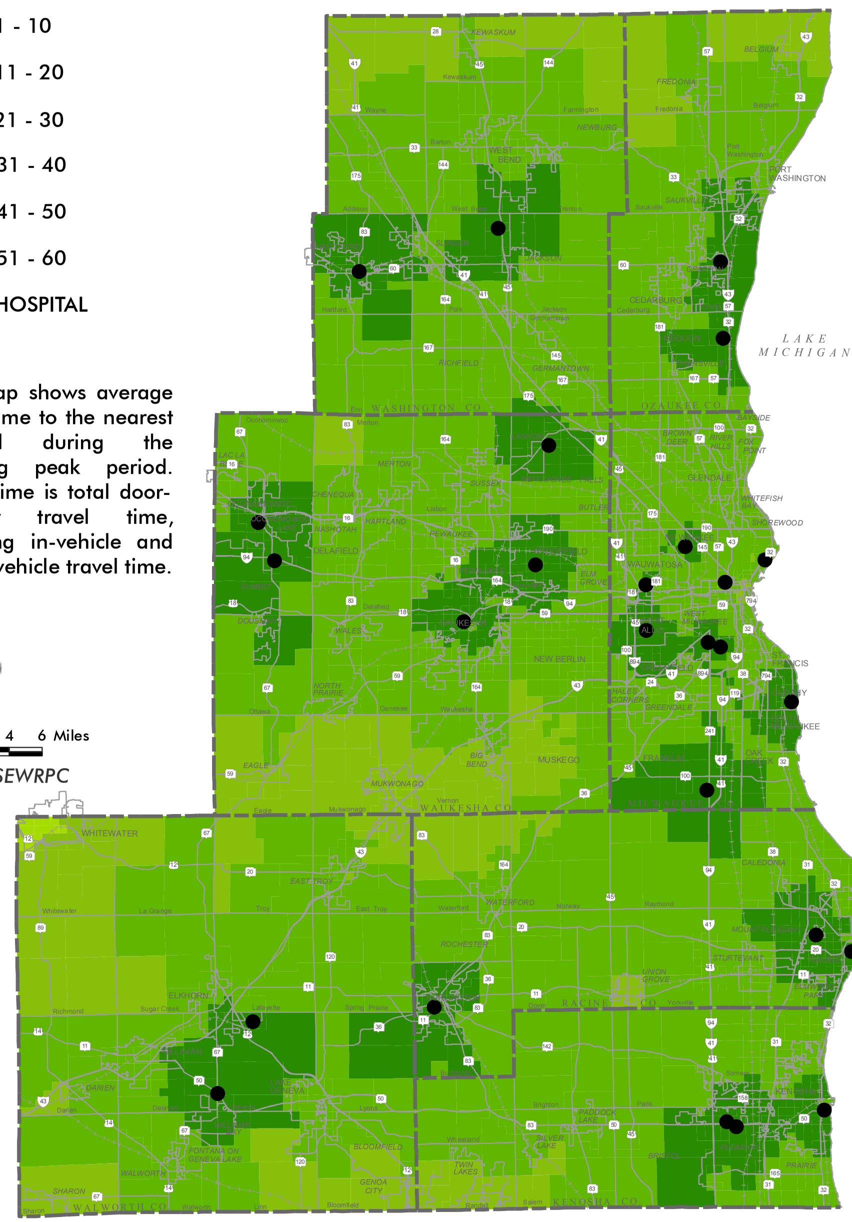


Map F.104
Average Peak Travel Time to Health Care Facilities: Alternative II Without Highway Improvements

Transit



Auto



TRAVEL TIME (MINUTES)

- 1 - 10
- 11 - 20
- 21 - 30
- 31 - 40
- 41 - 50
- 51 - 60
- ● HOSPITAL

Note: This map shows average travel time to the nearest hospital during the morning peak period. Travel time is total door-to-door travel time, including in-vehicle and out-of-vehicle travel time.

0 2 4 6 Miles

Source: SEWRPC

Table F.41
Population Within 30 Minutes of a Grocery Store

Alternative	Total Population Within a 30-Minute Transit Trip of a Grocery Store		Total Population Within a 30-Minute Drive of a Grocery Store	
	Population with Access	Percent of Total Population	Population with Access	Percent of Total Population
Existing - 2011	1,015,400	50.3	2,020,000	100.0
Trend - 2050	981,800	41.7	2,354,000	100.0
Alt I with Highway Improvements - 2050	1,378,100	58.5	2,354,000	100.0
Alt I Without Highway Improvements - 2050	1,378,100	58.5	2,354,000	100.0
Alt II with Highway Improvements - 2050	1,548,200	65.8	2,354,000	100.0
Alt II Without Highway Improvements - 2050	1,548,100	65.8	2,354,000	100.0

Source: SEWRPC

- **Transportation Access to Grocery Stores:** Maps F.105 through F.110 show drive and transit trip times to one of the Region's existing 177 grocery stores, and Table F.41 presents the population that would be within 30 minutes.[44] The entire population of the Region is currently within a 30-minute drive of one of the Region's existing grocery stores. Under all three alternatives, including under Alternatives I and II without highway improvements, the entire population would remain within a 30-minute drive. Depending on the location, drive time to a grocery store would slightly increase or decrease based on the alternative's traffic congestion levels and locations of arterial improvements.

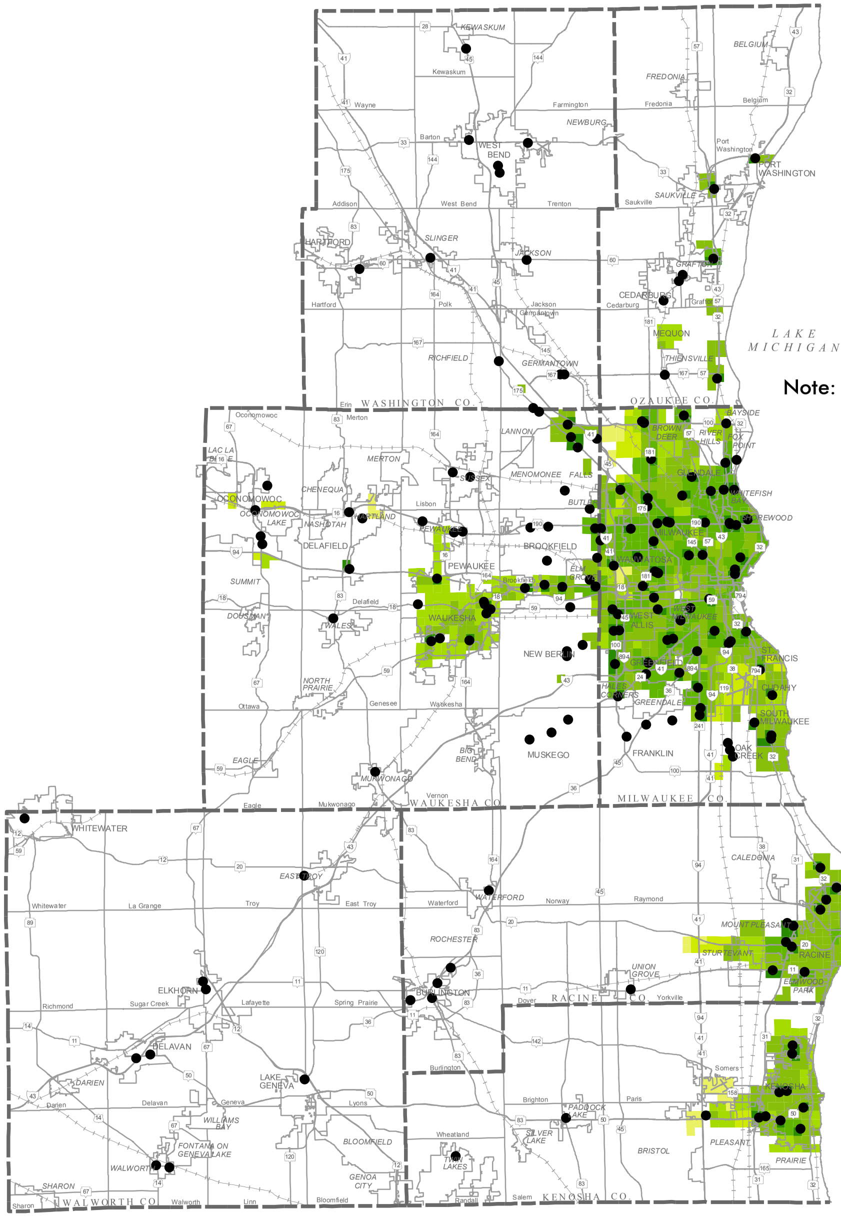
  Due to the declines in transit service levels expected under the Trend, approximately 30,000 fewer residents (3 percent) would be within a 30-minute transit trip of a grocery store compared to today, despite a projected increase in the Region's total population of about 334,000 (17 percent). Compared to the Trend, Alternative I would provide transit service within 30 minutes of a grocery store to about 400,000 additional residents (40 percent more) and under Alternative II this increase would be about 570,000 additional residents (58 percent more). Not including highway improvements under Alternatives I and II would not change or would slightly reduce these numbers.

  Another important consideration for grocery store access is whether residents are within a reasonable walking travel time to a grocery store. This criterion's analyses do not lend themselves to estimating changes in travel time to each grocery store under the alternatives because the alternatives would not affect walk speeds and cannot determine where future grocery stores will be located (this criterion's analyses are based on the locations of existing grocery stores). However, anticipating that residents in more walkable neighborhoods would be more likely to live within walking distance to a grocery store, the number of people living in walkable areas could be used as a proxy for access to grocery stores by walking. As described in Criterion 1.1.1 (Number of People Living in Walkable Areas), Alternative II would have the most people living in walkable areas (863,000)—12 percent more than Alternative I (770,000) and 19 percent more than the Trend (725,000). Therefore, more residents would be expected to have walk access to a grocery store under Alternative II, followed by Alternative I, then the Trend.

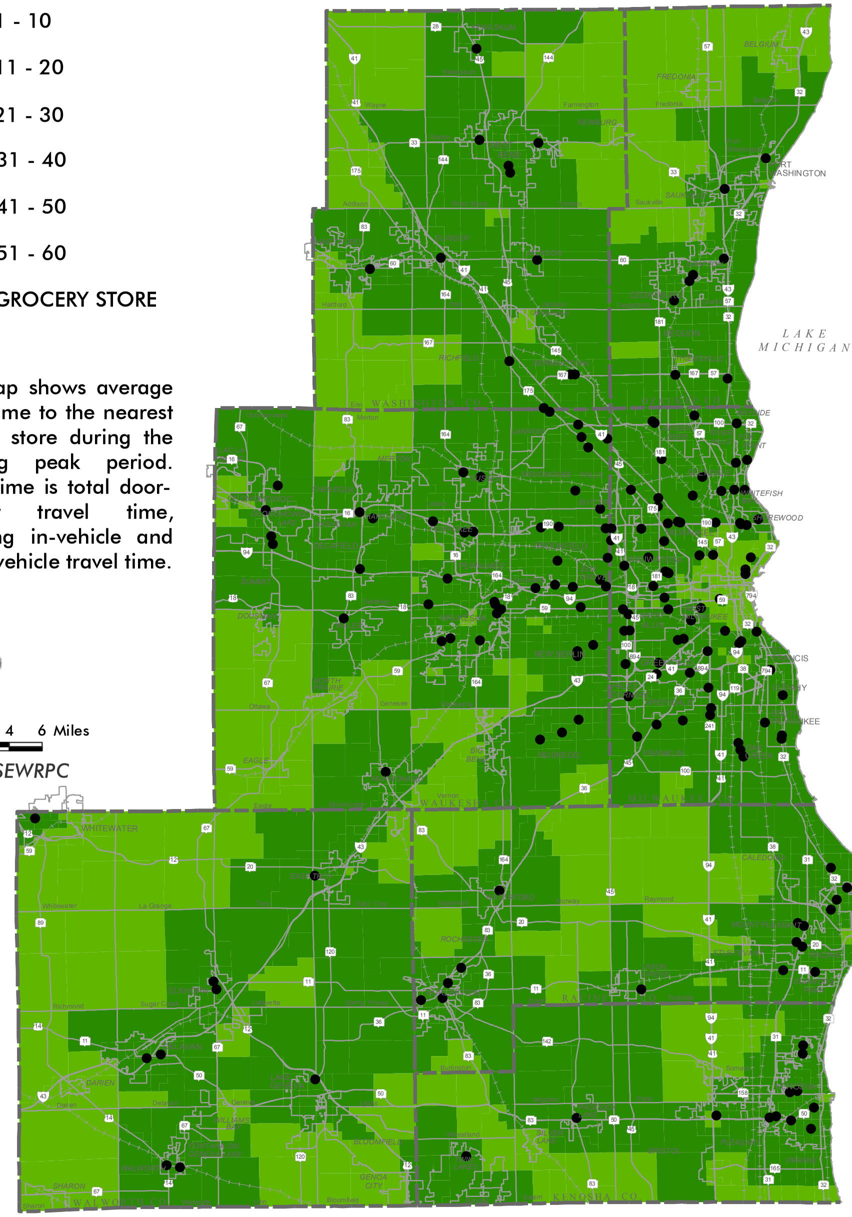
[44] *For this criterion, only grocery stores having at least 50,000 square feet were analyzed.*

Map F.105
Average Peak Travel Time to Grocery Stores: Existing

Transit



Auto



TRAVEL TIME (MINUTES)

- 1 - 10
- 11 - 20
- 21 - 30
- 31 - 40
- 41 - 50
- 51 - 60
- ● GROCERY STORE

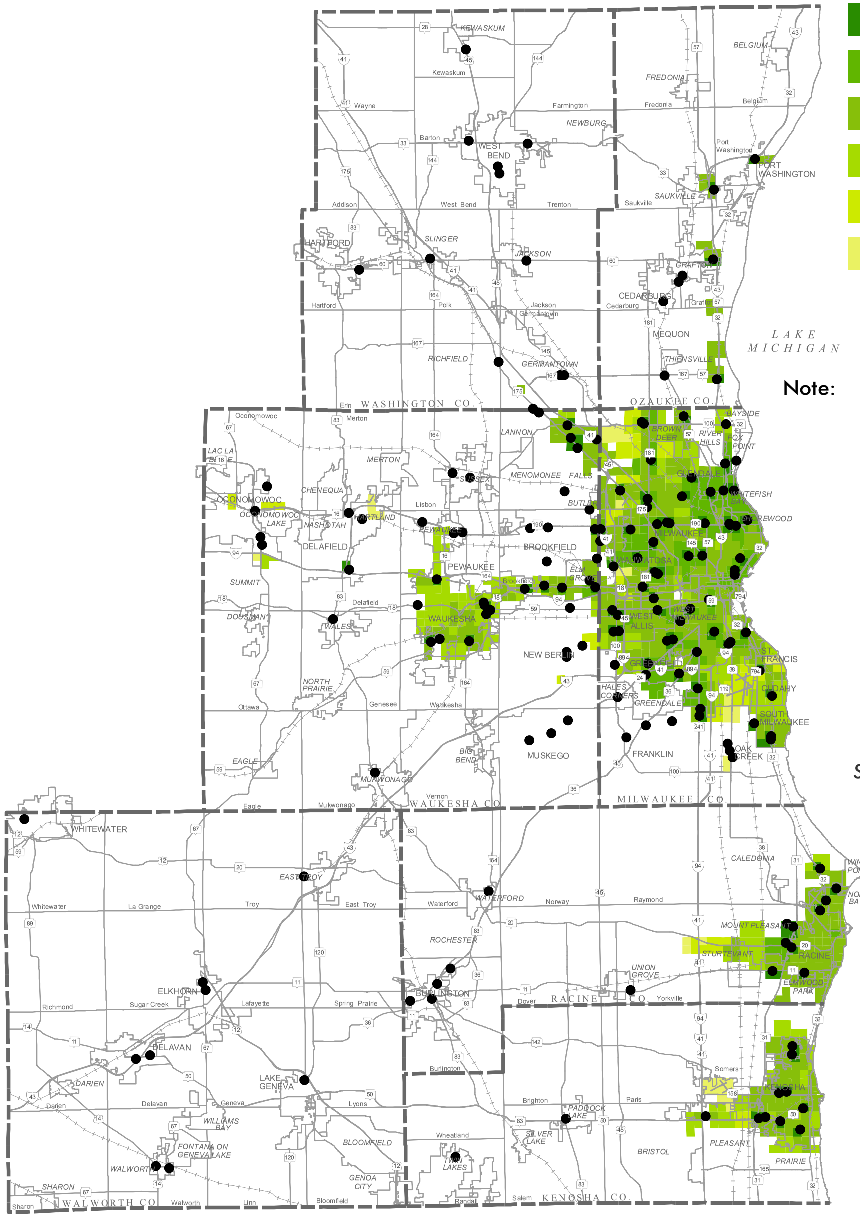
Note: This map shows average travel time to the nearest grocery store during the morning peak period. Travel time is total door-to-door travel time, including in-vehicle and out-of-vehicle travel time.

0 2 4 6 Miles

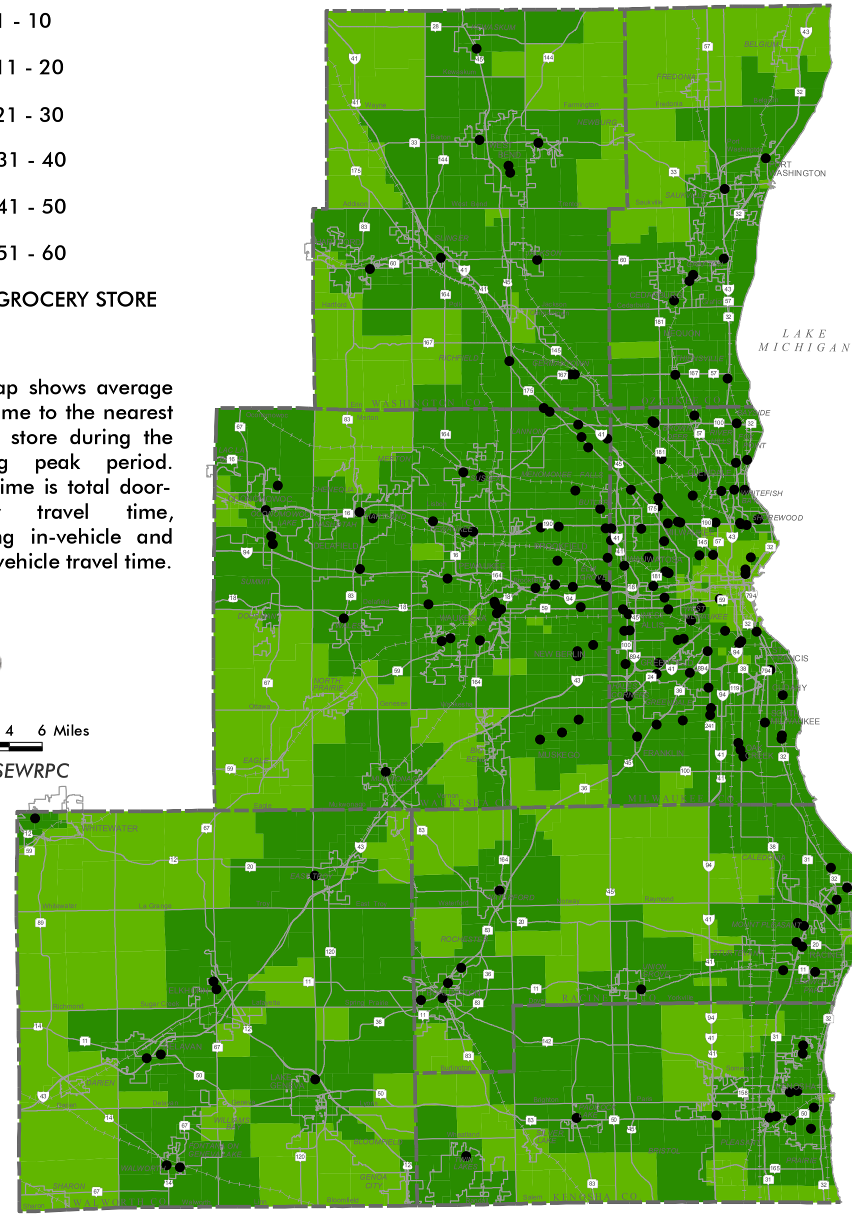
Source: SEWRPC

Map F.106
Average Peak Travel Time to Grocery Stores: Trend

Transit



Auto



TRAVEL TIME (MINUTES)

- 1 - 10
- 11 - 20
- 21 - 30
- 31 - 40
- 41 - 50
- 51 - 60
- ● GROCERY STORE

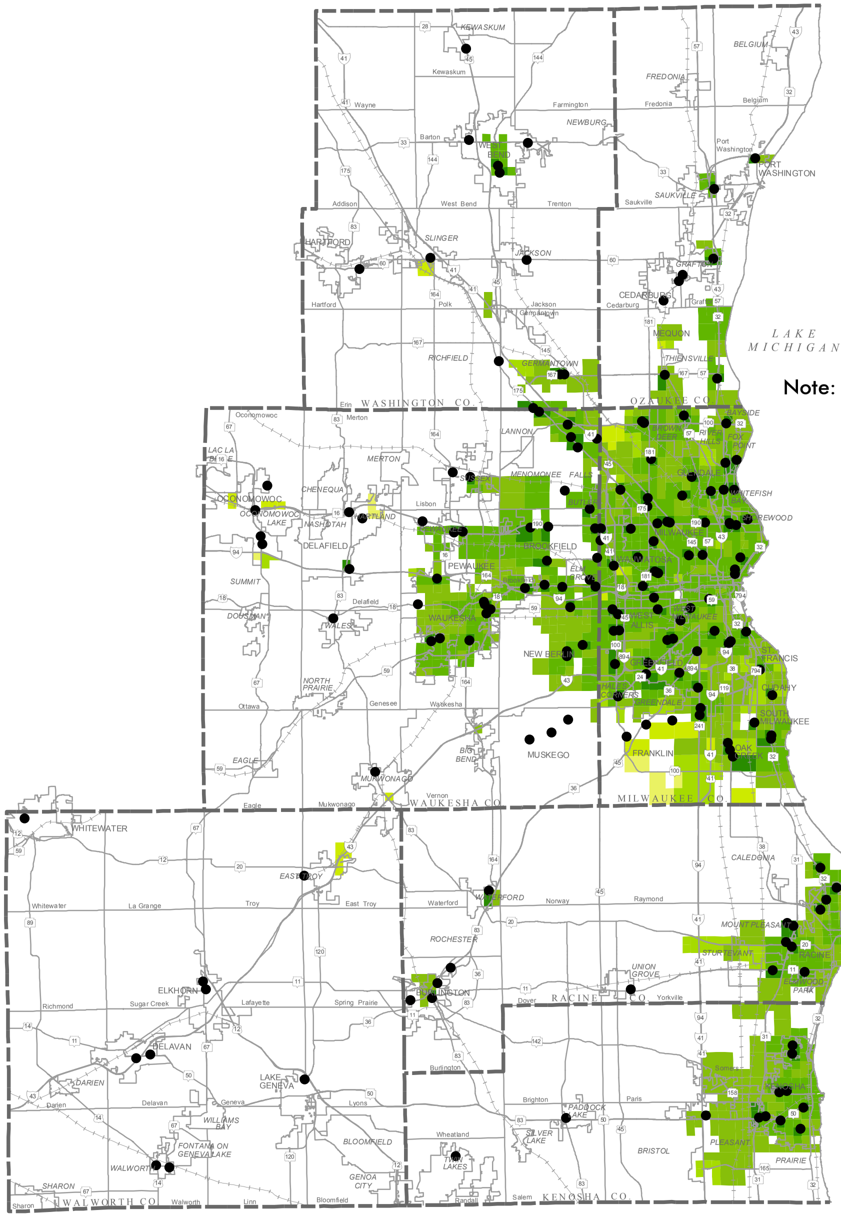
Note: This map shows average travel time to the nearest grocery store during the morning peak period. Travel time is total door-to-door travel time, including in-vehicle and out-of-vehicle travel time.

0 2 4 6 Miles

Source: SEWRPC

Map F.107
Average Peak Travel Time to Grocery Stores: Alternative I with Highway Improvements

Transit



TRAVEL TIME (MINUTES)

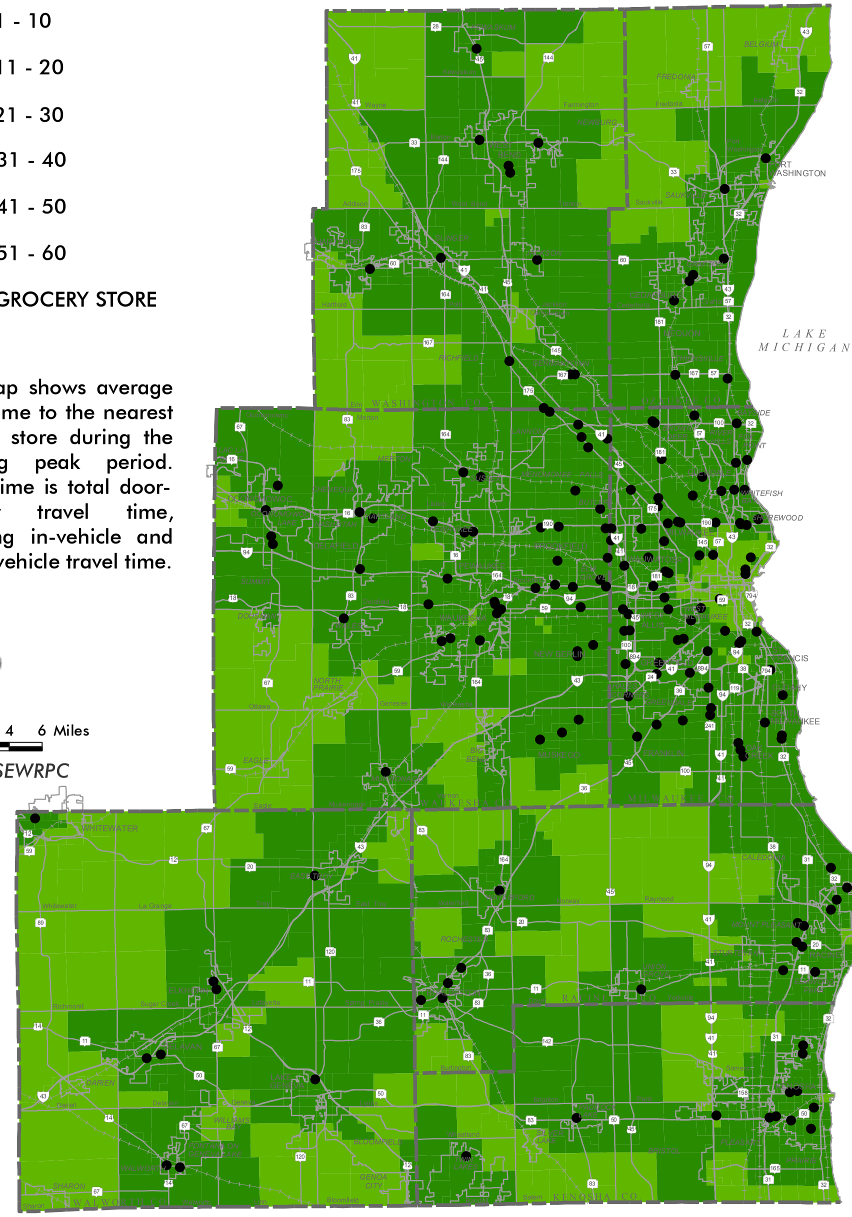
- 1 - 10
- 11 - 20
- 21 - 30
- 31 - 40
- 41 - 50
- 51 - 60
- ● GROCERY STORE

Note: This map shows average travel time to the nearest grocery store during the morning peak period. Travel time is total door-to-door travel time, including in-vehicle and out-of-vehicle travel time.

0 2 4 6 Miles

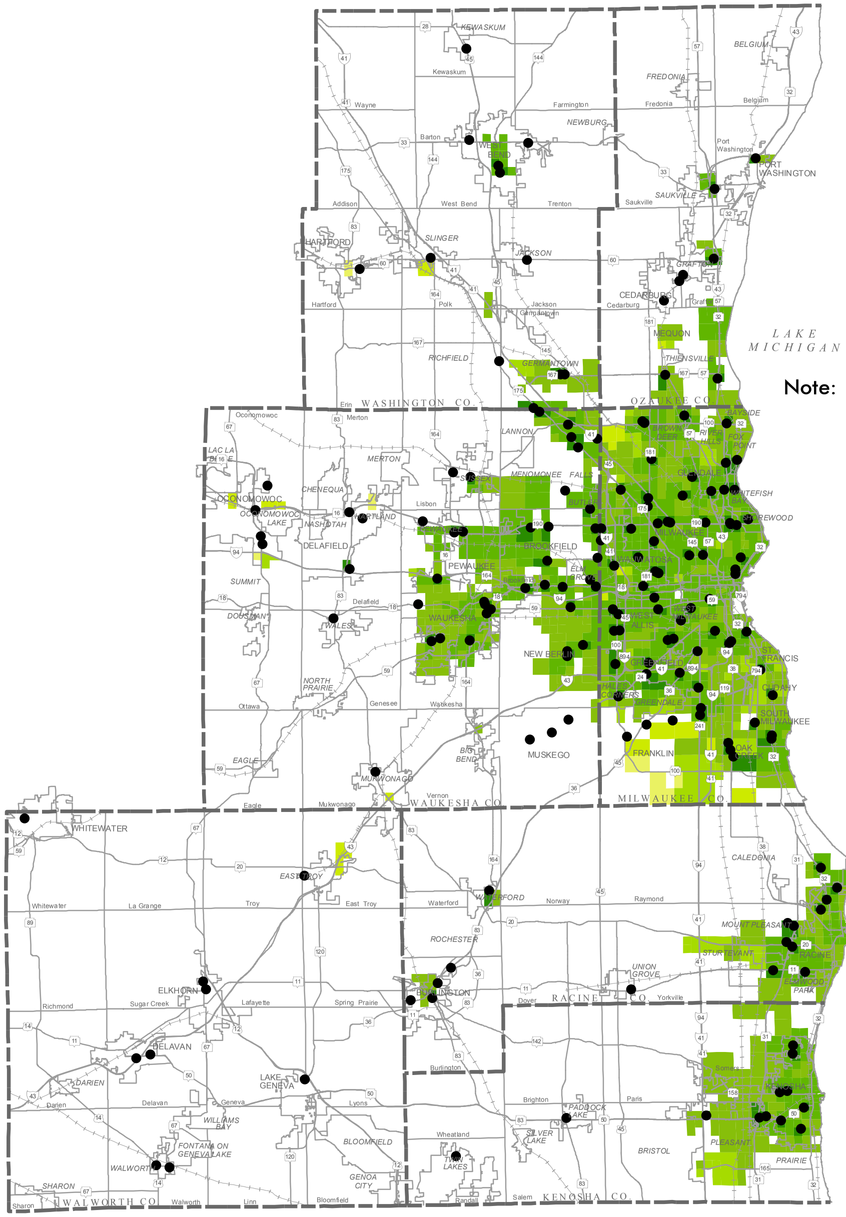
Source: SEWRPC

Auto

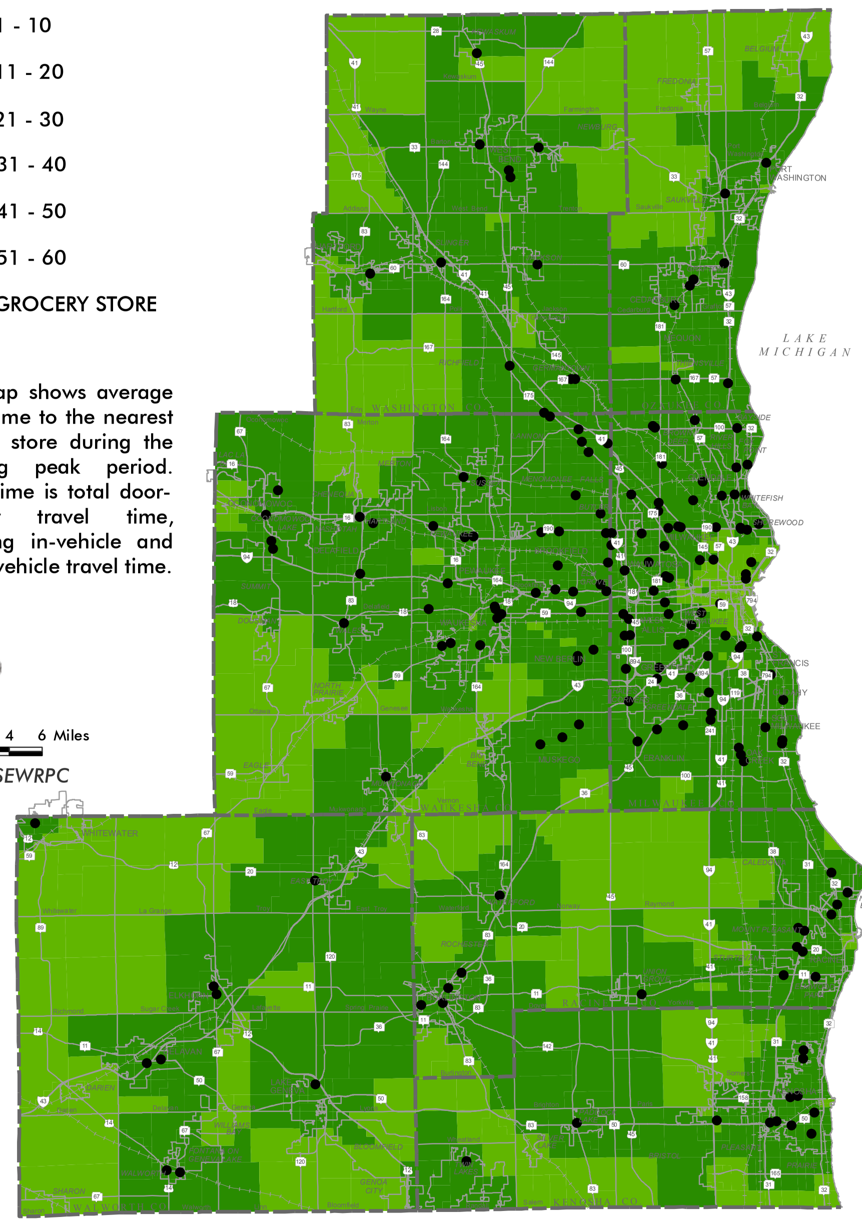


Map F.108
Average Peak Travel Time to Grocery Stores: Alternative I Without Highway Improvements

Transit



Auto



TRAVEL TIME (MINUTES)

- 1 - 10
- 11 - 20
- 21 - 30
- 31 - 40
- 41 - 50
- 51 - 60
- ● GROCERY STORE

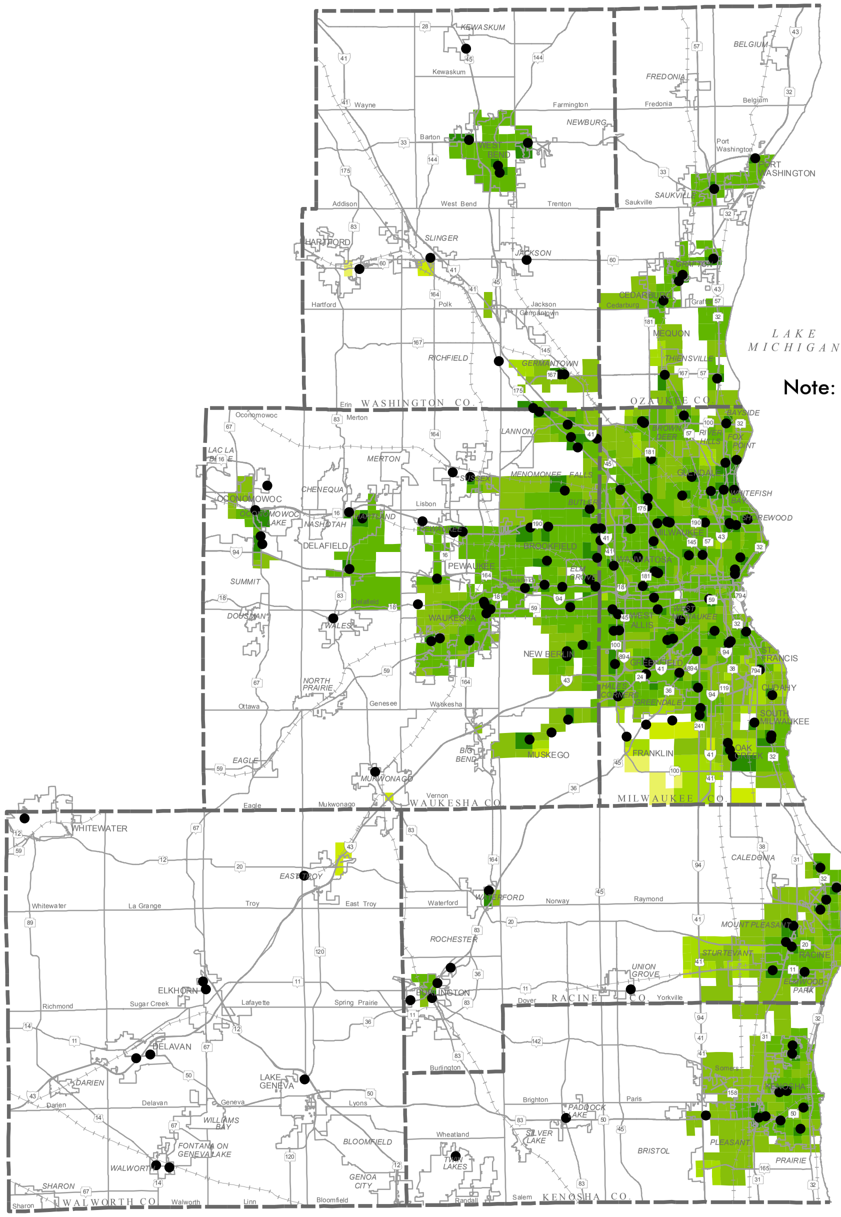
Note: This map shows average travel time to the nearest grocery store during the morning peak period. Travel time is total door-to-door travel time, including in-vehicle and out-of-vehicle travel time.

0 2 4 6 Miles

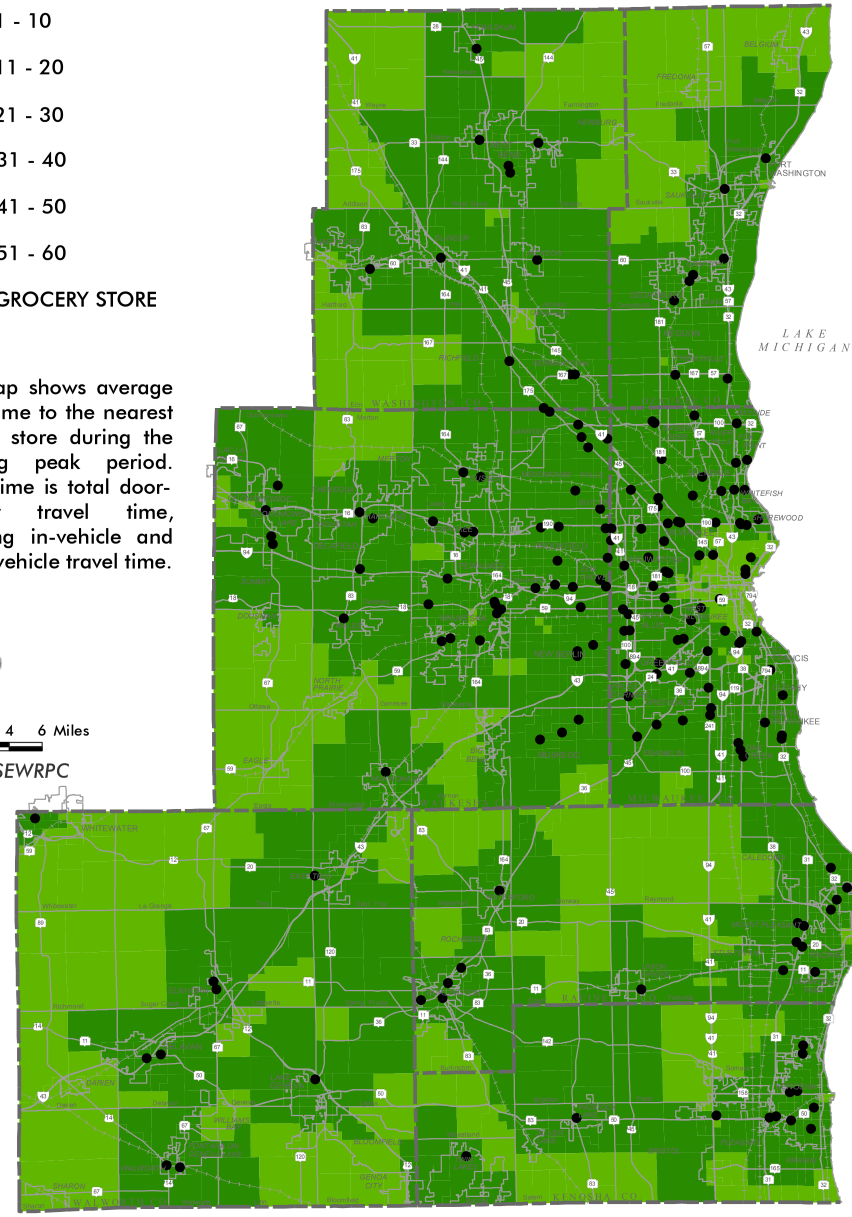
Source: SEWRPC

Map F.109
Average Peak Travel Time to Grocery Stores: Alternative II with Highway Improvements

Transit



Auto



TRAVEL TIME (MINUTES)

- 1 - 10
- 11 - 20
- 21 - 30
- 31 - 40
- 41 - 50
- 51 - 60
- ● GROCERY STORE

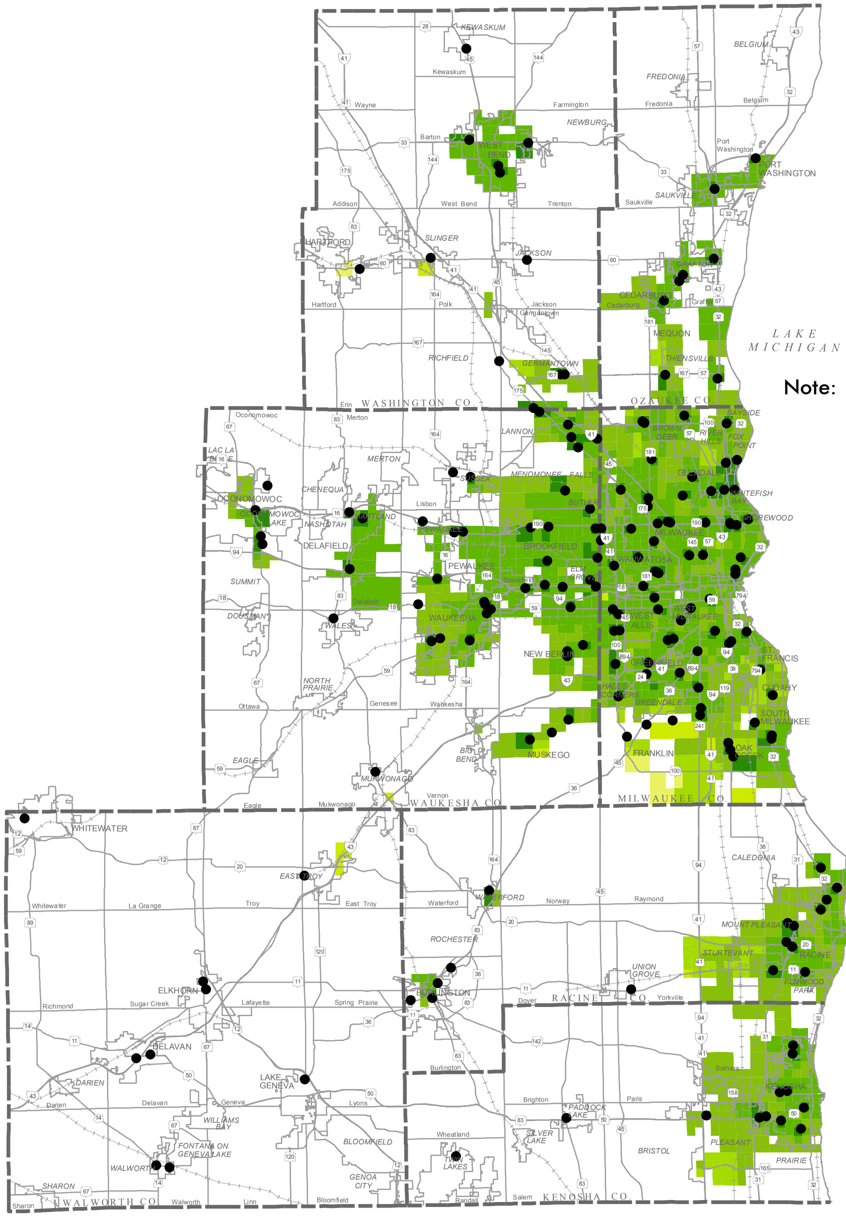
Note: This map shows average travel time to the nearest grocery store during the morning peak period. Travel time is total door-to-door travel time, including in-vehicle and out-of-vehicle travel time.

