CHAPTER 4

LONG RANGE TRANSPORTATION PLANNING AND THE CONGESTION MANAGEMENT PROCESS

4.1 Overview

MVRPC has assimilated many of the state and federal goals, strategies, and programs to manage congestion through its Long Range Transportation Plan (LRTP), Transportation Improvement Program (TIP), and various regional projects, strategies, and initiatives. This chapter focuses on the evaluation of the existing regional multimodal transportation network and the overall impact of the approved 2050 LRTP Congestion Management (CM) project list on managing regional congestion. In addition, the chapter documents how congestion evaluation and management serves as input to a number of MVRPC planning processes and programs. Other relevant congestion management efforts undertaken as part of the on-going transportation planning processes at MVRPC are also addressed, including public transportation, alternative modes, and technology-based solutions such as the Freeway Management System.

Summary of Congestion Management Efforts

Introduction to Congestion

"Congestion" is generally defined from the perspective of the roadway user. The public's perception of congestion relies primarily on their own experiences when traveling on the nation's roadways. However, an engineer would describe congestion as the condition where traffic demand approaches and/or exceeds the roadway's ability to facilitate travel at normal speeds. Typically, roadway congestion manifests itself as "stop-and-go" traffic conditions.

According to the Federal Highway Administration (FHWA), roadway congestion consists of three key elements: severity, extent, and duration. The blending of these elements determines the overall effect of congestion on roadway users. Roadway congestion occurs due to a number of planned and unplanned events either in isolation or in tandem. In some cases, the clockwork nature of recurring congestion can be the sole event. For example, up to 40 percent of roadway congestion can be attributed to physical bottlenecks (i.e. sections of the roadway system that have reached their operational capacity). However, presented below, research by FHWA has identified several additional root causes for roadway congestion along with their percent contribution as a cause of national roadway congestion. Collectively, these events can cause what is known as 'non-recurring congestion':

- Traffic Incidents (25%) — Random events occurring in the travel lanes that disrupt otherwise "normal" traffic flow, such as crashes, disabled vehicles, or roadway debris;
- Weather (15%) — Environmental conditions can affect driver behavior, causing motorists to drive more slowly and/or allow for larger gaps between cars;

- Work Zones (10%) — Construction activities that alter traffic flow due to lane or shoulder restrictions, lane shifts, or temporary closures;
- Traffic Control Devices (5%) — Poorly timed or spaced signals and railroad crossings can cause intermittent disruptions in traffic flow;
- Special Events (5%) — Sudden increases in traffic demand due to planned or unplanned events, particularly in rural areas, can temporarily overburden the roadway system;
- Fluctuations in Normal Traffic Flow (Unknown) — Day-to-day changes in the traffic demand placed on the system due to random unknown causes.

Other than bottlenecks resulting from maximized roadway capacity, the above listed events take place with irregularity throughout the day. Therefore, accurately predicting travel times between two points becomes increasingly difficult as irregular congestion disrupts the transportation network over longer periods of time and larger sections of roadway, leading to frustration for commuters, commercial operators, and public officials.

4.2 Roadway Congestion in the Miami Valley Region

MVRPC used its regional travel demand model to develop scenarios consistent with the congestion management projects proposed by the 2050 Plan (see Table 5.3 in Chapter 5). Three scenarios were developed: 2010 Base conditions, 2050 Existing plus Committed (E+C), and 2050 Plan. The 2050 Plan scenario includes all projects in the Long Range Transportation Plan (LRTP), while the E+C scenario includes only projects that are funded in the SFY 2021-2024 Transportation Improvement Program (TIP). Socioeconomic data from 2010 is used on the Base scenario, while 2050 forecasted socioeconomic data is used on the 2050 E+C and Plan scenarios. Detailed information on socioeconomic data assumptions is available in Chapter 3. Performance measure statistics for the base and future year scenarios were generated for each roadway segment by using POSTCMS software developed by the Ohio Department of Transportation (ODOT). Systemwide congestion was identified by location and quantified by severity using the level of service (LOS) performance measure.