0 2 4 6 Miles

Source: SEWRPC

Map F.110
Average Peak Travel Time to Grocery Stores: Alternative II Without Highway Improvements

Transit



TRAVEL TIME (MINUTES)

- 1 - 10
- 11 - 20
- 21 - 30
- 31 - 40
- 41 - 50
- 51 - 60
- ● GROCERY STORE

Note: This map shows average travel time to the nearest grocery store during the morning peak period. Travel time is total door-to-door travel time, including in-vehicle and out-of-vehicle travel time.

0 2 4 6 Miles

Source: SEWRPC

Auto

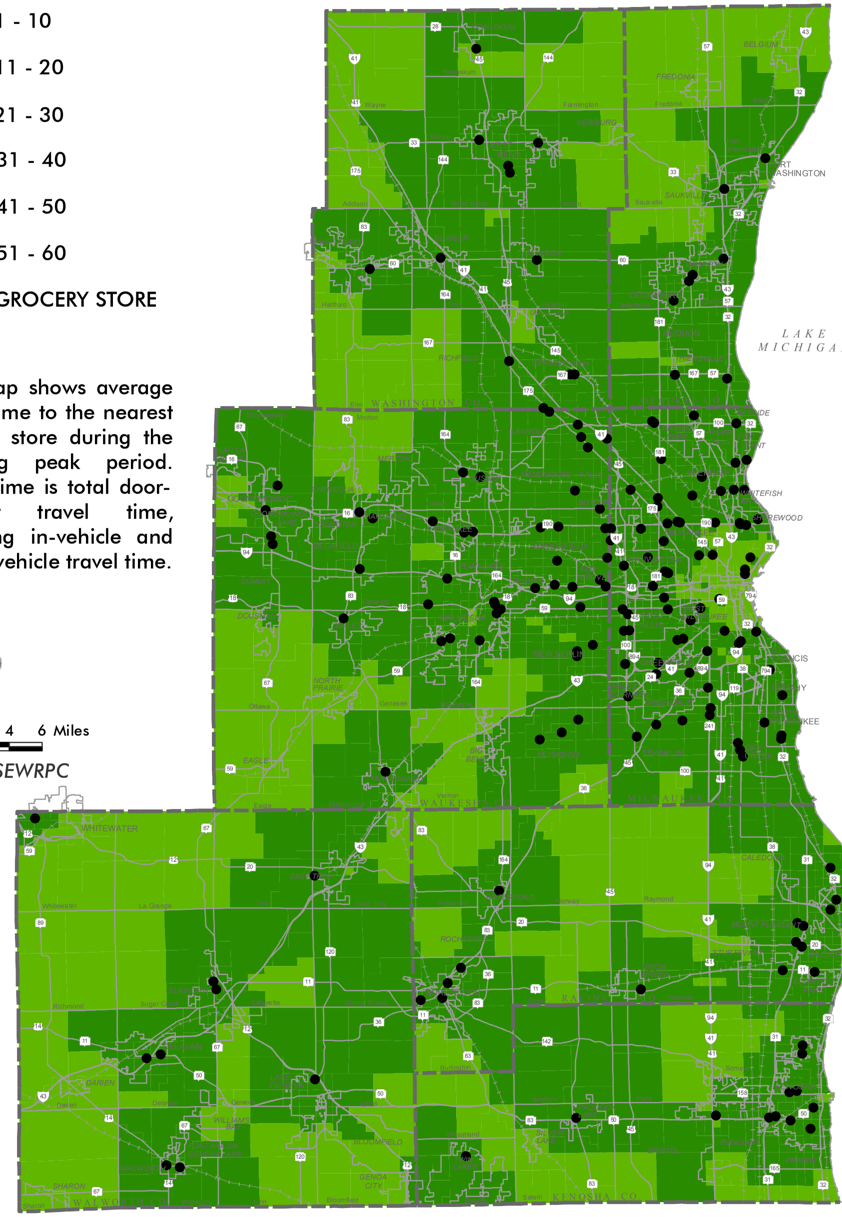


Table F.42
Population Within 60 Minutes of the Milwaukee Regional Medical Center

Alternative	Total Population Within a 60-Minute Transit Trip of the Milwaukee Regional Medical Center		Total Population Within a 60-Minute Drive of the Milwaukee Regional Medical Center	
	Population with Access	Percent of Total Population	Population with Access	Percent of Total Population
Existing - 2011	343,400	17.0	1,792,600	88.7
Trend - 2050	288,700	12.3	2,059,800	87.5
Alt I with Highway Improvements - 2050	647,200	27.5	2,078,500	88.3
Alt I Without Highway Improvements - 2050	635,800	27.0	2,034,700	86.4
Alt II with Highway Improvements - 2050	1,017,100	43.2	2,074,300	88.1
Alt II Without Highway Improvements - 2050	1,006,600	42.8	2,045,400	86.9

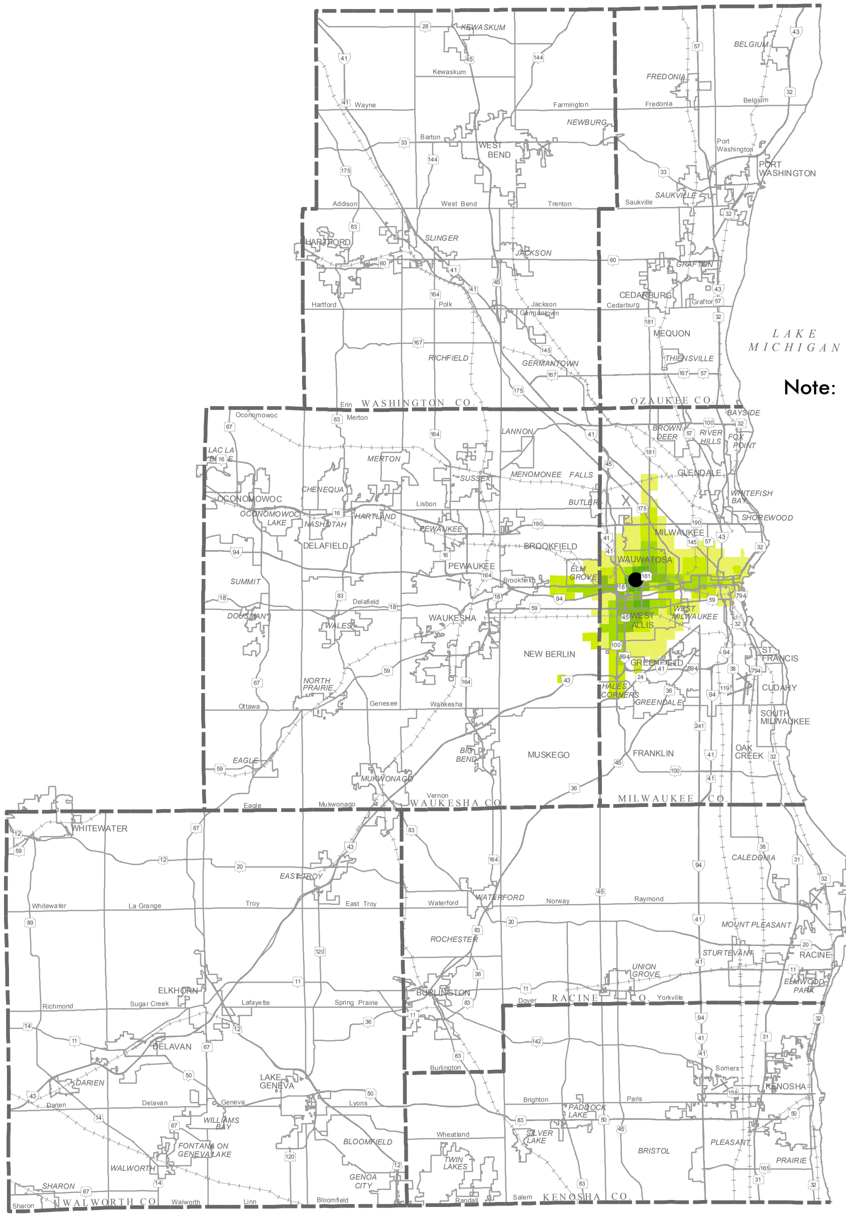
Source: SEWRPC

- **Transportation Access to the Milwaukee Regional Medical Center:** Maps F.111 through F.116 show drive and transit trip times to MRMC, and Table F.42 presents the population that would be within 60 minutes of MRMC. Population within 60 minutes, rather than within 30 minutes, was estimated for MRMC in recognition of the fact that MRMC tends to attract trips from a much larger area than other destinations in the Region. About 89 percent of the Region's population is currently within a 60-minute drive of MRMC. This proportion would remain at about 88 percent under the alternatives, with Alternatives I and II slightly higher than the Trend primarily due to the more compact development patterns envisioned under the two alternative plans compared to the Trend. Depending on the location, drive time to MRMC would slightly increase or decrease based on the alternative's traffic congestion levels and locations of arterial improvements. Not including highway improvements (except for currently committed highway expansion projects and freeway modernization) under Alternatives I and II would slightly lower the percent of the population within a 60-minute drive.

  Due to the declines in transit service levels expected under the Trend, approximately 50,000 fewer residents (16 percent) would be within a 60-minute transit trip of MRMC compared to today, despite a projected increase in the Region's total population of about 334,000 (17 percent). Compared to the Trend, Alternative I would provide transit service within 60 minutes of MRMC to about 360,000 additional residents (124 percent more) and under Alternative II this increase would be about 730,000 additional residents (252 percent more). Not including highway improvements under Alternatives I and II would slightly reduce these numbers.

Map F.111
Average Peak Travel Time to the Milwaukee Regional Medical Center: Existing

Transit



TRAVEL TIME (MINUTES)

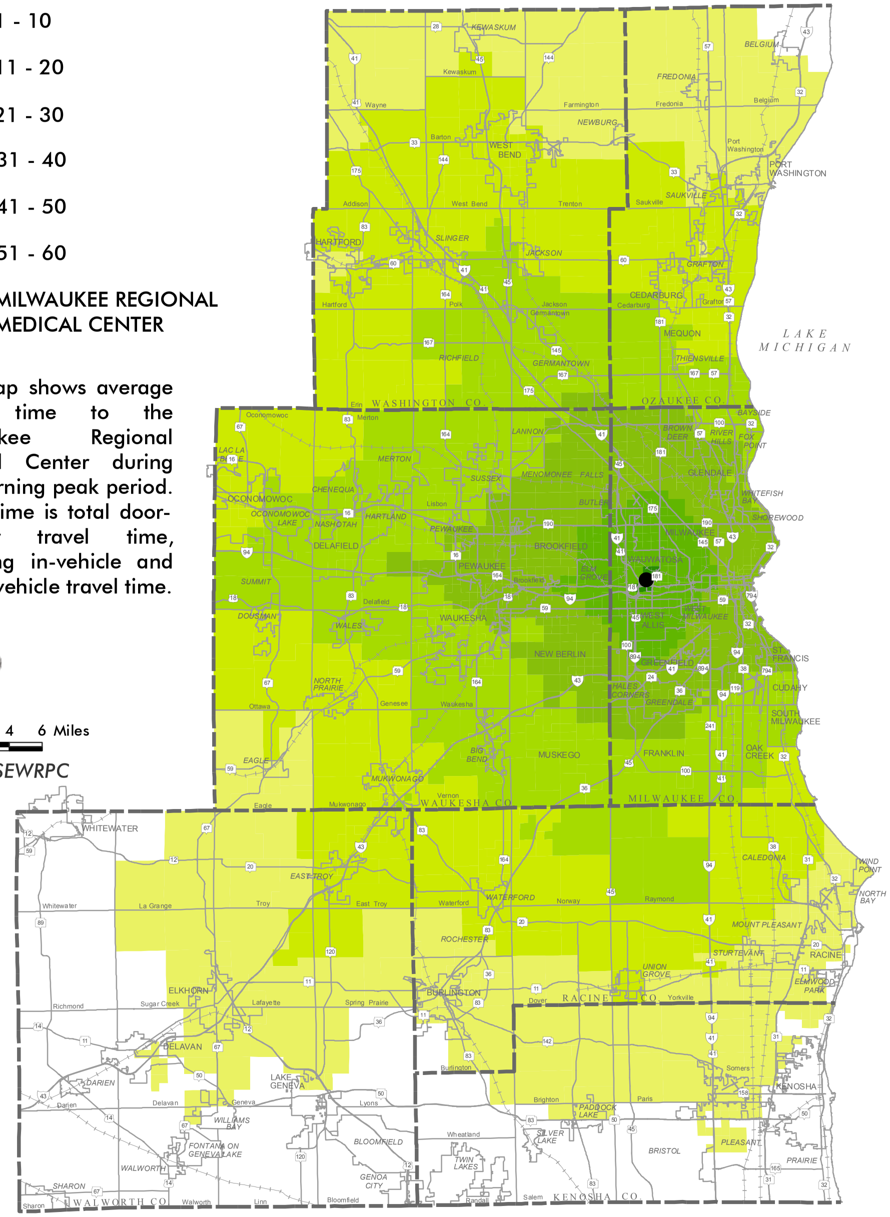
- 1 - 10
- 11 - 20
- 21 - 30
- 31 - 40
- 41 - 50
- 51 - 60
- ● MILWAUKEE REGIONAL MEDICAL CENTER

Note: This map shows average travel time to the Milwaukee Regional Medical Center during the morning peak period. Travel time is total door-to-door travel time, including in-vehicle and out-of-vehicle travel time.

0 2 4 6 Miles

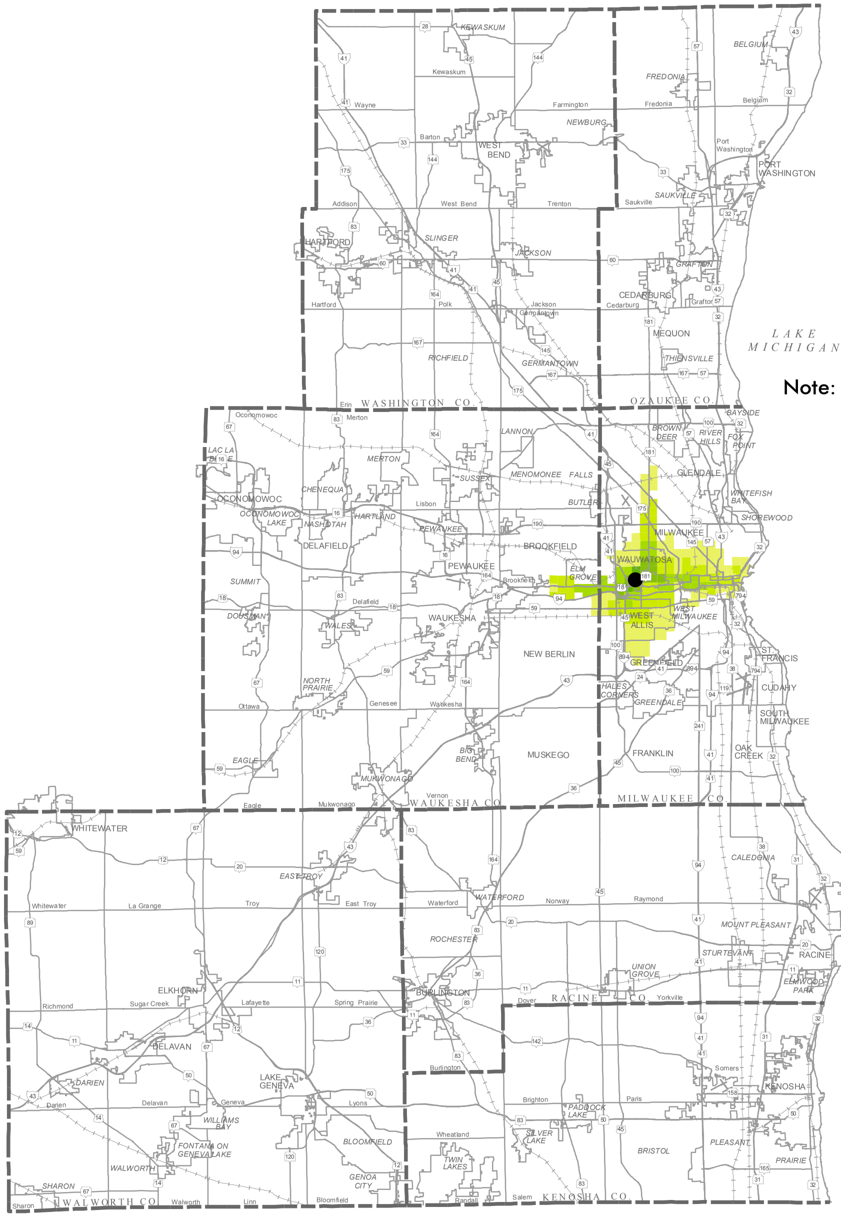
Source: SEWRPC

Auto

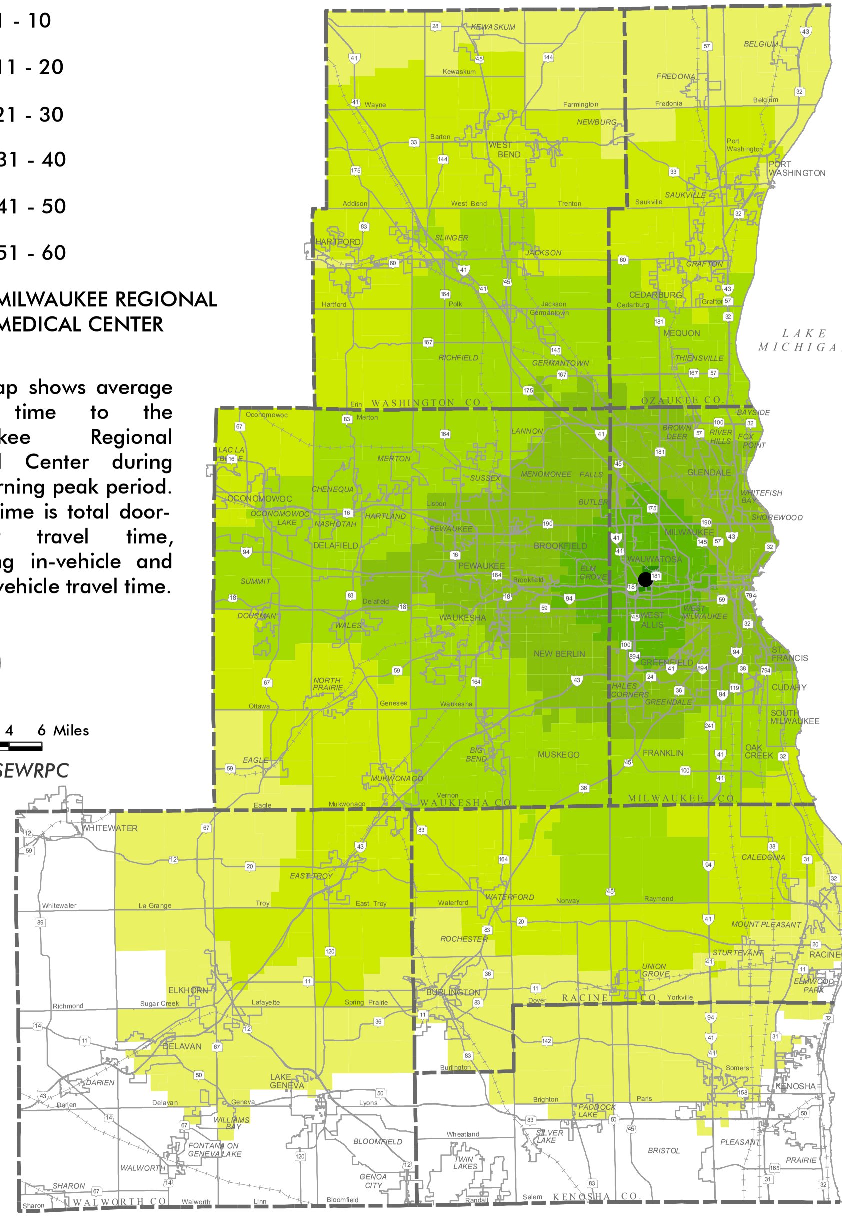


Map F.112
Average Peak Travel Time to the Milwaukee Regional Medical Center: Trend

Transit



Auto



TRAVEL TIME (MINUTES)

- 1 - 10
- 11 - 20
- 21 - 30
- 31 - 40
- 41 - 50
- 51 - 60
- ● MILWAUKEE REGIONAL MEDICAL CENTER

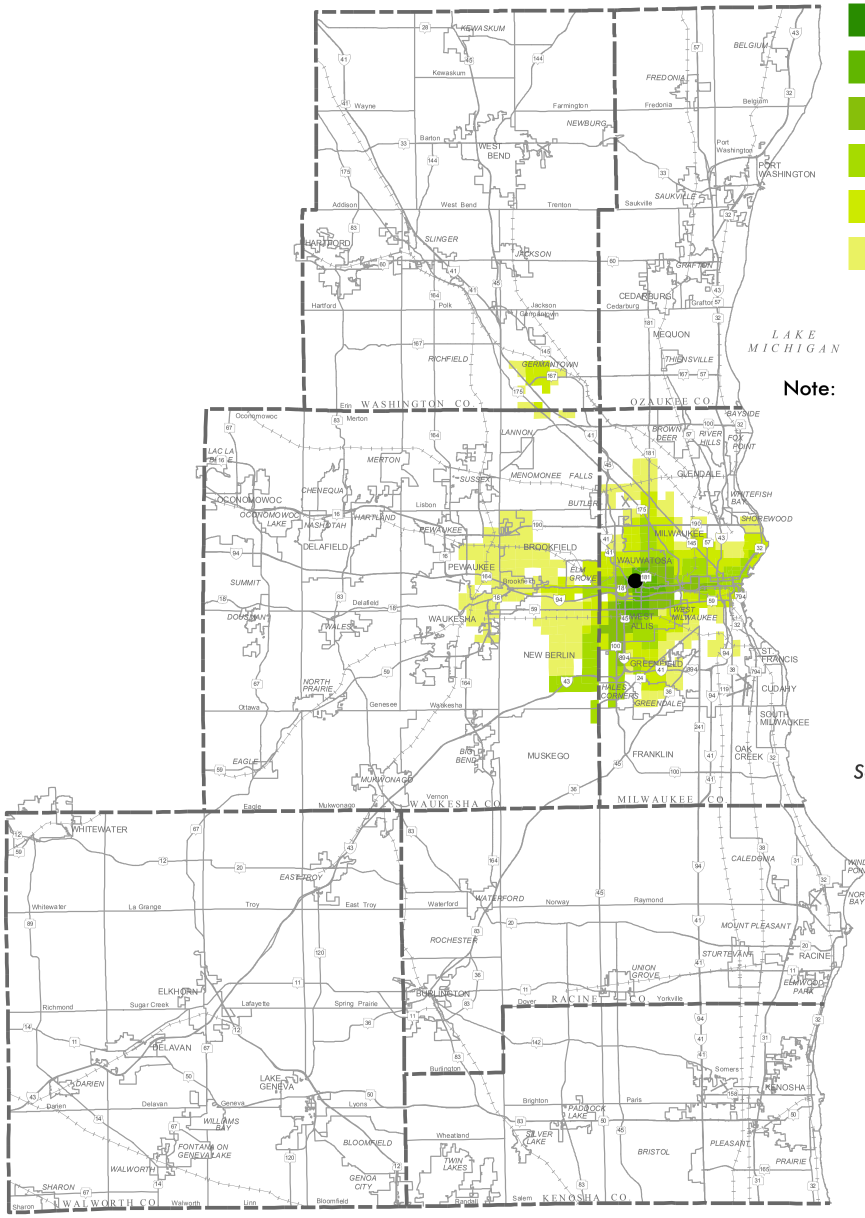
Note: This map shows average travel time to the Milwaukee Regional Medical Center during the morning peak period. Travel time is total door-to-door travel time, including in-vehicle and out-of-vehicle travel time.

0 2 4 6 Miles

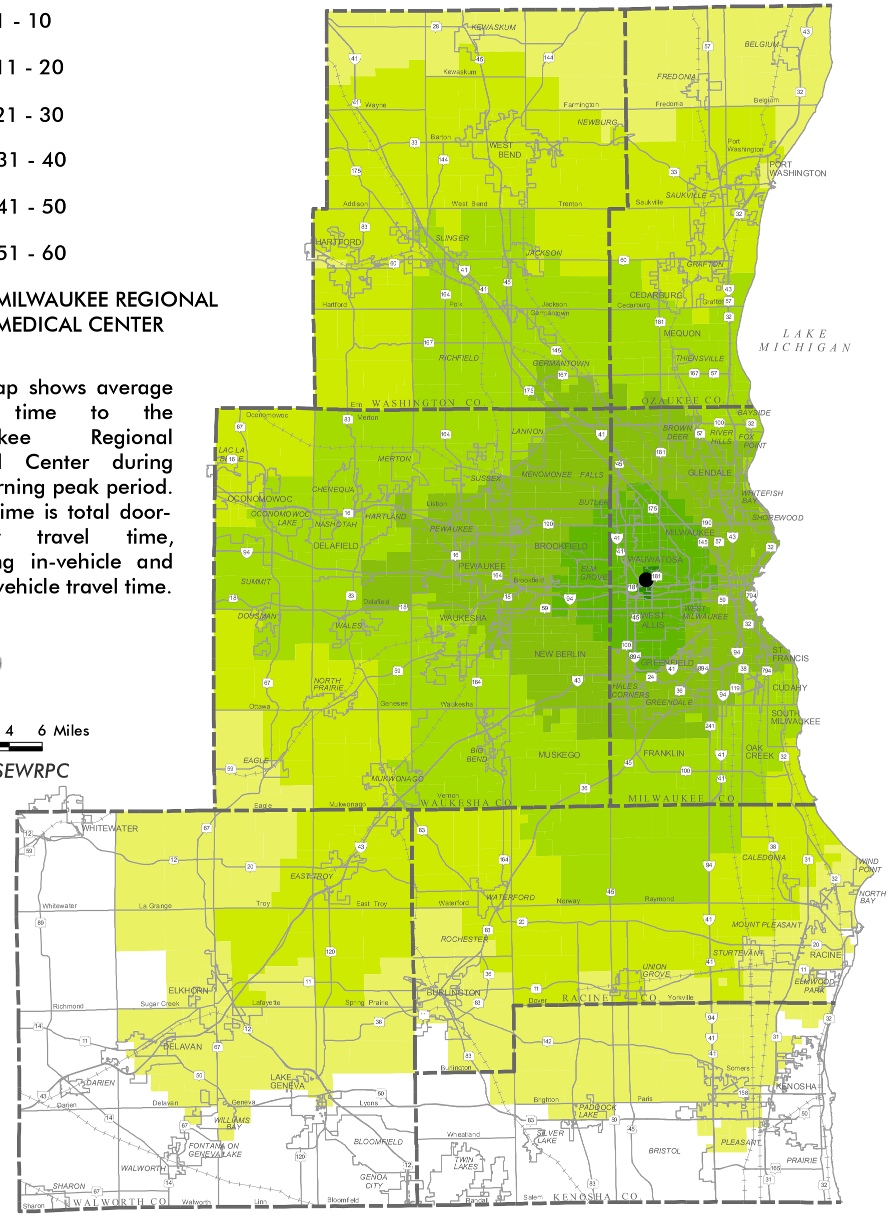
Source: SEWRPC

Map F.113
Average Peak Travel Time to the Milwaukee Regional Medical Center: Alternative I with Highway Improvements

Transit



Auto



TRAVEL TIME (MINUTES)

- 1 - 10
- 11 - 20
- 21 - 30
- 31 - 40
- 41 - 50
- 51 - 60
- ● MILWAUKEE REGIONAL MEDICAL CENTER

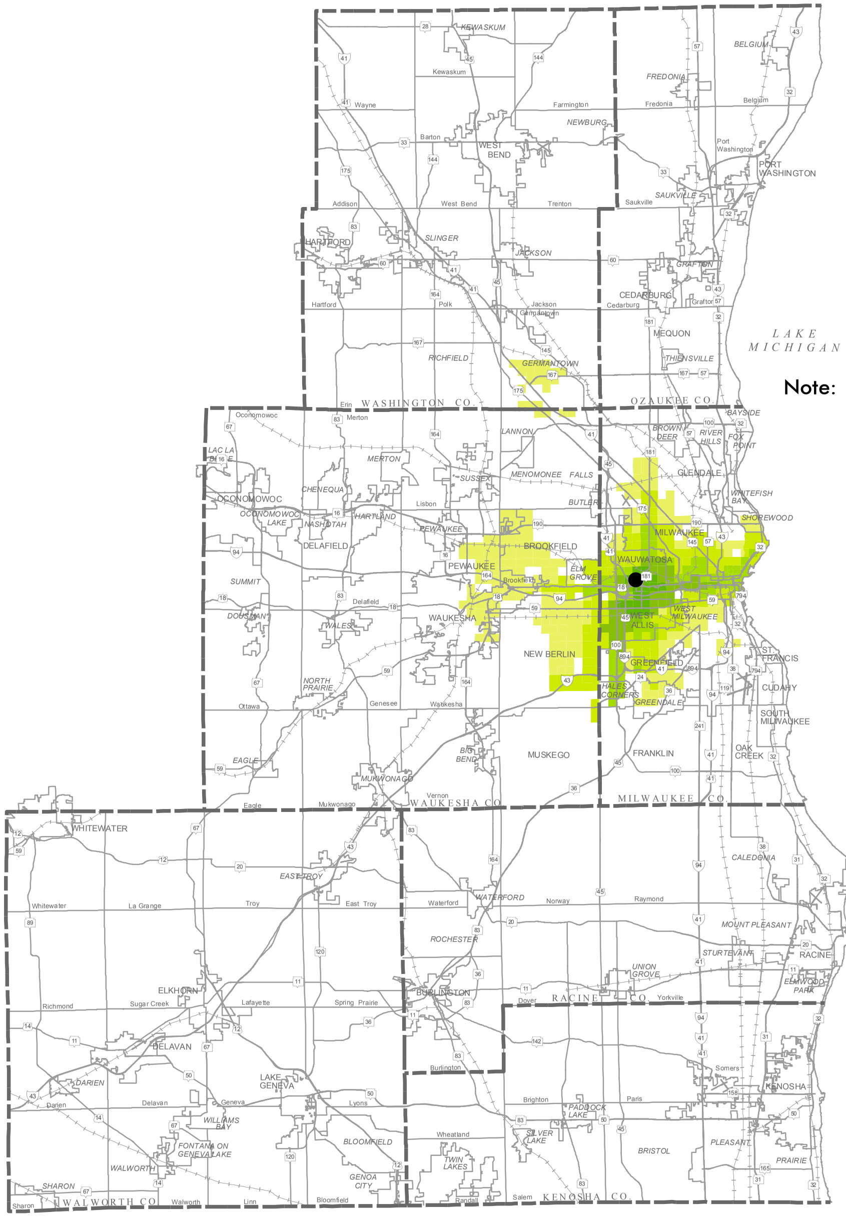
Note: This map shows average travel time to the Milwaukee Regional Medical Center during the morning peak period. Travel time is total door-to-door travel time, including in-vehicle and out-of-vehicle travel time.

0 2 4 6 Miles

Source: SEWRPC

Map F.114

Average Peak Travel Time to the Milwaukee Regional Medical Center: Alternative I Without Highway Improvements



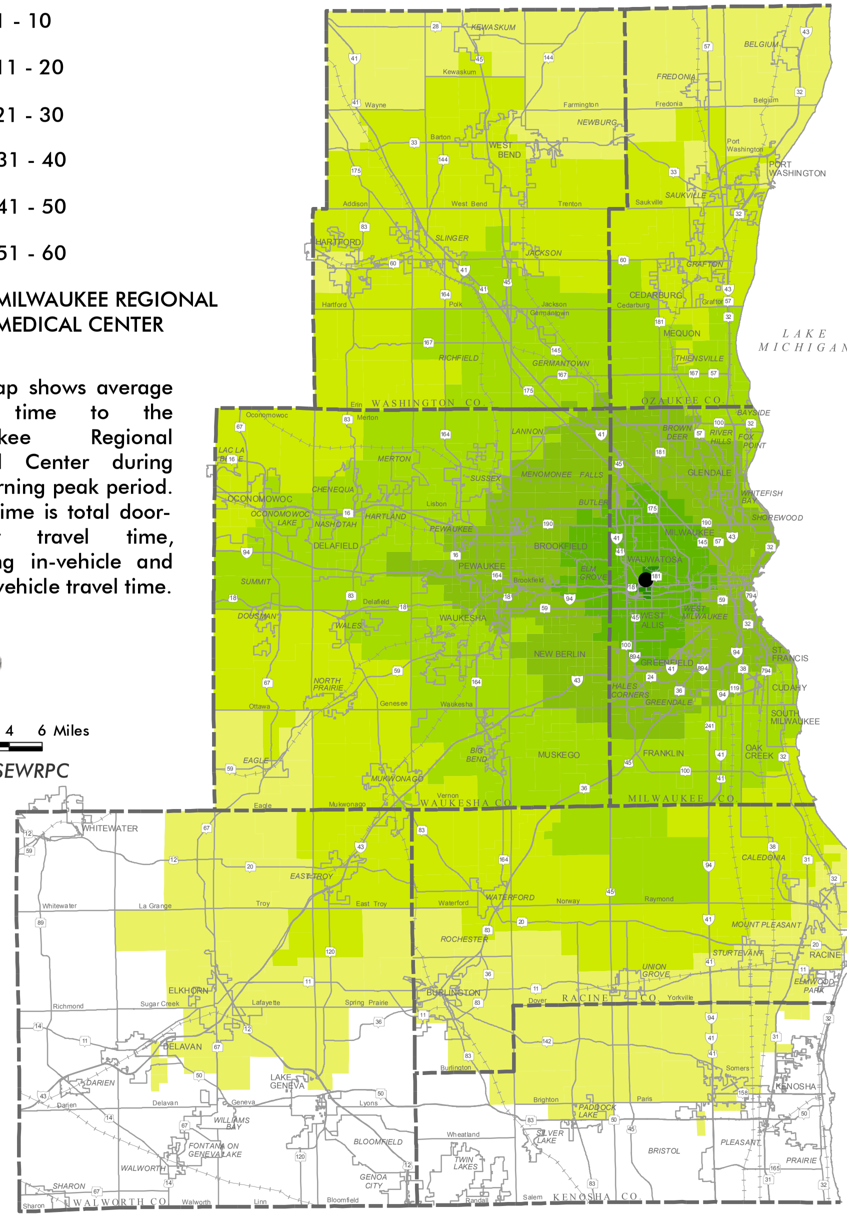
TRAVEL TIME (MINUTES)

- 1 - 10
- 11 - 20
- 21 - 30
- 31 - 40
- 41 - 50
- 51 - 60
- ● MILWAUKEE REGIONAL MEDICAL CENTER

Note: This map shows average travel time to the Milwaukee Regional Medical Center during the morning peak period. Travel time is total door-to-door travel time, including in-vehicle and out-of-vehicle travel time.

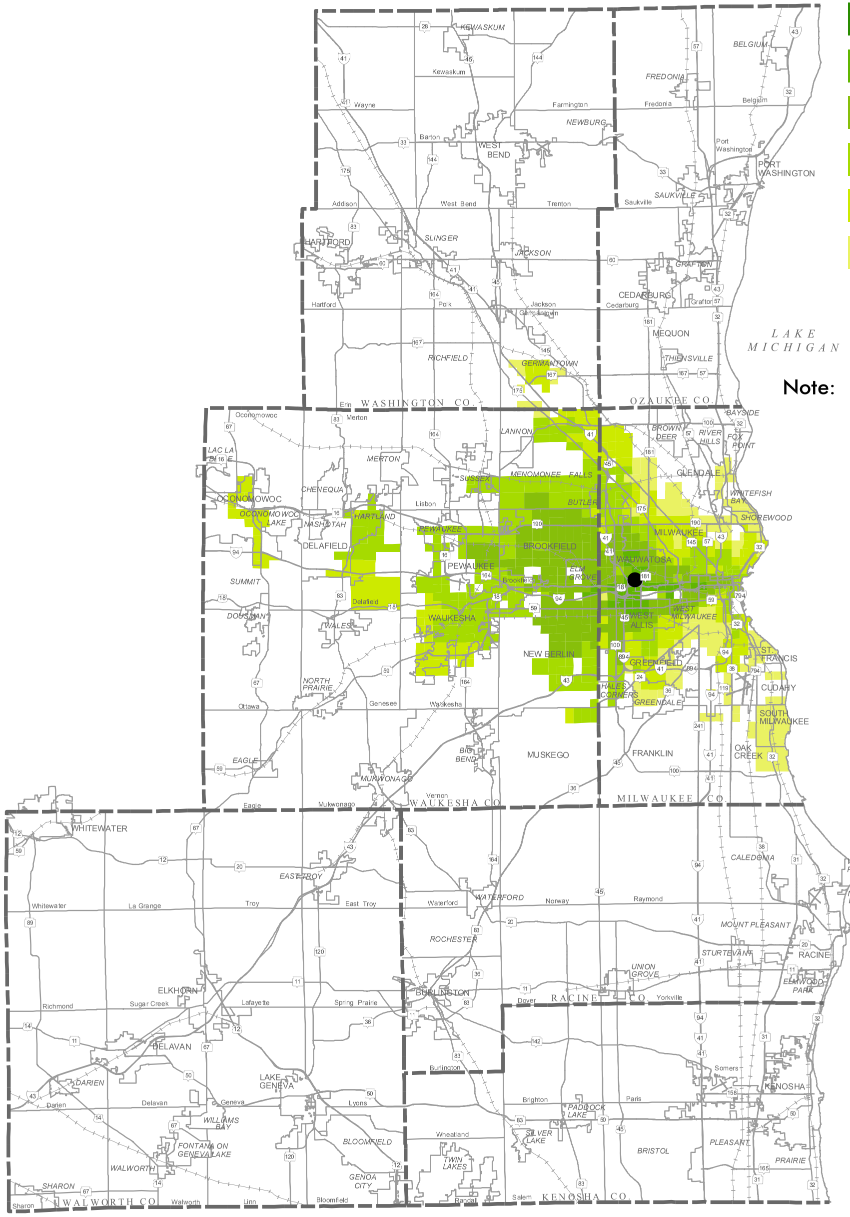
0 2 4 6 Miles

Source: SEWRPC



Map F.115
Average Peak Travel Time to the Milwaukee Regional Medical Center: Alternative II with Highway Improvements

Transit



TRAVEL TIME (MINUTES)

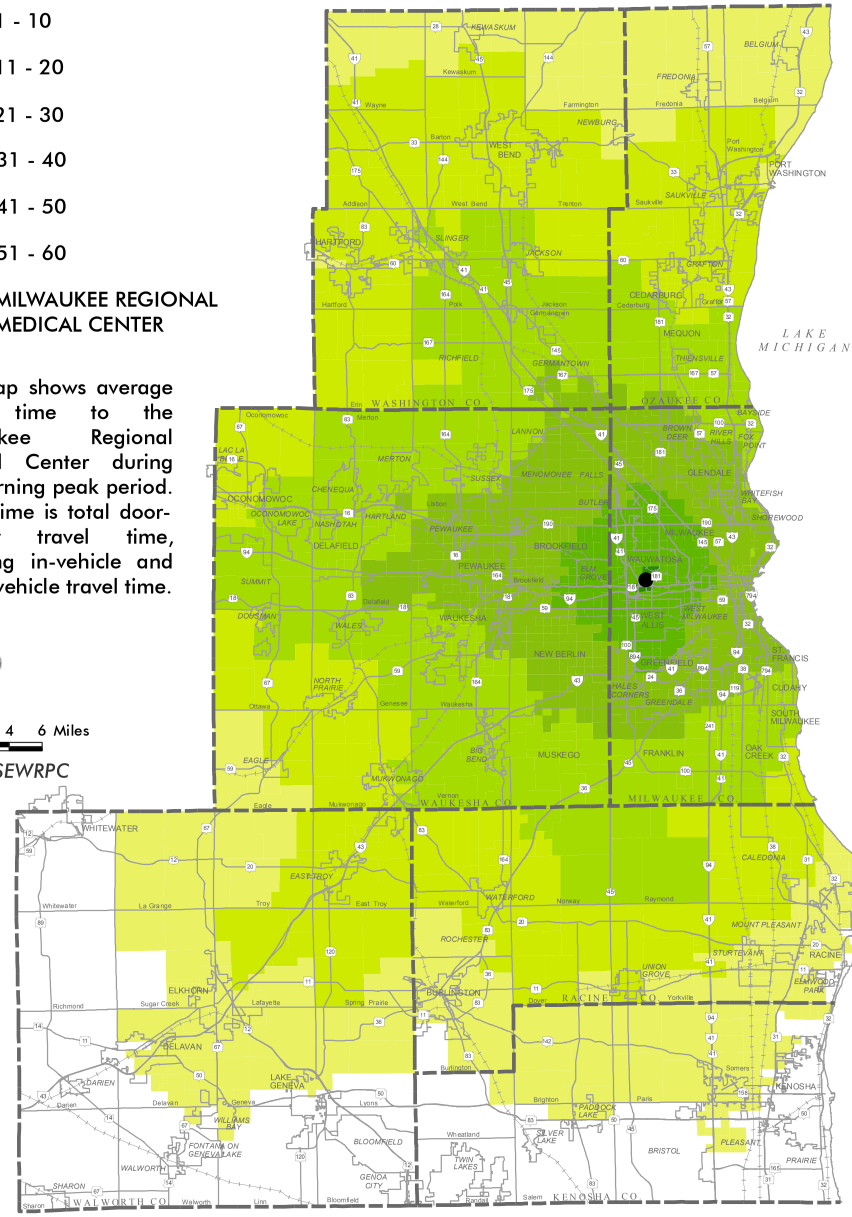
- 1 - 10
- 11 - 20
- 21 - 30
- 31 - 40
- 41 - 50
- 51 - 60
- ● MILWAUKEE REGIONAL MEDICAL CENTER

Note: This map shows average travel time to the Milwaukee Regional Medical Center during the morning peak period. Travel time is total door-to-door travel time, including in-vehicle and out-of-vehicle travel time.

0 2 4 6 Miles

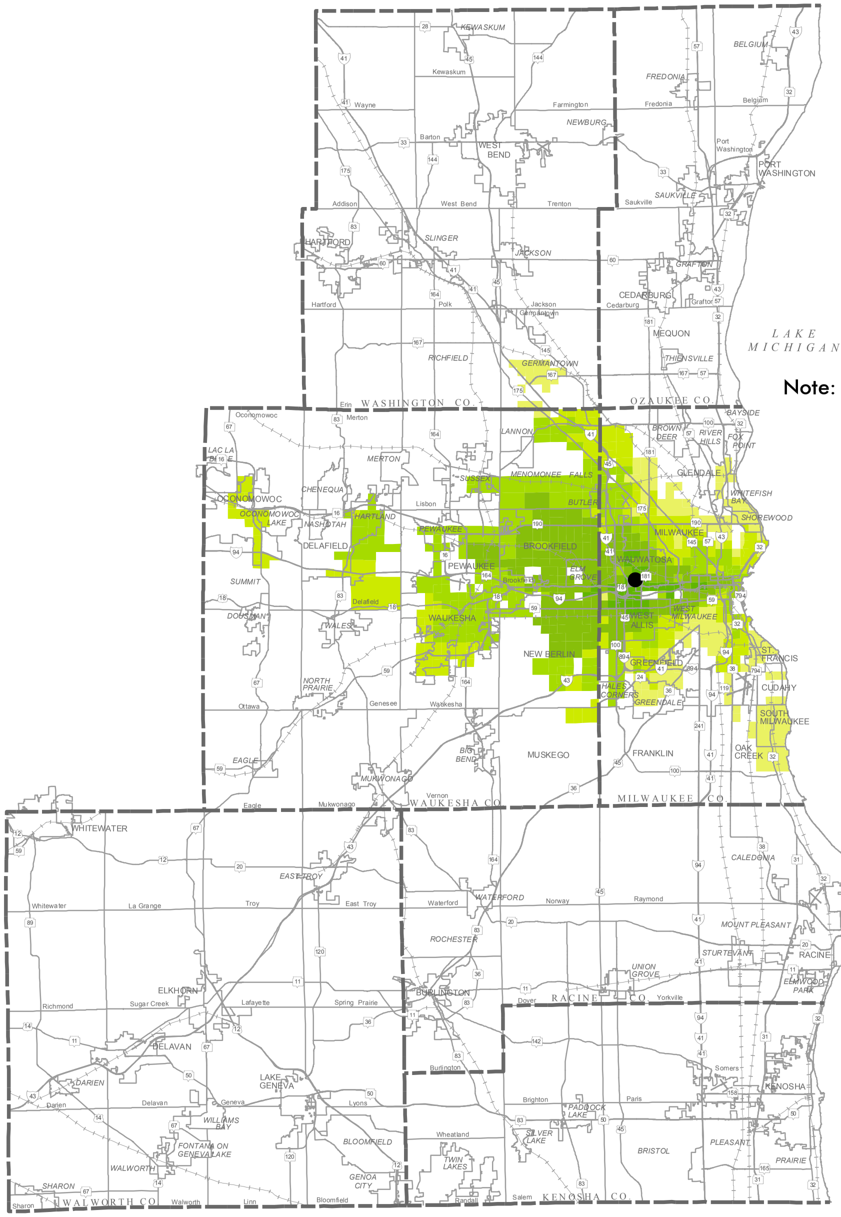
Source: SEWRPC

Auto



Map F.116
Average Peak Travel Time to the Milwaukee Regional Medical Center: Alternative II Without Highway Improvements

Transit



TRAVEL TIME (MINUTES)

- 1 - 10
- 11 - 20
- 21 - 30
- 31 - 40
- 41 - 50
- 51 - 60
- ● MILWAUKEE REGIONAL MEDICAL CENTER

Note: This map shows average travel time to the Milwaukee Regional Medical Center during the morning peak period. Travel time is total door-to-door travel time, including in-vehicle and out-of-vehicle travel time.

0 2 4 6 Miles

Source: SEWRPC

Auto

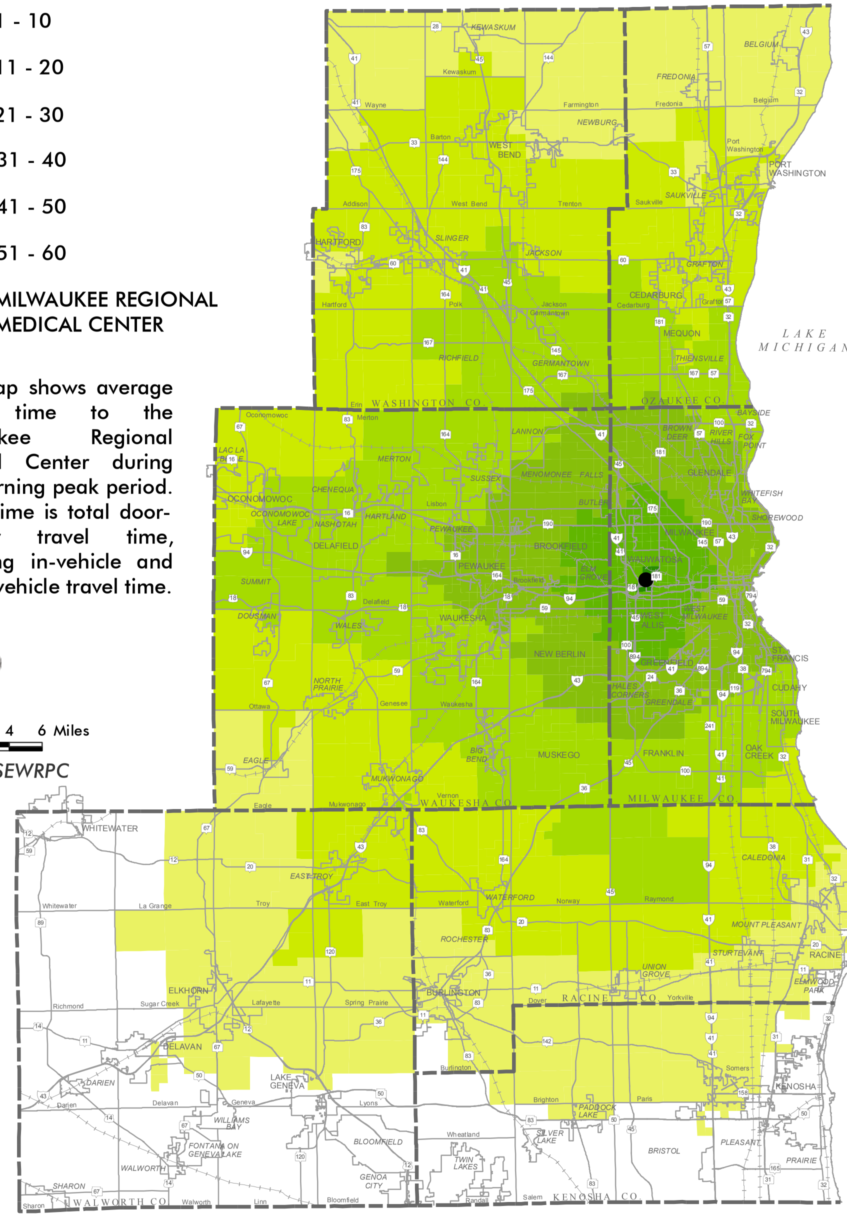


Table F.43
Population Within 60 Minutes of General Mitchell International Airport

Alternative	Total Population Within a 60-Minute Transit Trip of General Mitchell International Airport: Population with Access	Total Population Within a 60-Minute Transit Trip of General Mitchell International Airport: Percent of Total Population	Total Population Within a 60-Minute Drive of General Mitchell International Airport: Population with Access	Total Population Within a 60-Minute Drive of General Mitchell International Airport: Percent of Total Population
Existing - 2011	143,400	7.1	1,895,800	93.9
Trend - 2050	134,600	5.7	2,258,700	96.0
Alt I with Highway Improvements - 2050	318,900	13.5	2,264,400	96.2
Alt I Without Highway Improvements - 2050	312,200	13.3	2,198,700	93.4
Alt II with Highway Improvements - 2050	410,000	17.4	2,262,300	96.1
Alt II Without Highway Improvements - 2050	409,500	17.4	2,210,500	93.9

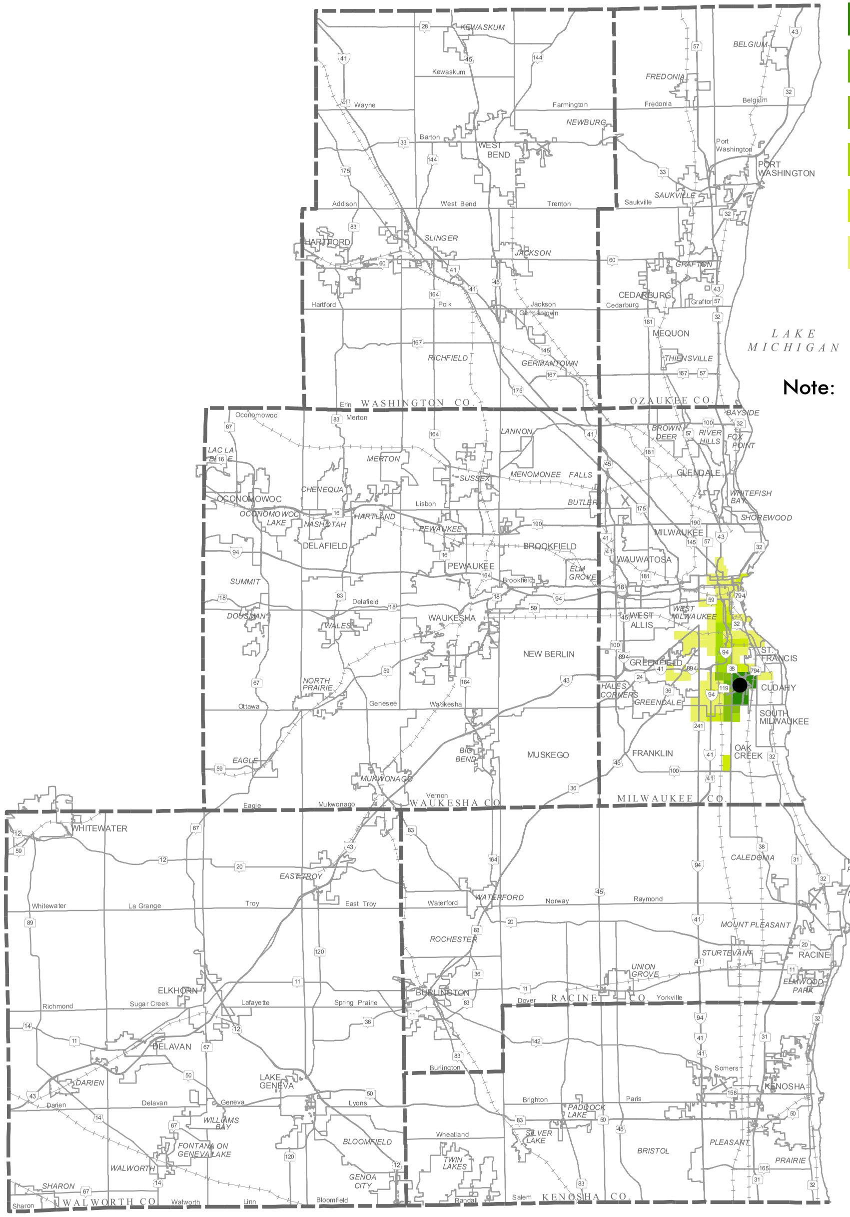
Source: SEWRPC

- **Transportation Access to General Mitchell International Airport:** Maps F.117 through F.122 show drive and transit trip times to GMIA, and Table F.43 presents the population that would be within 60 minutes of GMIA. Population within 60 minutes, rather than within 30 minutes, was estimated for GMIA in recognition of the fact that GMIA tends to attract trips from a much larger area than other destinations in the Region. About 94 percent of the Region's population is currently within a 60-minute drive of GMIA. This proportion would remain at about 96 percent under the alternatives, with Alternatives I and II slightly higher than the Trend primarily due to the more compact development patterns envisioned under the two alternative plans compared to the Trend. Depending on the location, drive time to GMIA would slightly increase or decrease based on the alternative's traffic congestion levels and locations of arterial improvements. Not including highway improvements (except for currently committed highway expansion projects and freeway modernization) under Alternatives I and II would slightly lower the percent of the population within a 60-minute drive.

  Due to the declines in transit service levels expected under the Trend, approximately 10,000 fewer residents (6 percent) would be within a 60-minute transit trip of GMIA compared to today, despite a projected increase in the Region's total population of about 334,000 (17 percent). Compared to the Trend, Alternative I would provide transit service within 60 minutes of GMIA to about 180,000 additional residents (136 percent more) and under Alternative II this increase would be about 280,000 additional residents (205 percent more). Not including highway improvements under Alternatives I and II would slightly reduce these numbers.

Map F.117
Average Peak Travel Time to General Mitchell International Airport: Existing

Transit



TRAVEL TIME (MINUTES)

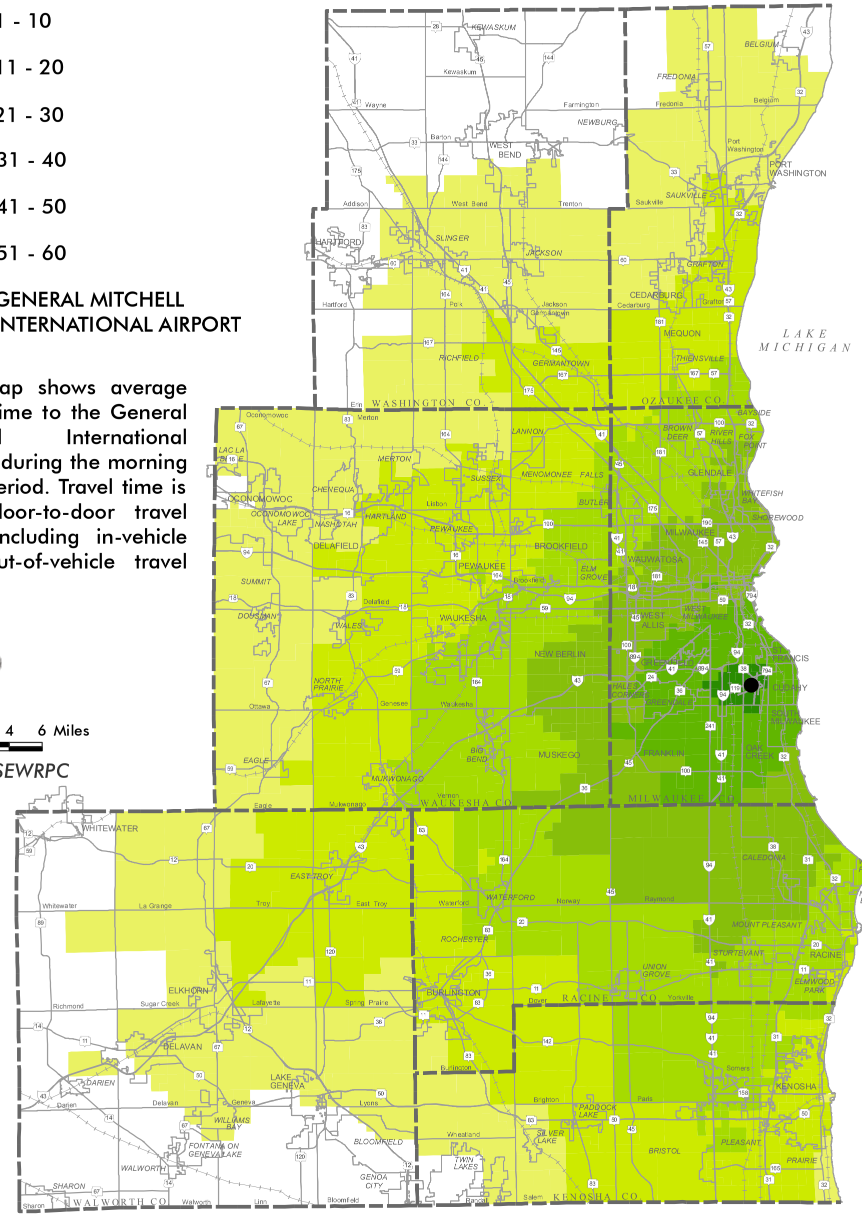
- 1 - 10
- 11 - 20
- 21 - 30
- 31 - 40
- 41 - 50
- 51 - 60
- ● GENERAL MITCHELL INTERNATIONAL AIRPORT

Note: This map shows average travel time to the General Mitchell International Airport during the morning peak period. Travel time is total door-to-door travel time, including in-vehicle and out-of-vehicle travel time.

0 2 4 6 Miles

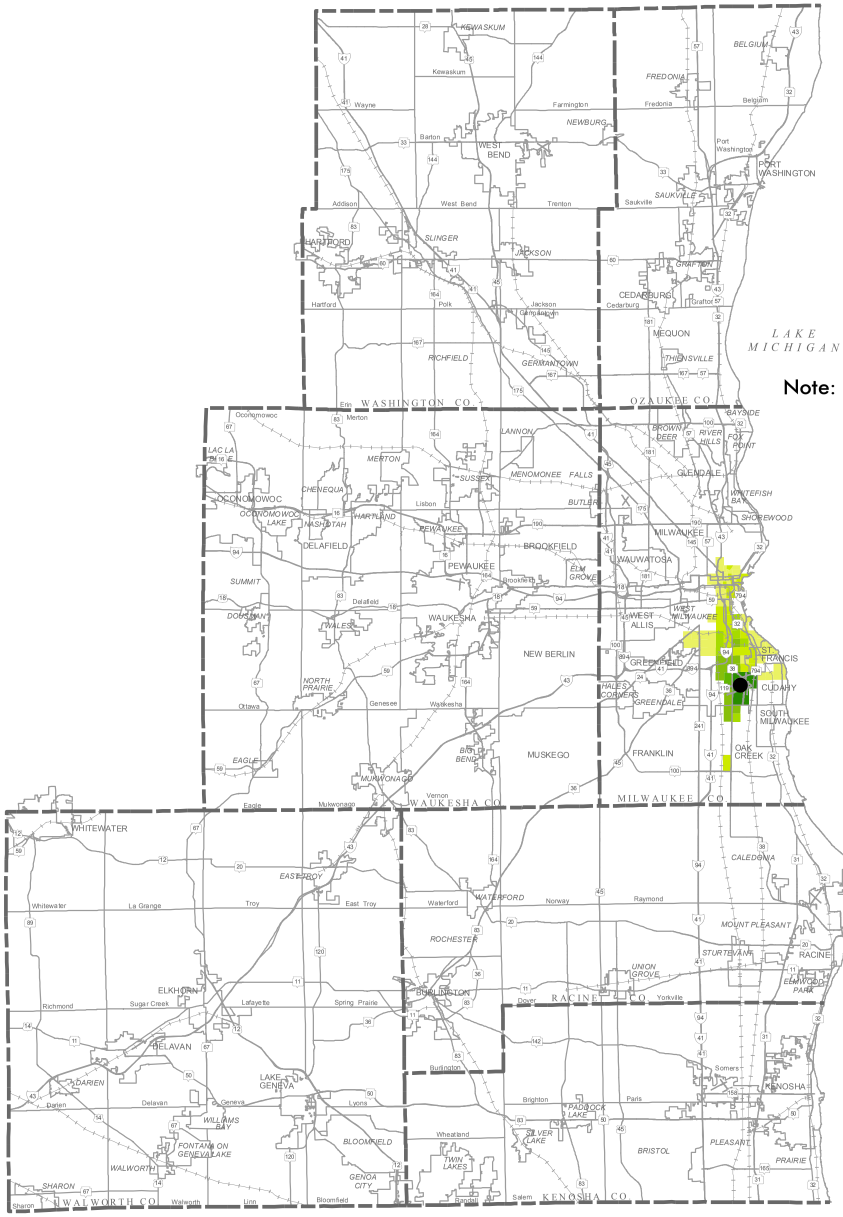
Source: SEWRPC

Auto

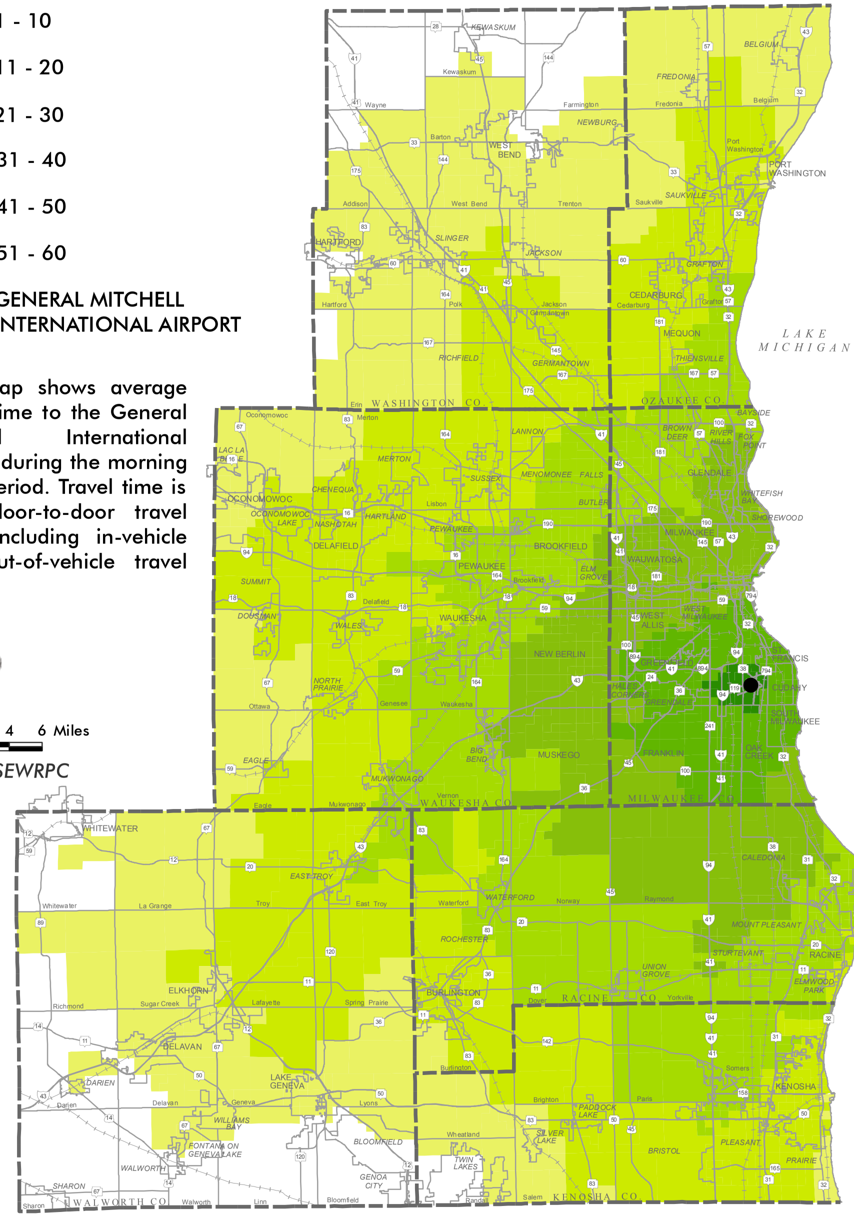


Map F.118
Average Peak Travel Time to General Mitchell International Airport: Trend

Transit



Auto



TRAVEL TIME (MINUTES)

- 1 - 10
- 11 - 20
- 21 - 30
- 31 - 40
- 41 - 50
- 51 - 60
- ● GENERAL MITCHELL INTERNATIONAL AIRPORT

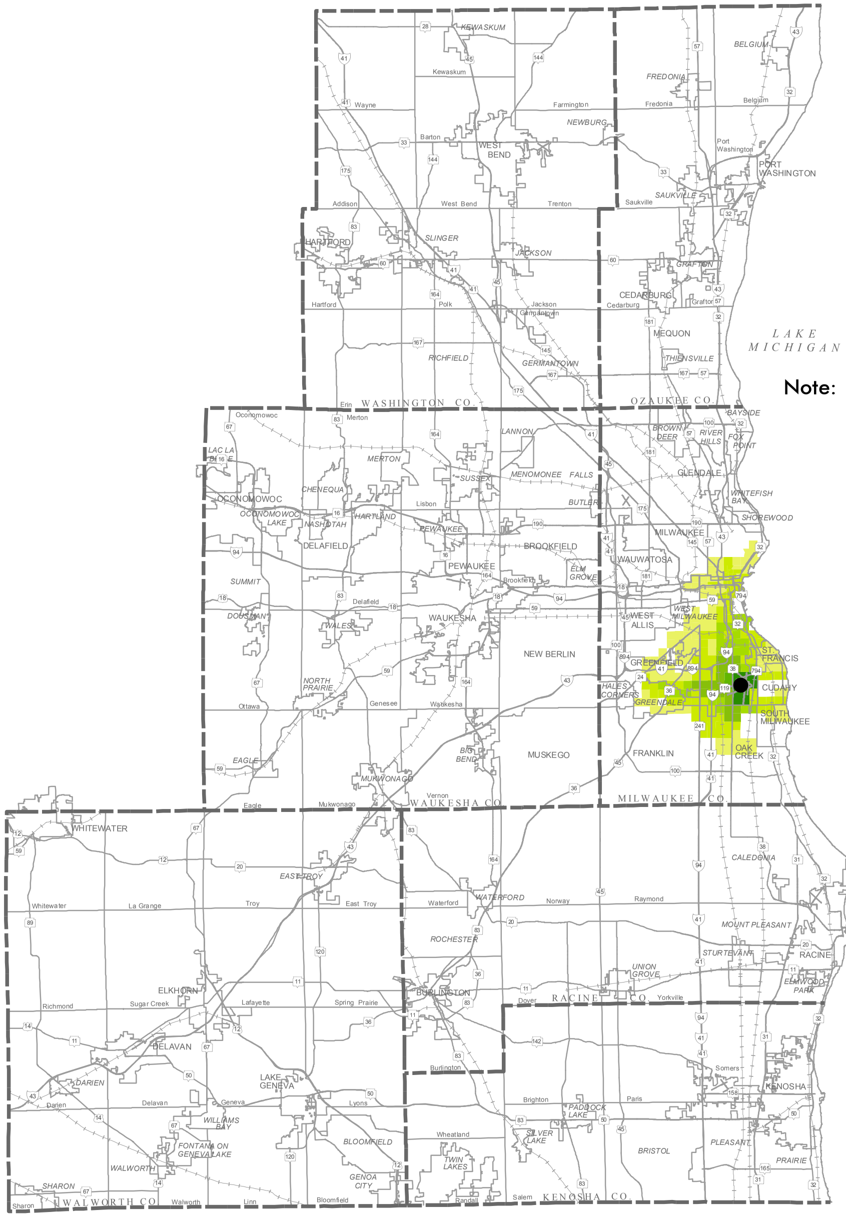
Note: This map shows average travel time to the General Mitchell International Airport during the morning peak period. Travel time is total door-to-door travel time, including in-vehicle and out-of-vehicle travel time.

0 2 4 6 Miles

Source: SEWRPC

Map F.119
Average Peak Travel Time to General Mitchell International Airport: Alternative I with Highway Improvements

Transit



TRAVEL TIME (MINUTES)

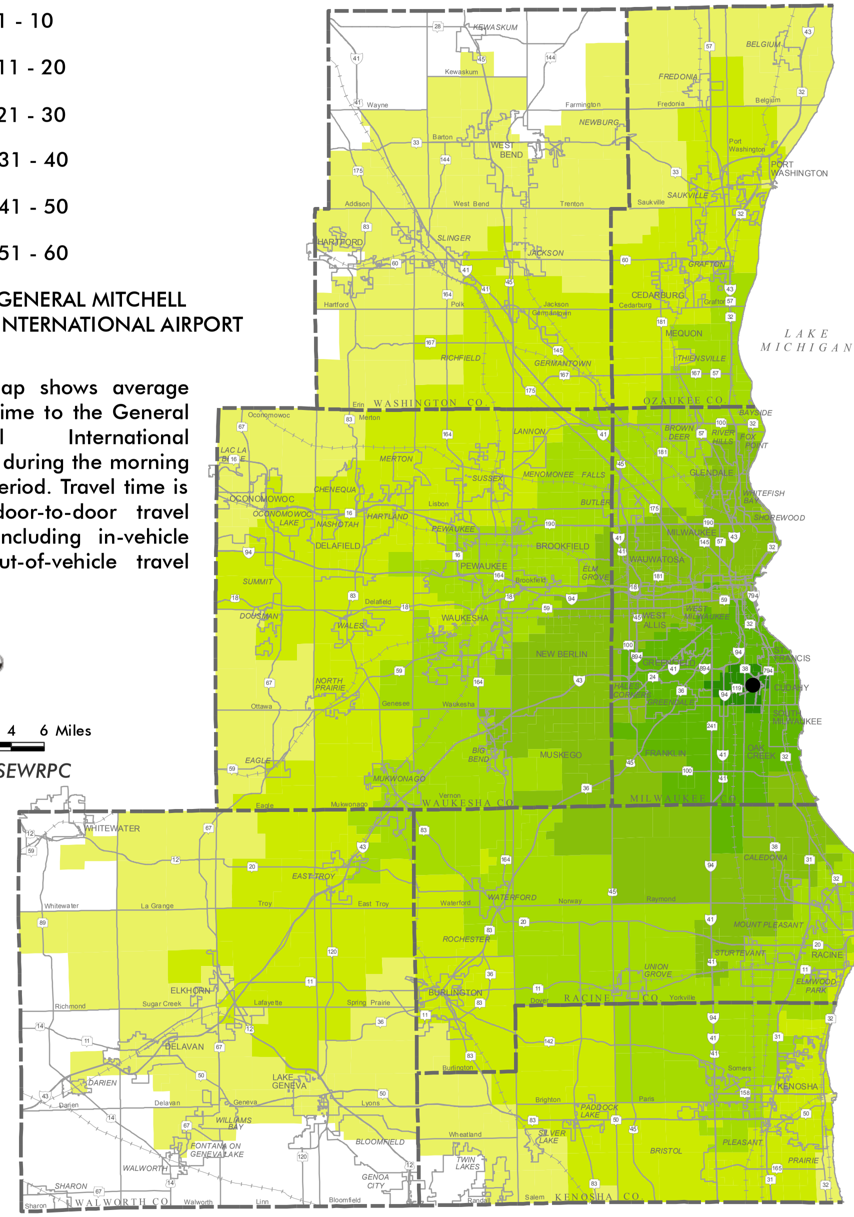
- 1 - 10
- 11 - 20
- 21 - 30
- 31 - 40
- 41 - 50
- 51 - 60
- ● GENERAL MITCHELL INTERNATIONAL AIRPORT

Note: This map shows average travel time to the General Mitchell International Airport during the morning peak period. Travel time is total door-to-door travel time, including in-vehicle and out-of-vehicle travel time.

0 2 4 6 Miles

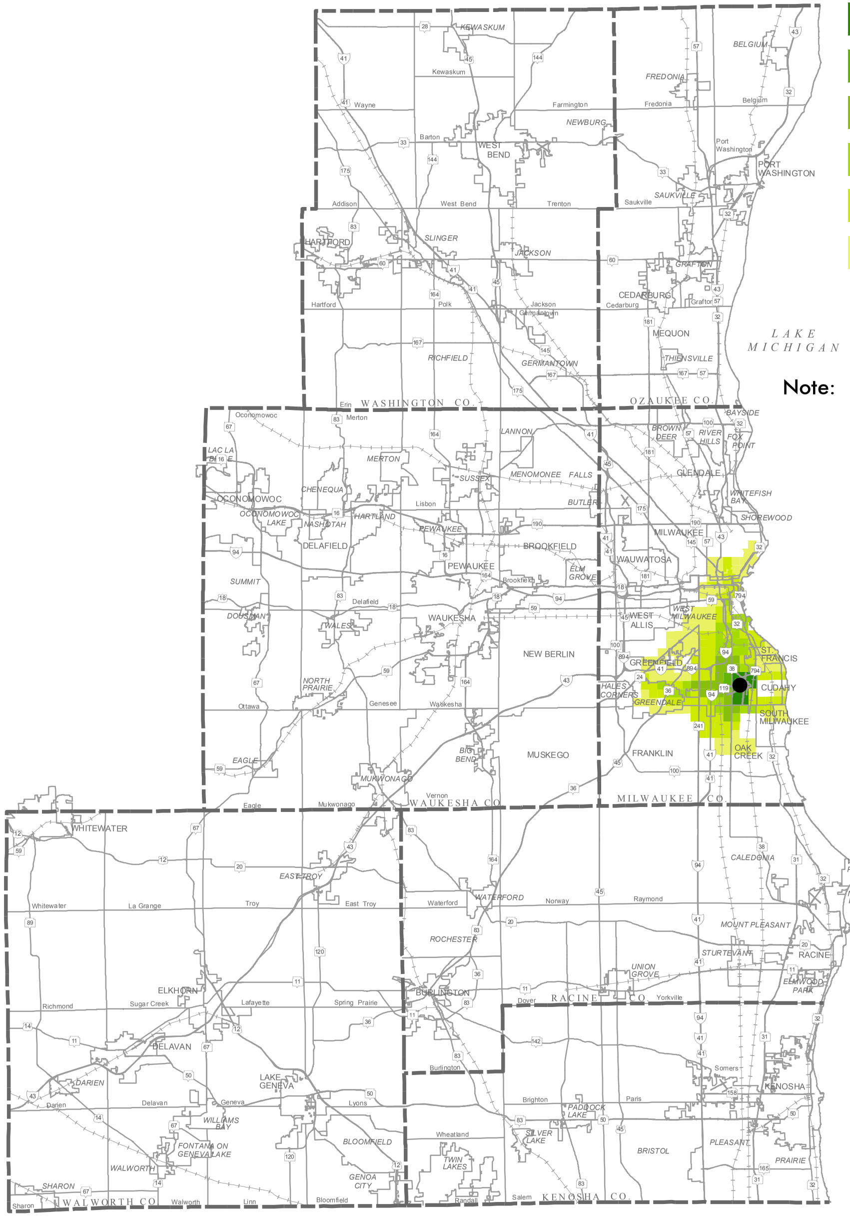
Source: SEWRPC

Auto

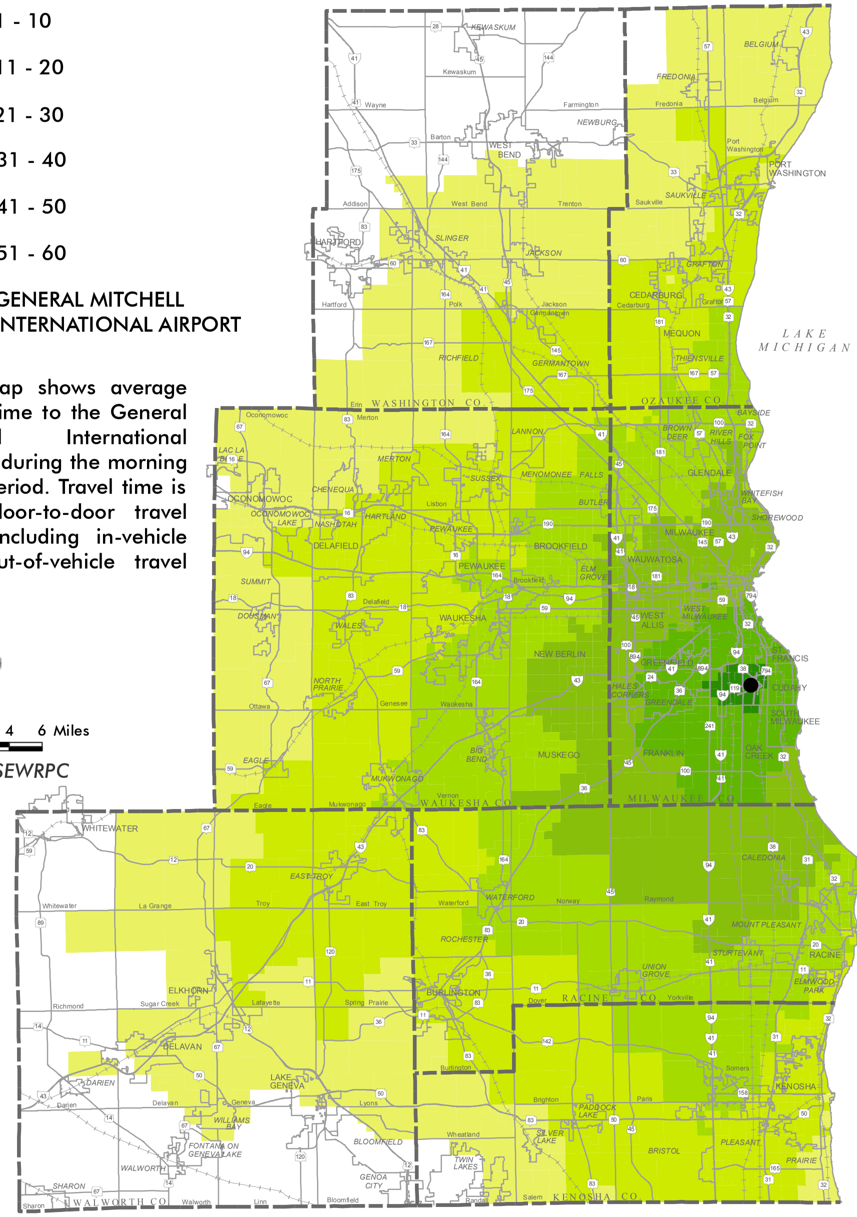


Map F.120
Average Peak Travel Time to General Mitchell International Airport: Alternative I Without Highway Improvements

Transit



Auto



TRAVEL TIME (MINUTES)

- 1 - 10
- 11 - 20
- 21 - 30
- 31 - 40
- 41 - 50
- 51 - 60
- ● GENERAL MITCHELL INTERNATIONAL AIRPORT

Note: This map shows average travel time to the General Mitchell International Airport during the morning peak period. Travel time is total door-to-door travel time, including in-vehicle and out-of-vehicle travel time.

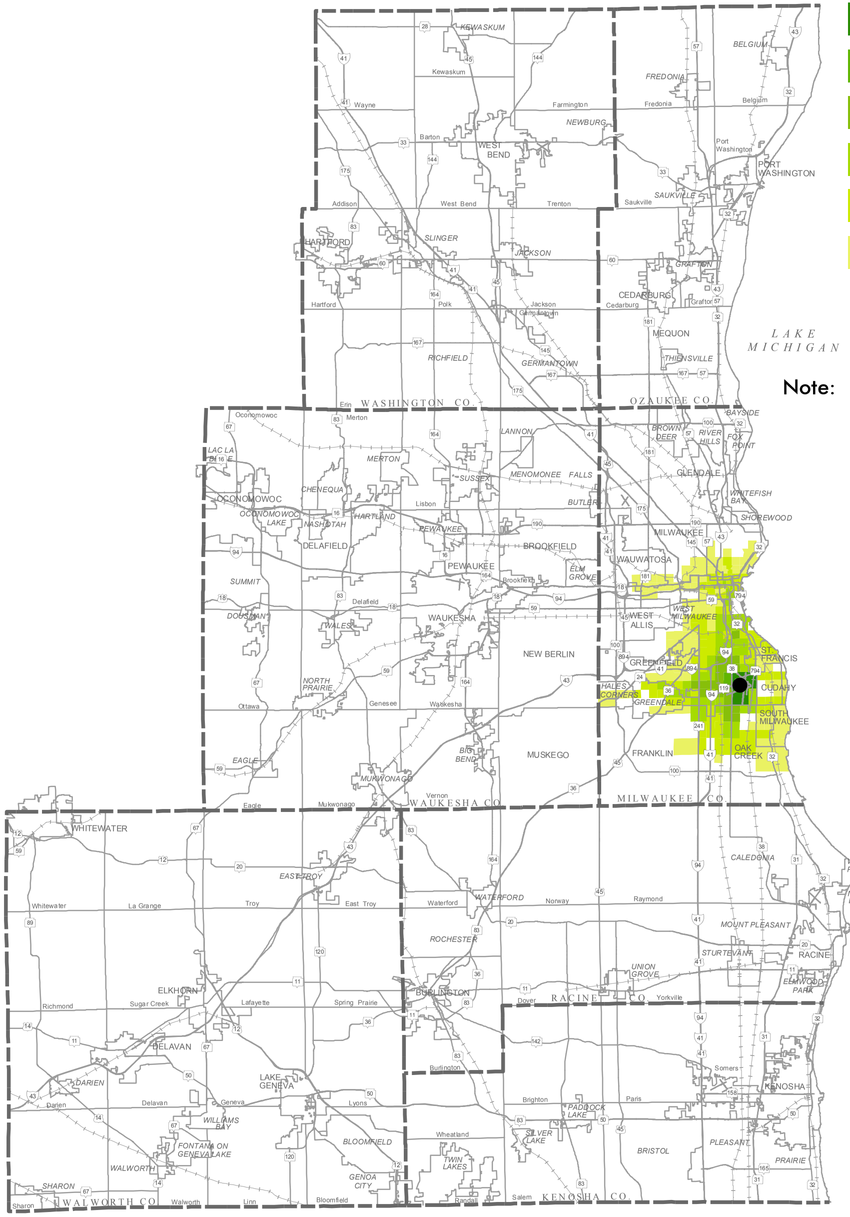
0 2 4 6 Miles

Source: SEWRPC

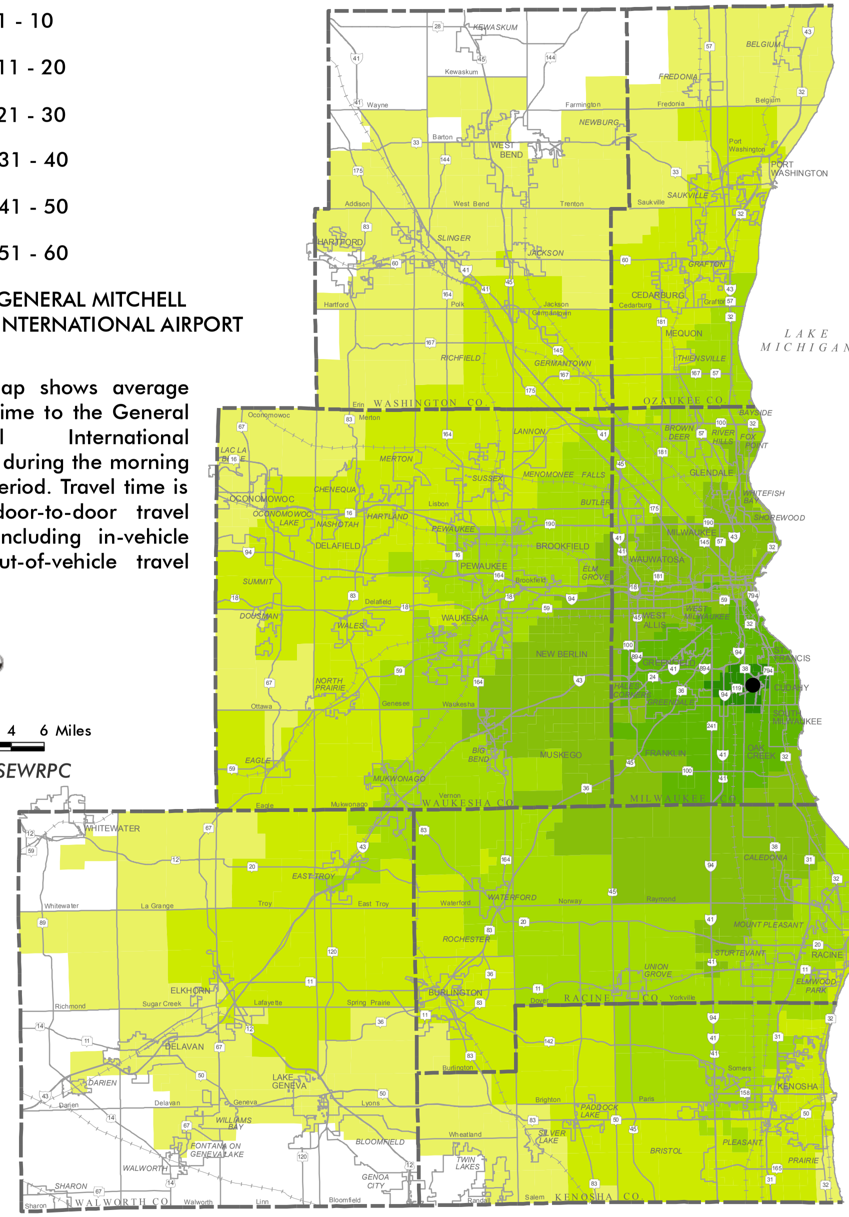
Map F.121

Average Peak Travel Time to General Mitchell International Airport: Alternative II with Highway Improvements

Transit



Auto



TRAVEL TIME (MINUTES)

- 1 - 10
- 11 - 20
- 21 - 30
- 31 - 40
- 41 - 50
- 51 - 60
- ● GENERAL MITCHELL INTERNATIONAL AIRPORT

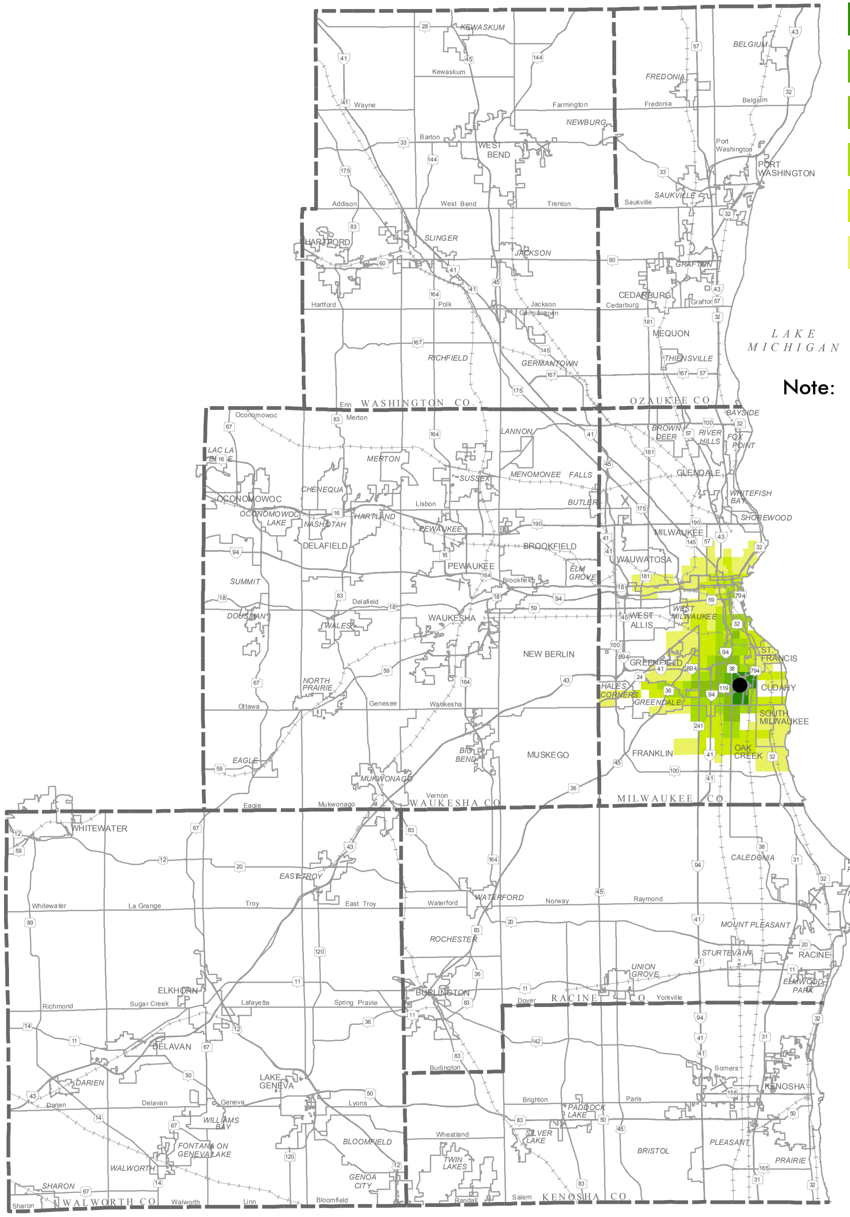
Note: This map shows average travel time to the General Mitchell International Airport during the morning peak period. Travel time is total door-to-door travel time, including in-vehicle and out-of-vehicle travel time.