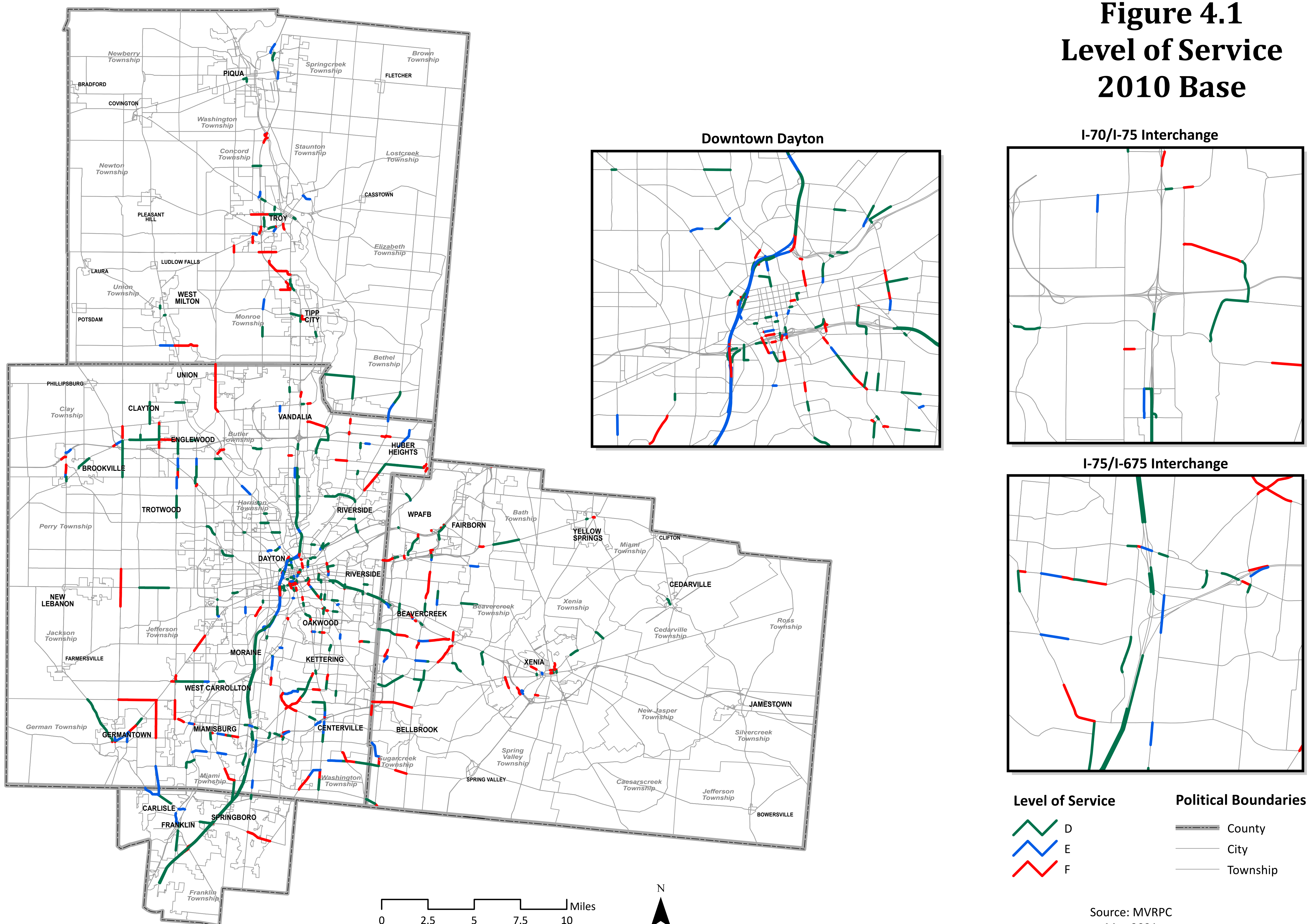
Level of Service

Level of Service (LOS) is defined as a qualitative measure describing operational conditions within a traffic stream and their perception by motorists. Volume-to-capacity (V/C) ratio is a measure of the traffic volume on a road compared to the capacity of the road. The capacity of a road depends on its physical and operational characteristics and varies by functional class. A higher V/C ratio indicates that the traffic volume of the road is nearing its capacity and is becoming congested. Similarly the ratio of average speed to free flow speed can also be used to measure congestion, with lower speed ratios indicating congested conditions.

The analyses presented in this section are based on calculations by POSTCMS software and its definition of LOS by Speed and V/C ratio. LOS is broken down into six levels (A through F), with significant traveler delay and recurring congestion occurring at LOS D, E, and F. LOS was used to identify specific locations of congestion in the Base (2010), Existing plus Committed (2050 E+C) and the Long Range Transportation Plan (2050 LRTP) networks. Figures 4.1, 4.2, and 4.3 identify roads having LOS D (V/C>0.751) or worse for surface