0 2 4 6 Miles

Source: SEWRPC

Map F.122
Average Peak Travel Time to General Mitchell International Airport: Alternative II Without Highway Improvements

Transit



TRAVEL TIME (MINUTES)

- 1 - 10
- 11 - 20
- 21 - 30
- 31 - 40
- 41 - 50
- 51 - 60
- ● GENERAL MITCHELL INTERNATIONAL AIRPORT

Note: This map shows average travel time to the General Mitchell International Airport during the morning peak period. Travel time is total door-to-door travel time, including in-vehicle and out-of-vehicle travel time.

0 2 4 6 Miles

Source: SEWRPC

Auto

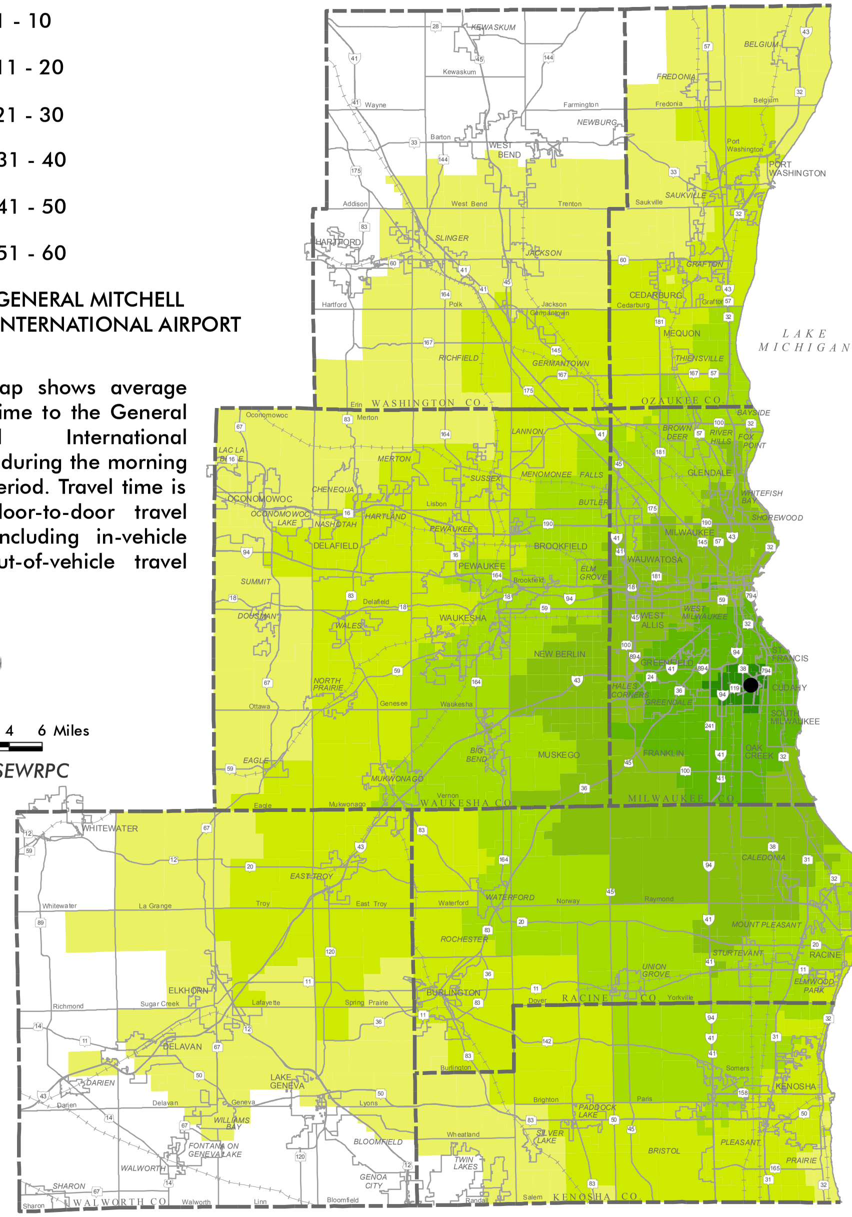


Table F.44
Population Within 30 Minutes of Downtown Milwaukee

Alternative	Total Population Within a 30-Minute Transit Trip of Downtown Milwaukee		Total Population Within a 30-Minute Drive of Downtown Milwaukee	
	Population with Access	Percent of Total Population	Population with Access	Percent of Total Population
Existing - 2011	143,000	7.1	684,900	33.9
Trend - 2050	120,800	5.1	782,200	33.2
Alt I with Highway Improvements - 2050	246,500	10.5	792,700	33.7
Alt I Without Highway Improvements - 2050	242,700	10.3	742,300	31.5
Alt II with Highway Improvements - 2050	367,800	15.6	781,200	33.2
Alt II Without Highway Improvements - 2050	361,300	15.3	763,400	32.4

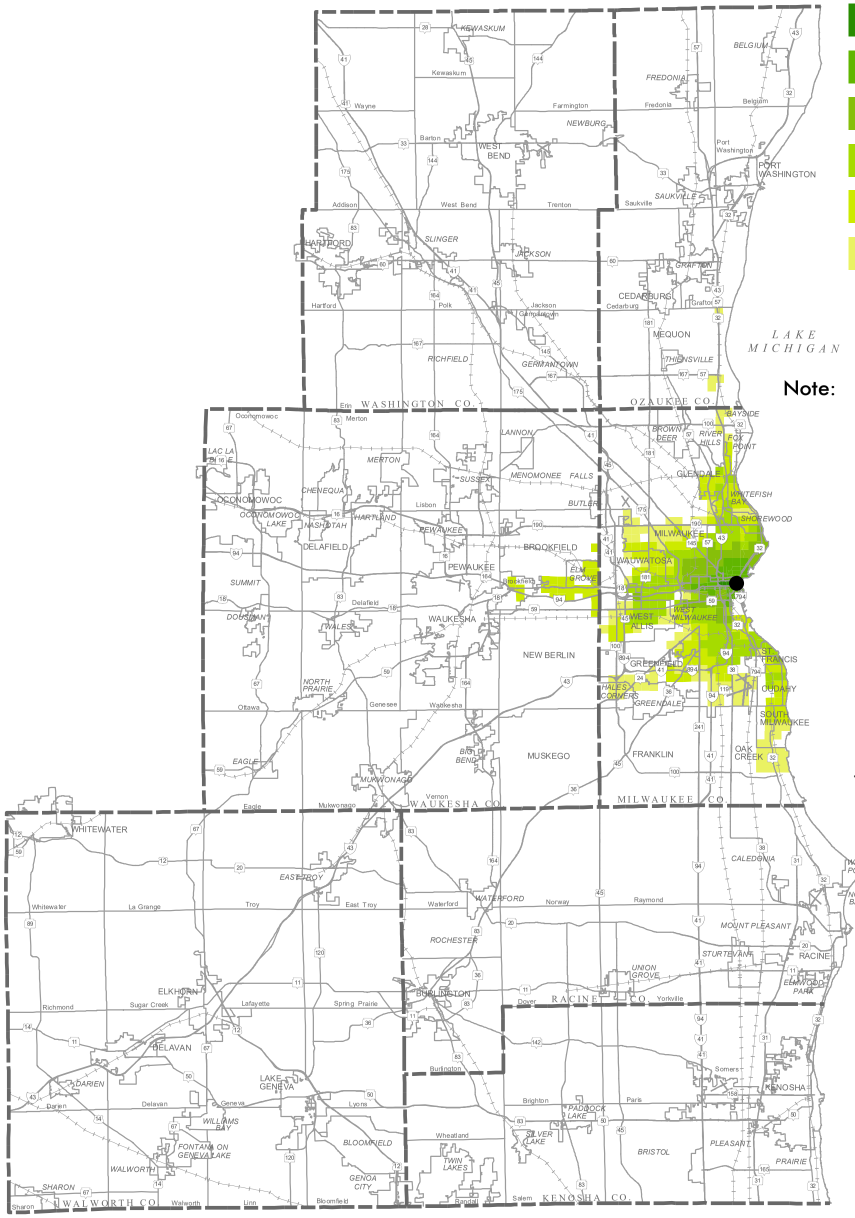
Source: SEWRPC

- **Transportation Access to Downtown Milwaukee:** Maps F.123 through F.128 show drive and transit trip times to downtown Milwaukee, and Table F.44 presents the population that would be within 30 minutes. About one-third of the Region's population is currently within a 30-minute drive of downtown Milwaukee. Under all three alternatives, about the same proportion would remain within a 30-minute drive. Depending on the location, drive time to downtown Milwaukee would slightly increase or decrease based on the alternative's traffic congestion levels and locations of arterial improvements. Not including highway improvements (except for currently committed highway expansion projects and freeway modernization) under Alternatives I and II would slightly lower the percent of the population within a 30-minute drive.

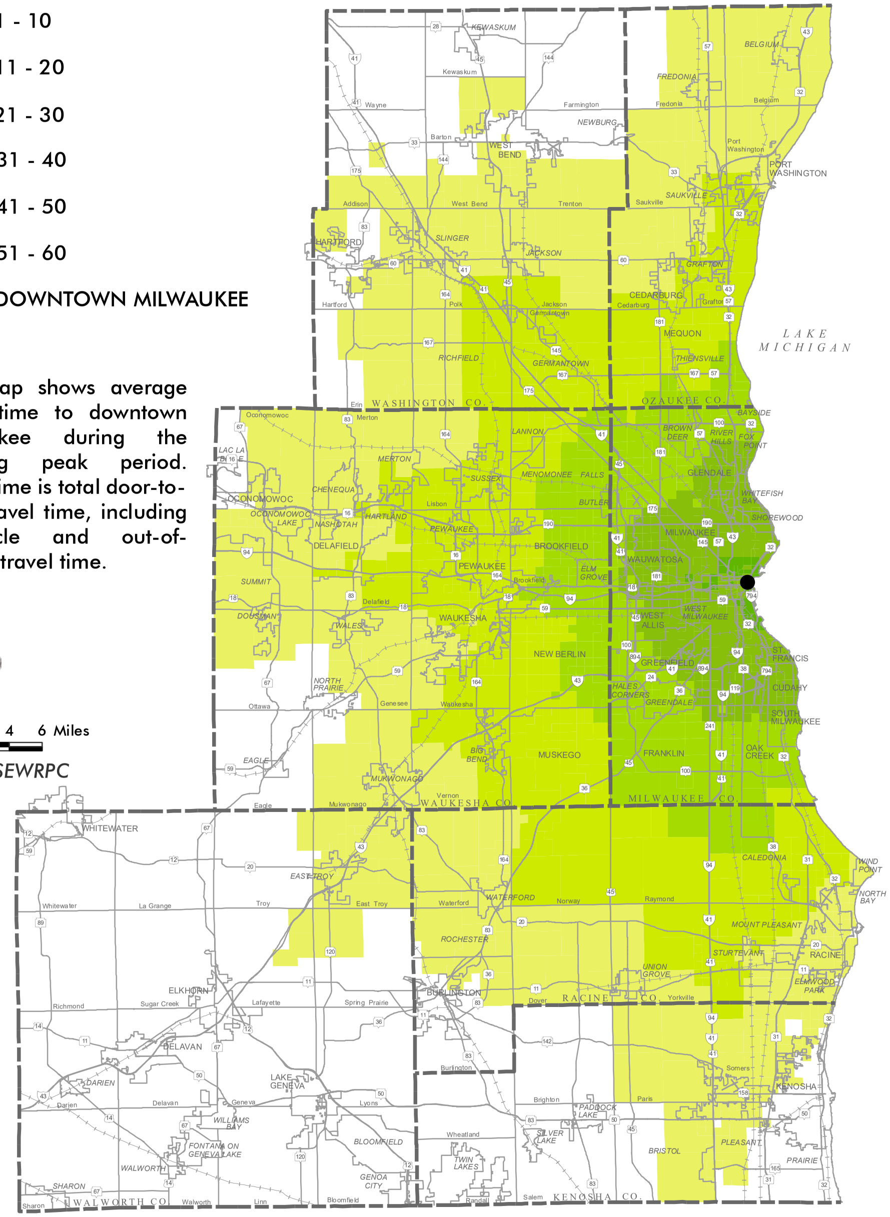
  Due to the declines in transit service levels expected under the Trend, approximately 20,000 fewer residents (16 percent) would be within a 30-minute transit trip of downtown Milwaukee compared to today, despite a projected increase in the Region's total population of about 334,000 (17 percent). Compared to the Trend, Alternative I would provide transit service within 30 minutes of downtown Milwaukee to about 100,000 additional residents (104 percent more) and under Alternative II this increase would be about 250,000 additional residents (204 percent more). Not including highway improvements under Alternatives I and II would slightly reduce these numbers.

Map F.123
Average Peak Travel Time to Downtown Milwaukee: Existing

Transit



Auto



TRAVEL TIME (MINUTES)

- 1 - 10
- 11 - 20
- 21 - 30
- 31 - 40
- 41 - 50
- 51 - 60
- ● DOWNTOWN MILWAUKEE

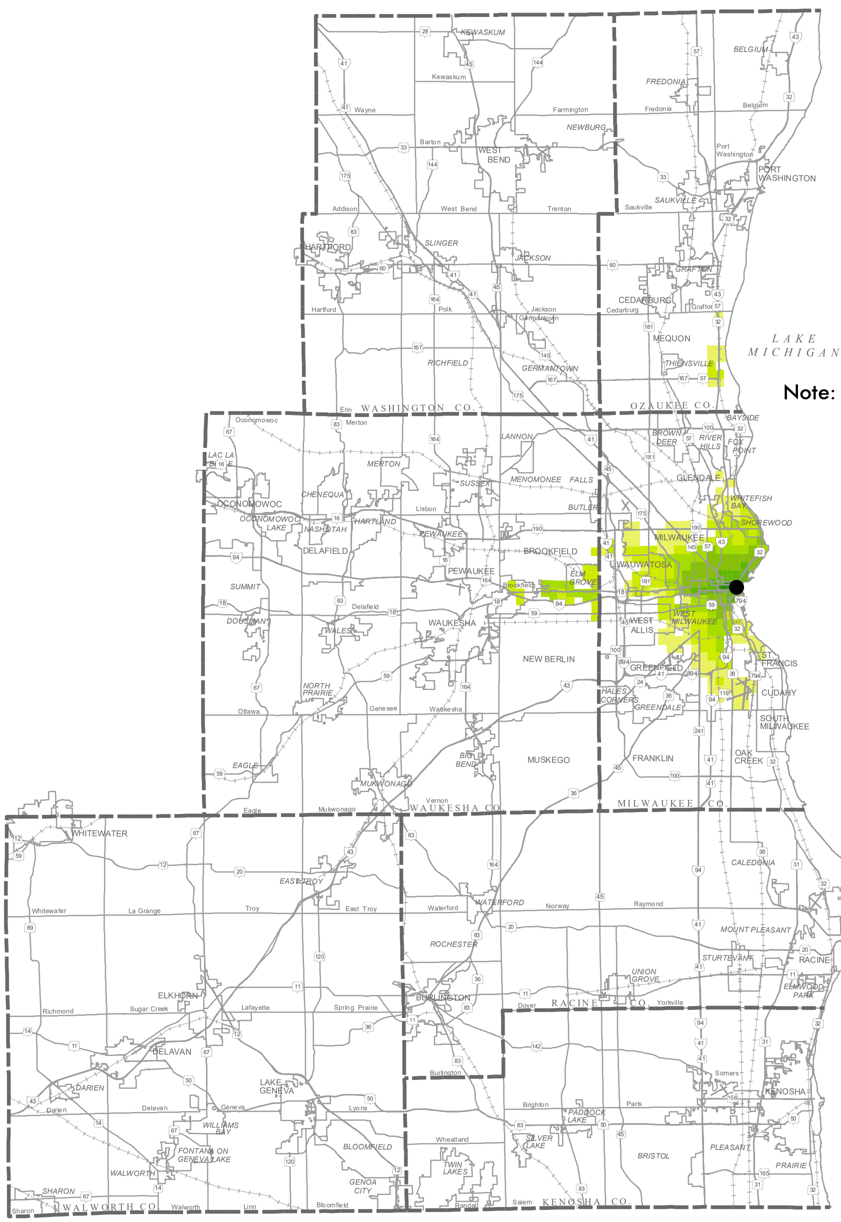
Note: This map shows average travel time to downtown Milwaukee during the morning peak period. Travel time is total door-to-door travel time, including in-vehicle and out-of-vehicle travel time.

0 2 4 6 Miles

Source: SEWRPC

Map F.124
Average Peak Travel Time to Downtown Milwaukee: Trend

Transit



TRAVEL TIME (MINUTES)

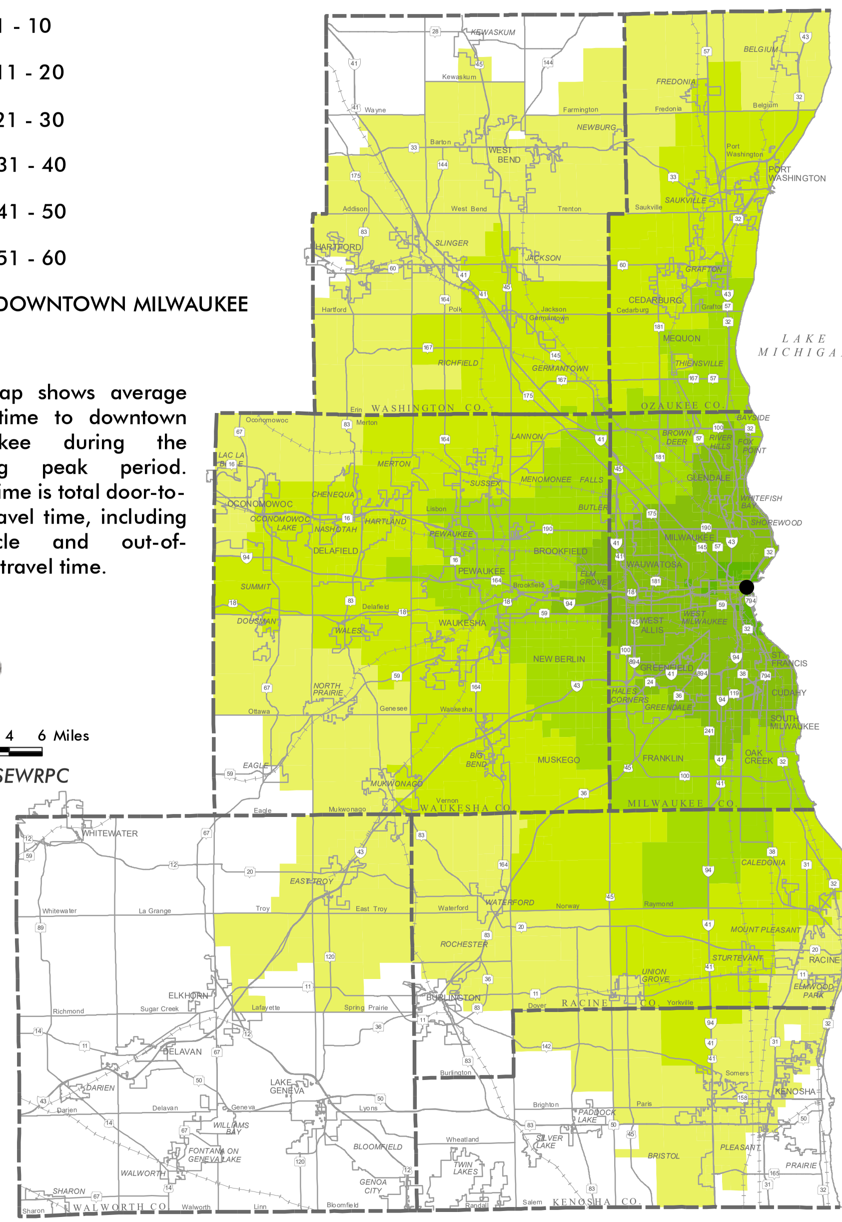
- 1 - 10
- 11 - 20
- 21 - 30
- 31 - 40
- 41 - 50
- 51 - 60
- ● DOWNTOWN MILWAUKEE

Note: This map shows average travel time to downtown Milwaukee during the morning peak period. Travel time is total door-to-door travel time, including in-vehicle and out-of-vehicle travel time.

0 2 4 6 Miles

Source: *SEWRPC*

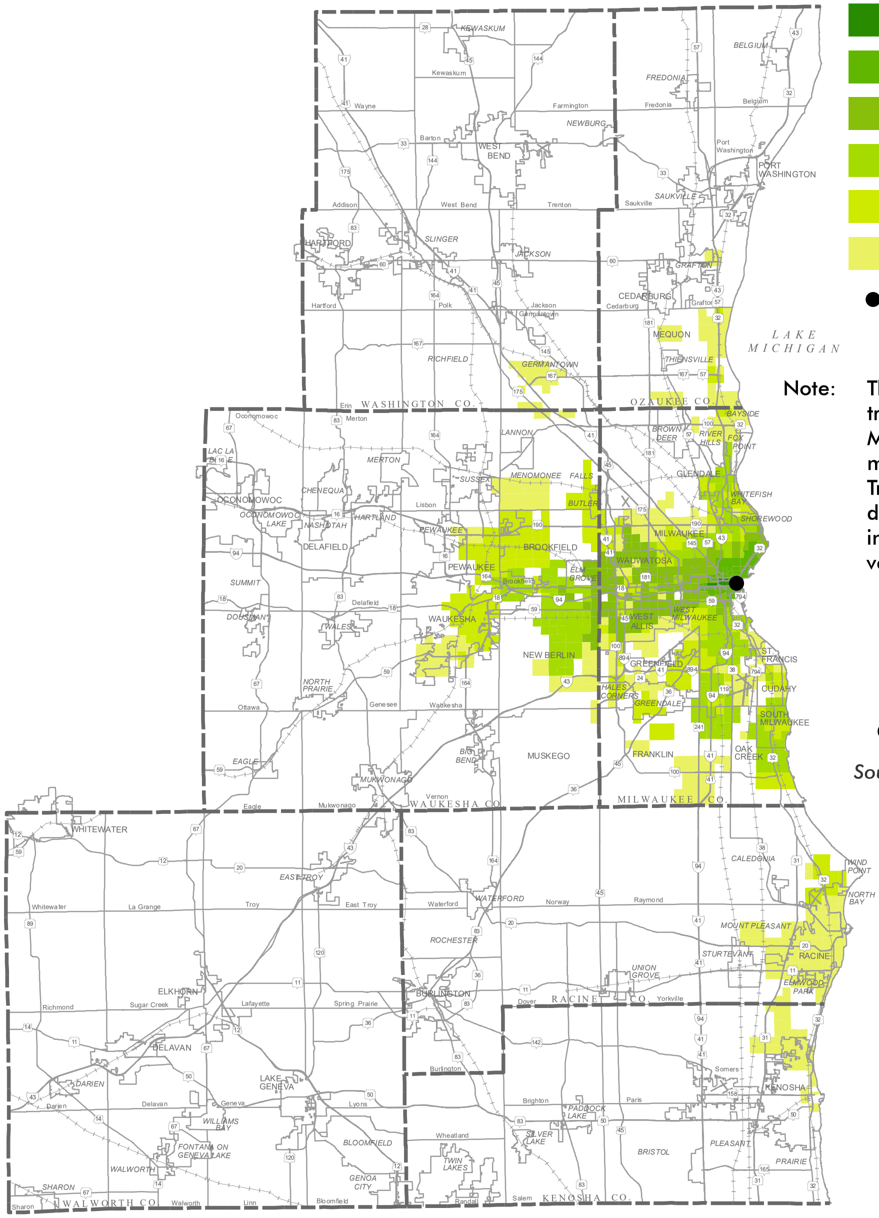
Auto



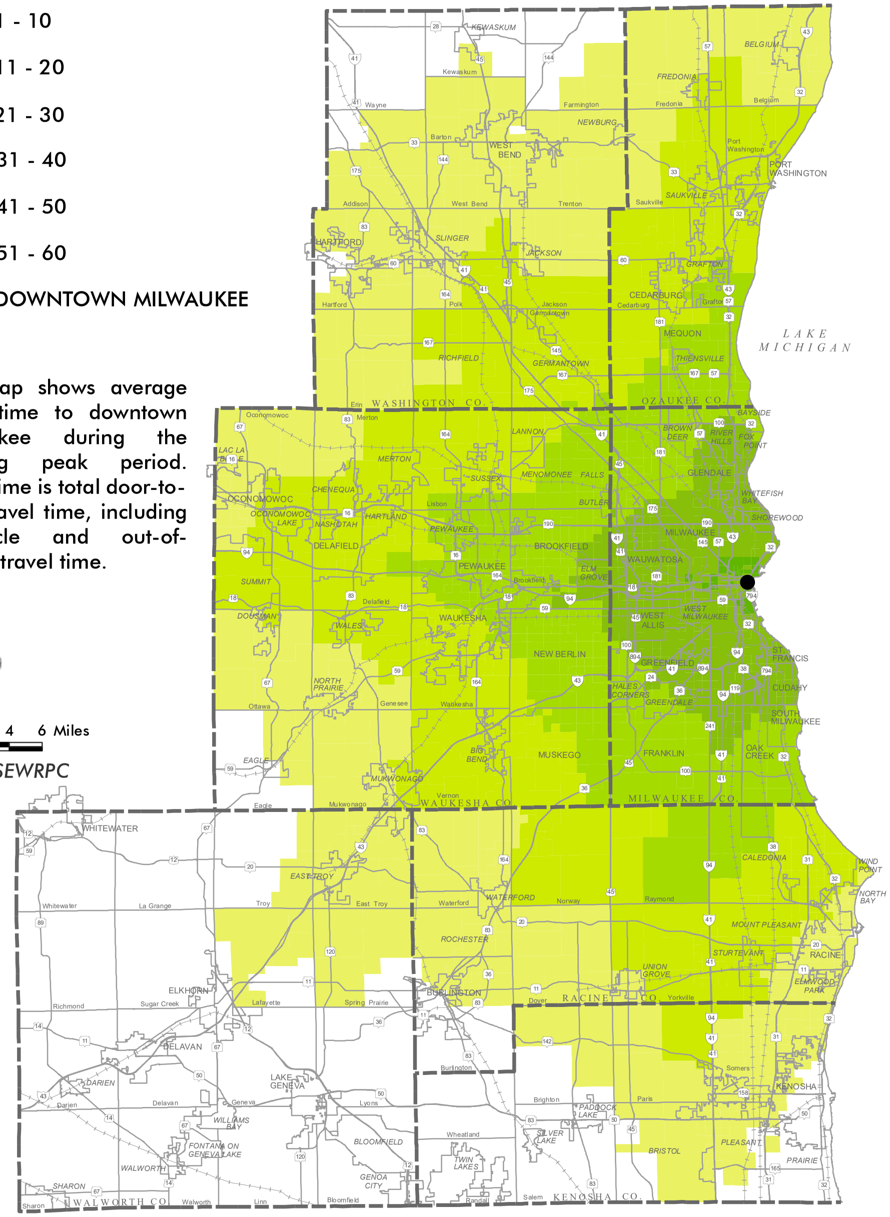
Map F.125

Average Peak Travel Time to Downtown Milwaukee: Alternative I with Highway Improvements

Transit



Auto



TRAVEL TIME (MINUTES)

- 1 - 10
- 11 - 20
- 21 - 30
- 31 - 40
- 41 - 50
- 51 - 60
- ● DOWNTOWN MILWAUKEE

Note: This map shows average travel time to downtown Milwaukee during the morning peak period. Travel time is total door-to-door travel time, including in-vehicle and out-of-vehicle travel time.

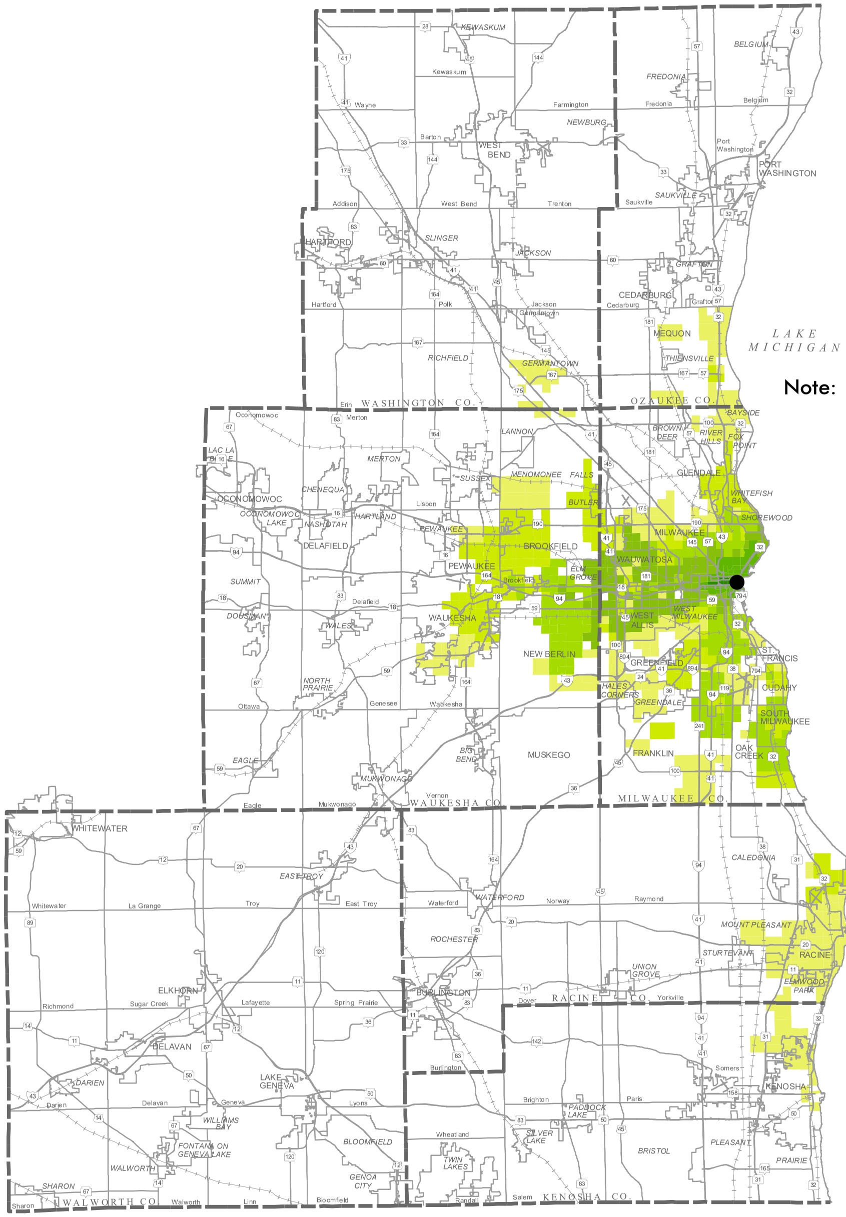
0 2 4 6 Miles

Source: SEWRPC

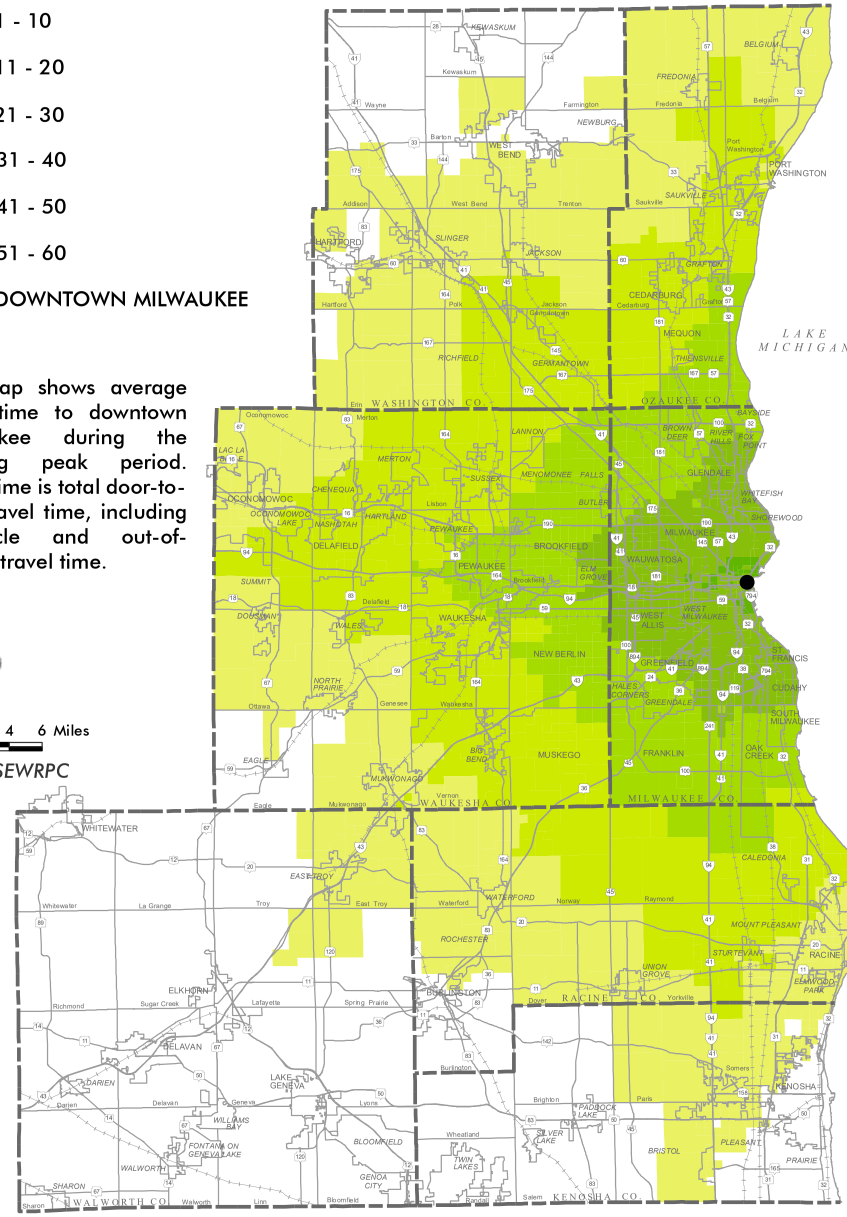
Map F.126

Average Peak Travel Time to Downtown Milwaukee: Alternative I Without Highway Improvements

Transit



Auto



TRAVEL TIME (MINUTES)

- 1 - 10
- 11 - 20
- 21 - 30
- 31 - 40
- 41 - 50
- 51 - 60
- ● DOWNTOWN MILWAUKEE

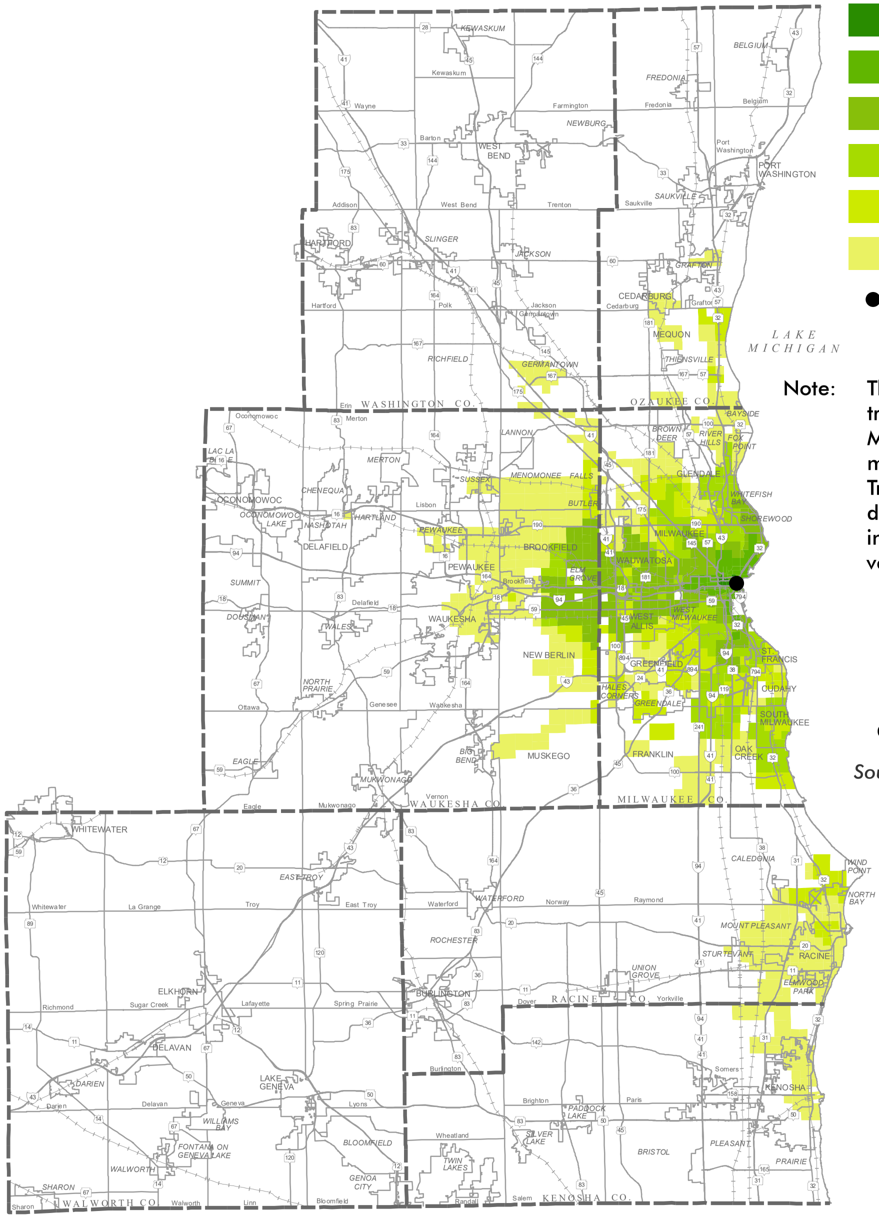
Note: This map shows average travel time to downtown Milwaukee during the morning peak period. Travel time is total door-to-door travel time, including in-vehicle and out-of-vehicle travel time.

0 2 4 6 Miles

Source: SEWRPC

Map F.127
Average Peak Travel Time to Downtown Milwaukee: Alternative II with Highway Improvements

Transit



TRAVEL TIME (MINUTES)

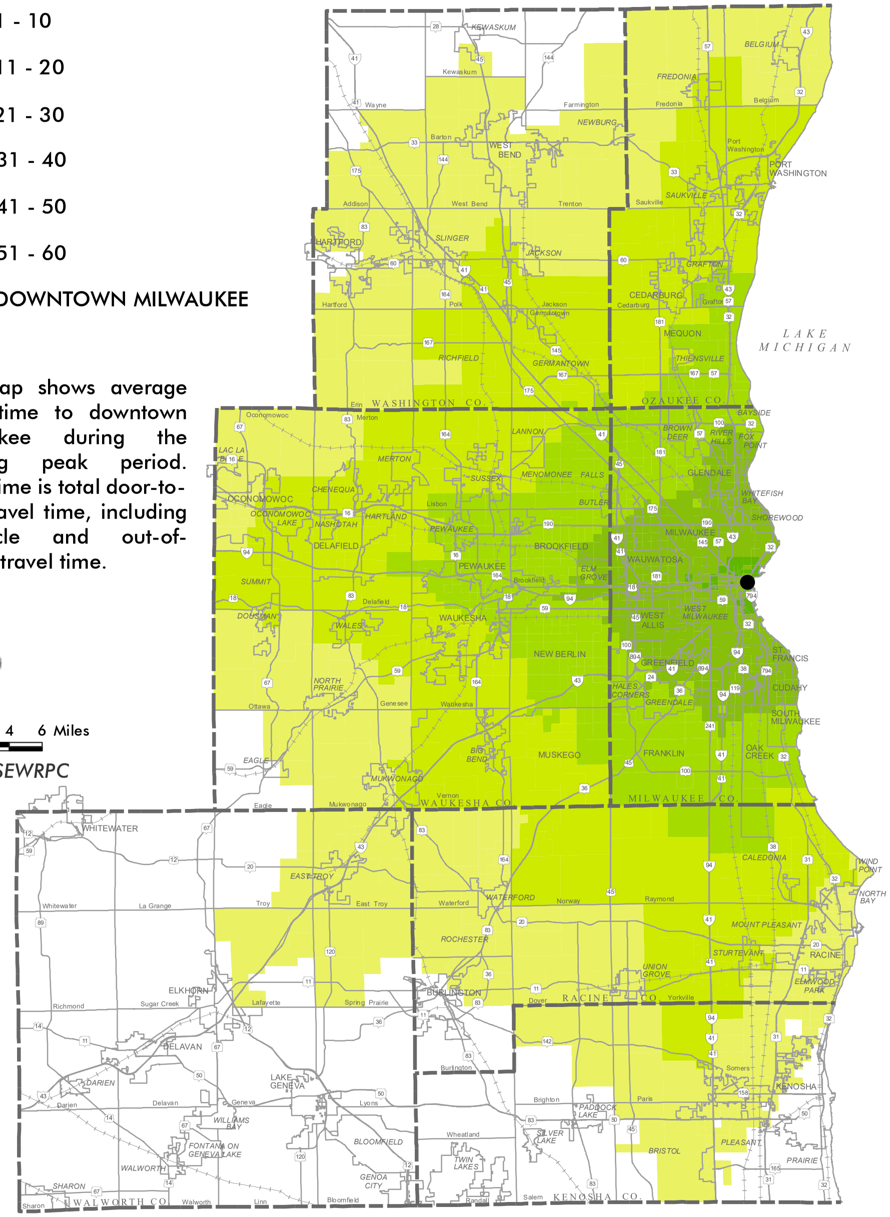
- 1 - 10
- 11 - 20
- 21 - 30
- 31 - 40
- 41 - 50
- 51 - 60
- ● DOWNTOWN MILWAUKEE

Note: This map shows average travel time to downtown Milwaukee during the morning peak period. Travel time is total door-to-door travel time, including in-vehicle and out-of-vehicle travel time.

0 2 4 6 Miles

Source: SEWRPC

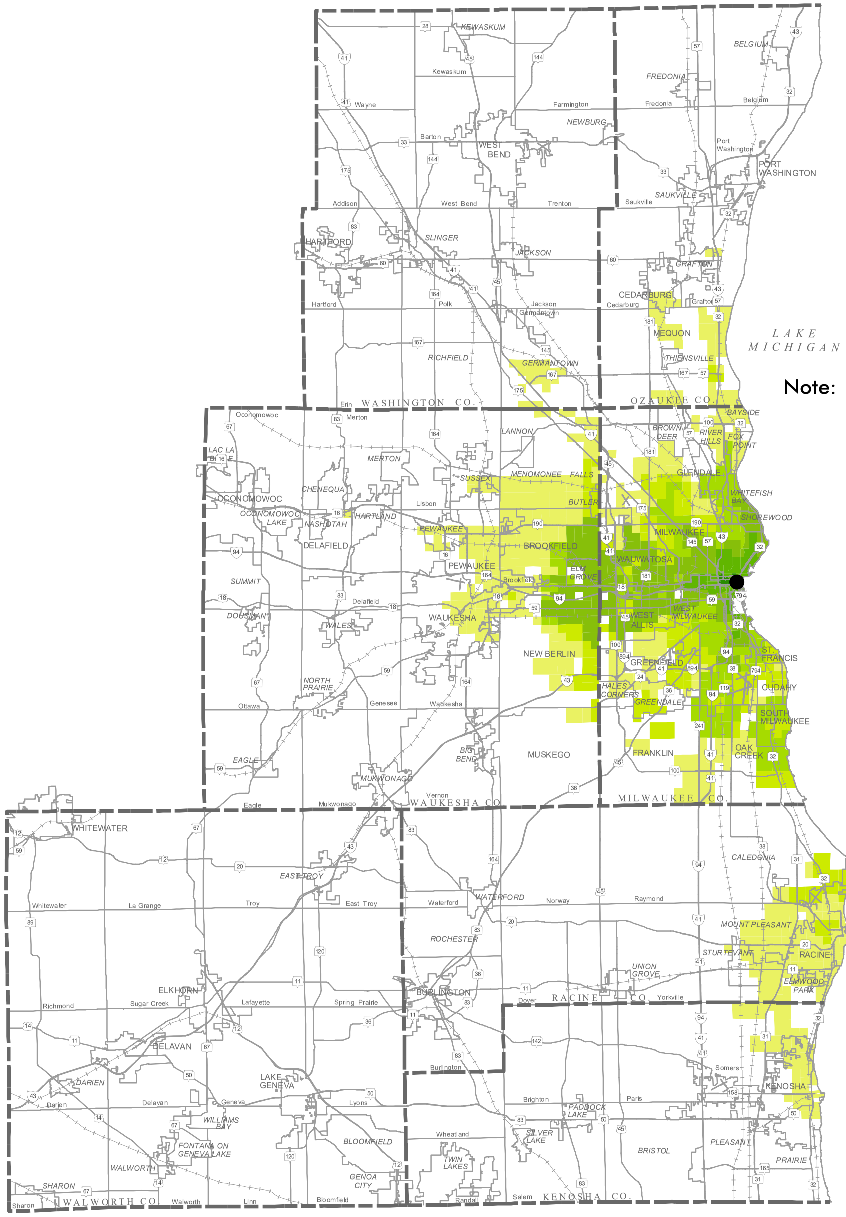
Auto



Map F.128

Average Peak Travel Time to Downtown Milwaukee: Alternative II Without Highway Improvements

Transit



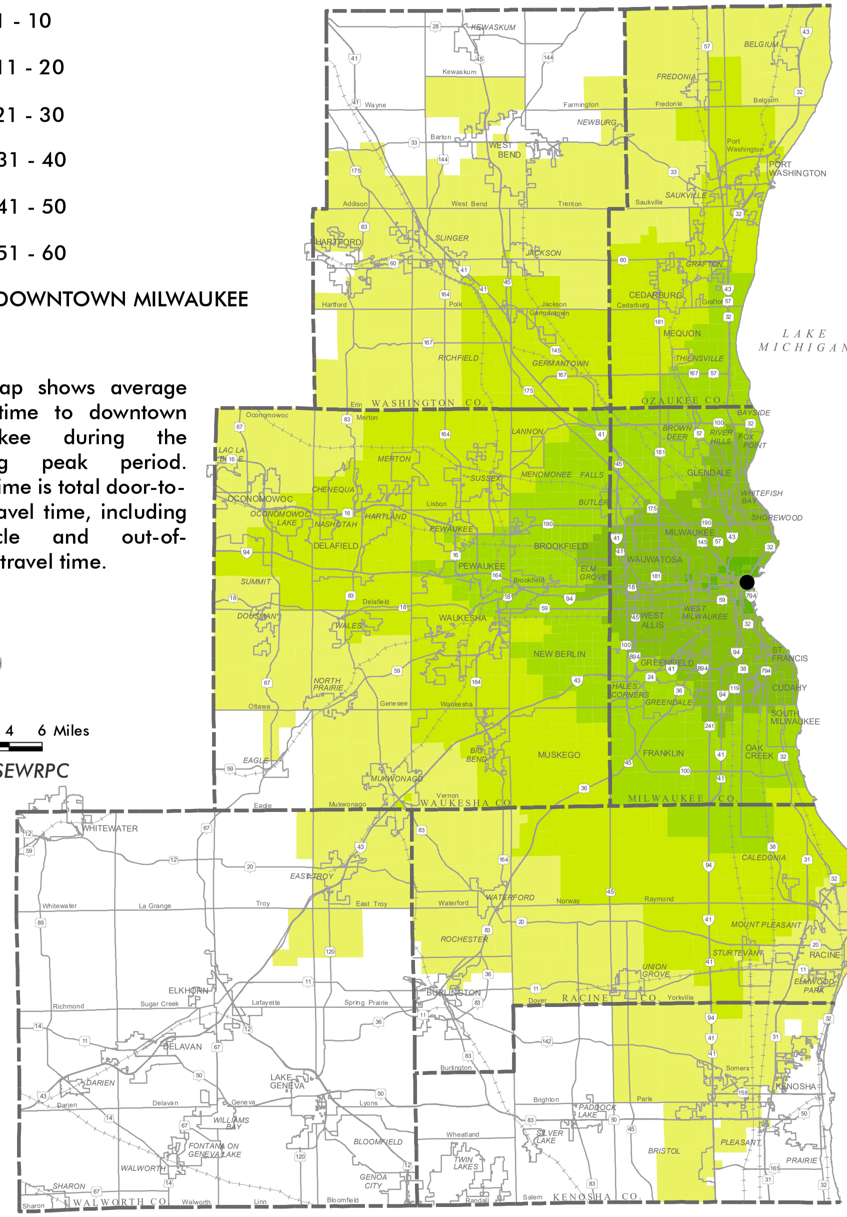
TRAVEL TIME (MINUTES)

- 1 - 10
- 11 - 20
- 21 - 30
- 31 - 40
- 41 - 50
- 51 - 60
- DOWNTOWN MILWAUKEE

Note: This map shows average travel time to downtown Milwaukee during the morning peak period. Travel time is total door-to-door travel time, including in-vehicle and out-of-vehicle travel time.

Source: SEWRPC

Auto



CRITERION 4.2.2: ACCESS TO PARK-RIDE FACILITIES

KEY CONCLUSIONS

- **The most residents would live within three miles of a park-ride facility (83.6 percent) under Alternative II, compared with slightly fewer under Alternative I (82.8 percent), and significantly fewer than under the Trend (67.2 percent).**
- **In contrast, the most residents live within three miles of a park-ride facility that is served by transit under Alternative I (78.8 percent), slightly more than under Alternative II (78.6 percent), and significantly more than under the Trend (55.1 percent).**

Park-ride lots enable carpooling and increase access to the Region's transit system. They are generally located in such a way that residents would utilize a park-ride lot rather than enter the Region's freeway system. They are also sometimes located in areas that allow residents to choose to divert off of a freeway just before they reach a part of the freeway system that is frequently congested. By parking at a park-ride lot and either riding in another person's car or boarding a bus or train, commuters can avoid any parking costs at their destination, wear and tear on their car, and stress related to congestion. They also provide driving and bicycling access to commuter and rapid transit services for residents that live further than a short walk from stations and stops.

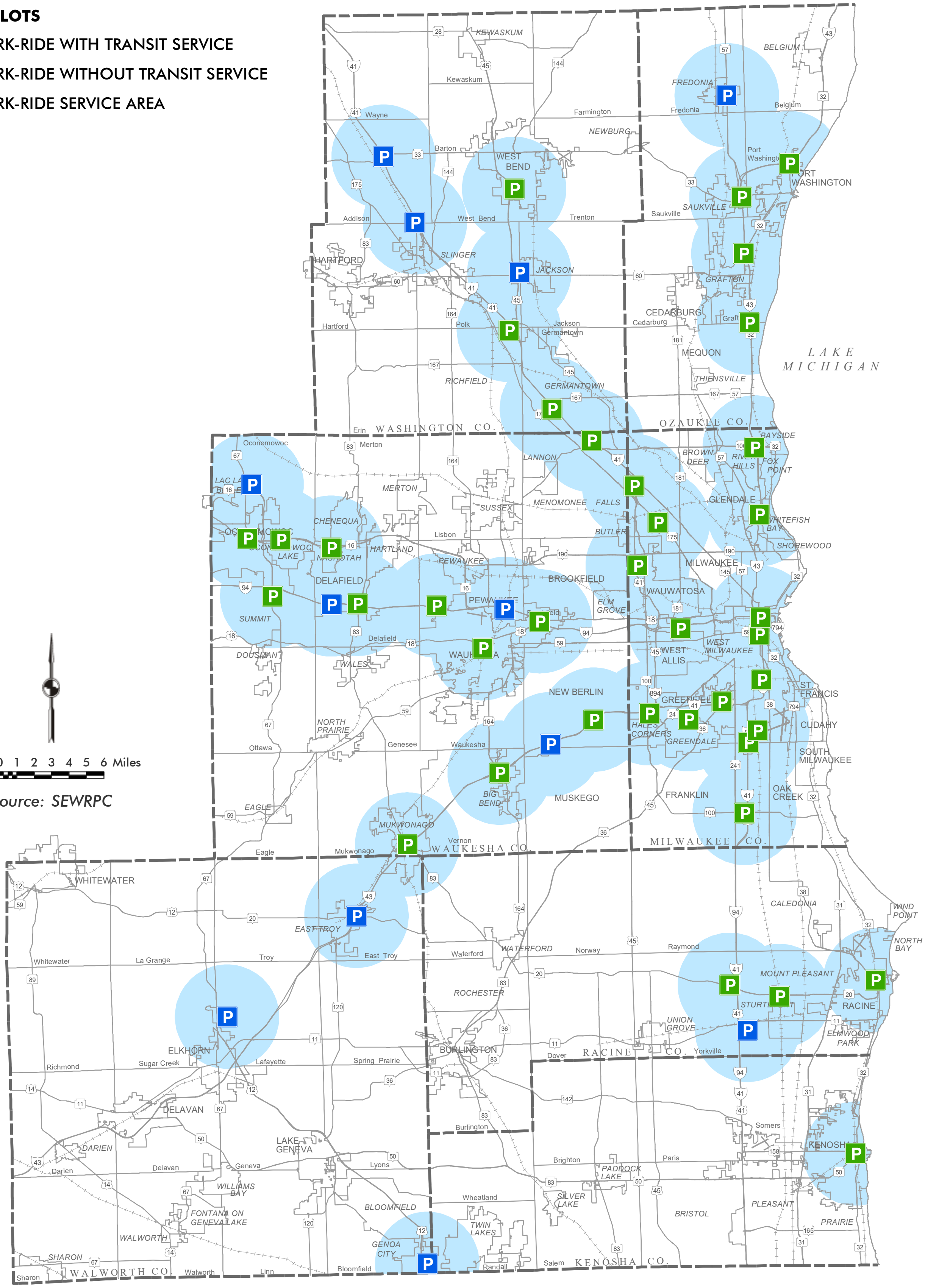
- **<u>Evaluation Results:</u>** Maps F.129 through F.132 show park-ride lots and their service areas, as well as which lots would be served by transit, under existing conditions and each alternative. The most residents would be within three miles of a park-ride facility under Alternative Plan II, 83.6 percent of all residents. Alternative Plan I would have nearly the same percent of residents within three miles of a park-ride at 82.8 percent, while the Trend would have the fewest residents within three miles of a park-ride at 67.2 percent. Despite having a few additional park-ride lots that would be added under the Trend as part of the reconstruction of the Region's freeway system, the percent of residents within three miles decreases because more residents would be added to the Region outside of that three-mile buffer than within that buffer.

  Under Alternative I, slightly more residents would live within three miles of a park-ride lot served by transit (78.8 percent) than under Alternative II (78.6 percent), although the quality of the transit service provided in those areas with fewer park-ride lots would significantly increase under Alternative II. The percent of residents within three miles of a park-ride lot with transit service decreases slightly under Alternative II when compared to Alternative I because there are slightly fewer park-ride facilities in Waukesha County due to the Oconomowoc-Brookfield-Milwaukee Commuter Rail line replacing some commuter bus routes. The Trend performs significantly worse than either alternative plan, as only 55.1 percent of the Region's population would live within three miles of a park-ride facility with transit service. The decrease in population living within three miles of a park-ride lot with transit service between existing conditions and the Trend is due to the significant reduction in commuter bus service included in the Trend.

Map F.129
Access to Park-Ride Lots: Existing

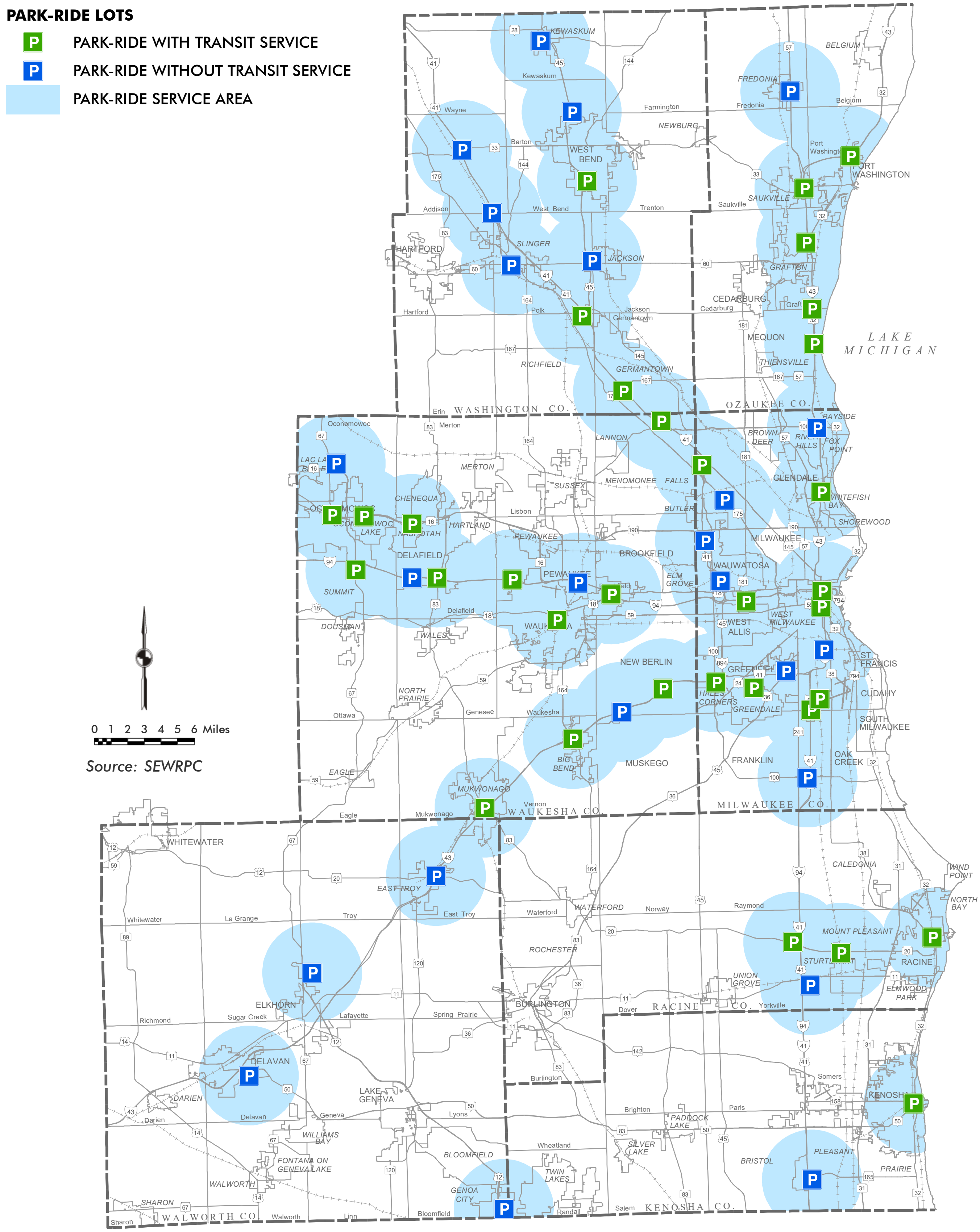
PARK-RIDE LOTS

- P PARK-RIDE WITH TRANSIT SERVICE
- P PARK-RIDE WITHOUT TRANSIT SERVICE
- PARK-RIDE SERVICE AREA



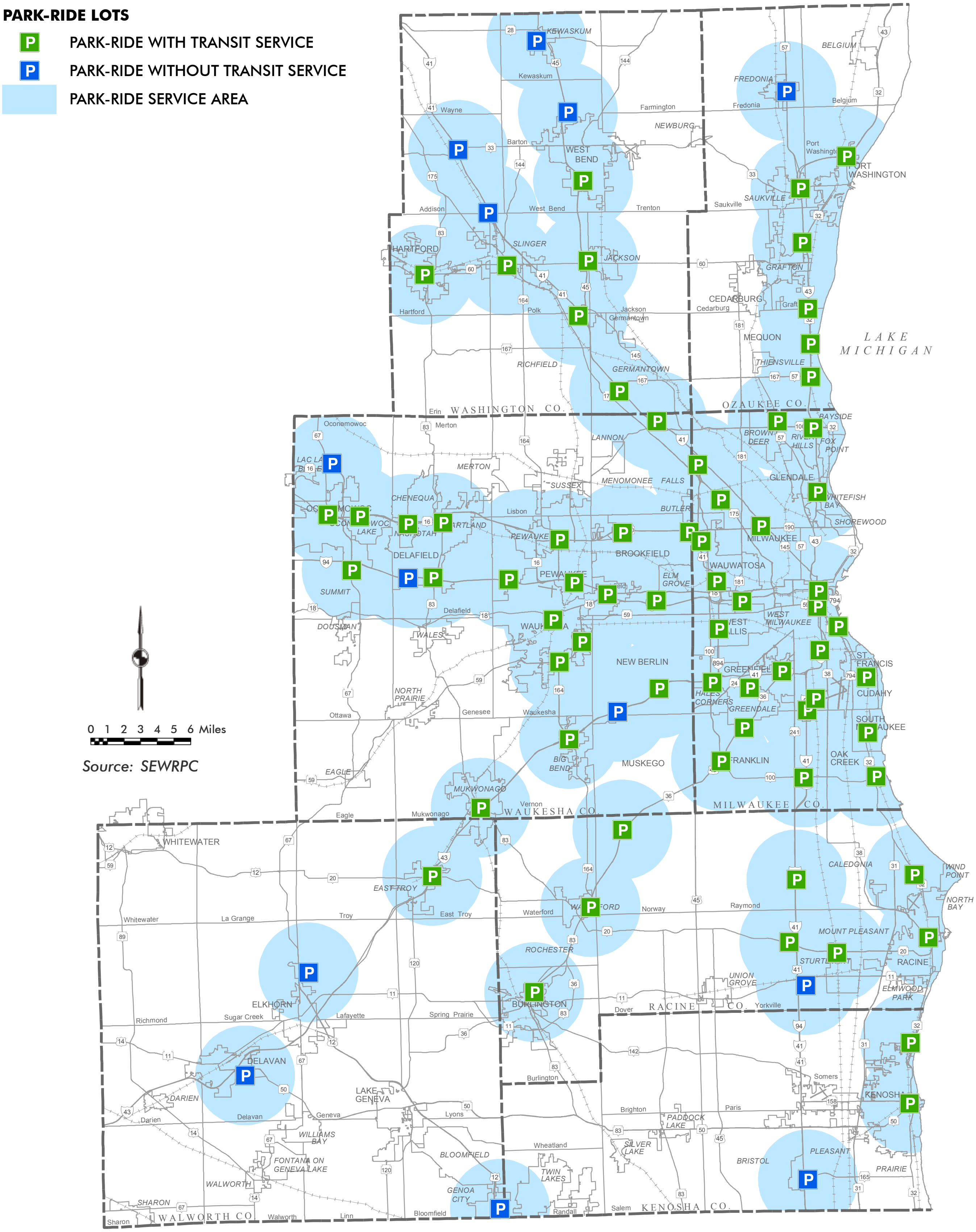
Source: SEWRPC

Map F.130
Access to Park-Ride Lots: Trend



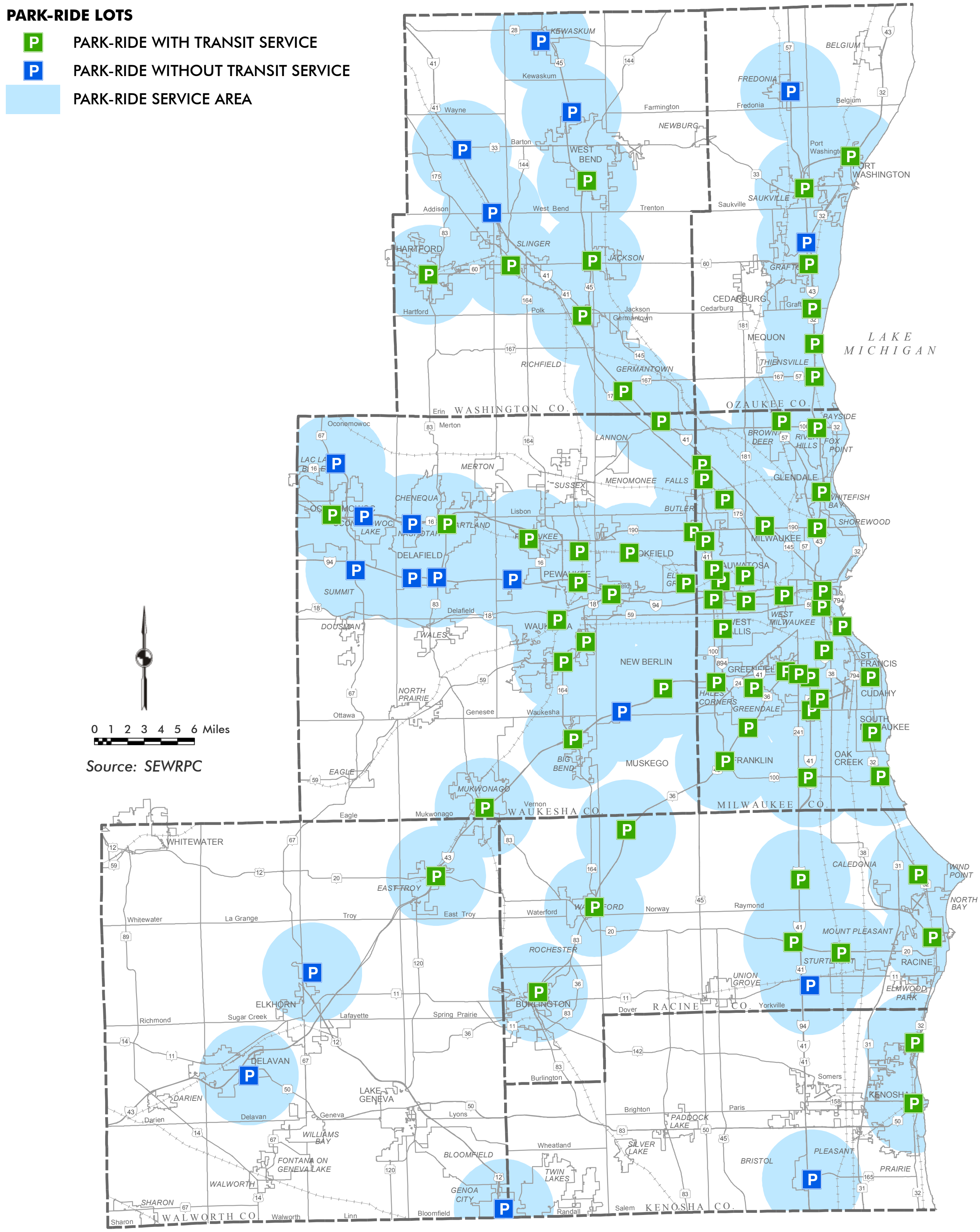
Source: SEWRPC

Map F.131
Access to Park-Ride Lots: Alternative Plan I



Source: SEWRPC

Map F.132
Access to Park-Ride Lots: Alternative Plan II



Source: SEWRPC

Table F.45
Population with Access to Park-Ride Facilities

Alternative	Within Three Miles of a Park-Ride Facility		Within Three Miles of a Park-Ride Facility with Transit Service	
	Population	Percent	Population	Percent
Existing - 2010	1,406,000	69.6	1,345,000	66.6
Trend - 2050	1,583,000	67.2	1,297,000	55.1
Alt I - 2050	1,948,000	82.8	1,856,000	78.8
Alt II - 2050	1,968,000	83.6	1,851,000	78.6

Source: SEWRPC

CRITERION 4.3.1: PAVEMENT CONDITION

KEY CONCLUSIONS

- **Preserving the condition of the Region's arterial streets and highways is critical to provide for safe and efficient travel throughout the Region.**
- **As Federal, State, and local funding is limited, it is important that the timing and choice of rehabilitation and timing of reconstruction of the roadway be done consistent with the roadway's life cycle to utilize the available funding effectively.**
- **An estimated $548.6 million would be needed annually to maintain the pavement condition levels for the existing and committed arterial street and highway system through the year 2050. $602.1 million would be needed under the Trend, $600.5 million under Alternative I, and $583.8 million under Alternative II.**

Preserving the condition of the Region's arterial streets and highways is critical to provide for safe and efficient travel throughout the Region. As they carry a higher level of people and goods each day, preserving the condition of the arterial streets and highways is important for achieving a high standard of living for the Region's residents and giving the Region a competitive edge in terms of retaining and attracting businesses. Like other major public infrastructure, roadways have a long life (typically 50 to 60 years) before they need to be replaced or reconstructed. However, because of vehicular use (particularly by trucks) and changing weather conditions (freeze/thaw cycle in winters and hot summers), the condition of the roadway surface deteriorates over time. When roadway surfaces reach a critical level of deterioration, the comfort and safety of drivers can be affected. As a result, it is necessary improve the condition of the roadway surface through routine maintenance and periodic rehabilitation. Rehabilitation typically includes resurfacing (removing and overlaying a layer of the pavement), reconditioning (resurfacing plus spot base repairs), or pavement replacement (removing and replacing the full-depth of pavement). The first rehabilitation typically occurs 20 to 30 years following a roadway's construction or reconstruction, with two subsequent rehabilitations occurring every 8 to 18 years.

As available Federal, State, and local funding is limited, it is important that the timing and choice of rehabilitation and timing of reconstruction of the roadway be done consistent with the roadway's life cycle to utilize the available funding effectively. Sound pavement management practices are necessary, focusing more on less costly maintenance work and rehabilitations as needed to maximize pavement life, and avoiding substantial pavement deterioration and costly premature pavement reconstruction. To assist in managing the condition of their roadways, many States and local governments have developed pavement management plans that include strategies for pavement condition monitoring and for implementing cost-effective maintenance and rehabilitation activities. Development of these plans is particularly important to local governments, which need to maintain a large system of arterial and nonarterial roadways, with the length of nonarterials typically 5 to 15 times that of arterials under their jurisdiction.

The condition of all roadways (arterials and nonarterials) in the Region are evaluated by the level of government having jurisdiction of the roadway (State for state trunk highways, counties for county trunk highways, and local governments for local trunk highways). In the Region, WisDOT assesses all of the state trunk highways (including interstate highways) based on many factors, including the International Roughness Index (IRI), which is estimated utilizing special equipment to physically measure pavement condition along the roadway. Counties and local governments generally use the Pavement Surface and Evaluation Rating (PASER) System to evaluate their roadways. PASER is a rating system that employs visual inspection techniques to assess the pavement condition. The results of these evaluations assist the States, counties, and local governments in determining the appropriate work needed to maintain their roadway systems and to prioritize the timing of that work.

- **Evaluating Pavement Condition:** Based on the IRI for state trunk highways and the PASER rating for county/local arterial streets and highways, the arterial streets and highways in the Region were grouped as having good, fair, or poor pavement conditions—good being a pavement that requires little or no maintenance; fair being a pavement that requires minor rehabilitation (sealcoating/non-structural resurfacing), and poor being a pavement that requires major rehabilitation (structural resurfacing/pavement replacement) or reconstruction.[45] Map F.133 shows the existing arterial streets and highways that have a pavement condition of good, fair, and poor under the base year (2013). As described in Chapter 4 of Volume I, State, county, and local governments have maintained these levels since 2006, with some improvement in reducing the mileage of poor pavements and increasing the mileage of good pavements.

  The estimated number of miles of arterial streets and highways by pavement condition under each alternative is presented in Table F.46. Table F.47 presents costs estimated for each alternative to maintain similar pavement conditions through the year 2050 to those observed in 2013. An estimated $548.6 million would be needed annually to maintain the existing and committed arterial street and highway system through the year 2050. This cost includes the construction of the committed surface arterial and freeway improvements and the reconstruction and modernization costs of the remaining segments of the freeway system. The costs associated with reconstructing and maintaining the envisioned arterial street and highway system under the Trend would be the highest at $602.1 million annually, followed by Alternative I at $600.5 million and Alternative II at $583.8 million. The primary reason for the difference in costs between the alternatives is the inclusion or exclusion of envisioned new or widened arterial facilities. These costs anticipate that the existing arterials are maintained, rehabilitated, and reconstructed based on the typical life cycle of a pavement. The costs estimated for preserving the existing arterial street and highway system provided under Criterion 3.2.1 (Average Annual Transportation System Investment) also assume that the pavement condition in the base year would be maintained for the Trend and Alternatives I and II. However, maintaining this level of pavement condition through the year 2050 will be in part dependent on the amount of Federal, State, and local funding available for the construction and preservation of the arterial street and highway system.

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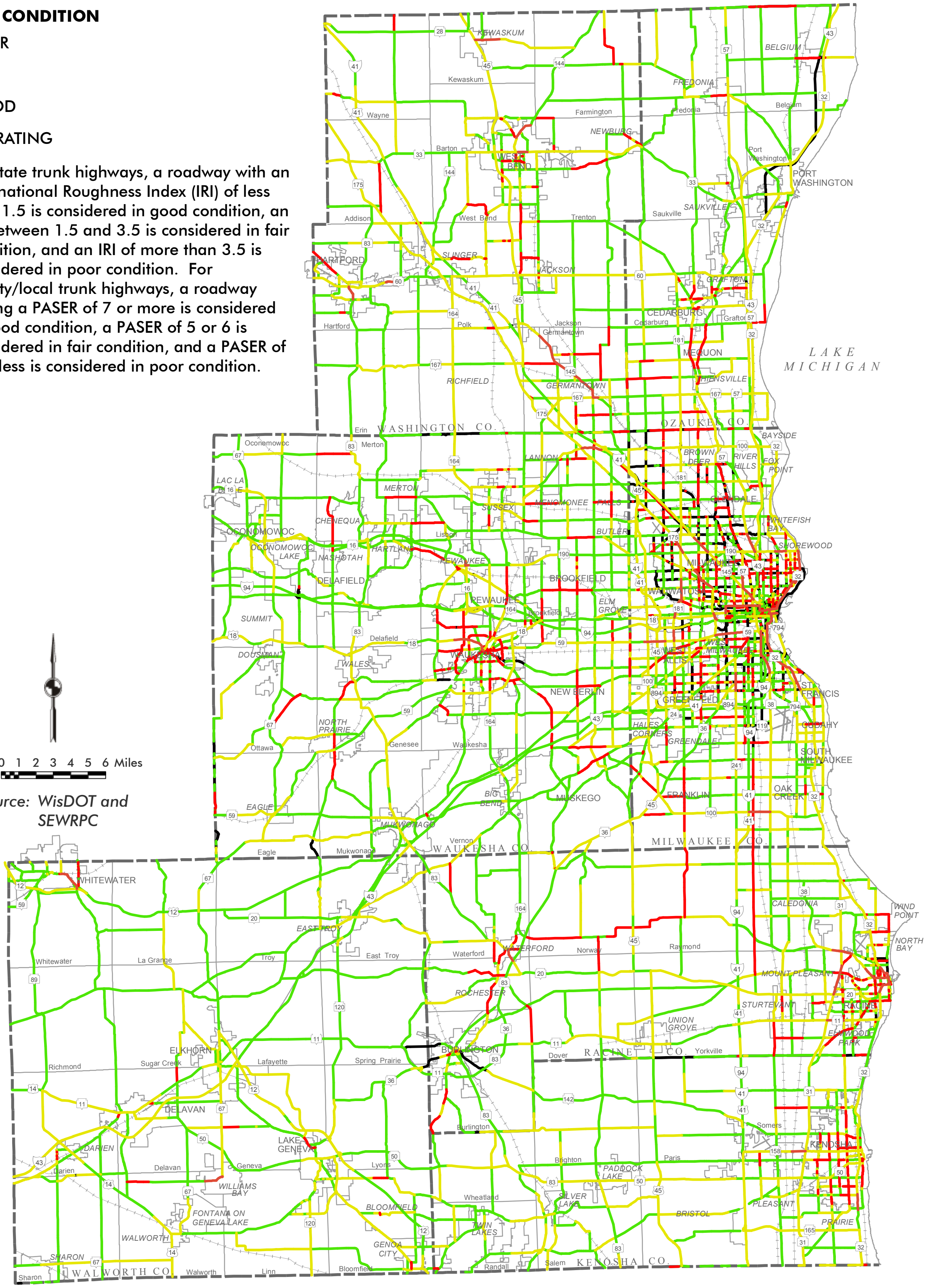
[45] For state trunk highways, a roadway with an IRI of less than 1.5 is considered in good condition, an IRI between 1.5 and 3.5 is considered in fair condition, and an IRI more than 3.5 is considered in poor condition. For county/local trunk highways, a roadway having a PASER of 7 or more is considered in good condition, a PASER of 5 or 6 is considered in fair condition, and a PASER of 4 or less is considered in poor condition.

Map F.133
Pavement Condition on Arterial Streets and Highways in the Region: 2013

PAVEMENT CONDITION

- POOR
- FAIR
- GOOD
- NO RATING

Note: For state trunk highways, a roadway with an International Roughness Index (IRI) of less than 1.5 is considered in good condition, an IRI between 1.5 and 3.5 is considered in fair condition, and an IRI of more than 3.5 is considered in poor condition. For county/local trunk highways, a roadway having a PASER of 7 or more is considered in good condition, a PASER of 5 or 6 is considered in fair condition, and a PASER of 4 or less is considered in poor condition.



Source: WisDOT and SEWRPC

Table F.46
Pavement Condition of Arterial Streets and Highways

Condition	Existing (2013)		Existing and Committed System (2050)		Trend (2050)		Alt I (2050)		Alt II (2050)	
	Miles	Percent	Miles	Percent	Miles	Percent	Miles	Percent	Miles	Percent
Good	1,958	54.7	2,198	61.4	2,247	61.5	2,247	61.5	2,243	61.5
Fair	1,239	34.7	995	27.8	1,018	27.9	1,018	27.9	1,017	27.9
Poor	380	10.6	387	10.8	388	10.6	388	10.6	388	10.6
Total	3,577	100.0	3,579	100.0	3,654	100.0	3,654	100.0	3,647	100.0

Source: WisDOT and SEWRPC

Table F.47
Cost per Year to Maintain Existing Pavement Condition Levels (in $ millions)

Highway	Existing and Committed System (2050)	Trend (2050)	Alt I (2050)	Alt II (2050)
Surface Arterials[a]	$260.1	$282.4	$280.8	$277.4
Freeways				
Construction[a]	256.6	287.8	287.8	274.4
Resurface/Rehab	31.9	31.9	31.9	31.9
Total	$548.6	$602.1	$600.5	$583.8

[a] *Cost estimates include the highway improvements—new and widened facilities—included in the alternative.*

Source: SEWRPC

CRITERION 4.3.2: TRANSIT FLEET CONDITION

KEY CONCLUSION

- **Alternative Plans I and II would have no transit vehicles beyond their useful life, resulting in fewer breakdowns, lower operating and maintenance costs, and a more environmentally friendly fleet than under the Trend, where 20 percent of vehicles would be older than recommended by the Federal Transit Administration.**

The Federal Transit Administration recommends replacing a standard 40-foot transit bus once every 12 years or 500,000 miles, whichever comes first. There are similar recommendations for all other types of transit vehicles, from sedans used for shared-ride taxi services to subway cars. Many transit operators in our Region have struggled to replace buses on this schedule for a number of years due to severe funding restrictions on the Federal, State, and local levels. Replacing transit vehicles on a regular schedule keeps operating costs low, reduces breakdowns that introduce unreliability in transit service, and helps to keep emissions low as older vehicles are replaced with newer, more environmentally friendly vehicles.

- **Evaluation Results:** Because implementing the transit systems included in Alternative Plans I and II would require new, stable funding sources for transit in the Region, it is envisioned that the transit fleet under both alternative plans would be replaced as recommended, and therefore that 0 percent of the transit fleet would be beyond its useful life by year 2050. The funding limitations projected under the Trend would result in approximately 20 percent of the transit fleet—about 75 of the Region's 387 fixed-route buses under the Trend—being beyond its useful life. As of 2015, approximately 15 percent of the transit fleet—about 90 of the Region's existing 591 fixed-route buses—is older than recommended.

CRITERION 4.4.1: CONGESTION ON ARTERIAL STREETS AND HIGHWAYS

KEY CONCLUSIONS

- **By a small margin, Alternative I would result in the least congested arterial street and highway system in the Region, with 6.6 percent (242.3 miles) of the system operating over its design capacity (moderate, severe, or extreme congestion) at some point during an average weekday.**
- **The number of congested arterial street and highway miles under Alternative I would be about 0.1 percent less than the Trend (244.5 miles) and 0.7 percent less than Alternative II (264.7 miles).**

Congestion on the arterial street and highway system increases the time it takes for automobiles, buses, and trucks to travel within Southeastern Wisconsin. Compared to other midwest metro areas and metro areas across the nation, congestion and associated travel time delays in the Region are relatively low, and have increased slower than nearly all other metro areas over the last 30 years.[46] Even with relatively low levels of congestion, however, efforts to decrease congestion in the Region would contribute to a range of benefits, including reduced vehicle emissions, reduced travel time delay for personal vehicles and public transit, reduced energy use, improved connectivity to nearby metropolitan areas, and reduced freight shipping travel times and costs.

Congestion on arterial streets and highways occurring on an average weekday results from traffic volumes exceeding roadway design capacity, usually during weekday peak traffic hours. This type of recurring congestion differs from non-recurring congestion, which can result from time to time due to crashes, bad weather, or major events (such as sporting events). Table F.48 presents a comparison of the average weekday congestion on the arterial street and highway system for the Region and for each county in the Region under existing conditions, the Trend, and Alternatives I and II. Also included in Table F.48 are the estimated congestion levels if the highway improvements under Alternatives I and II are not implemented, except for committed highway expansion projects and freeway modernization. Maps F.134 through F.139 illustrate the average weekday congestion on the arterial street and highway system in the Region under the alternatives.

- **<u>Total Congestion:</u>** Alternative I would result in the least congested arterial street and highway system in the Region, with 6.6 percent (242.3 miles) of the system operating over its design capacity (moderate, severe, or extreme congestion[47]) for at least part of an average weekday. The number of congested arterial street and highway miles under Alternative I would be about 0.1 percent less than the Trend (244.5 miles) and about 0.7 percent less than Alternative II (264.7

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[46] *SEWRPC Memorandum Report No. 221,* A Comparison of the Milwaukee Metropolitan Areas to Its Peers, *May 2015.*

[47] *Under moderate congestion, average freeway speeds are 1 to 2 mph below free-flow speeds, and average surface arterial speeds are 40 to 50 percent of free-flow speeds. Under severe congestion, average freeway speeds are up to 10 mph below free-flow speeds, and average surface arterial speeds are 33 to 40 percent of free-flow speeds. Under extreme congestion, average freeway speeds are 20 to 30 mph or less, and average surface arterial speeds are 25 to 33 percent of free-flow speeds.*

Table F.48
Average Weekday Congestion on Arterial Streets and Highways

Existing (2011)

	Under or At Design Capacity		Over Design Capacity						
			Moderate Congestion		Severe Congestion		Extreme Congestion		
County	Mileage	Percent of Total	Mileage	Percent of Total	Mileage	Percent of Total	Mileage	Percent of Total	Total Mileage
Kenosha	303.2	94.8	11.3	3.5	4.9	1.5	0.6	0.2	320.0
Milwaukee	647.5	82.1	64.6	8.2	49.5	6.3	26.8	3.4	788.4
Ozaukee	236.2	94.2	9.6	3.8	4.7	1.9	0.3	0.1	250.8
Racine	345.0	96.3	9.5	2.7	2.5	0.7	1.3	0.4	358.3
Walworth	442.6	99.3	2.4	0.5	0.4	0.1	0.2	0.0	445.6
Washington	397.8	97.9	6.1	1.5	2.3	0.6	0.3	0.1	406.5
Waukesha	676.5	89.8	43.4	5.8	27.9	3.7	5.5	0.7	753.3
Region	3,048.8	91.8	146.9	4.4	92.2	2.8	35.0	1.1	3,322.9

Trend (2050)

	Under or At Design Capacity		Over Design Capacity						
			Moderate Congestion		Severe Congestion		Extreme Congestion		
County	Mileage	Percent of Total	Mileage	Percent of Total	Mileage	Percent of Total	Mileage	Percent of Total	Total Mileage
Kenosha	341.4	94.4	15.0	4.1	4.9	1.4	0.3	0.1	361.6
Milwaukee	656.4	81.5	57.0	7.1	61.8	7.7	30.1	3.7	805.3
Ozaukee	304.6	98.3	3.8	1.2	1.3	0.4	0.3	0.1	310.0
Racine	432.4	97.5	7.7	1.7	2.7	0.6	0.7	0.2	443.5
Walworth	485.2	99.3	2.4	0.5	0.8	0.2	0.1	0.0	488.5
Washington	440.7	95.7	16.5	3.6	3.0	0.7	0.3	0.1	460.5
Waukesha	748.6	95.4	25.9	3.3	7.7	1.0	2.2	0.3	784.4
Region	3,409.3	93.3	128.3	3.5	82.2	2.2	34.0	0.9	3,653.8

Alternative I with Highway Improvements (2050)

	Under or At Design Capacity		Over Design Capacity						
			Moderate Congestion		Severe Congestion		Extreme Congestion		
County	Mileage	Percent of Total	Mileage	Percent of Total	Mileage	Percent of Total	Mileage	Percent of Total	Total Mileage
Kenosha	340.1	94.1	15.6	4.3	5.4	1.5	0.5	0.1	361.6
Milwaukee	652.8	81.1	58.7	7.3	63.0	7.8	30.8	3.8	805.3
Ozaukee	304.5	98.2	3.9	1.3	1.3	0.4	0.3	0.1	310.0
Racine	432.8	97.6	7.3	1.6	2.7	0.6	0.7	0.2	443.5
Walworth	484.8	99.2	3.0	0.6	0.6	0.1	0.1	0.0	488.5
Washington	441.6	95.9	15.5	3.4	3.1	0.7	0.3	0.1	460.5
Waukesha	754.9	96.2	19.3	2.5	7.9	1.0	2.3	0.3	784.4
Region	3,411.5	93.4	123.3	3.4	84.0	2.3	35.0	1.0	3,653.8

Alternative I Without Highway Improvements[a] (2050)

	Under or At Design Capacity		Over Design Capacity						
			Moderate Congestion		Severe Congestion		Extreme Congestion		
County	Mileage	Percent of Total	Mileage	Percent of Total	Mileage	Percent of Total	Mileage	Percent of Total	Total Mileage
Kenosha	333.1	92.4	20.6	5.7	6.3	1.7	0.5	0.1	360.5
Milwaukee	628.3	78.7	67.3	8.4	59.8	7.5	43.4	5.4	798.8
Ozaukee	284.8	93.7	11.5	3.8	5.5	1.8	2.2	0.7	304.0
Racine	417.0	96.4	10.9	2.5	3.9	0.9	0.7	0.2	432.5
Walworth	455.2	98.1	4.4	0.9	2.5	0.5	2.0	0.4	464.1
Washington	411.4	93.5	23.8	5.4	4.1	0.9	0.8	0.2	440.1
Waukesha	687.4	88.2	33.0	4.2	44.5	5.7	14.5	1.9	779.4
Region	3,217.2	89.9	171.5	4.8	126.6	3.5	64.1	1.8	3,579.4

Table continued on next page.