MVRPC

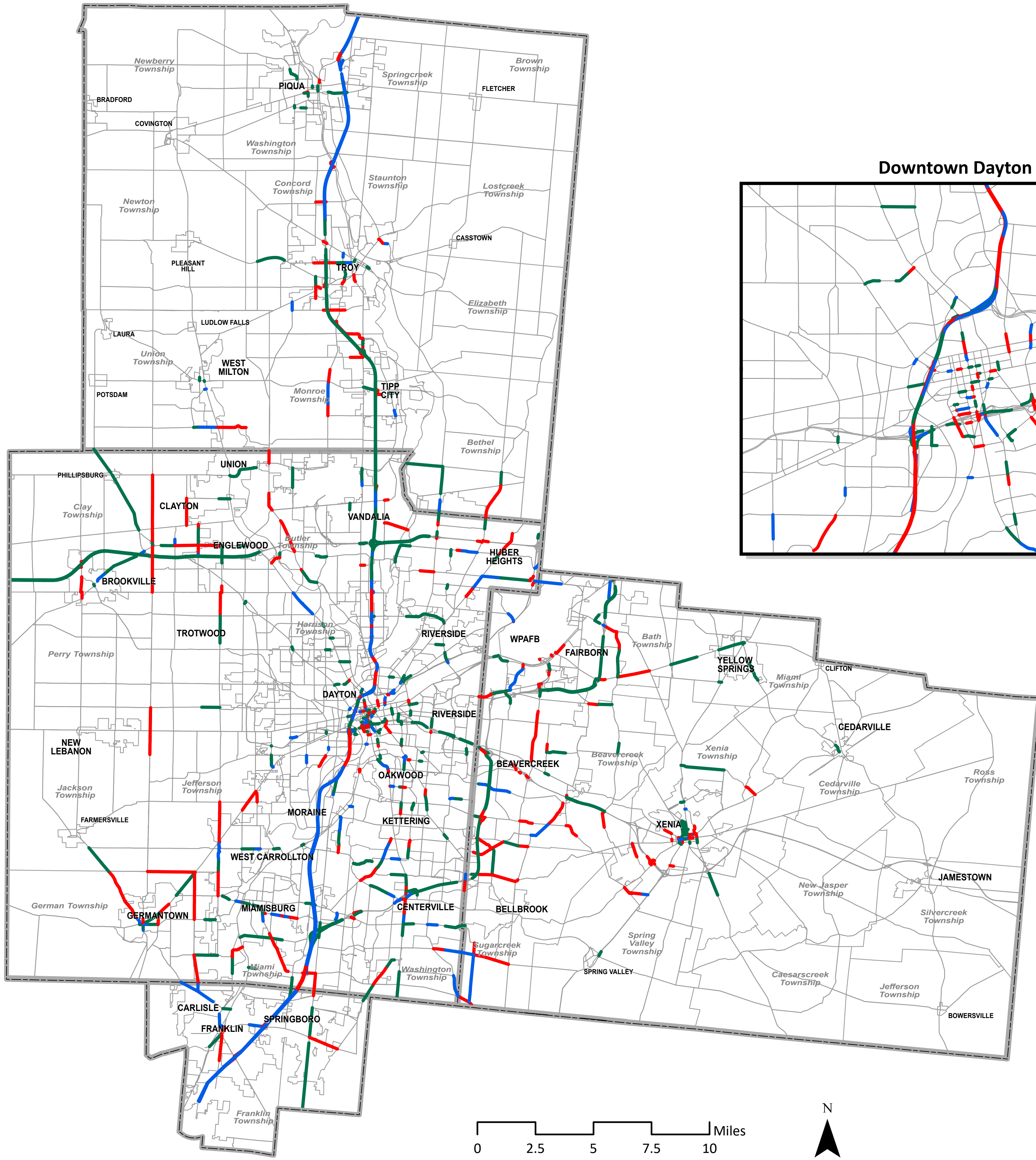
Figure 4.1
Level of Service
2010 Base



Source: MVRPC
May 2021

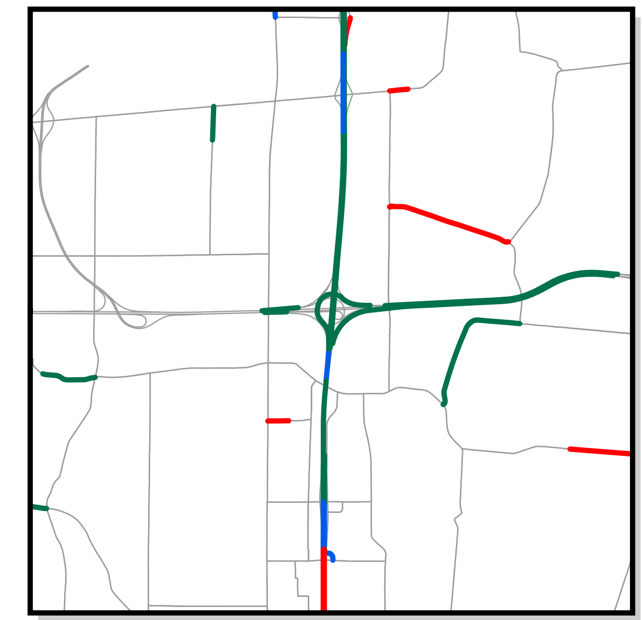
MVRPC

Figure 4.2
Level of Service
2050 Existing+Committed

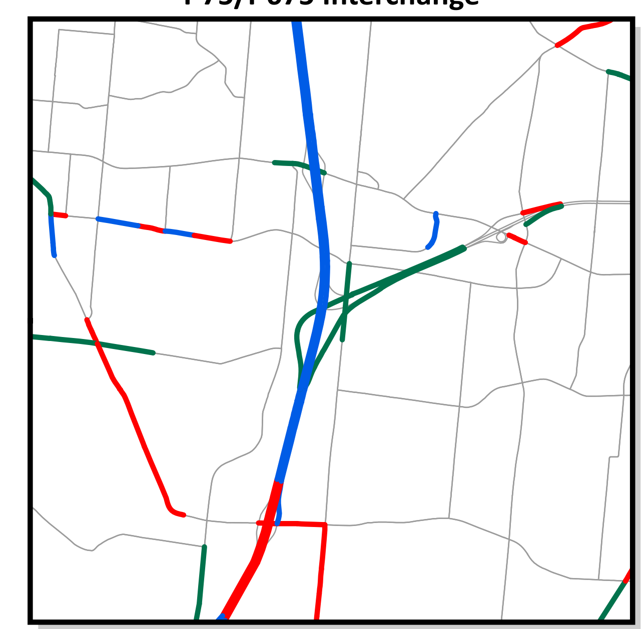


Downtown Dayton

I-70/I-75 Interchange



I-75/I-675 Interchange



Level of Service

- D
- E
- F

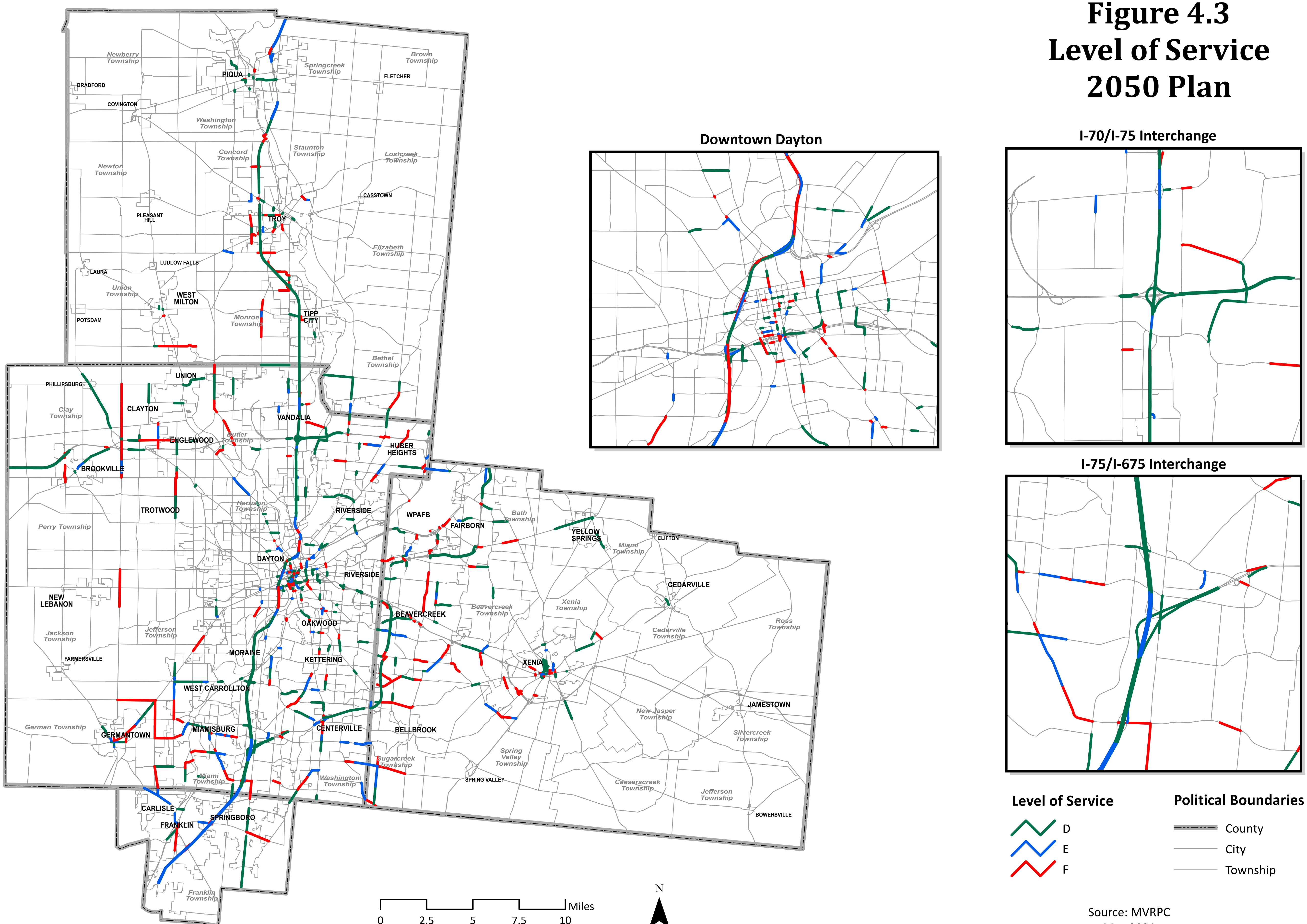
Political Boundaries

- County
- City
- Township

Source: MVRPC
May 2021

MVRPC

Figure 4.3
Level of Service
2050 Plan



Source: MVRPC
May 2021

roads while LOS for freeways is determined by speed ratios as recommended in the 2015 Highway Capacity Manual.

2010 Base

In the Base (2010) network, roadway congestion is located mainly on I-75 and US-35 in Montgomery County, particularly in the downtown Dayton area. Roadway congestion is also present on surface roadways near local-access interchanges.

2050 E+C

Roadway congestion is increasingly present in the 2050 E+C network. The majority of freeway sections in Montgomery County will operate at LOS D or E, with significant roadway congestion along I-75 through and south of downtown Dayton, in Miami County, and near the Warren County border in Montgomery County. Congestion will also spread to I-70 and on surface roadways in rural sections of Greene County, particularly US 42 and US 68, and in parts of western and southern Montgomery County. Various projects, including interchange and freeway reconstruction, are included in the 2050 LRTP to improve the freeway performance; this is reflected in Figure 4.3 representing the 2050 Plan scenario.