Table F.48 (Continued)

Alternative II with Highway Improvements (2050)

	Under or At Design Capacity		Over Design Capacity: Moderate Congestion		Over Design Capacity: Severe Congestion		Over Design Capacity: Extreme Congestion		
County	Mileage	Percent of Total	Mileage	Percent of Total	Mileage	Percent of Total	Mileage	Percent of Total	**Total Mileage**
Kenosha	338.9	93.7	16.9	4.7	5.5	1.5	0.3	0.1	361.6
Milwaukee	634.5	79.4	62.6	7.8	63.2	7.9	38.5	4.8	798.8
Ozaukee	300.5	96.9	7.7	2.5	1.5	0.5	0.3	0.1	310.0
Racine	430.4	97.0	8.6	1.9	3.8	0.9	0.7	0.2	443.5
Walworth	485.2	99.3	2.7	0.6	0.6	0.1	0.0	0.0	488.5
Washington	441.7	95.9	15.4	3.3	3.1	0.7	0.3	0.1	460.5
Waukesha	751.4	95.8	21.7	2.8	9.1	1.2	2.2	0.3	784.4
Region	3,382.6	92.7	135.6	3.7	86.8	2.4	42.3	1.2	3,647.3

Alternative II Without Highway Improvements[a] (2050)

	Under or At Design Capacity		Over Design Capacity: Moderate Congestion		Over Design Capacity: Severe Congestion		Over Design Capacity: Extreme Congestion		
County	Mileage	Percent of Total	Mileage	Percent of Total	Mileage	Percent of Total	Mileage	Percent of Total	**Total Mileage**
Kenosha	332.4	92.2	21.7	6.0	5.9	1.6	0.5	0.1	360.5
Milwaukee	620.5	77.7	69.6	8.7	62.0	7.8	46.7	5.8	798.8
Ozaukee	286.4	94.2	10.1	3.3	5.4	1.8	2.1	0.7	304.0
Racine	416.8	96.4	11.1	2.6	3.9	0.9	0.7	0.2	432.5
Walworth	455.6	98.2	4.2	0.9	2.3	0.5	2.0	0.4	464.1
Washington	410.6	93.3	24.6	5.6	4.1	0.9	0.8	0.2	440.1
Waukesha	689.3	88.4	32.9	4.2	44.8	5.7	12.4	1.6	779.4
Region	3,211.6	89.7	174.2	4.9	128.4	3.6	65.2	1.8	3,579.4

[a] *The impacts of committed highway improvements are included under these alternatives.*

Source: SEWRPC

miles).[48] The lower congestion under Alternative I would result due to a combination of proposing more arterial street and highway expansion than Alternative II and proposing more compact land use development and transit service expansion than the Trend. Not including highway improvements (except for currently committed highway expansion projects and freeway modernization) under Alternatives I and II would increase the percentage of congested arterial street and highway miles under these alternatives by about 3.5 percent (an additional 119.9 miles) and 3.0 percent (an additional 103.1 miles), respectively.

Milwaukee County has the largest population and concentration and density of households and jobs in the Region. As of 2011, it also had about 51.4 percent (140.9 miles) of the total miles of congested arterial streets and highways in the Region. This percentage would increase to 60.9 percent (148.9 miles) under the Trend, to 62.9 percent (152.5 miles) under Alternative I, and to 62.1 percent (164.3 miles) under Alternative II. Comparing the arterial streets and highways within each county, Milwaukee County would have the highest percentage of congested arterial street and highway miles of any county. The Trend would result in the least congested arterial street and highway system in Milwaukee County, with 18.5 percent (148.9 miles) of the

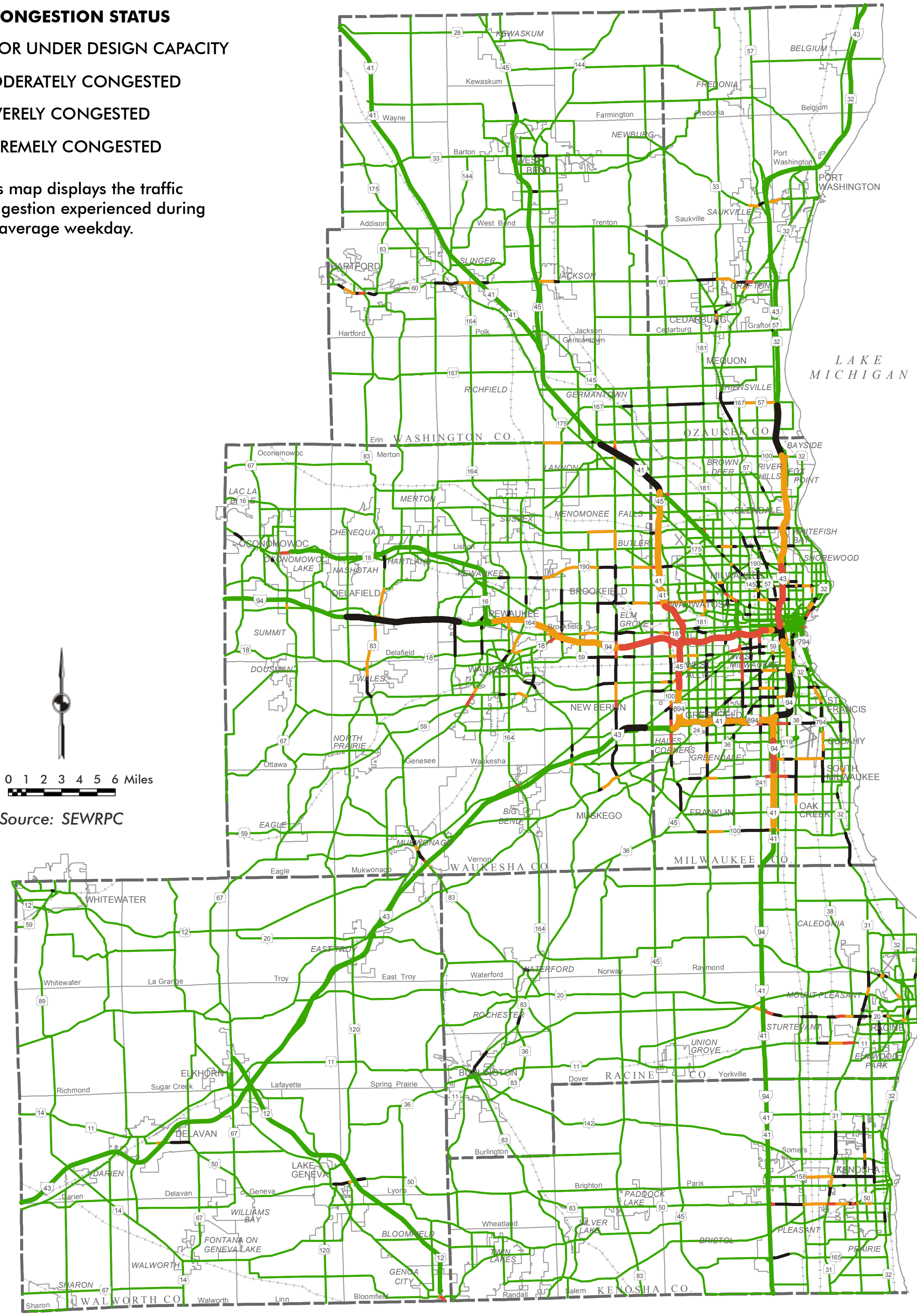
[48] *The arterial street and highway system under the Trend and Alternative I totals 3,653.8 miles. The system under Alternative II, which proposes less construction of new facilities, totals 3,647.3 miles.*

Map F.134
Congestion on the Arterial Street and Highway System: 2011

FACILITY CONGESTION STATUS

- AT OR UNDER DESIGN CAPACITY
- MODERATELY CONGESTED
- SEVERELY CONGESTED
- EXTREMELY CONGESTED

Note: This map displays the traffic congestion experienced during an average weekday.



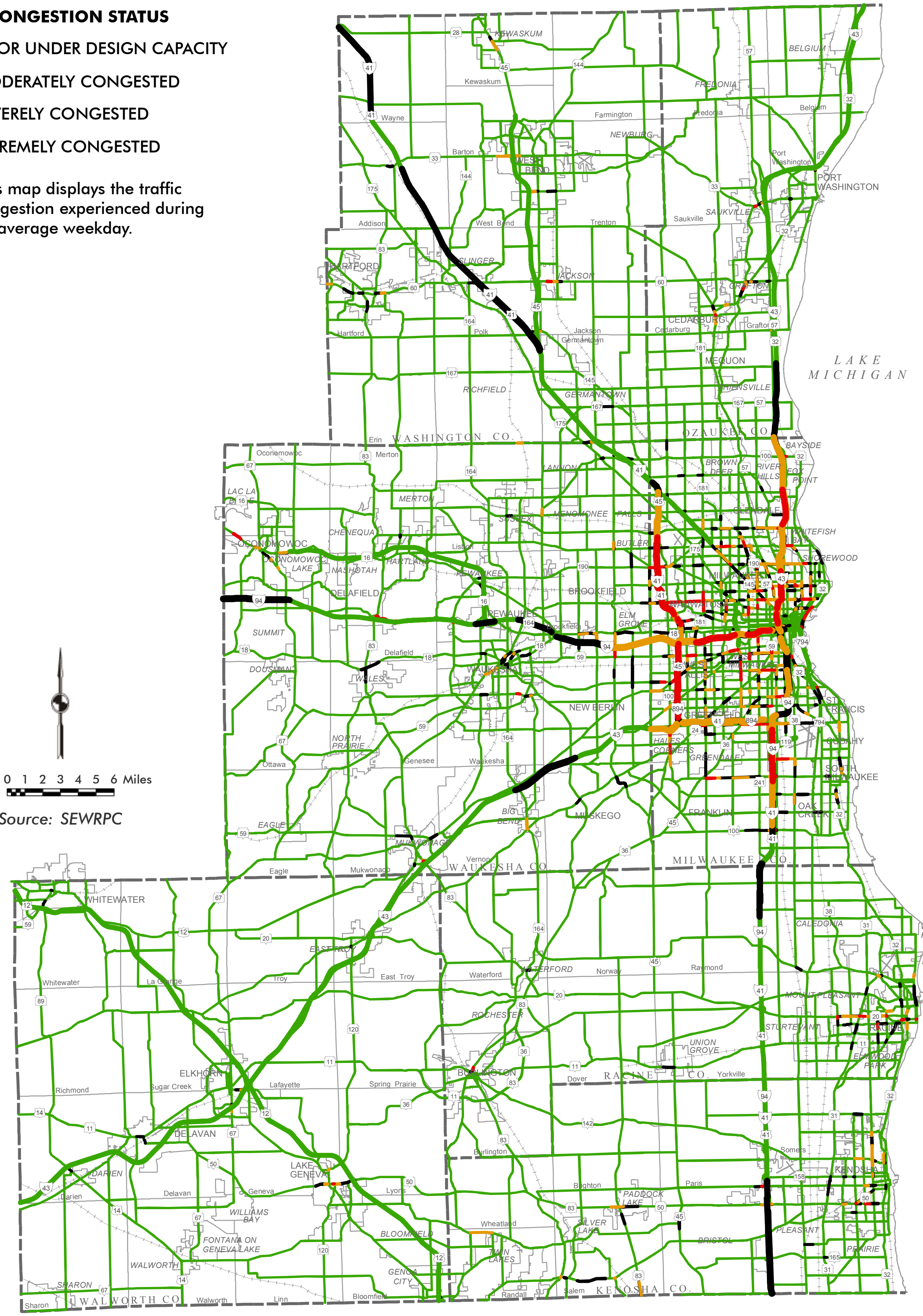
Source: SEWRPC

Map F.135
Congestion on the Arterial Street and Highway System: Trend

FACILITY CONGESTION STATUS

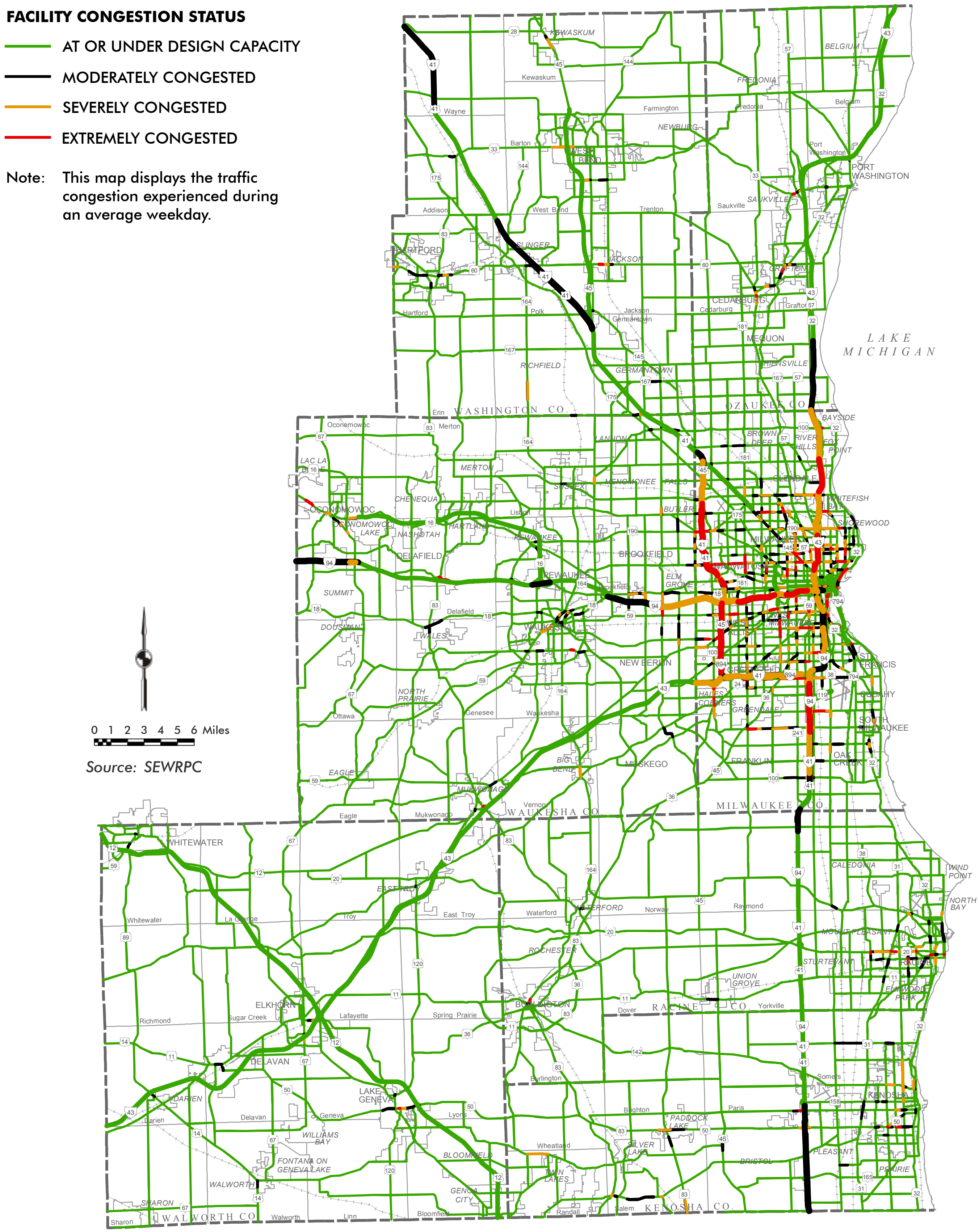
- AT OR UNDER DESIGN CAPACITY
- MODERATELY CONGESTED
- SEVERELY CONGESTED
- EXTREMELY CONGESTED

Note: This map displays the traffic congestion experienced during an average weekday.



Source: SEWRPC

Map F.136
Congestion on the Arterial Street and Highway System: Alternative I with Highway Improvements

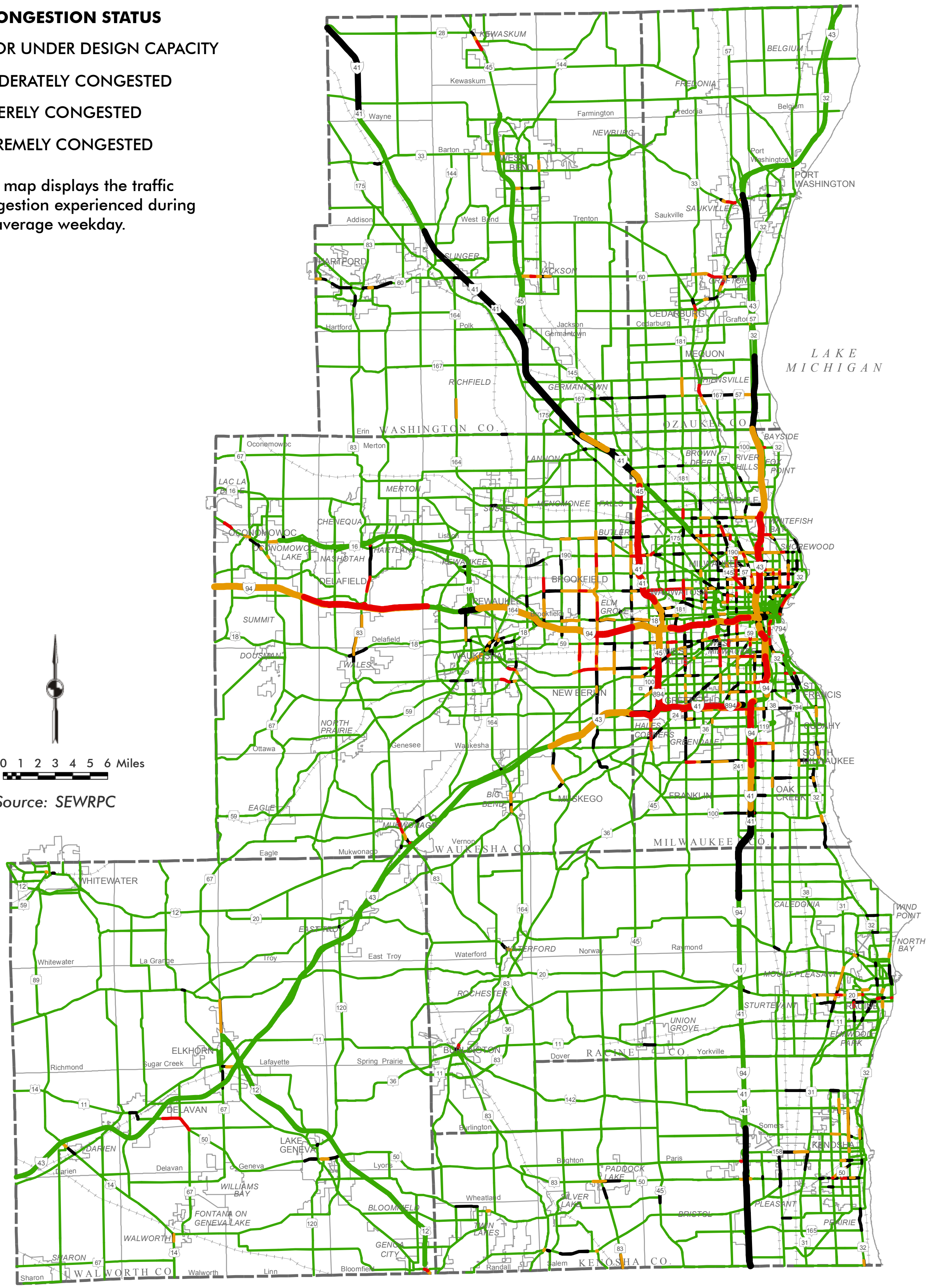


Map F.137
Congestion on the Arterial Street and Highway System: Alternative I Without Highway Improvements

FACILITY CONGESTION STATUS

- AT OR UNDER DESIGN CAPACITY
- MODERATELY CONGESTED
- SEVERELY CONGESTED
- EXTREMELY CONGESTED

Note: This map displays the traffic congestion experienced during an average weekday.

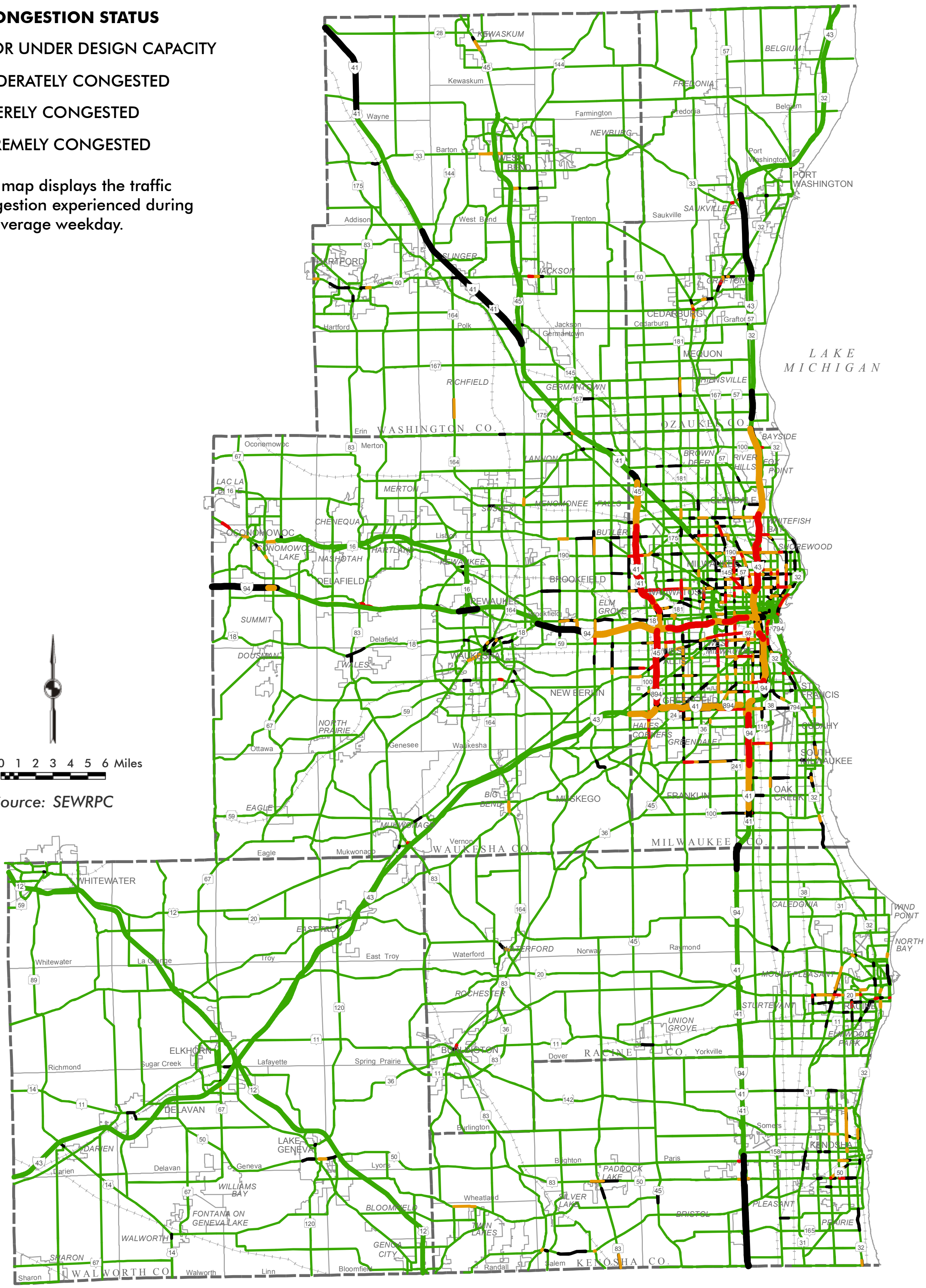


Map F.138
Congestion on the Arterial Street and Highway System: Alternative II with Highway Improvements

FACILITY CONGESTION STATUS

- AT OR UNDER DESIGN CAPACITY
- MODERATELY CONGESTED
- SEVERELY CONGESTED
- EXTREMELY CONGESTED

Note: This map displays the traffic congestion experienced during an average weekday.



0 1 2 3 4 5 6 Miles

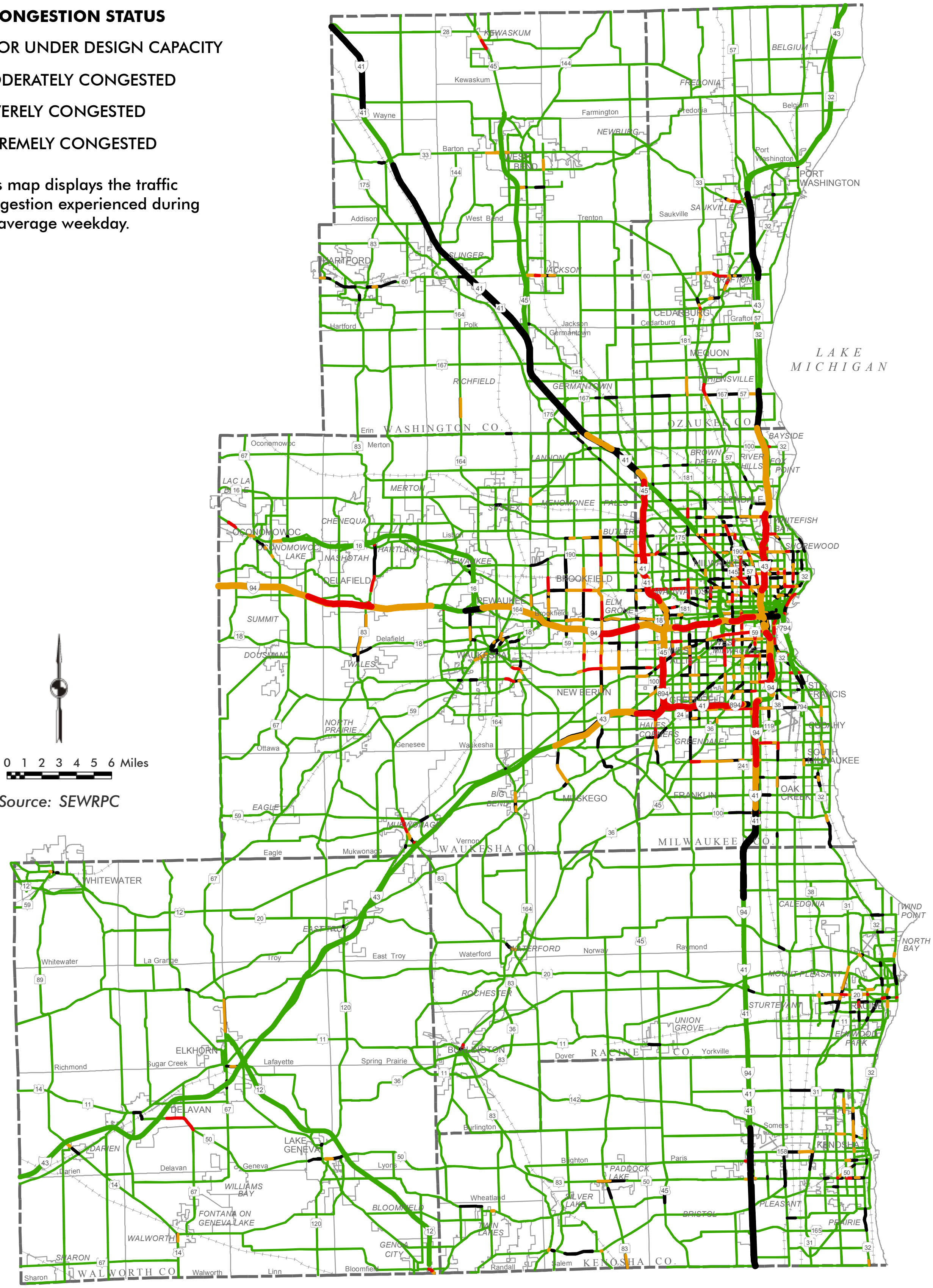
Source: SEWRPC

Map F.139
Congestion on the Arterial Street and Highway System: Alternative II Without Highway Improvements

FACILITY CONGESTION STATUS

- AT OR UNDER DESIGN CAPACITY
- MODERATELY CONGESTED
- SEVERELY CONGESTED
- EXTREMELY CONGESTED

Note: This map displays the traffic congestion experienced during an average weekday.



Source: SEWRPC

system operating over its design capacity at some point during an average weekday. The congested arterial street and highway miles in Milwaukee County under the Trend would be about 0.4 percent less than Alternative I (152.5 miles) and about 2.1 percent less than Alternative II (164.3 miles). The lower percentage of congested arterial street and highway miles in Milwaukee County under the Trend would result due to a combination of the Trend envisioning more arterial street and highway expansion in the County compared to Alternatives I and II, and Alternatives I and II proposing to add more households and jobs in the County (which would generate more traffic in the County) than the Trend.

Alternative I would result in the least congested freeway system in the Region, with 26.6 percent (76 miles) of the system operating over its design capacity for at least part of an average weekday. The congested freeway miles under Alternative I would be about 1.2 percent less than Alternative II (79 miles) and about 2.5 percent less than the Trend (84 miles). Congestion on the freeway system would vary during an average weekday, with the worst congestion occurring during the morning (from about 7:00 to 9:00 a.m.) and afternoon (from about 3:00 to 5:00 p.m.) rush hour periods. Table F.49 presents the number of hours of extreme, severe, and moderate congestion occurring on the Region's freeways during an average weekday under each of the alternatives.

- **Severe and Extreme Congestion:** The Trend would result in the least amount of severe and extreme congestion in the Region, with 3.2 percent (116.2 miles) of the arterial street and highway system operating with severe or extreme congestion for at least part of an average weekday. The number of arterial street and highway miles with severe or extreme congestion under the Trend would be about 0.1 percent less than Alternative I (119.0 miles) and about 0.3 percent less than Alternative II (129.1 miles). The lower amount of severe and extreme congestion under the Trend would largely result from this alternative envisioning the most arterial street and highway expansion. Not including highway improvements (except for currently committed projects and freeway modernization) under Alternatives I and II would increase the percent of arterial street and highway miles with severe or extreme congestion under these alternatives by about 2.0 percent and 1.9 percent, respectively.

  As of 2011, Milwaukee County had about 60.0 percent (76.3 miles) of the arterial street and highway miles experiencing severe or extreme congestion in the Region, and this percentage would increase to 79.1 percent (91.9 miles) under the Trend, to 78.8 percent (93.8 miles) under Alternative I, and to 78.8 percent (101.7 miles) under Alternative II. Comparing the arterial streets and highways within each county, Milwaukee County would have the highest percentage of arterial street and highway miles with severe or extreme congestion of any county. The Trend would result in the least amount of severe and extreme congestion in Milwaukee County, with about 11.4 percent (91.9 miles) of arterial street and highway miles operating with severe or extreme congestion for at least part of an average weekday. The arterial street and highway miles in Milwaukee County with severe or extreme congestion under the Trend would be about 0.2 percent less than Alternative I (93.8 miles) and about 1.3 percent less than Alternative II (101.7 miles). Similar to total congestion in Milwaukee

Table F.49
Average Hours of Congestion on an Average Weekday

Alternative	Highest Level of Hourly Congestion Experienced	Miles of Congested Freeways		Average Hours of Congestion on an Average Weekday			
		Number	Percent of Freeway System	Extreme	Severe	Moderate	Total
Existing - 2011	Extreme	18	6.8	1.3	2.9	3.9	8.1
	Severe	34	12.9	--	1.4	2.3	3.7
	Moderate	21	7.7	--	--	1.8	1.8
	Total	73	27.4	--	--	--	--
Trend - 2050	Extreme	15	5.2	1.2	2.5	3.6	7.3
	Severe	29	9.9	--	1.3	2.4	3.7
	Moderate	40	14.0	--	--	1.8	1.8
	Total	84	29.1	--	--	--	--
Alternative I with Highway Improvements - 2050	Extreme	14	4.9	1.2	2.5	3.5	7.2
	Severe	29	10.1	--	1.3	2.4	3.7
	Moderate	33	11.6	--	--	2.0	2.0
	Total	76	26.6	--	--	--	--
Alternative I Without Highway Improvements - 2050	Extreme	30	11.2	1.5	3.3	4.4	9.2
	Severe	42	15.5	--	1.4	2.3	3.7
	Moderate	43	15.9	--	--	1.7	1.7
	Total	115	42.6	--	--	--	--
Alternative II with Highway Improvements - 2050	Extreme	18	6.3	1.3	2.9	4.0	8.2
	Severe	27	9.5	--	1.3	2.3	3.6
	Moderate	34	12.0	--	--	2.1	2.1
	Total	79	27.8	--	--	--	--
Alternative II Without Highway Improvements - 2050	Extreme	28	10.4	1.5	3.4	4.5	9.4
	Severe	43	15.8	--	1.4	2.2	3.6
	Moderate	46	17.0	--	--	1.7	1.7
	Total	117	43.2	--	--	--	--

Source: SEWRPC

County, the lower percentage of arterial street and highway miles with severe or extreme congestion in the County under the Trend is a result of a combination of the Trend envisioning more arterial street and highway expansion in the County than the other alternatives and Alternatives I and II proposing to add more households and jobs in the County (which would generate more traffic) than the Trend.

Alternative I would result in the least amount of severe and extreme congestion on the Region's freeway system, with 15.0 percent (43 miles) of the system operating with severe or extreme congestion at some point during an average weekday. The freeway miles with severe or extreme congestion under Alternative I would be about 0.1 percent less than the Trend (44 miles) and about 0.8 percent less than Alternative II (45 miles).

CRITERION 4.4.2: TRAVEL TIME DELAY

KEY CONCLUSION

- **Alternative I would be expected to result in the lowest average annual minutes of travel time delay for total personal and commercial travel in the Region (1,544 million minutes), about 0.8 percent lower than the Trend (1,556 million minutes) and 6 percent lower than Alternative II (1,624 million minutes).**

The estimated minutes of travel time delay[49] under each alternative are largely influenced by the number of average weekday trips for each transportation mode and the level of congestion on the arterial street and highway system (congested roadway conditions increase the time it takes to travel). As described in Criterion 4.1.1 (Trips per Day by Mode), the average number of weekday automobile trips is expected to increase under all three alternatives, with automobile trips continuing to account for the vast majority of trips made in the Region. The average number of weekday trips using transit is expected to decline from existing levels under the Trend, but is expected to substantially increase under Alternatives I and II (47 percent and 62 percent more than the Trend, respectively). As described in Criterion 4.4.1 (Congestion on Arterial Streets and Highways), congestion and associated travel time delays in the Region are relatively low compared to other midwest metro areas and metro areas across the nation, and have increased slower than nearly all other metro areas over the last 30 years.[50] Criterion 4.4.1 also estimated that Alternative I would be expected to have the least overall congestion on the arterial street and highway system, followed by the Trend, and then Alternative II.

Table F.50 presents a comparison of estimated minutes of travel time delay (both on an average weekday and on an average annual basis[51]), for automobile, transit, and commercial travel under existing conditions, the Trend, and Alternatives I and II. Also included in Table F.50 are the estimated minutes of travel time delay if the highway improvements under Alternatives I and II are not implemented, except for committed highway improvements and freeway modernization.

- **<u>Total Travel:</u>** Alternative I would be expected to result in the lowest average annual minutes of travel time delay for total personal and commercial travel in the Region (1,544 million minutes), about 0.8 percent lower than the Trend (1,556 million minutes) and 6 percent lower than Alternative II (1,624 million minutes). The lower average annual minutes of travel time delay under Alternative I is a result of a combination of this alternative proposing more arterial street and highway expansion than Alternative II and proposing more compact land use development and transit service expansion than the Trend. Not including highway improvements (except for currently committed projects) under Alternative I and Alternative II would be expected to increase average annual minutes of travel time delay under these alternatives by about 41 percent and 31 percent, respectively.

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[49] *Travel time delay is defined as the difference in travel time between congested and uncongested conditions.*

[50] *SEWRPC Memorandum Report No. 221,* A Comparison of the Milwaukee Metropolitan Areas to Its Peers, *May 2015.*

[51] *Average annual delay is calculated by multiplying average weekday delay by the number of weekdays in a year.*

Table F.50
Travel Time Delay

Alternative	Average Weekday Minutes of Delay[a] (Millions)			
	Personal Travel		Commercial	
	Automobile	Transit	Travel	Total
Existing - 2011	4.94	0.29	0.86	6.09
Trend - 2050	4.95	0.24	0.91	6.10
Alt I with Highway Improvements - 2050	4.76	0.41	0.89	6.06
Alt I Without Highway Improvements - 2050	6.76	0.49	1.27	8.52
Alt II with Highway Improvements - 2050	5.08	0.32	0.95	6.36
Alt II Without Highway Improvements - 2050	6.71	0.36	1.27	8.33

Alternative	Average Annual Minutes of Delay[b] (Millions)			
	Personal Travel		Commercial	
	Automobile	Transit	Travel	Total
Existing - 2011	1,259	66	224	1,549
Trend - 2050	1,264	55	238	1,556
Alt I with Highway Improvements - 2050	1,214	98	232	1,544
Alt I Without Highway Improvements - 2050	1,727	117	331	2,175
Alt II with Highway Improvements - 2050	1,296	80	248	1,624
Alt II Without Highway Improvements - 2050	1,715	87	330	2,133

[a] *Travel time delay is defined as the difference in travel time between congested and uncongested conditions.*

[b] *Average annual delay is calculated by multiplying average weekday delay by the number of weekdays in a year.*

Source: SEWRPC

- **Automobile Travel:** Alternative I would be expected to result in the lowest average annual minutes of travel time delay for automobile travel in the Region (1,214 million minutes), about 4 percent lower than the Trend (1,264 million minutes) and 6 percent lower than Alternative II (1,296 million minutes). Similar to total travel, the lower average annual minutes of travel time delay for automobile travel under Alternative I is a result of a combination of this alternative proposing more arterial street and highway expansion than Alternative II and proposing more compact land use development and transit service expansion than the Trend. Not including highway improvements under Alternative I and Alternative II would be expected to increase average annual minutes of travel time delay under these alternatives by about 42 percent and 32 percent, respectively.

- **Transit Travel:** The Trend would be expected to result in the lowest average annual minutes of travel time delay for transit travel in the Region (55 million minutes), about 31 percent lower than Alternative II (80 million minutes) and 44 percent lower than Alternative I (98 million minutes). The higher average annual minutes of travel time delay under Alternatives I and II compared to the Trend reflects the substantial increase in transit service and transit ridership under the two alternative plans. The increased transit travel under Alternatives I and II would utilize both transit service operating in mixed traffic and fixed-guideway transit service operating in medians, transit-only lanes, or rail corridors. The transit travel in mixed traffic would be subject to traffic congestion and associated travel time delay, while fixed-guideway transit would mostly be unaffected by traffic congestion. Not including highway improvements under Alternative I and Alternative II would be expected to increase average annual minutes of transit travel time delay under these alternatives by about 19 percent and 9 percent, respectively.

- **Commercial Travel:** Alternative I would be expected to result in the lowest average annual minutes of travel time delay for commercial travel in the Region (232 million minutes), about 3 percent lower than the Trend (238 million minutes) and 6 percent lower than Alternative II (248 million minutes). As with automobile travel, the lower average annual minutes of travel time delay for commercial travel under Alternative I is a result of a combination of this alternative proposing more arterial street and highway expansion than Alternative II and proposing more compact land use development and transit service expansion than the Trend. Not including highway improvements under Alternative I and Alternative II would be expected to increase average annual minutes of delay under these alternatives by about 43 percent and 33 percent, respectively.

CRITERION 4.4.3: AVERAGE TRIP TIMES

KEY CONCLUSIONS

- **Average auto trip times only vary slightly by community under the alternatives, primarily due to differences between alternatives in traffic congestion levels.**
- **Average transit trip times would be significantly improved for most communities in the Region under Alternative Plans I and II compared to the Trend, with Alternative II resulting in the most significant reductions.**
- **Excluding highway improvements from Alternatives I and II would result in average trip times for both auto and transit increasing slightly due to additional congestion.**

This criterion compares average trip times for communities (counties and subareas of counties) by trip mode (auto and transit) and by trip purpose (work and other). As defined in Criterion 4.2.1 (Travel Time to Important Places by Mode), this criterion uses overall travel time, which is the total door-to-door time for traveling between a trip origin and destination, including both in-vehicle and out-of-vehicle travel time. The trip times for this criterion represent average travel time during an average weekday.

- **Evaluation Results:** Table F.51 presents average trip times by community, trip mode, and trip purpose under existing conditions. Tables F.52 through F.56 present the change in average trip times compared to existing conditions under the Trend and Alternatives I and II. Trip times that would increase by more than 20 percent compared to existing conditions are highlighted in red, while trip times that would decrease by more than 20 percent compared to existing conditions are highlighted in green.

  For auto trip times, there would be slight increases or decreases across all alternatives regardless of trip purpose, with variations occurring primarily due to differences in traffic congestion levels in each respective community between alternatives. The largest differences in auto trip times would occur if the highway improvements under Alternatives I and II were not implemented.

  For transit trip times, the Trend would result in the majority of communities experiencing increased trip times, with the City of Racine and the remainder of Racine County experiencing the most significant increases. Ozaukee, Walworth, and Washington Counties would be the exceptions, experiencing reductions in trip times under the Trend primarily due to expected traffic congestion levels being reduced on the commuter bus routes serving those counties. The only trip time increases under Alternative Plans I and II would be slight increases in Racine County for residents living outside the City of Racine. All other areas of the Region would maintain average transit trip times or experience reduced—sometimes significantly reduced—trip times under each alternative plan. The most significant reductions in transit trip times would occur in Washington County primarily due to the availability of bi-directional commuter bus service. Communities in Kenosha, Waukesha, Ozaukee, and Walworth Counties would also experience significant trip time reductions.

Table F.51
Average Travel Times in Minutes by Residents of the Region by Community, Mode, and Purpose: 2011

	Auto			Transit			Total		
Community	Work	Other	Total	Work	Other	Total	Work	Other	Total
City of Kenosha	16	9	12	50	40	44	17	10	12
Remainder of Kenosha County	22	12	16	59	47	52	22	12	16
Kenosha County	18	11	13	51	41	45	19	11	14
City of Milwaukee	19	15	16	46	41	43	20	16	18
Remainder of Milwaukee County	18	12	14	56	45	50	19	13	15
Milwaukee County	18	14	15	48	42	45	20	14	16
City of Racine	17	10	13	50	34	42	19	10	13
Remainder of Racine County	23	13	16	53	37	45	23	13	16
Racine County	21	12	15	51	35	43	21	12	15
City of Waukesha	18	12	14	49	36	42	19	12	15
Remainder of Waukesha County	20	13	16	57	43	51	20	13	16
Waukesha County	20	13	15	54	40	47	20	13	16
Ozaukee County	21	12	15	60	47	56	21	12	15
Walworth County	22	11	15	88	91	88	22	11	15
Washington County	21	12	15	79	77	78	22	12	15
Region	19	13	15	49	41	45	20	13	16

Source: SEWRPC

Table F.52
Change in Average Travel Times in Minutes: Trend Compared to 2011

	Auto			Transit			Total		
Community	Work	Other	Total	Work	Other	Total	Work	Other	Total
City of Kenosha	--	1	--	7	2	4	--	--	--
Remainder of Kenosha County	-1	--	-1	9	2	5	--	--	-1
Kenosha County	1	--	--	7	2	4	1	--	--
City of Milwaukee	--	--	1	2	1	2	1	--	--
Remainder of Milwaukee County	--	--	--	6	4	4	--	--	--
Milwaukee County	1	--	--	3	2	2	--	--	--
City of Racine	1	--	--	14	13	13	1	1	1
Remainder of Racine County	--	--	--	11	11	10	--	--	--
Racine County	--	--	--	13	12	12	1	--	1
City of Waukesha	--	--	--	-2	-2	-2	-1	--	-1
Remainder of Waukesha County	-1	--	-1	1	5	2	-1	--	-1
Waukesha County	-1	--	--	-1	--	--	-1	--	-1
Ozaukee County	-2	-1	-1	-7	-7	-7	-2	-1	-1
Walworth County	-1	--	-1	-18	-13	-17	-1	--	-1
Washington County	-1	--	--	-13	-19	-14	-2	--	--
Region	--	-1	--	4	3	3	--	--	-1

Source: SEWRPC

In addition, there are noticeable reductions in average trip times in the City of Milwaukee and the rest of Milwaukee County under Alternative Plans I and II, with the reductions slightly greater under Alternative II than under Alternative I. Those reductions, while not greater than 20 percent under either alternative plan compared to existing conditions, would affect a far greater number of transit users than would be affected in other areas of the Region. In comparing average transit trip times under Alternatives I and II with and without highway improvements being implemented (except for committed highway expansion projects and freeway modernization), there are

Table F.53
Change in Average Travel Times in Minutes: Alternative I with Highway Improvements Compared to 2011

	Auto			Transit			Total		
Community	Work	Other	Total	Work	Other	Total	Work	Other	Total
City of Kenosha	--	1	--	-9	-11	-10	--	--	--
Remainder of Kenosha County	-1	--	-1	-8	-10	-7	--	--	-1
Kenosha County	1	--	--	-8	-10	-8	--	--	--
City of Milwaukee	--	--	1	--	--	--	1	--	--
Remainder of Milwaukee County	--	--	--	-4	-2	-3	--	--	--
Milwaukee County	1	--	--	-1	-1	-1	--	1	1
City of Racine	1	--	--	-8	-4	-6	--	1	1
Remainder of Racine County	-1	-1	--	--	1	1	--	--	--
Racine County	--	--	--	-4	-1	-3	1	--	--
City of Waukesha	--	--	--	-5	--	-3	--	--	--
Remainder of Waukesha County	-1	-1	-1	-5	-1	-5	-1	--	-1
Waukesha County	-1	-1	--	-5	--	-3	-1	--	-1
Ozaukee County	-2	-1	-1	-2	-5	-6	-2	-1	-1
Walworth County	-2	-1	-1	-6	-41	-21	-2	-1	-1
Washington County	-2	-1	-1	-25	-43	-35	-2	--	-1
Region	--	-1	--	-1	-1	-2	--	--	-1

Source: SEWRPC

Table F.54
Change in Average Travel Times in Minutes: Alternative I Without Highway Improvements Compared to 2011

	Auto			Transit			Total		
Community	Work	Other	Total	Work	Other	Total	Work	Other	Total
City of Kenosha	--	1	--	-8	-11	-9	--	--	--
Remainder of Kenosha County	--	--	-1	-8	-10	-7	--	--	-1
Kenosha County	1	--	--	-7	-10	-8	1	--	--
City of Milwaukee	1	--	1	--	--	1	2	1	--
Remainder of Milwaukee County	--	--	--	-4	-2	-3	1	--	--
Milwaukee County	1	--	1	--	--	--	1	1	1
City of Racine	1	--	--	-7	-4	-6	--	1	1
Remainder of Racine County	--	--	--	1	2	1	--	--	--
Racine County	--	--	--	-3	-1	-2	1	--	1
City of Waukesha	--	--	--	-4	--	-2	--	1	--
Remainder of Waukesha County	--	--	-1	-4	-1	-4	--	--	-1
Waukesha County	-1	--	--	-4	--	-2	--	--	-1
Ozaukee County	-1	--	-1	--	-5	-6	-1	--	-1
Walworth County	-1	--	-1	-4	-41	-20	-1	--	-1
Washington County	-1	--	-1	-24	-43	-35	-2	--	-1
Region	1	--	--	-1	-1	-1	1	--	--

Source: SEWRPC

slight increases without highway improvements due to additional traffic congestion delaying transit routes operating in mixed traffic.

It should also be noted that average trip lengths on transit trips tend to be higher under Alternatives I and II due to the increased ability to travel longer distances in shorter periods of time. The higher average trip lengths tend to result in higher average trip times, which masks the fact that transit travel is faster on many trips. Thus, even though both alternative plans show reductions in average trip times

Table F.55
Change in Average Travel Times in Minutes: Alternative II with Highway Improvements Compared to 2011

	Auto			Transit			Total		
Community	Work	Other	Total	Work	Other	Total	Work	Other	Total
City of Kenosha	0	1	0	-6	-11	-8	0	0	0
Remainder of Kenosha County	-1	0	-1	-5	-9	-5	0	0	-1
Kenosha County	1	0	0	-5	-10	-7	0	0	0
City of Milwaukee	0	0	1	-2	-1	-1	1	0	0
Remainder of Milwaukee County	0	0	0	-7	-4	-5	0	0	0
Milwaukee County	1	0	0	-2	-2	-2	0	1	1
City of Racine	1	0	0	-6	-4	-5	0	1	1
Remainder of Racine County	0	0	0	2	1	1	0	0	0
Racine County	0	0	0	-2	-1	-2	1	0	0
City of Waukesha	0	0	0	-7	-1	-4	0	0	0
Remainder of Waukesha County	-1	-1	-1	-12	-5	-10	-1	0	-1
Waukesha County	-1	-1	-1	-10	-3	-7	-1	0	-1
Ozaukee County	-2	-1	-1	-5	-10	-11	-1	-1	-1
Walworth County	-2	-1	-1	-6	-40	-21	-1	-1	-1
Washington County	-2	-1	-1	-27	-43	-36	-2	0	-1
Region	0	-1	0	-3	-2	-3	0	0	0

Source: SEWRPC

Table F.56
Change in Average Travel Times in Minutes: Alternative II Without Highway Improvements Compared to 2011

	Auto			Transit			Total		
Community	Work	Other	Total	Work	Other	Total	Work	Other	Total
City of Kenosha	--	1	--	-6	-11	-8	--	--	--
Remainder of Kenosha County	--	--	-1	-4	-9	-5	--	--	-1
Kenosha County	1	--	--	-4	-10	-6	1	--	--
City of Milwaukee	1	--	1	-2	-1	-1	2	1	--
Remainder of Milwaukee County	--	--	--	-6	-3	-5	1	--	--
Milwaukee County	1	--	1	-2	-1	-2	1	1	1
City of Racine	1	--	--	-5	-4	-4	--	1	1
Remainder of Racine County	--	--	--	2	1	2	--	--	--
Racine County	--	--	--	-2	-1	-1	1	--	1
City of Waukesha	--	--	--	-6	-1	-3	--	1	--
Remainder of Waukesha County	--	--	-1	-11	-5	-9	--	--	-1
Waukesha County	-1	--	--	-9	-3	-6	--	--	-1
Ozaukee County	-1	-1	-1	-4	-9	-10	-1	--	-1
Walworth County	-1	--	-1	-5	-40	-20	-1	--	-1
Washington County	-1	-1	-1	-26	-43	-36	-2	--	-1
Region	1	--	--	-3	-2	-3	1	--	--

Source: SEWRPC

for most communities, the variation would likely be even greater if average trip length were to be held constant between the Trend and Alternatives I and II.

CRITERION 4.5.1: ACCESS TO TRANSIT

KEY CONCLUSIONS

- **Alternative II provides the most residents with access to transit and makes the most jobs accessible via transit when compared to Alternative I and the Trend.**
- **60 percent of the Region's population would be a short walk from transit under Alternative II, while 56 percent and 44 percent of the Region's population would be a short walk from transit under Alternative I and the Trend, respectively.**
- **Alternative II provides transit riders access to 74 percent of the Region's jobs via transit, while Alternative I serves 70 percent and the Trend serves 52 percent of the Region's jobs with transit.**

Access to transit service provides choices to residents of the Region, allowing them to travel farther distances than they could by walking or biking, and providing an alternative to driving. In addition to giving residents an additional choice for travel, there are numerous other benefits associated with transit. Studies have shown that:

- Employers with transit service to their business experience lower employee turnover rates
- Transit service in mid- to large-sized metropolitan areas provides significant congestion relief
- People with access to reliable transit service are less likely to forgo healthcare appointments and therefore transit service lowers society's overall healthcare costs
- Household costs associated with transportation are significantly lower for households that replace one or more personal automobiles with transit use

In addition to providing an alternative to driving for many residents of the Region, access to transit service is vitally important for residents who do not own their own car. About 1 in 10 households in the Region do not have any cars, and for the residents of those households, access to transit means access to jobs, healthcare, education, retail centers, and recreation.

The Region has historically had among the highest transit service levels per capita compared to other midwest metro areas and metro areas across the nation, but it has experienced among the most severe declines in transit service and ridership—20 percent and 40 percent, respectively, since 2000—compared to its peers.[52] Currently, about 55 percent of the Region's residents have access via a short walk to fixed-route transit, such as a local bus route or a commuter service, from a suburban community to downtown Milwaukee. About 63 percent of the Region's jobs were accessible via transit services in 2015, a level achieved by the addition of new bus routes to suburban job centers added in recent years. Of the three alternatives, Alternative II has the most extensive transit service and the most compact land use development pattern, which results in the best access to transit for the Region's residents, and the best access to jobs via transit among the

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[52] *SEWRPC Memorandum Report No. 221,* A Comparison of the Milwaukee Metropolitan Areas to Its Peers, *May 2015.*

Table F.57
Access to Transit

Alternative	Population Served	Total Population in the Region	Percent of Population Served	Jobs Accessible	Total Jobs in the Region	Percent of Jobs Accessible
Existing - 2010/2015	1,104,000	2,020,000	54.7	734,000	1,176,600	62.4
Trend - 2050	1,042,000	2,354,000	44.3	727,000	1,386,900	52.4
Alt I - 2050	1,328,000	2,354,000	56.4	967,000	1,386,900	69.7
Alt II - 2050	1,421,000	2,354,000	60.4	1,020,000	1,386,900	73.5

Source: SEWRPC

alternatives (as shown in Table F.57). More than 300,000 more people would have access to fixed-route transit and nearly 300,000 more jobs would be accessible by transit under this alternative than in 2015.

Alternative I would stop the Region's decline in urban density and expand transit service, resulting in approximately 230,000 more people in the Region with access to transit and 230,000 additional jobs being accessible via transit than in 2015. In contrast, under the Trend, the declines in urban density seen in recent decades would continue and transit service would decline due to the limitations of reasonably expected future funds to support transit. Therefore, the Trend would result in slight decreases in people with transit access and jobs accessible via transit despite the expected growth in the Region's population and jobs.

This criterion only calculates how many and what percentage of the Region's residents and jobs are within walking distance of fixed-route transit under each alternative, and does not attempt to quantify the speed, frequency, or usefulness of that service to reach destinations. Criterion 4.5.3 (Transit Service Quality) compares the amount, speed, and frequency of transit service and number of jobs reachable within 30 minutes via transit under each alternative. Criterion 4.2.1 (Travel Time to Important Places by Mode) includes comparisons of how many hospitals, parks, colleges, major retail centers, and grocery stores can be reached within 30 minutes via transit under each alternative.

CRITERION 4.5.2: ACCESS TO FIXED-GUIDEWAY TRANSIT

KEY CONCLUSIONS

- **More than twice as many residents and nearly twice as many jobs would be a short walk from fixed-guideway transit service in Alternative II than in Alternative I. No fixed-guideway transit service would exist under the Trend.**
- **Under Alternative II's extensive network of rapid transit corridors and commuter rail, 22 percent of the Region's residents would be within walking distance of fixed-guideway transit service and 33 percent of jobs would be within walking distance of fixed-guideway transit.**
- **Alternative I would provide a more limited network of rapid transit corridors and commuter rail, and therefore only 10 percent of the Region's residents would be within walking distance of fixed-guideway transit service and 19 percent of jobs would be within walking distance of fixed-guideway transit.**

Bus rapid transit, light rail, and commuter rail are all types of fixed-guideway transit services with their own exclusive lane or right-of-way, and have been shown to produce significant benefits for their riders in reduced travel time and improved reliability when compared to transit services operating in mixed traffic lanes. In addition, many communities in the U.S. and abroad have coordinated investments in fixed-guideway transit lines with reducing parking requirements and allowing increased density for new developments near transit stations. Fixed-guideway transit lines can help encourage the development of these TODs, resulting in significant increases in the tax base along fixed-guideway transit lines. In addition to new developments, research has shown that property values can be significantly higher if they are located near fixed-guideway transit service than at comparable properties not near fixed-guideway transit service.[53]

Table F.58 shows how many and what percentage of all people and jobs would be within a short walk (one-half mile) of fixed-guideway transit under each alternative. Currently, there are no transit services in the Region that combine fixed-guideway technology with an exclusive lane or right-of-way, station spacing of at least one-half mile, and frequent service over a large span of the day (a limited commuter rail service is currently provided to Kenosha from northeastern Illinois on Metra's Union Pacific North Line). Under the Trend, the transit system in 2050 would not add any fixed-guideway transit services. With three rapid transit corridors and one commuter rail line, Alternative I would enable 229,000 people (about 10 percent of the Region's population in 2050) and 264,000 jobs (19 percent of the Region's jobs in 2050) to be within walking distance of fixed-guideway transit service. Alternative II envisions a more extensive fixed-guideway transit system of 10 rapid transit corridors and two commuter rail lines, and therefore 522,000 people (22 percent) and 458,000 jobs (33 percent) would be within walking distance of fixed-guideway transit.

This criterion only calculates how many and what percentage of the Region's residents and jobs are within walking distance of fixed-guideway transit services under each alternative, and does not attempt to quantify the speed,

[53] *Center for Transit-Oriented Development,* Capturing the Value of Transit, *November 2008.*

Table F.58
Access to Fixed-Guideway Transit

Alternative	Population Served	Total Population in the Region	Percent of Population Served	Jobs Accessible	Total Jobs in the Region	Percent of Jobs Accessible
Existing - 2010/2015	5,500	2,020,000	0.3	3,500	1,176,600	0.3
Trend - 2050	5,800	2,354,000	0.2	3,700	1,386,900	0.3
Alt I - 2050	229,300	2,354,000	9.7	264,300	1,386,900	19.1
Alt II - 2050	521,800	2,354,000	22.2	458,100	1,386,900	33.0

Source: SEWRPC

frequency, or usefulness of that service to reach destinations. Criterion 4.5.3 (Transit Service Quality) compares the amount, speed, and frequency of transit service and number of jobs reachable within 30 minutes via transit under each alternative. Criterion 4.2.1 (Travel Time to Important Places by Mode) includes comparisons of how many hospitals, parks, colleges, major retail centers, and grocery stores can be reached within 30 minutes via transit under each alternative.

CRITERION 4.5.3: TRANSIT SERVICE QUALITY

KEY CONCLUSIONS

- **Alternative II provides the most residents of the Region with "Excellent" or "Very Good" transit service, although transit level of service is also significantly improved under Alternative I.**
- **Alternative II provides the highest level of transit service and access to the most jobs within 30 minutes via transit for every part of the Region, with 14 percent of residents having access to at least 100,000 jobs in under 30 minutes.**
- **Alternative I also improves on the Trend, with about 8 percent of residents having access to at least 100,000 jobs in under 30 minutes, as opposed to 2 percent under the Trend.**

Measuring access to transit (see Criterion 4.5.1) is important, but does not provide information about the speed or frequency of transit service, or any information about how useful transit service is to the people who have access to it. Transit level of service quantifies the amount and speed of transit service each area of the Region receives under each alternative. Also included under this criterion is an analysis that goes a step further, measuring the number of jobs accessible via transit within 30 minutes as a proxy for what residents can get to in a reasonable amount of time via transit under each alternative. Combined, these two measures help compare the quality and effectiveness of transit under each alternative.

- **<u>Transit Level of Service:</u>** The level of service provided by the transit system under each alternative is measured by comparing the number of buses or trains that can be reached via a short walk (10 minutes or less) throughout an average weekday. Buses or trains that travel faster, such as those that are part of a bus rapid transit or light rail line (rapid transit line), are valued higher than buses that are part of a standard local bus route. Level of service is categorized into four groups:

  - **Excellent:** If a part of the Region receives "Excellent" transit service, it is typically within walking distance of at least one rapid transit station, and also is within walking distance of multiple frequent local or express bus services. A resident living in an area of the Region with Excellent transit service has a high likelihood of not needing to own a car.

  - **Very Good:** Areas with "Very Good" transit service typically include parts of the Region that are within walking distance of a rapid transit or commuter rail station, but may have fewer local or express bus routes nearby than an area with Excellent service. Alternatively, areas with Very Good service may not be within walking distance of a rapid transit or commuter rail station, but may instead be near multiple frequent local and express bus routes.

  - **Good:** In order to have "Good" transit service, an area is within walking distance of one local or express bus route that provides service at least every 15 minutes all day, or may be near three or more local bus routes that do not provide frequent, all-day service. An area with Good transit service typically would not have access to a rapid transit line.

Table F.59
Transit Level of Service

Alternative	Excellent		Very Good		Good		Basic		Regional Population
	People	Percent	People	Percent	People	Percent	People	Percent	
Existing - 2011	3,000	0.1	118,000	5.8	403,000	20.0	580,000	28.7	2,020,000
Trend - 2050	11,000	0.5	46,000	2.0	258,000	11.0	727,000	30.9	2,354,000
Alt I - 2050	129,000	5.5	347,000	14.7	489,000	20.8	363,000	15.4	2,354,000
Alt II - 2050	154,000	6.5	416,000	17.7	485,000	20.6	366,000	15.5	2,354,000

Source: SEWRPC

- o **Basic:** If a part of the Region is served by "Basic" transit service, it is within walking distance of at least one local bus route, but generally not more than two routes. The routes are not likely to have service better than every 15 minutes all day.

Although accessible shared-ride taxi services are an important part of the transit system under each alternative, they are not included in this analysis as their amount of service is directly related to the number of rides requested by users. Alternatives I and II would have 24-hour advance reservation shared-ride taxi service available in all parts of the Region that would not be served by local bus service. Under the Trend, shared-ride taxi service would be provided in Ozaukee County, Washington County, and the City of Whitewater.

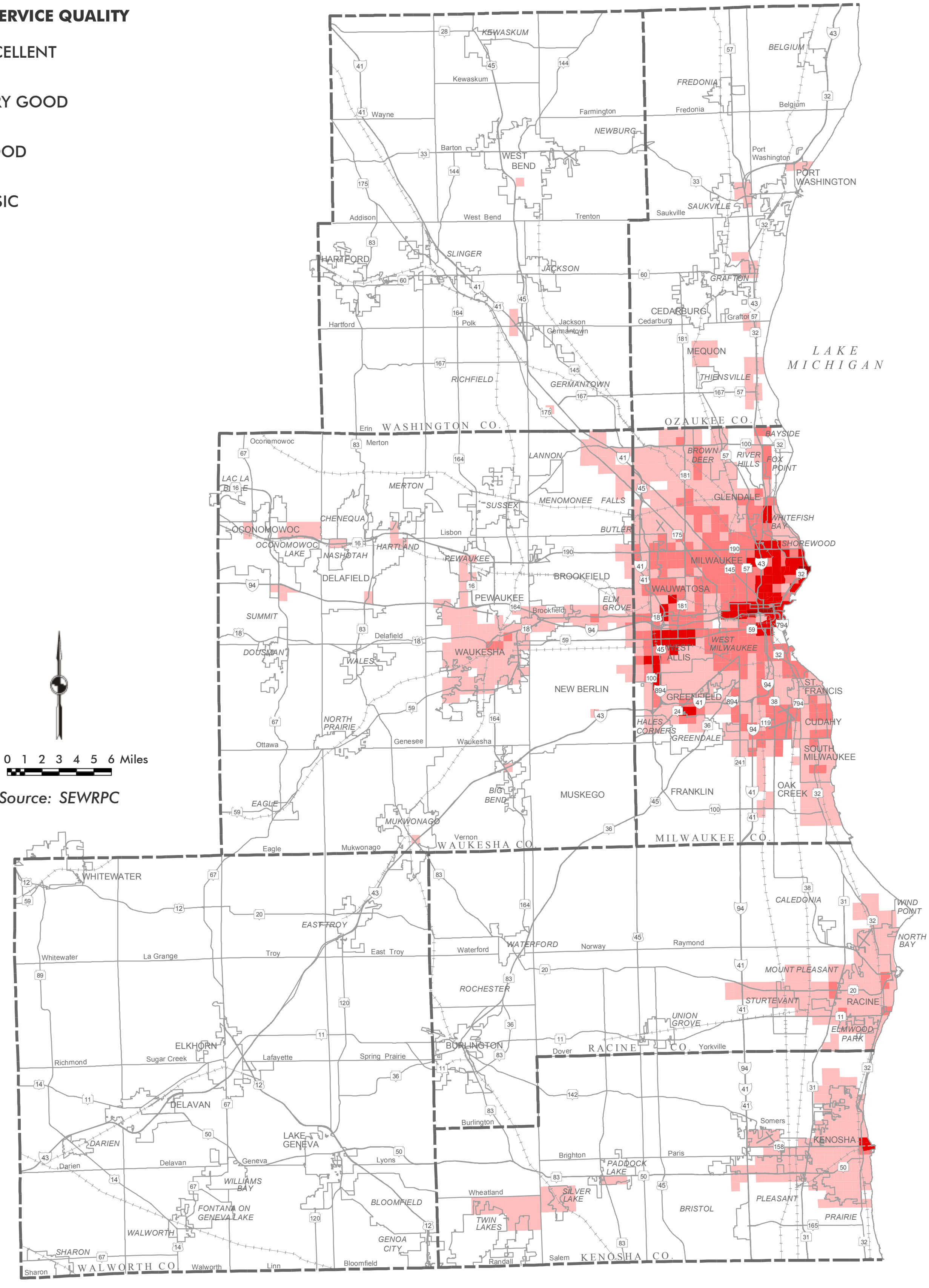
As shown in Table F.59, about 24 percent of the Region has access to Excellent or Very Good transit service in Alternative II, better than the approximately 20 percent in Alternative I. Almost none of the Trend has Excellent service, with the exception of downtown Milwaukee, which is served by more than a dozen local bus routes, the Milwaukee Streetcar, and a number of commuter bus routes under the Trend. Overall, about 41 percent of the Region's residents would see their transit level of service at least one grade higher under Alternative II when compared to the Trend, whereas 37 percent would see at least one grade level higher under Alternative I. Under the Trend, approximately 12 percent of the Region's residents in the year 2050 would live in an area that would receive transit service a full grade level less than under the Region's existing transit system. Maps F.140 through F.143 show the level of service provided by the existing transit system and under the transit system of each alternative.

- **<u>Jobs Accessible Within 30 Minutes via Transit:</u>** In order to more fully understand the benefits of an improved transit system, it is important to consider not only access to transit and the level of transit service provided, but also what that transit service can be used to get to in a reasonable amount of time. This is not only determined by the level of transit service provided, but also by the land use served by transit service. Denser areas, with more people, jobs, and activity centers, make it easier to provide access to more destinations within a reasonable travel time on transit, especially if the transit service is separated from traffic congestion. Due to their higher rate of transit use, the number of jobs accessible within 30 minutes is particularly important for minority populations and low-income populations, which is discussed further in Criterion 2.1.1 (Level of Accessibility to Jobs and Activity Centers for Minority Populations and Low-Income Populations by Mode).

Map F.140
Transit Service Quality: Existing

TRANSIT SERVICE QUALITY

- EXCELLENT
- VERY GOOD
- GOOD
- BASIC

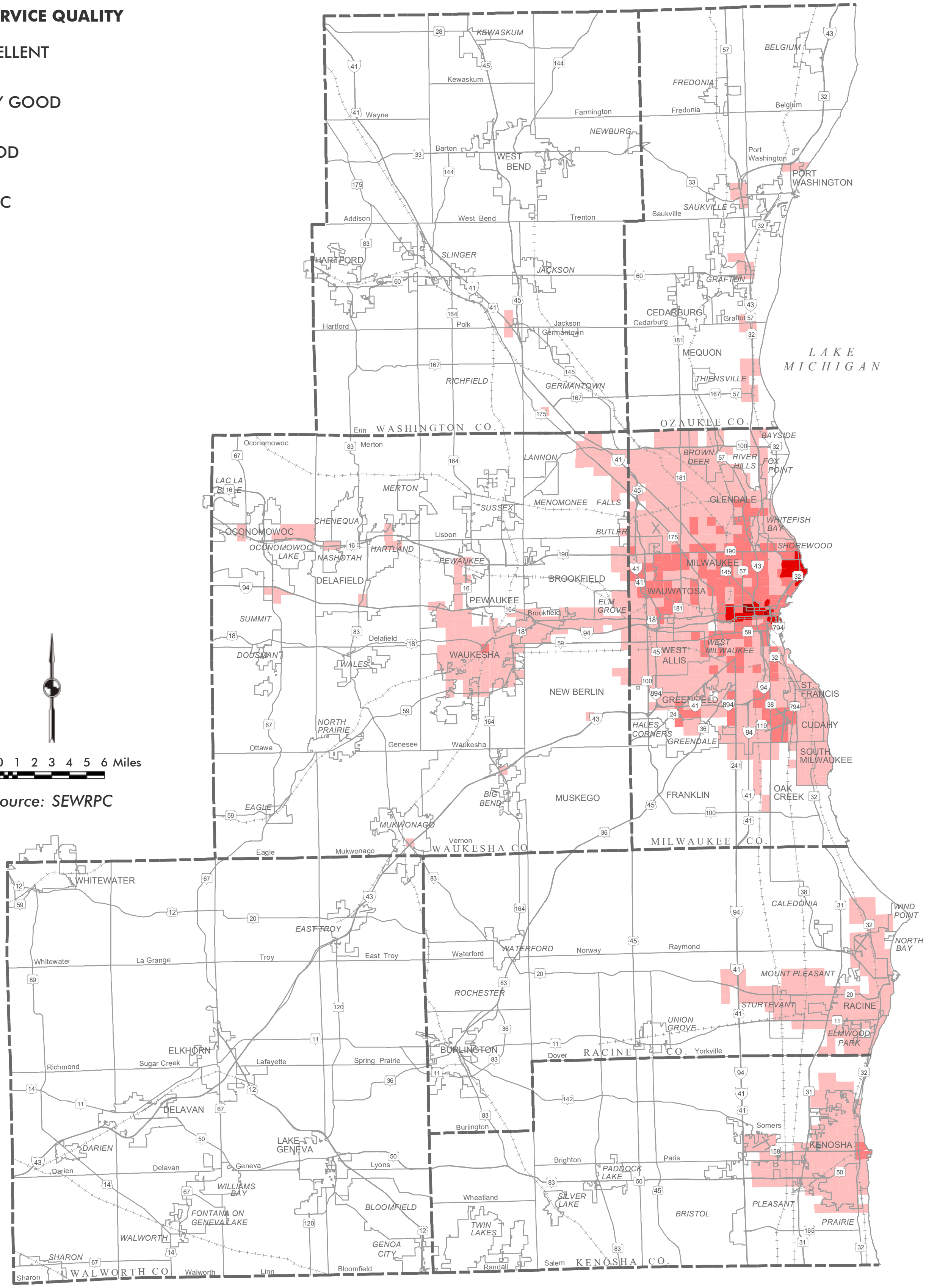


Source: SEWRPC

Map F.141
Transit Service Quality: Trend

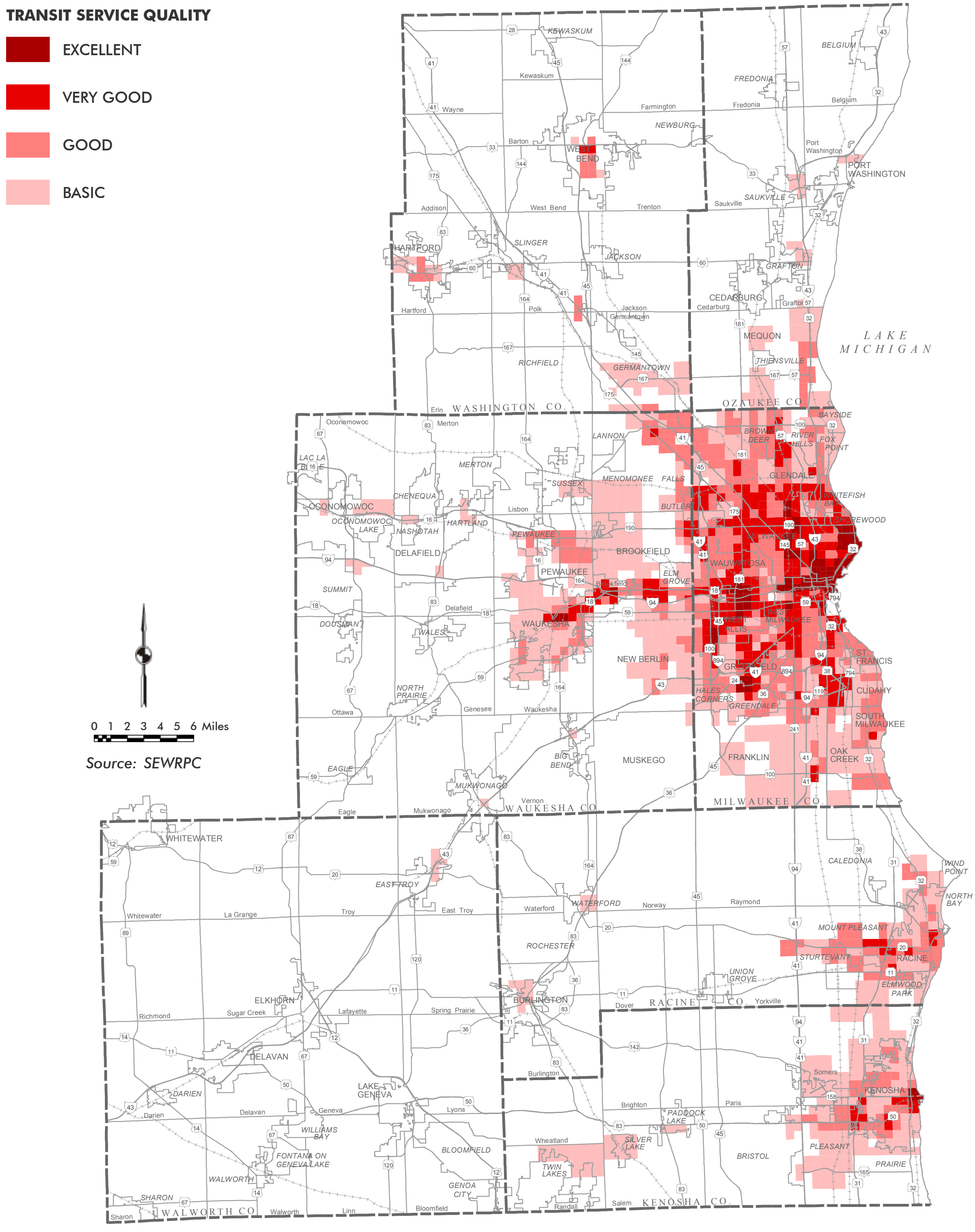
TRANSIT SERVICE QUALITY

- EXCELLENT
- VERY GOOD
- GOOD
- BASIC



Source: SEWRPC

Map F.142
Transit Service Quality: Alternative Plan I



Source: SEWRPC

Map F.143
Transit Service Quality: Alternative Plan II

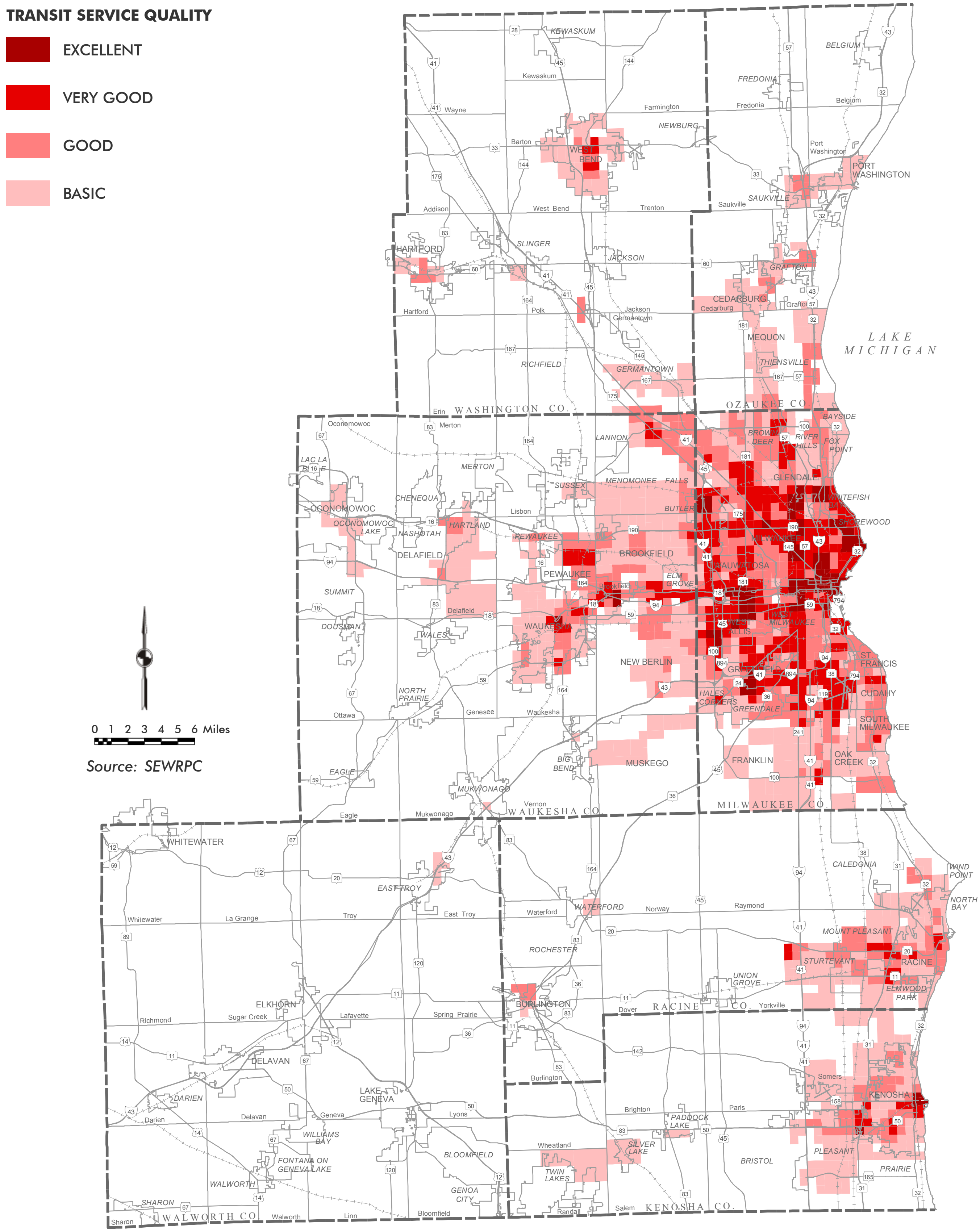


Table F.60
Access to Jobs Within 30 Minutes by Transit

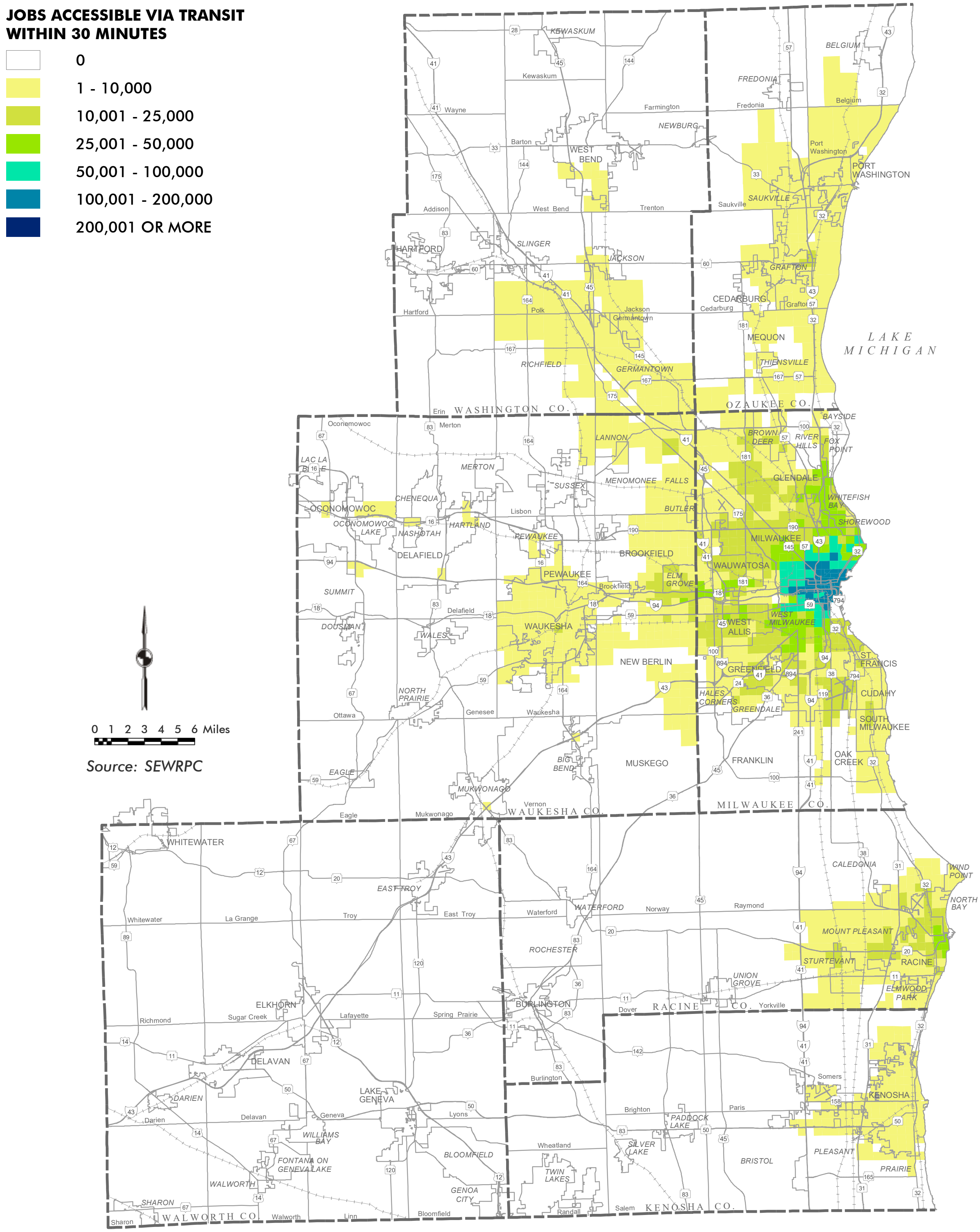
Alternative	10,000 - 49,999 Jobs		50,000 - 99,999 Jobs		100,000 or More Jobs		Regional Population
	People	Percent	People	Percent	People	Percent	
Existing - 2011	505,000	25.0	94,000	4.7	45,000	2.2	2,020,000
Trend - 2050	422,000	17.9	40,000	1.7	51,000	2.2	2,354,000
Alt I - 2050	881,000	37.4	248,000	10.5	193,000	8.2	2,354,000
Alt II - 2050	766,000	32.5	345,000	14.7	337,000	14.3	2,354,000

Source: SEWRPC

In order to measure this element of transit service quality, the number of jobs accessible within 30 minutes via transit was measured for each alternative and is shown on Maps F.144 through F.147. Significant increases in access to jobs in under 30 minutes can be seen when comparing Alternative II to the Trend. In addition to measuring one of the key purposes of transit (providing access to jobs and serving commute trips), measuring jobs accessible within 30 minutes via transit also acts as a proxy for access to other destinations (which frequently have employment associated with them). Additional destinations (such as hospitals, colleges, major retail centers, major parks, and grocery stores) are also discussed as part of Criterion 4.2.1 (Travel Time to Important Places by Mode).

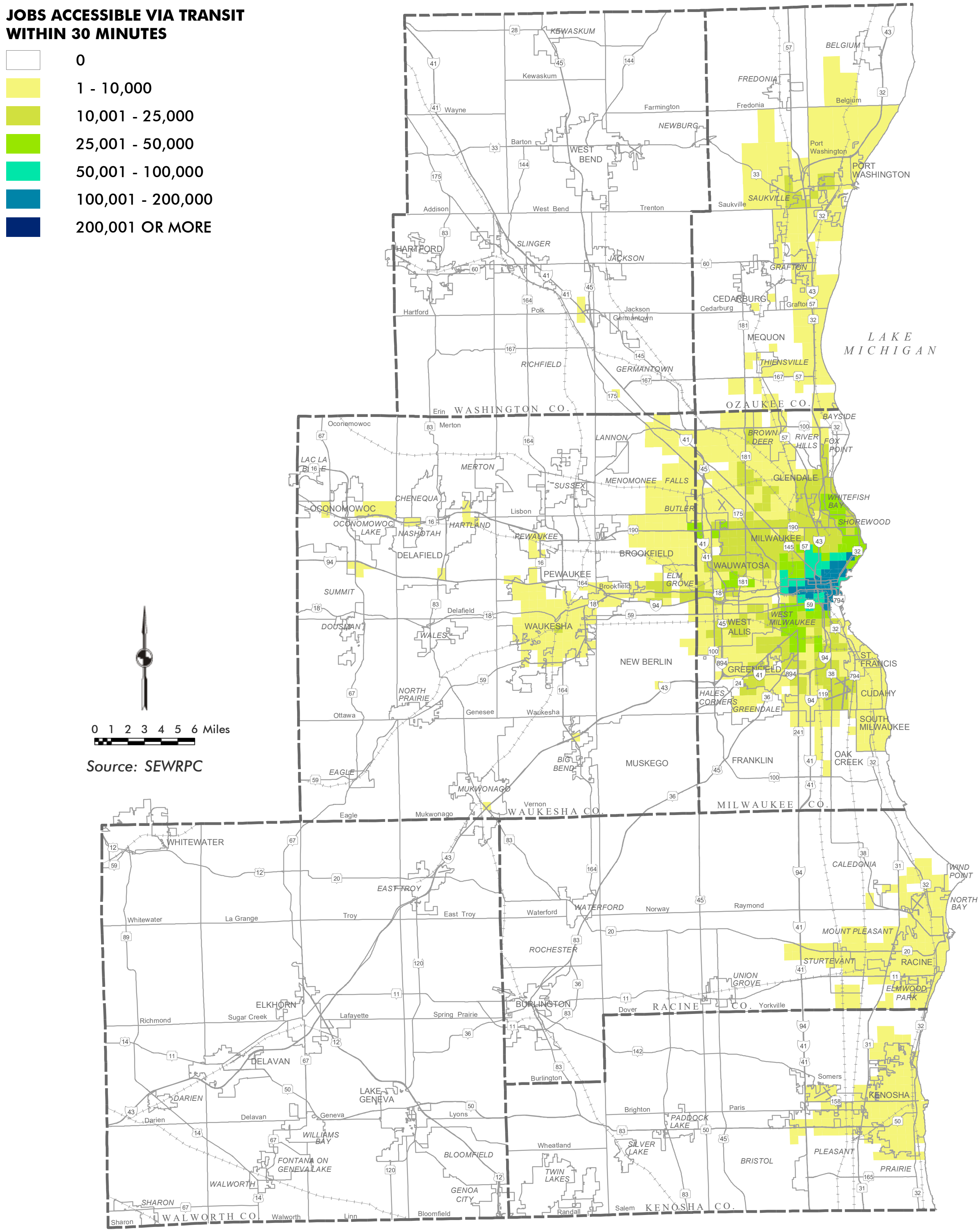
Table F.60 summarizes the results of this analysis, demonstrating that under Alternative II, a significantly larger number of jobs would be within 30 minutes via transit than the other alternatives. Approximately 14 percent of residents would have access to at least 100,000 jobs within 30 minutes under Alternative II, about 8 percent of residents under Alternative I, and 2 percent of residents under the Trend.