2050 Plan

Under the 2050 LRTP scenario, the level of service generally improves even as demand grows with segments of the I-75 corridor improving from LOS E to D. Given the importance of freeways to the regional economy, MVRPC recommends continued monitoring and potential implementation of additional travel demand management strategies along these corridors in the medium to long-term timeframe, including connected and autonomous vehicles and other smart mobility solutions.

4.3 Congestion and Safety

The Dayton Regional Safety Initiative (DaRSI) began in SFY 2006 as a response to the emphasis placed on roadway safety by the 2005 Federal Transportation Bill known as SAFETEA-LU (Safe, Accountable, Flexible, Efficient Transportation Equity Act - A Legacy for Users). In an effort to reduce roadway fatalities and injuries throughout the Miami Valley, the original Regional Safety Analysis (RSA) was initiated in SFY 2006. The goal of DaRSI is to generate a list of locations in need of safety countermeasures to reduce the frequency or severity of crashes.

The adoption of MAP-21 of 2012 and the subsequent FAST Act of 2015 required MPOs to coordinate with state departments of transportation on setting the following five safety performance targets for the region: number of fatalities, number of serious injuries, fatality rate, serious injury rate, and number of non-motorized injuries and fatalities. More information is available in Chapter 8.

MVRPC analyzes crash data to help improve transportation safety and inform the planning process. A number of statistical and comparative analyses are performed on the regional crash data, which is collected from the Ohio Department of Transportation (ODOT) and the Ohio Department of Public Safety (ODPS) in three-year intervals. MVRPC analyzes crash trends and generates a list of high-crash locations that identify roadways that may need further examination to determine need for improvement.

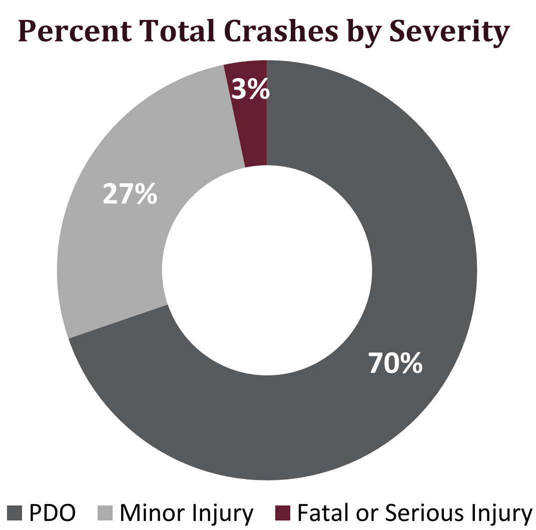
The SFY 2021 High Crash Location Analysis used the roadway crash data for the years 2017 – 2019 to rank intersections and roadway segments based on the frequency and severity of crashes. These high-crash locations were prioritized as low, medium, and high priority, and included 162 intersections and 222 segments. A few excerpts from the *2017-2019 Crash Data Report for the Miami Valley Region* are presented in the following paragraphs.

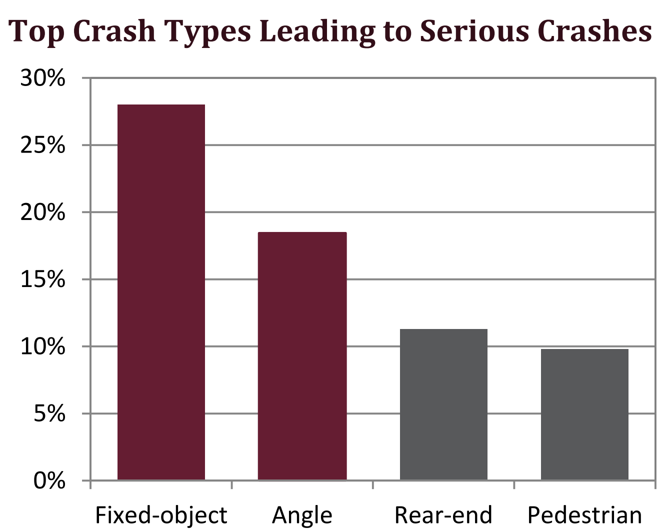
In the last 10 years, the number of crashes reported annually in the Miami Valley has increased. From 2010 to 2019, total reported crashes increased by 8%. In 2010, 19,174 crashes were reported compared to 20,721 in 2019. This increase has been noticeable despite average VMT remaining relatively constant during the same period.

Serious Crashes

Serious crashes are those that lead to an incapacitating injury or loss of life. Although, serious crashes represented a small percent of total crashes (3%), a total of 1,134 serious injury crashes and 194 fatal crashes occurred between 2017-2019. The remaining crashes led to minor injuries or property damage only (PDO). In the last 10 years, serious injuries have decreased by 29% while fatalities have increased by 47%.

Twenty-eight percent (28%) of serious crashes were fixed object crashes, and 18% were angle crashes. These crashes varied by age group of drivers involved. Twenty-six percent (26%) of fixed-object crashes involved youth, ages 16 to 25. Similarly, twenty-four percent (24%) of angle crashes involved seniors, ages 66 and above.

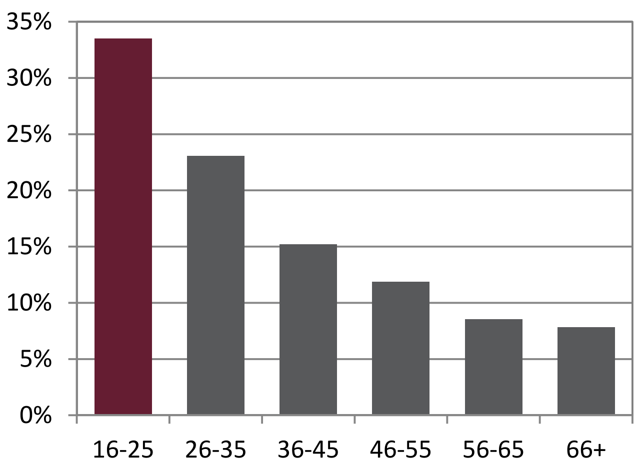




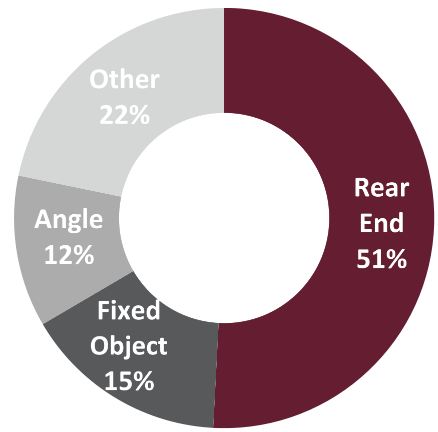
Distracted Driving

In SFY 2013, law enforcement officers were required to include detailed information on distracted driving in crash reports. A total of 3,374 distracted driving crashes were recorded from 2017 to 2019 and it is widely believed that distracted driving crashes are both under-reported and are rising. These include distractions inside the vehicle (internal), external distractions, phones, and other electronic devices. People aged 16 to 25 were most frequently reported in distracted driving. The top crash type reported with distracted driving was rear ends. Fifty-one percent (51%) of distracted driving crashes were rear ends.