Map F.144
Access to Jobs Within 30 Minutes by Transit: Existing



Source: SEWRPC

Map F.145
Access to Jobs Within 30 Minutes by Transit: Trend

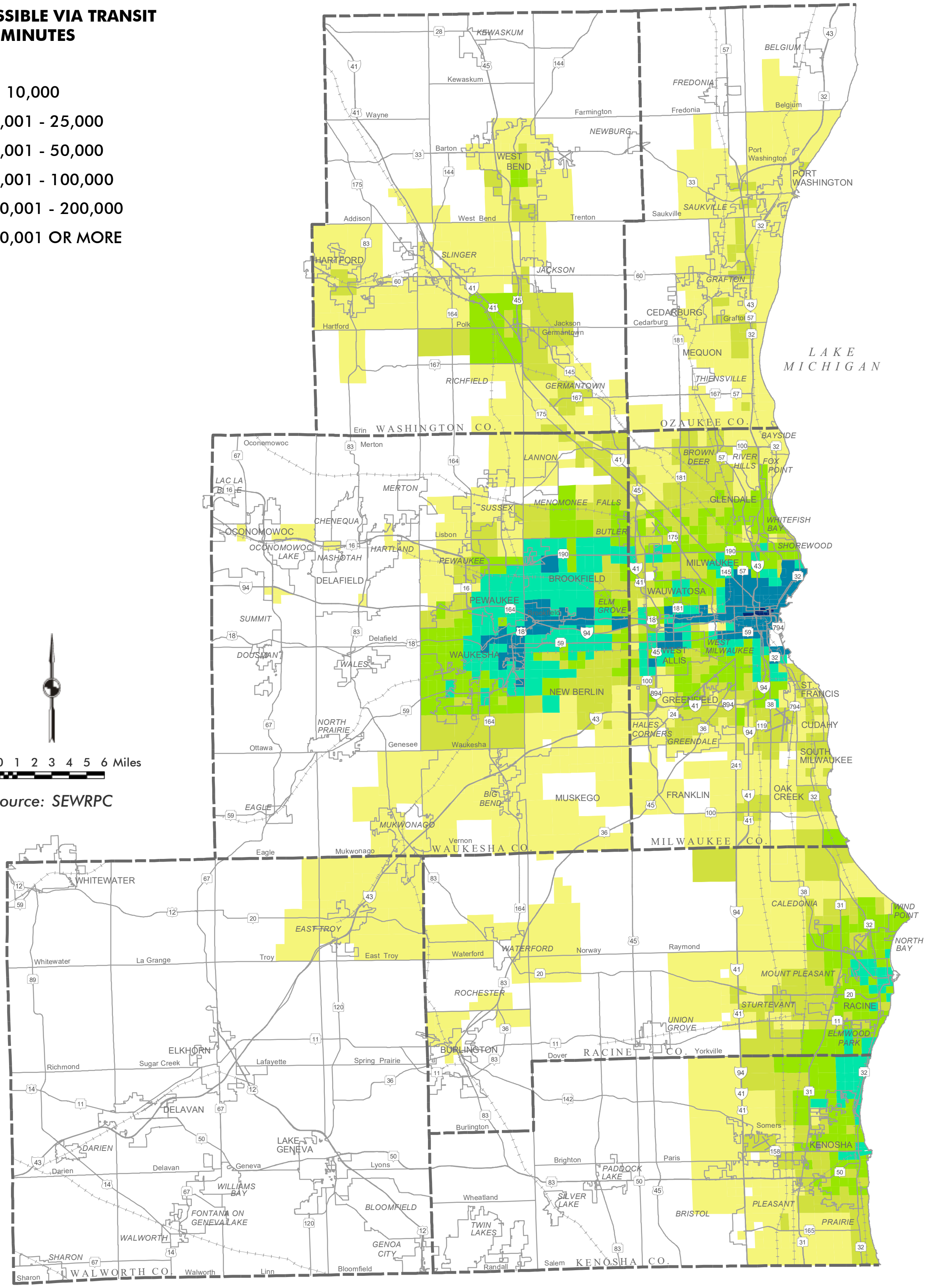


Source: SEWRPC

Map F.146
Access to Jobs Within 30 Minutes by Transit: Alternative Plan I

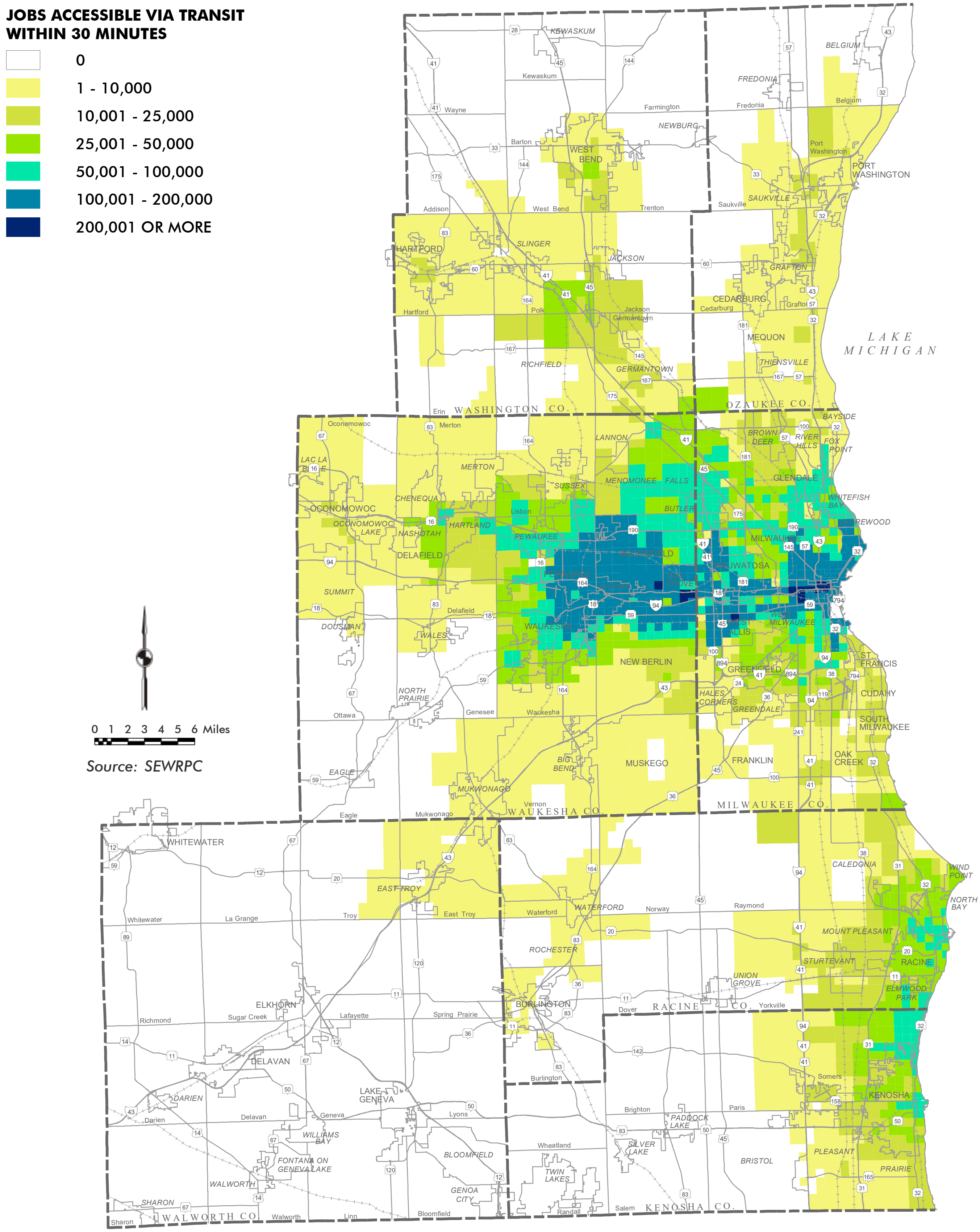
JOBS ACCESSIBLE VIA TRANSIT WITHIN 30 MINUTES

- 0
- 1 - 10,000
- 10,001 - 25,000
- 25,001 - 50,000
- 50,001 - 100,000
- 100,001 - 200,000
- 200,001 OR MORE



Source: SEWRPC

Map F.147
Access to Jobs Within 30 Minutes by Transit: Alternative Plan II



Source: SEWRPC

CRITERION 4.6.1: TRANSPORTATION RELIABILITY

KEY CONCLUSIONS

- **In general, Alternative I would provide the best transportation reliability in the Region, followed by Alternative II, and then the Trend.**
- **Alternative I would result in the least congested arterial street and highway system and the fewest vehicular crashes on freeways.**
- **Alternative II would result in the fewest vehicular crashes on surface arterials, the highest quality transit service, and the most people living in walkable areas.**
- **Alternatives I and II would both provide fixed-guideway transit and would both result in a bicycle level of surface that is higher than the Trend.**
- **Alternative I would result in the lowest average annual minutes of travel time delay, followed by the Trend, and then Alternative II.**

Transportation reliability in Southeastern Wisconsin reflects the degree to which travelers in the Region are able to reach their destinations safely and on time. Travelers using a less reliable transportation system would be more likely to experience unexpected delays than travelers using a more reliable transportation system. From a regional perspective, the additional delays associated with a less reliable transportation system would result in negative impacts, such as increased total travel time delay for personal vehicles and public transit, increased vehicle emissions, increased energy use, and increased freight shipping travel time and costs.

Improving the ability of travelers to reach their destinations safely and on-time largely depends on a variety of factors, including: reducing total congestion[54] on the arterial street and highway system and on the regional highway freight network, which would allow the system to better accommodate natural day-to-day fluctuations in traffic volumes; reducing the frequency of events, such as vehicular crashes on arterial streets and highways, which can cause non-recurring congestion;[55] improving alternative routes and modes (such as arterial streets and highways, transit service, bicycle facilities, and pedestrian facilities) that can provide an opportunity for travelers to avoid congestion; and expanding transportation options (such as commuter rail, light rail, and bus rapid transit) that are impacted to a lesser degree by inclement weather and crashes.

- **Total Congestion and Delay:** As described in more detail in Criterion 4.4.1 (Congestion on Arterial Streets and Highways), Alternative I would result in the least congested arterial street and highway system in the Region, with 6.6 percent (242.3 miles) of the system operating over its design capacity (moderate, severe, or extreme congestion) at some point during an average weekday. The congested arterial street and highway miles under Alternative I would be about 0.1 percent less than the Trend (244.5 miles) and 0.7 percent less than

[54] *Congestion on arterial streets and highways occurring on an average weekday results from traffic volumes exceeding roadway design capacity, usually during weekday peak traffic hours.*

[55] *Non-recurring congestion is congestion that can occur from time to time due to crashes, roadway construction, inclement weather, or special events.*

Alternative II (264.7 miles). Not including highway improvements (except for currently committed highway expansion projects and freeway modernization) under Alternatives I and II would increase the congested arterial street and highway miles under these alternatives by about 3.5 percent (an additional 119.9 miles) and 3.0 percent (an additional 103.1 miles), respectively.

As described further in Criterion 4.4.2 (Travel Time Delay), Alternative I would result in the lowest average annual minutes of travel time delay for total personal and commercial travel in the Region (1,554 million minutes), about 0.8 percent lower than the Trend (1,556 million minutes) and 6 percent lower than Alternative II (1,624 million minutes).

- **Congestion on the Regional Highway Freight Network:** As noted in Criterion 4.6.2 (Congestion on the Regional Highway Freight Network), Alternative I would result in the least congested regional highway freight network, with 10.7 percent (180.7 miles) of the network operating over its design capacity at some point during an average weekday. The percentage of congested regional highway freight network miles under Alternative I would be about 0.3 percent less than the Trend (185.7 miles) and 0.9 percent less than Alternative II (196.1 miles). Not including highway improvements (except for currently committed highway expansion projects and freeway modernization) under Alternative I and II would increase the percentage of congested regional highway freight network miles under these alternatives by about 6.3 percent (an additional 103.7 miles) and 5.5 percent (an additional 91.1 miles), respectively.

- **Non-Recurring Congestion:** Except for vehicular crashes on arterial streets and highways, the alternatives would not be expected to influence the causes of non-recurring congestion. As described in more detail in Criterion 1.6.1 (Crashes by Mode), Alternative II would result in the least number of annual vehicular crashes in 2050 for surface arterials (28,500 crashes), followed by Alternative I (28,700), and then the Trend (29,600). For freeways, Alternative II would also result in the least number of vehicular crashes (5,800 crashes), followed by Alternative I (5,900), and then the Trend (6,000).

- **Alternative Routes and Modes:** Alternative routes and modes that could provide an opportunity for travelers to avoid congestion include transit service, bicycle facilities, and arterial streets and highways that serve as alternate routes. People living in walkable areas would also have a greater opportunity to avoid congestion when making shorter distance trips.

  As described in more detail in Criterion 4.5.3 (Transit Service Quality), Alternative II would best support transit as an alternative to driving on congested arterial streets and highways by providing the most residents of the Region with high-quality transit service (transit quality would also be significantly improved under Alternative I). In particular, Alternatives I and II would include fixed-guideway transit that would offer attractive alternatives to traveling on congested freeways. The fixed-guideway transit routes would be parallel to freeways and would mostly be unaffected by traffic congestion by operating in medians, transit-only lanes, or rail corridors.

As described in more detail in Criterion 1.2.1 (Bicycle Level of Service) and Criterion 1.2.2 (Bicycle Connectivity), Alternatives I and II would best support bicycling as an alternative to driving on congested arterial streets and highways by providing the highest comfort level for bicyclists riding on roadways as well as the most extensive bicycle facility network.

Southeastern Wisconsin's arterial street and highway system is largely laid out as a grid. As a result, a variety of alternative routes—such as W. Bluemound Road (USH 18), W. Greenfield Avenue (STH 59), N. Mayfair Road/S. 108th Street (STH 100), and STH 31—that parallel freeways exist throughout the Region. As noted above, Alternative I would result in the least congested arterial street and highway system and would therefore best accommodate travel via alternative routes. The Trend would result in slightly more congestion, and Alternative II would result in the most congestion on the system. Not including highway improvements (except for currently committed highway expansion projects and freeway modernization) under Alternatives I and II would increase the congested arterial street and highway miles under these alternatives.

As described in more detail in Criterion 1.1.1 (Number of People Living in Walkable Areas), Alternative II would best support walking as an opportunity to avoid congestion when making shorter distance trips. Alternative II would result in the most people living in walkable areas, followed by Alternative I, and then the Trend. Alternative II would also have the most developed land in walkable areas, followed by Alternative I, and then the Trend.

- **Resilience to Inclement Weather:** Fixed-guideway transit (such as commuter rail, light rail, and bus rapid transit) would be impacted to a lesser degree by inclement weather, as it would typically operate in a median, dedicated lane, or rail corridor, and would be able to avoid non-recurring congestion on arterials caused by weather-related crashes and reduced travel speeds. In particular, commuter rail and light rail, which have vehicles with steel wheels operating on steel rails, would be more resilient to winter conditions. As noted above, Alternatives I and II would include fixed-guideway transit service, while the Trend would not.

CRITERION 4.6.2: CONGESTION ON THE REGIONAL HIGHWAY FREIGHT NETWORK

KEY CONCLUSIONS

- **Alternative I would result in the least congested regional highway freight network, with 10.7 percent (180.7 miles) of the network operating over its design capacity (moderate, severe, or extreme congestion) for at least part of an average weekday.**
- **The congested regional highway freight network miles under Alternative I would be about 0.3 percent less than the Trend (185.7 miles) and 0.9 percent less than Alternative II (196.1 miles).**

The safe and efficient movement of raw materials and finished products to, from, and within Southeastern Wisconsin is essential for maintaining and growing the Region's economy. Freight shipments in the Region—including shipments involving ships, airplanes, and trains—rely heavily on trucks using the Region's arterial street and highway system. In particular, the movement of freight depends in large part on trucks using the regional highway freight network—arterial streets and highways in the Region intended to carry a higher percentage of truck traffic. The regional highway freight network incorporates the National Highway System as well as the State of Wisconsin's designated long truck routes. Higher levels of congestion on the regional highway freight network can result in increased shipping delays and higher shipping costs, negatively impacting businesses and manufacturers in the Region.

Congestion on the regional highway freight network occurring on an average weekday results from traffic volumes exceeding roadway design capacity, usually during weekday peak traffic hours. This type of recurring congestion differs from non-recurring congestion, which can result from time to time due to crashes, bad weather, or major events (such as sporting events). Table F.61 presents a comparison of the average weekday congestion on the regional highway freight network for the Region and for each county in the Region under existing conditions, the Trend, and Alternatives I and II. Also included in Table F.61 are the estimated congestion levels if the highway improvements under Alternatives I and II are not implemented, except for committed highway expansion projects and freeway modernization. Maps F.148 through F.153 illustrate the average weekday congestion on the regional highway freight network under the alternatives.

- **Total Congestion:** Alternative I would result in the least congested regional highway freight network, with 10.7 percent (180.7 miles) of the network operating over its design capacity (moderate, severe, or extreme congestion[56]) for at least part of an average weekday. The number of congested regional highway freight network miles under Alternative I would be about 0.3 percent less than the Trend (185.7 miles) and about 0.9 percent less than Alternative II (196.1

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[56] Under moderate congestion, average freeway speeds are 1 to 2 mph below free-flow speeds, and average surface arterial speeds are 40 to 50 percent of free-flow speeds. Under severe congestion, average freeway speeds are up to 10 mph below free-flow speeds, and average surface arterial speeds are 33 to 40 percent of free-flow speeds. Under extreme congestion, average freeway speeds are 20 to 30 mph or less, and average surface arterial speeds are 25 to 33 percent of free-flow speeds.

Table F.61
Average Weekday Congestion on the Regional Highway Freight Network

Existing (2011)

	Under or At Design Capacity		Over Design Capacity						
			Moderate Congestion		Severe Congestion		Extreme Congestion		
County	Mileage	Percent of Total	Mileage	Percent of Total	Mileage	Percent of Total	Mileage	Percent of Total	Total Mileage
Kenosha	138.6	91.5	7.9	5.2	4.4	2.9	0.6	0.4	151.5
Milwaukee	231.7	66.2	47.4	13.5	45.3	12.9	25.9	7.4	350.3
Ozaukee	99.7	87.2	9.6	8.4	4.7	4.1	0.3	0.3	114.3
Racine	171.4	93.3	8.6	4.7	2.3	1.3	1.3	0.7	183.6
Walworth	221.8	98.7	2.4	1.1	0.4	0.2	--	--	224.6
Washington	193.6	95.8	6.1	3.0	2.2	1.1	0.3	0.1	202.2
Waukesha	358.2	83.0	41.7	9.7	26.5	6.1	5.2	1.2	431.6
Region	1,415.0	85.3	123.7	7.5	85.8	5.2	33.6	2.0	1,658.1

Trend (2050)

	Under or At Design Capacity		Over Design Capacity						
			Moderate Congestion		Severe Congestion		Extreme Congestion		
County	Mileage	Percent of Total	Mileage	Percent of Total	Mileage	Percent of Total	Mileage	Percent of Total	Total Mileage
Kenosha	136.9	90.4	12.3	8.1	2.2	1.5	0.0	0.0	151.4
Milwaukee	248.1	70.0	34.8	9.8	46.1	13.0	25.6	7.2	354.6
Ozaukee	108.8	95.3	3.8	3.3	1.3	1.1	0.3	0.3	114.2
Racine	186.8	96.1	5.1	2.6	2.0	1.0	0.5	0.3	194.4
Walworth	237.4	98.8	1.9	0.8	0.8	0.3	0.1	0.0	240.2
Washington	183.0	90.5	16.0	7.9	3.0	1.5	0.3	0.1	202.3
Waukesha	407.6	93.2	21.2	4.8	6.9	1.6	1.5	0.3	437.2
Region	1,508.6	89.0	95.1	5.6	62.3	3.7	28.3	1.7	1,694.3

Alternative I with Highway Improvements (2050)

	Under or At Design Capacity		Over Design Capacity						
			Moderate Congestion		Severe Congestion		Extreme Congestion		
County	Mileage	Percent of Total	Mileage	Percent of Total	Mileage	Percent of Total	Mileage	Percent of Total	Total Mileage
Kenosha	136.5	90.2	12.7	8.4	2.2	1.5	0.0	0.0	151.4
Milwaukee	246.5	69.5	34.8	9.8	47.3	13.3	26.0	7.3	354.6
Ozaukee	108.7	95.2	3.9	3.4	1.3	1.1	0.3	0.3	114.2
Racine	187.3	96.3	4.6	2.4	2.0	1.0	0.5	0.3	194.4
Walworth	237.0	98.7	2.6	1.1	0.5	0.2	0.1	0.0	240.2
Washington	183.9	90.9	15.0	7.4	3.1	1.5	0.3	0.1	202.3
Waukesha	413.7	94.6	15.1	3.5	6.8	1.6	1.6	0.4	437.2
Region	1,513.6	89.3	88.7	5.2	63.2	3.7	28.8	1.7	1,694.3

Alternative I Without Highway Improvements[a] (2050)

	Under or At Design Capacity		Over Design Capacity						
			Moderate Congestion		Severe Congestion		Extreme Congestion		
County	Mileage	Percent of Total	Mileage	Percent of Total	Mileage	Percent of Total	Mileage	Percent of Total	Total Mileage
Kenosha	132.6	87.6	15.4	10.2	3.4	2.2	0.0	0.0	151.4
Milwaukee	229.2	65.5	40.4	11.5	43.0	12.3	37.3	10.7	349.9
Ozaukee	95.0	83.2	11.5	10.1	5.5	4.8	2.2	1.9	114.2
Racine	183.2	94.2	7.5	3.9	3.2	1.6	0.5	0.3	194.4
Walworth	220.2	96.5	4.1	1.8	2.0	0.9	1.8	0.8	228.1
Washington	174.7	86.4	23.3	11.5	3.5	1.7	0.8	0.4	202.3
Waukesha	358.1	81.9	26.4	6.0	38.8	8.9	13.8	3.2	437.1
Region	1,393.0	83.0	128.6	7.7	99.4	5.9	56.4	3.4	1,677.4

Table continued on next page.

Table F.61 (Continued)

Alternative II with Highway Improvements (2050)

County	Under or At Design Capacity		Over Design Capacity: Moderate Congestion		Over Design Capacity: Severe Congestion		Over Design Capacity: Extreme Congestion		Total Mileage
	Mileage	Percent of Total	Mileage	Percent of Total	Mileage	Percent of Total	Mileage	Percent of Total	
Kenosha	135.1	89.2	14.0	9.2	2.3	1.5	0.0	0.0	151.4
Milwaukee	235.0	67.2	34.9	10.0	47.3	13.5	32.7	9.3	349.9
Ozaukee	104.7	91.7	7.7	6.7	1.5	1.3	0.3	0.3	114.2
Racine	185.0	95.2	5.8	3.0	3.1	1.6	0.5	0.3	194.4
Walworth	237.4	98.8	2.2	0.9	0.6	0.2	0.0	0.0	240.2
Washington	184.0	91.0	14.9	7.4	3.1	1.5	0.3	0.1	202.3
Waukesha	412.3	94.3	15.9	3.6	7.5	1.7	1.5	0.3	437.2
Region	1,493.5	88.4	95.4	5.6	65.4	3.9	35.3	2.1	1,689.6

Alternative II Without Highway Improvements[a] (2050)

County	Under or At Design Capacity		Over Design Capacity: Moderate Congestion		Over Design Capacity: Severe Congestion		Over Design Capacity: Extreme Congestion		Total Mileage
	Mileage	Percent of Total	Mileage	Percent of Total	Mileage	Percent of Total	Mileage	Percent of Total	
Kenosha	132.2	87.3	15.9	10.5	3.3	2.2	0.0	0.0	151.4
Milwaukee	223.4	63.8	41.1	11.7	45.5	13.0	39.9	11.4	349.9
Ozaukee	96.6	84.6	10.1	8.8	5.4	4.7	2.1	1.8	114.2
Racine	183.2	94.2	7.5	3.9	3.2	1.6	0.5	0.3	194.4
Walworth	220.7	96.8	3.6	1.6	2.0	0.9	1.8	0.8	228.1
Washington	173.9	86.0	24.1	11.9	3.5	1.7	0.8	0.4	202.3
Waukesha	360.2	82.4	25.6	5.9	39.5	9.0	11.8	2.7	437.1
Region	1,390.2	82.9	127.9	7.6	102.4	6.1	56.9	3.4	1,677.4

[a] *The impacts of committed highway improvements are included under these alternatives.*

Source: SEWRPC

miles).[57] The lower congestion under Alternative I is a result of a combination of this alternative proposing more arterial street and highway expansion than Alternative II and proposing more compact land use development and transit service expansion than the Trend. Not including highway improvements (except for currently committed highway expansion projects and freeway modernization) would increase the number of congested regional highway freight network miles under Alternatives I and II by about 6.3 percent (an additional 103.7 miles) and 5.5 percent (an additional 91.1 miles), respectively.

Milwaukee County has the largest population and concentration and density of households and jobs in the Region, and it had 350.3 regional highway freight network miles as of 2011, second only to Waukesha County (431.6 miles). Milwaukee County had about 42.1 percent (120.7 miles) of the total miles of the congested regional highway freight network in 2011, and this percentage would increase to 57.4 percent (106.5 miles) under the Trend, to 58.6 percent (114.9 miles) under Alternative II, and to 59.8 percent (108.1 miles) under Alternative I. Comparing the arterial streets and highways within each county, Milwaukee County would have the highest percentage of congested regional highway freight network miles of any county.

[57] *The regional highway freight network under the Trend and Alternative I totals 1,694.3 miles. The network under Alternative II, which proposes less construction of new facilities, totals 1,689.6 miles.*

Map F.148
Congestion on the Regional Highway Freight Network: 2011

FACILITY CONGESTION STATUS

- AT OR UNDER DESIGN CAPACITY
- MODERATELY CONGESTED
- SEVERELY CONGESTED
- EXTREMELY CONGESTED

Note: This map displays the traffic congestion experienced during an average weekday.

The regional highway freight network is based on the National Highway System (NHS) and the State of Wisconsin's designated routes for long trucks. The network may be revised upon completion of two freight planning efforts now underway, the U.S. Department of Transportation's *National Freight Strategic Plan* and the Wisconsin Department of Transportation's *Wisconsin State Freight Plan*.

Source: SEWRPC

Map F.149
Congestion on the Regional Highway Freight Network: Trend

FACILITY CONGESTION STATUS

AT OR UNDER DESIGN CAPACITY

MODERATELY CONGESTED

SEVERELY CONGESTED

EXTREMELY CONGESTED

Note: This map displays the traffic congestion experienced during an average weekday.

The regional highway freight network is based on the National Highway System (NHS) and the State of Wisconsin's designated routes for long trucks. The network may be revised upon completion of two freight planning efforts now underway, the U.S. Department of Transportation's *National Freight Strategic Plan* and the Wisconsin Department of Transportation's *Wisconsin State Freight Plan*.

Source: SEWRPC

Map F.150
Congestion on the Regional Highway Freight Network: Alternative I with Highway Improvements

FACILITY CONGESTION STATUS

- AT OR UNDER DESIGN CAPACITY
- MODERATELY CONGESTED
- SEVERELY CONGESTED
- EXTREMELY CONGESTED

Note: This map displays the traffic congestion experienced during an average weekday.

The regional highway freight network is based on the National Highway System (NHS) and the State of Wisconsin's designated routes for long trucks. The network may be revised upon completion of two freight planning efforts now underway, the U.S. Department of Transportation's *National Freight Strategic Plan* and the Wisconsin Department of Transportation's *Wisconsin State Freight Plan*.

Source: SEWRPC

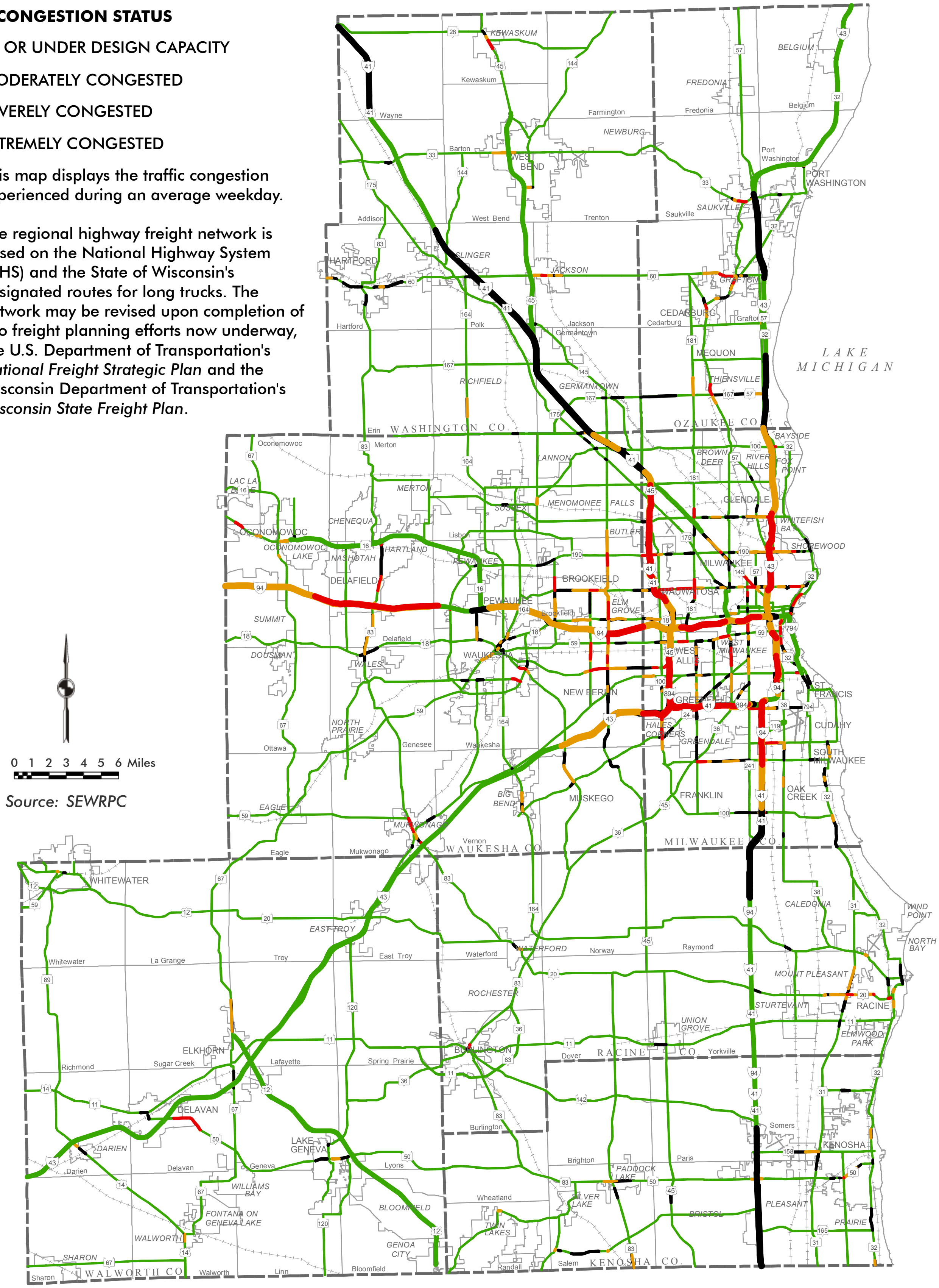
Map F.151
Congestion on the Regional Highway Freight Network: Alternative I Without Highway Improvements

FACILITY CONGESTION STATUS

- AT OR UNDER DESIGN CAPACITY
- MODERATELY CONGESTED
- SEVERELY CONGESTED
- EXTREMELY CONGESTED

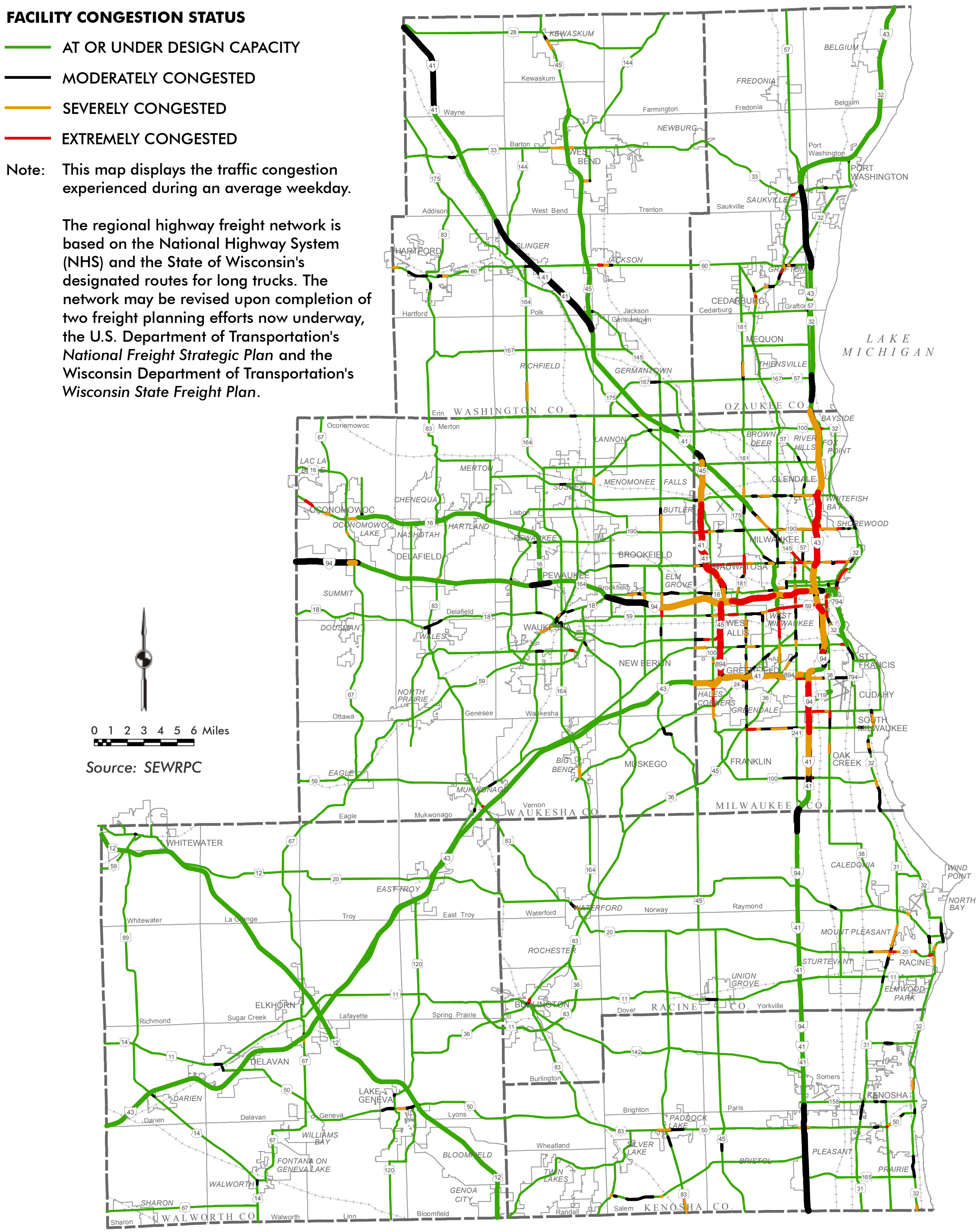
Note: This map displays the traffic congestion experienced during an average weekday.

The regional highway freight network is based on the National Highway System (NHS) and the State of Wisconsin's designated routes for long trucks. The network may be revised upon completion of two freight planning efforts now underway, the U.S. Department of Transportation's *National Freight Strategic Plan* and the Wisconsin Department of Transportation's *Wisconsin State Freight Plan*.



Source: SEWRPC

Map F.152
Congestion on the Regional Highway Freight Network: Alternative II with Highway Improvements



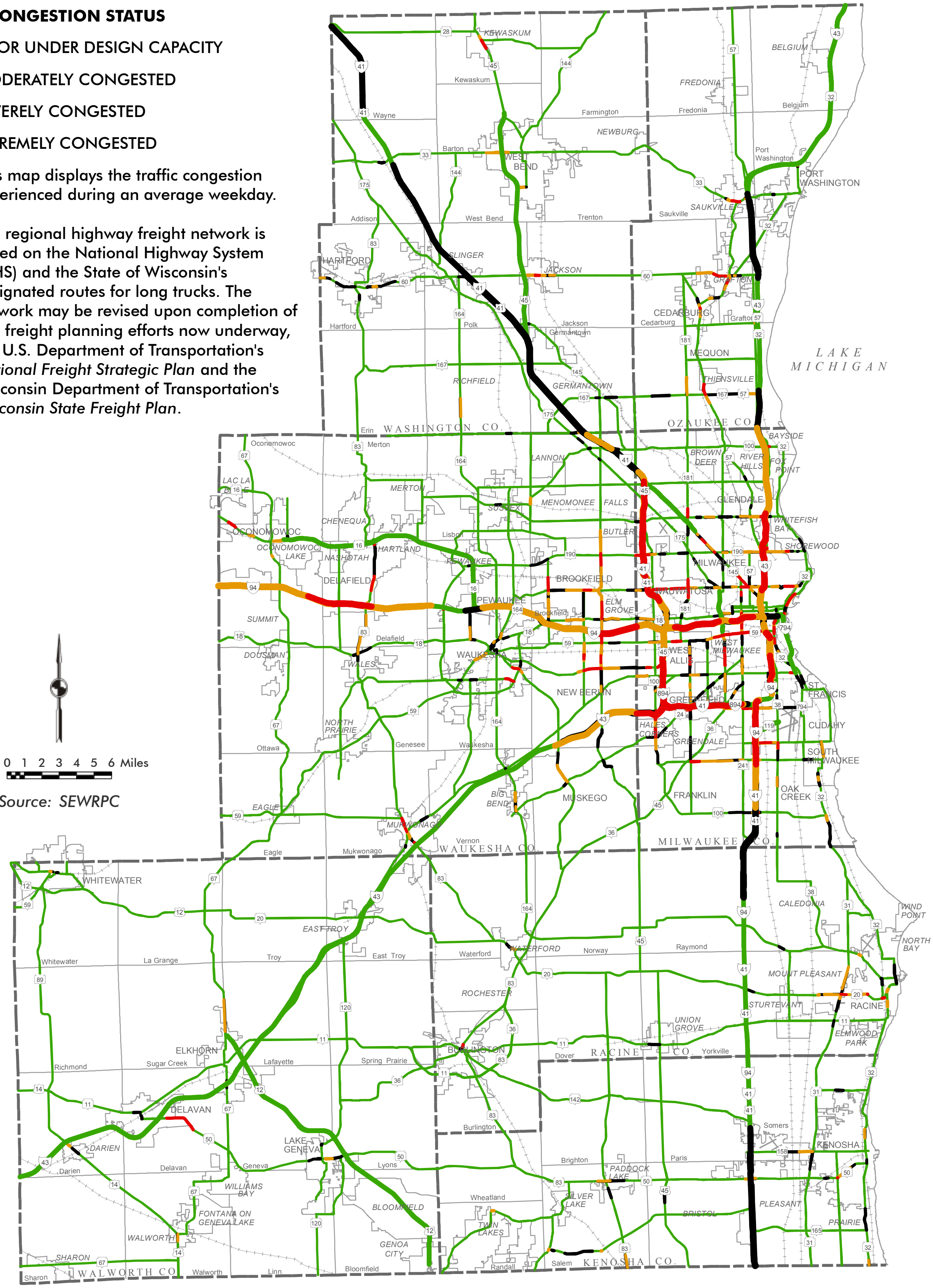
Map F.153
Congestion on the Regional Highway Freight Network: Alternative II Without Highway Improvements

FACILITY CONGESTION STATUS

- AT OR UNDER DESIGN CAPACITY
- MODERATELY CONGESTED
- SEVERELY CONGESTED
- EXTREMELY CONGESTED

Note: This map displays the traffic congestion experienced during an average weekday.

The regional highway freight network is based on the National Highway System (NHS) and the State of Wisconsin's designated routes for long trucks. The network may be revised upon completion of two freight planning efforts now underway, the U.S. Department of Transportation's *National Freight Strategic Plan* and the Wisconsin Department of Transportation's *Wisconsin State Freight Plan*.



Source: SEWRPC

The Trend would result in the least congested regional highway freight network in Milwaukee County, with 30.0 percent (106.5 miles) of the network operating over its design capacity for at least part of an average weekday. The congested regional highway freight network miles in Milwaukee County under the Trend would be about 0.5 percent less than Alternative I (108.1 miles) and about 2.8 percent less than Alternative II (114.9 miles). The lower percentage of congested regional highway freight network miles in Milwaukee County under the Trend would result due to of a combination of the Trend envisioning more arterial street and highway expansion in the County compared to the other alternatives and Alternatives I and II proposing to add more households and jobs in the County (which would generate more traffic in the County) than the Trend.

- **Severe and Extreme Congestion:** The Trend would result in the least amount of severe and extreme congestion in the Region, with 5.3 percent (90.6 miles) of the regional highway freight network operating with severe or extreme congestion for at least part of an average weekday. The percent of regional highway freight network miles with severe or extreme congestion under the Trend would be about 0.1 percent less than Alternative I (92.0 miles) and about 0.7 percent less than Alternative II (100.7 miles).[58] The lower amount of severe and extreme congestion under the Trend largely would result from this alternative envisioning the most arterial street and highway expansion. Not including highway improvements (except for currently committed highway expansion projects and freeway modernization) under Alternatives I and II would increase the percent of regional highway freight network miles with severe or extreme congestion under these alternatives by about 3.9 percent (an additional 63.8 miles) and 3.5 percent (an additional 58.6 miles), respectively.

  As of 2011, Milwaukee County had about 59.6 percent (71.2 miles) of the regional highway freight network miles operating with severe or extreme congestion for at least part of an average weekday, and this percentage would increase to 79.1 percent (71.7 miles) under the Trend, to 79.4 percent (80.0 miles) under the Alternative II, and to 79.7 percent (73.3 miles) under Alternative I. Comparing the regional highway freight network within each county, Milwaukee County would have the highest percentage of regional highway freight network miles with severe or extreme congestion of any county. The Trend would result in the least amount of severe and extreme congestion on the regional highway freight network in Milwaukee County, with about 20.2 percent (71.7 miles) of the regional highway freight network operating with severe or extreme congestion for at least part of an average weekday. The percent of regional highway freight network miles in Milwaukee County with severe or extreme congestion under the Trend would be about 0.5 percent less than Alternative I (73.3 miles) and about 2.7 percent less than Alternative II (80.0 miles). Similar to total congestion in Milwaukee County, the lower percentage of regional highway freight network miles with severe or extreme congestion in the County under the Trend is a result of a combination of the Trend envisioning more arterial street and highway expansion in the County than the other alternatives and Alternatives I and II proposing to add more households and jobs in the County (which would generate more traffic) than the Trend.

[58] *Ibid.*

CRITERION 4.6.3: IMPACTS TO FREIGHT TRAFFIC

KEY CONCLUSIONS

- **Alternative I would best support the efficient movement of freight traffic in the Region, including congestion levels and reliability, followed by Alternative II, and then the Trend.**
- **Regardless of the alternative, WisDOT and county and local governments in the Region should work together to ensure oversize/overweight truck routes are identified and preserved.**
- **Commuter rail service under Alternatives I and II may require infrastructure improvements to prevent commuter train operations from negatively impacting freight train operations.**

The safe and efficient movement of raw materials and finished goods to, from, and within Southeastern Wisconsin is essential for maintaining and growing the Region's economy. Freight shipments in the Region—including shipments involving ships, airplanes, and trains—rely heavily on trucks using the Region's arterial street and highway system. In 2015, approximately 138 million tons of domestic and international cargo valued at about $206 billion were shipped to, from, and within the Milwaukee-Racine-Waukesha Combined Statistical Area (CSA).[59] This cargo was transported using a variety of modes, including: truck (82 percent of all shipments by weight and 78 percent by value); rail (11 percent by weight and 2 percent by value); water (4 percent by weight and 2 percent by value); air (0.1 percent by weight and 3 percent by value); multiple modes and mail (2 percent by weight and 14 percent by value); pipeline (1 percent by weight and 0.3 percent by value); and other/unknown (less than 0.1 percent by weight and less than 0.1 percent by value).[60]

- **<u>Congestion on the Regional Highway Freight Network:</u>** Southeastern Wisconsin's regional highway freight network is composed of arterial streets and highways in the Region intended to carry a higher percentage of truck traffic. The network incorporates the National Highway System as well as the State of Wisconsin's high-priority freight network. Higher levels of congestion on the regional highway freight network can result in increased shipping delays and higher shipping costs, negatively impacting businesses and manufacturers in the Region.

  As described in more detail in Criterion 4.6.2 (Congestion on the Regional Highway Freight Network), Alternative I would result in the lowest level of congestion on the regional highway freight network. The Trend would result in the next lowest level of congestion, followed by Alternative II.

- **<u>Transportation Reliability:</u>** Businesses and manufacturers in the Region benefit when the travel times of their freight shipments are predictable. In particular, the "just-in-time" business model requires carefully coordinated shipping schedules, since freight shipments that arrive late or early can increase the cost of doing business.

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[59] *Office of Freight Management and Operations,* Federal Highway Administration, Freight Analysis Framework (FAF) Version 4.1. *The Milwaukee-Racine-Waukesha Combined Statistical Area consists of Dodge, Jefferson, Milwaukee, Ozaukee, Racine, Walworth, Washington, and Waukesha Counties.*

[60] *Ibid.*

As described in Criterion 4.6.1 (Transportation Reliability), Alternative I in general would provide the best level of transportation reliability for trucks using the Region's arterial street and highway system. Alternative II would provide the next best level of transportation reliability, followed by the Trend.

- **Access to Intermodal Shipping Options:** In many cases, freight shipments to and from other countries or other regions of the United States are most effectively transported using more than one mode of transportation. These intermodal freight shipments typically involve using a ship, airplane, or train for the longer portion of a trip and a truck for the shorter first mile or last mile trip between a port, an airport, or a truck-rail intermodal facility and the shipment's origin or destination. The Region's arterial street and highway system is essential for allowing trucks to provide first mile and last mile trips to and from the Port of Milwaukee, General Mitchell International Airport, O'Hare International Airport in Chicago, and truck-rail intermodal facilities located in Chicago, western Wisconsin, and Minneapolis-St. Paul.

  Given the importance of reducing unexpected delays experienced by first mile and last mile freight shipments, Alternative I would provide the best access to intermodal shipping options for the Region's businesses and manufacturers since it would result in the most reliable arterial street and highway system—as described in Criterion 4.6.1 (Transportation Reliability). Alternative II would provide the next best access to intermodal shipping options, followed by the Trend.

- **Oversize/Overweight Truck Impediments:** Unusually large or heavy goods shipped within or through the Region require that specific oversize/overweight (OSOW) truck routes be used that do not have physical impediments, such as low bridges, sharp turns, or weight restrictions. OSOW truck routes may consist of streets and highways under State, county, or local jurisdiction. While these OSOW shipments constitute only a small percentage of all truck shipments in the Region, they typically consist of high-value goods that are important to the regional economy. Regardless of the alternative, WisDOT and county and local governments in the Region should work together to ensure that the necessary OSOW routes—and in particular routes to and from the Port of Milwaukee—are identified and preserved.

- **Congestion on the Freight Rail Network:** The proposed additional commuter rail service included in Alternatives I and II would operate over privately owned freight rail lines and share track infrastructure with freight trains. The proposed commuter rail service operating between Kenosha and Milwaukee in Alternatives I and II would use track owned by Union Pacific Railroad (UP) and Canadian Pacific Railway (CP), and the proposed commuter rail service operating between Oconomowoc and Milwaukee in Alternative II would use track owned by CP. Alternatives I and II each envision that the costs of implementing new commuter rail service would include the costs of infrastructure improvements necessary to keep commuter train operations from negatively affecting freight train operations.