Age Groups of Distracted Drivers

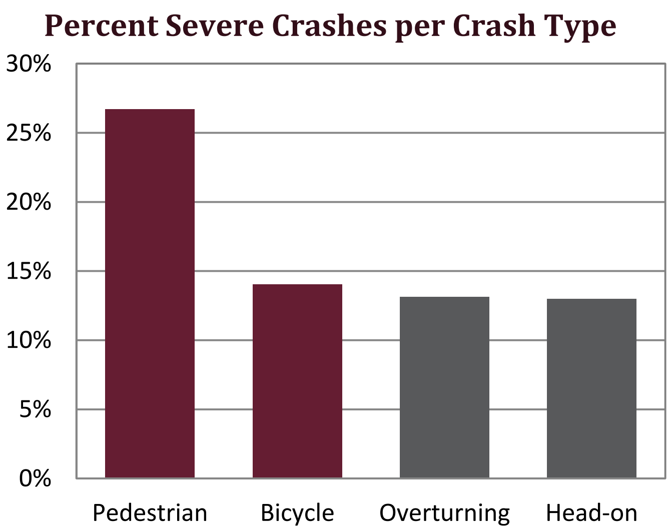


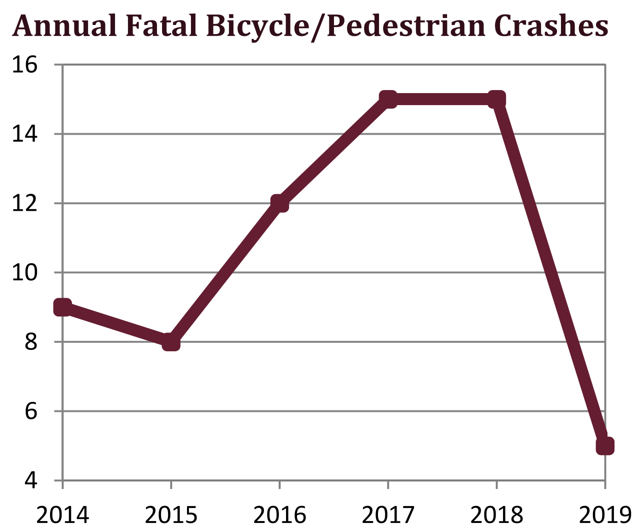
Types of Crashes Involving Distractions



Bicycle and Pedestrian Crashes

From 2017 to 2019, there were 235 bicyclist-motorist and 487 pedestrian-motorist crashes reported. While these crashes represented only a small fraction of all roadway crashes (1.5%), they were very severe. Up to twenty-seven (27%) of pedestrian crashes and fourteen percent (14%) of bicycle crashes resulted in a serious injury or fatality. The number of fatal crashes involving a bicycle or pedestrian has increased from the previous analysis period. From 2014 to 2016, 29 fatal crashes were reported; that number increased to 35 from 2017 to 2019.

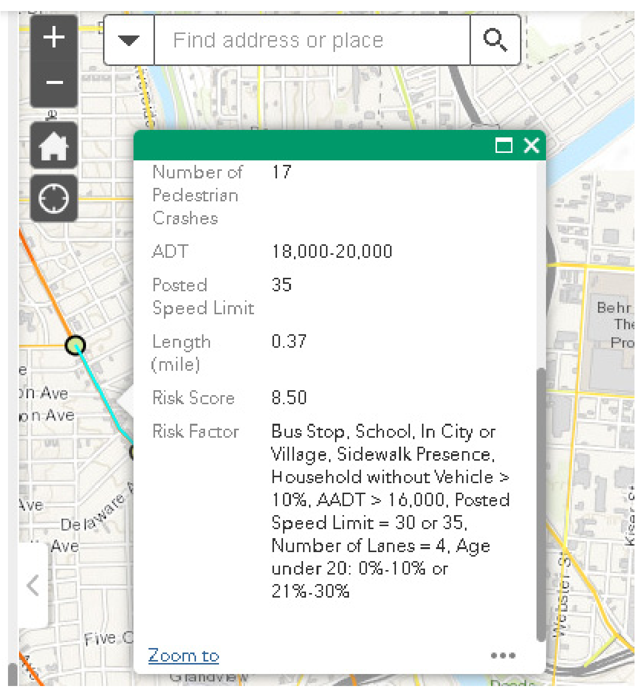




This analysis platform allows comparisons between the SFY 2021 update and past and future iterations of the Regional Safety Analysis. As future analyses are completed, MVRPC can work with our regional partners to identify locations where roadway safety continues to be a public hazard. Pre- and post-implementation data can also be compared using the analysis platform to determine if implemented safety countermeasures are achieving noticeable reductions in crash frequency and/or severity.

Pedestrian Crash Risk Assessment

Due to the high level of severity associated with pedestrian crashes, a systemic safety analysis was commissioned by ODOT to identify risk for pedestrian crashes on intersections and segments (arterials and collectors) using ODOT District 8 as a pilot and including Greene and Warren Counties in our Region. Miami and Montgomery Counties in District 7 were later added following discussions with ODOT's safety program staff.



Using a variety of data impacting pedestrian crashes, risk factors were used to identify the "priority network" — locations where conditions exist for pedestrian crashes to occur on arterial and collector facilities for both intersections and segments. Several risk factors were con sidered including roadway characteristics (e.g. speed and traffic volume) as well as area characteristics such as the presence of libraries and zero car households.

More than 400 attributes were tested for consideration and the final analysis produced 15 risk factors that were used to identify the priority network. The analysis focused on the transportation urbanized area since the majority of pedestrian crashes occur there. Locations were then plotted on a map based on an overrepresentation of risk factors — the higher the number of risk factors, the higher the risk for pedestrian crashes. A map application displaying the results can be found at:
https://www.mvrpc.org/transportation/transportation-safety/pedestrian-crash-risk-assessment-study.

Safety and Congestion

There is a correlation between roadway safety and congestion, with increasing congestion levels resulting in diminished road safety. During times of recurring congestion, when the roadway is at or over capacity, there is usually an increase in crash frequency. These periods are usually during peak travel times in the morning (AM peak: 7 to 10 AM) and/or evening (PM peak: 3 to 6 PM). The chart in Figure 4.4 illustrates the percent of total crashes that occurred by hour and weekday. As indicated by the darker colors, a higher percent of crashes occurs during the peak weekday AM, midday, and PM hours than other times of the day.

Figure 4.4 — Percent of Crashes by Time and Day

Day	12A	1A	2A	3A	4A	5A	6A	7A	8A	9A	10A	11A	12P	1P	2P	3P	4P	5P	6P	7P	8P	9P	10P	11P
Sun	0.4%	0.3%	0.4%	0.2%	0.1%	0.1%	0.1%	0.2%	0.2%	0.3%	0.4%	0.5%	0.7%	0.8%	0.7%	0.7%	0.7%	0.7%	0.7%	0.6%	0.6%	0.4%	0.3%	0.2%
Mon	0.2%	0.1%	0.1%	0.1%	0.1%	0.1%	0.4%	0.9%	0.8%	0.6%	0.6%	0.7%	0.8%	0.9%	0.9%	1.3%	1.5%	1.6%	0.9%	0.6%	0.5%	0.4%	0.3%	0.2%
Tue	0.2%	0.1%	0.1%	0.1%	0.1%	0.2%	0.4%	1.1%	0.8%	0.6%	0.5%	0.7%	0.8%	0.8%	1.0%	1.4%	1.4%	1.7%	0.9%	0.6%	0.4%	0.4%	0.2%	0.2%
Wed	0.1%	0.1%	0.1%	0.1%	0.1%	0.2%	0.4%	1.0%	0.8%	0.7%	0.6%	0.7%	0.9%	0.8%	0.9%	1.3%	1.4%	1.6%	1.1%	0.6%	0.5%	0.4%	0.3%	0.2%
Thu	0.2%	0.1%	0.1%	0.1%	0.1%	0.2%	0.4%	1.2%	0.8%	0.6%	0.6%	0.8%	0.9%	0.9%	1.1%	1.5%	1.5%	1.7%	1.0%	0.6%	0.5%	0.4%	0.3%	0.3%
Fri	0.2%	0.2%	0.1%	0.1%	0.1%	0.1%	0.4%	0.8%	0.7%	0.6%	0.6%	0.8%	1.0%	1.0%	1.3%	1.5%	1.7%	1.8%	1.3%	0.8%	0.6%	0.6%	0.5%	0.4%
Sat	0.4%	0.3%	0.3%	0.2%	0.1%	0.1%	0.1%	0.2%	0.3%	0.4%	0.6%	0.7%	0.9%	0.8%	0.9%	1.0%	0.9%	0.9%	0.8%	0.7%	0.6%	0.5%	0.5%	0.4%
									14% AM Peak				27% Midday				27% PM Peak							

4.4 Smart Mobility and Connected and Automated Vehicles Scenarios

There is substantial anticipation and excitement in the area of connected/automated vehicles (CAVs) and their potential to change mobility. Given that MPOs incorporate a multi-decade planning horizon, MVRPC has begun to consider the implications of CAVs now, before their widespread implementation. To that end, MVRPC's Smart Mobility webpage highlights efforts to keep abreast of developments in these areas, and research new technologies and best practices.

State and Local Developments

DriveOhio, an initiative of the State of Ohio, was created in 2018 to highlight the State's efforts to design, test and deploy smart mobility technologies. In 2018, ODOT/DriveOhio, in partnership with the Indiana DOT and the Transportation Research Center (TRC), received a federal grant to deploy smart logistics solutions along a stretch of I-70 between Columbus, Ohio and Indianapolis, Indiana through the Miami Valley Region. The 4-year I-70 Truck Automation Corridor project, involving participation from technology providers, truck manufacturers, regional logistics councils and private freight companies, would deploy partially automated driving technology in daily "revenue service" operations on this corridor, (Photo by Virginia DOT).

Locally, the GDRTA Connect service, described in Chapter 6, is Greater Dayton RTA's effort to improve mobility in the Miami Valley through the use of smart technologies. In 2019, over 51,000 trips used the GDRTA Connect service.

The cities of Dayton, Xenia, and Springboro are also in talks with DriveOhio to pilot automated technology and infrastructure. Recent advances in mobile technologies and innovative apps have led to growth of "shared mobility" options throughout the Miami Valley.

CAV Scenario Planning and Congestion Impacts

Determining the effect automated and connected vehicles could have on traffic flow and congestion would ideally require testing the vehicles themselves in a real-world environment and widespread public acceptance. In the absence of such testing, MVRPC developed scenarios to study long-term congestion impacts of these new technologies. The analysis presented in this section is intended to start a conversation about potential benefits of CAV technology.

MVRPC's new activity-based travel demand model was used to generate and compare several congestion metrics for three different scenarios: 2050 Plan, 2050E+C with 50% CAVs, and 2050E+C with 100% CAVs. The two CAV scenarios denote 50% and 100% CAV fleet penetration respectively. All three scenarios are compared against the base 2050 Existing+Committed network as described in Section 4.2. Table 4.1 provides a summary of the various measures and their impact for each scenario. A circle symbol represents neutral or no change, "-" and "+" symbols represent negative and positive impacts, respectively. The number of "-" or "+" represent the intensity of the negative or positive impact. The model uses a "car allocation" model to predict changes on vehicle use and a capacity multiplier to increase capacity as a function of CAV fleet penetration. The highest increases in capacity are realized in the freeway system.

Table 4.1 shows that CAVs provide a significant improvement (the greater the CAVs percentage, more significant the improvement) in the percentage of peak hour VMT exceeding congestion as well as hours of congestion delay, primarily due to improvement in road capacity driven by technology enabled safety gap and harmonized speeds. Some of these gains are offset by increases in the demand for urban road use directly attributable to CAVs; the shift to CAVs is estimated to increase the vehicle person trips, percentage of single occupancy vehicle (SOV) trips, percentage of empty car trips as well as the vehicle miles traveled (VMT) due to generation of entirely new trips, and also because CAVs are likely to introduce a trip multiplier. For example, enabling trips by non-drivers to switch to a single occupancy automated vehicle. The greater the percentage of CAVs in the vehicle fleet, the worse the impact; thus, the 100% CAV scenario has double the negative impact of the 50% CAV scenario for these demand related congestion metrics.

Table 4.1 — Comparison of CAVs and 2050 Plan Scenarios against the 2050 Existing+Committed Baseline

	2050 E+C	2050 E+C (50% CAV)	2050 E+C (100% CAV)	2050 Plan	
Vehicle Person Trips 	2,675,638	2,830,858	2,897,174	2,675,541	Measure
	o	–	– –	o	Impact
Percentage SOV Person Trips 	67.3%	73.0%	77.6%	67.3%	Measure
	o	–	– –	o	Impact
Percentage Empty Trips 	0.0%	2.5%	4.7%	0.0%	Measure
	o	–	– –	o	Impact
Vehicle Miles Traveled (VMT) 	24,357,850	25,319,184	26,056,938	24,315,890	Measure
	o	–	– –	o	Impact
Lane Miles 	5,832	5,832	5,832	6,063	Measure
	o	o	o	–	Impact
Peak Hour VMT Exceeding Congestion Threshold-Percentage 	28.9%	17.6%	5.0%	26.2%	Measure
	o	+ +	+ + +	+	Impact
Hours of Congestion Delay 	30,768	18,313	8,034	27,109	Measure
	o	+ +	+ + +	+	Impact

Source: MVRPC

4.5 Public Transportation

An important tool to manage recurring and non-recurring congestion is the regional public transportation system. Public transportation provides people with mobility and access to employment, community resources, medical care, and recreational opportunities in communities across the Region. It also has the potential to significantly reduce congestion on the regional roadway network. The role of public transit in roadway congestion management is to give commuters an alternative to the automobile for local trips. The Miami Valley Region is served by four transit agencies including the Greater Dayton Regional Transit Authority (GDRTA), offering fixed route services; Greene CATS Public Transit (Greene CATS), offering deviated fixed route and demand responsive services; and Miami County Transit System (MCTS) and Warren County Transit System (WCTS) offering demand responsive services only (see Chapter 6 - Figure 6.1).

Load Factor Analysis

Transit is less attractive when passengers must stand for long periods of time, especially when transit vehicles are highly crowded. When passengers must stand, it becomes difficult for them to use their travel time productively, which eliminates a potential advantage of transit over the private automobile. Crowded vehicles also slow down transit operations, as it takes more time for passengers to get on and off[2]. Load factor is a measure of ridership compared to seating capacity of a route for a given period of time. Similar to level of service on roadways, the relative comfort that a passenger may experience while seated on a transit vehicle is given a level of service label of A through F as seen in Table 4.2. A load factor of 1.0 means that all seats are taken.

Table 4.2 — Transit Vehicle LOS and Load Factor

LOS	Load Factor	Passenger Conditions
A	0.00-0.50	No passenger needs to sit next to another
B	0.51-0.75	Some passengers may need to sit together, but not all
C	0.76-1.00	All passengers may sit together, limited seat choice
D	1.01-1.25	Some passengers will need to stand
E	1.26-1.50	Full vehicle, spacing between passengers at maximum level of tolerability
F	>1.50	Crush load, extremely intolerable

Source: TCRP Report 100: Transit Capacity and Level of Service Manual 2003

Table 4.3 shows the 10 routes with the highest load factor for each travel period.

[2] Transit Capacity and Quality of Service Manual—3rd Edition

Table 4.3 — Maximum Load Factor Level of Service

Route	Route Name	Direction	Peak Headway	Load Factor AM Peak	LOS AM Peak
Maximum Load Factor Level of Service AM Peak (6:30 AM-9:00 AM)					
7N	N. Main St.	Inbound	15	0.82	C
7N	N. Main St.	Outbound	15	0.80	C
9N	Greenwich Village	Inbound	25	0.75	B
14N	Trotwood	Inbound	40	0.74	B
9N	Greenwich Village	Outbound	25	0.74	B
8N	Salem Ave.-Northwest Hub	Inbound	20	0.69	B
16N	Union	Inbound	30	0.67	B
14N	Trotwood	Outbound	40	0.62	B
9S	Miami Chapel	Inbound	25	0.59	B
56	The Flyer	Northbound	10	0.58	B
Maximum Load Factor Level of Service PM Peak (3:00 PM-6:30 PM)					
Route	**Route Name**	**Direction**	**Peak Headway**	**Load Factor PM Peak**	**LOS PM Peak**
7S	Watervliet	Inbound	15	0.90	C
16S	Bigger Rd.-Kettering	Inbound	30	0.76	C
7S	Watervliet	Outbound	20	0.76	C
8S	Nicholas-Westown Hub	Inbound	20	0.76	C
14S	Centerville	Inbound	40	0.75	B
14S	Centerville	Outbound	40	0.74	B
8S	Nicholas-Westown Hub	Outbound	25	0.74	B
9S	Miami Chapel	Inbound	30	0.69	B
18S	Miamisburg	Inbound	40	0.69	B
23	South Hub-Eastown Hub	Northbound	70	0.68	B
Maximum Load Factor Level of Service Off Peak (4:00 AM-6:30 AM, 9:00 AM-3:00 PM, 6:30 PM-1:00 AM)					
Route	**Route Name**	**Direction**	**Off Peak Headway**	**Load Factor Off Peak**	**LOS Off Peak**
8S	Nicholas-Westown Hub	Inbound	65	0.99	C
18N	Troy Pk.-Huber Heights	Outbound	55	0.83	C
18N	Troy Pk.-Huber Heights	Inbound	55	0.83	C
9S	Miami Chapel	Inbound	55	0.83	C
7N	N. Main St.	Inbound	45	0.79	C
8N	Salem Ave.-Northwest Hub	Inbound	60	0.79	C
18S	Miamisburg	Inbound	55	0.73	B
8S	Nicholas-Westown Hub	Outbound	60	0.72	B
9N	Greenwich Village	Outbound	55	0.68	B
16N	Union	Inbound	90	0.68	B

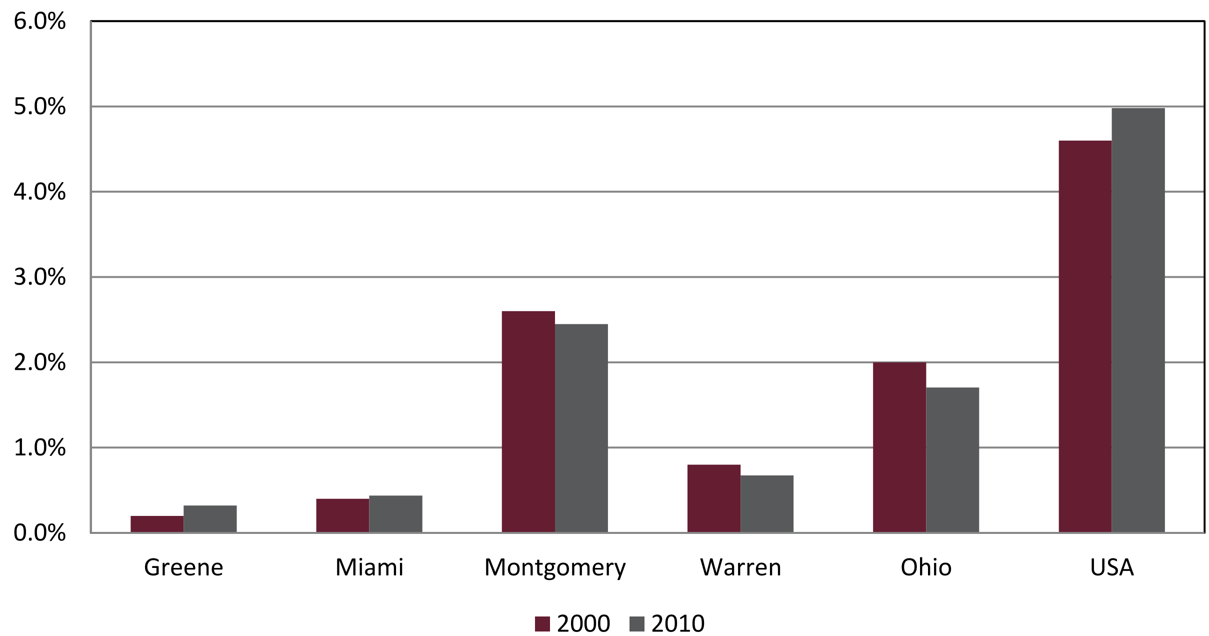
Source: GDRTA

The results of the load factor analysis indicate that all of the GDRTA routes are experiencing load factors less than 1.0, indicating high LOS and acceptable levels of passenger congestion. Riders experience comfortable conditions, available seats, and often flexible space with which to make use of their travel time. As GDRTA implements plans to attract new riders, load factors are likely to increase and headways may need to increase to maintain the current exemplary LOS for some routes.

Regional Analysis

The vast majority of the Miami Valley Region population commutes by single occupancy vehicle. Transit remains a very small portion of the regional commuting profile. Being that Montgomery County is served by the largest and only fixed-route system, its residents use public transit more than any other county in the Region. About 2.6% of Montgomery County residents use public transit on a daily basis compared to less than 1% for Greene, Miami, and Warren Counties. While all counties in the Region use public transit less than the United States average, Montgomery County residents use public transit in greater numbers than Ohio residents as a whole. Figure 4.5 displays public transit usage for all counties in the Region compared to both the Ohio and United States averages.

Figure 4.5 — Regional Public Transit Use



Source: CTTP 2000; American Community Survey 2008-2012

4.6 Regional Intelligent Transportation Systems

ITS (Intelligent Transportation Systems) continues to be at the forefront of transportation planning as MVRPC proceeds with the Region's Early Deployment Plan. The plan focuses on making the transportation system more efficient and responsive to drivers by using technological improvements instead of making major road capacity expansions. In addition to many signal coordination systems implemented throughout the years, the Freeway Management System was completed in 2012 and provides timely and accurate traveler information to motorists that can be accessed through www.ohgo.com or mobile applications.

To maintain and build upon the Region’s strong ITS foundation, the Miami Valley Region ITS stakeholders initiated the development of the Miami Valley ITS Regional Architecture in 2003. Simply put, the regional architecture defines the framework on which to build the ITS system. It functionally defines what the pieces of the system are and the information that is exchanged between them. A regional architecture is required by both the Federal Highway Administration (FHWA) and the Federal Transit Administration (FTA) to qualify ITS projects for federal funding after April 2005. The ITS architecture was updated in 2008 and again in 2013 and is maintained as needed by MVRPC staff.

In 2019, MVRPC updated the regional architecture again to be consistent with the recently released National Reference ITS Architecture, ARC-IT, version 8.3. To that end, the ITS list of regional stakeholders was updated and a list of relevant ITS applications and service packages for the Region were identified. Around the same time ODOT/DriveOhio commissioned a systems engineering analysis to develop a statewide framework for Connected and Automated Vehicles (CV/AV) technology deployments and incorporate it into the Statewide ITS Architecture. This framework would promote consistency and interoperability as various projects are implemented at varying scales by a wide range of stakeholders. MVRPC paused its regional architecture update program to align the schedule with the completion of the statewide ITS architecture update so that the regional architecture could be updated simultaneously with the components of the statewide CV/AV architecture as well as previously planned updates.

MVRPC continued to monitor progress on Ohio's CV/AV ITS Architecture update by attending and hosting ODOT/DriveOhio sponsored workshops. In June 2020, MVRPC staff were notified regarding completion of the State's ITS architecture update and it's availability for integration with MPO regional architectures. ODOT/DriveOhio has approved the use of the project consultant services to incorporate the State's updated ITS architecture into MVRPC's regional architecture. Upon completion of that process, MVRPC staff then plan to update MVRPC's regional architecture with previously identified non-CV/AV components.

4.7 Congestion Management Strategies

Currently, there are a number of strategies that transportation planners and engineers implement to reduce the geographic and temporal extent of roadway congestion. These countermeasures include both physical and operational roadway improvements. More often, two or more of these strategies are combined to provide for maximum congestion relief. Below is an abbreviated list of potential roadway congestion countermeasures:

- **Access Management** — These physical roadway treatments attempt to regulate the manner in which motorists access adjacent land uses by consolidating multiple driveways, providing exclusive turning lanes, and/or incorporating various median treatments including two-way left-turn lanes and non-traversable barriers.

- **Traffic Signal Timing** — Adjusting signal times for current roadway demand can be a cost effective way to increase roadway capacity and is one of the most basic roadway congestion countermeasures.

- **Freeway Management Systems** — These systems integrate a number of operational enhancements, such as cameras, dynamic message signs, and highway advisory radio, into a traffic management center which provides the motoring public with up-to-the-minute updates on current traffic conditions, allowing them to bypass areas with roadway congestion.

- **Travel Demand Management** — A transportation policy that aims to spread transportation demand amongst numerous modes, including carpooling, transit, and bikeway/pedestrian pathways, to reduce dependence on the automobile.

- **Traffic Incident Management** — A program that encourages the quick, safe, and coordinated removal of traffic incidents to restore normal traffic flow.

- **Value Pricing** — A strategy that charges travelers a user fee to access congested corridors during pre-determined periods of high demand.

- **Adding Capacity** — By increasing the carrying capacity of a roadway, the growth of congestion may be alleviated.

MVRPC's *2015 Congestion Management Process Technical Report* includes a matrix describing a toolbox of congestion countermeasures either currently implemented in the Region or their suitability for application in the Region in the future. Table 4.4 includes some congestion mitigation strategy examples from the toolbox.

As technologies emerge and our understanding of roadway congestion expands, the use of these and other strategies will have a significant effect on reducing roadway congestion, thus providing a safer and more reliable transportation network. As shown in the connected and automated vehicles (CAVs) scenario planning analysis in Section 4.4, CAVs have the potential to provide significant benefits towards congestion mitigation by increasing capacity without adding additional travel lanes.

Table 4.4 — Sample* Congestion Mitigation Strategies

Congestion Mitigation Strategy	Description	Currently Implemented in Dayton	Suitability of Application to MPO Region	Illustration / Photograph
Highway Capacity Addition Strategies				
Highway Capacity Expansion	This strategy involves increasing the capacity of congested roadways through additional general purpose travel lanes and/or upgrading interchanges on freeways. Strategies to add capacity are the most costly and least desirable strategies. They should only be considered after exhausting all feasible demand and operational management strategies.	Yes; Downtown Dayton Subcorridor Reconstruction Project; I-70/I-75 Interchange Modification, Upgrade of South Dixie Interchange from Partial to Full Interchange; Various I-70 Widening Projects.	Medium - Selected locations only.	
Alternative Transportation Mode Strategies				
Bicycle and Pedestrian Projects Including Exclusive Non-Motorized ROW and New Sidewalk Connections	Investments in these modes can increase safety and mobility in a cost-efficient manner, while providing a zero-emission alternative to motorized modes. In many cases, bicycle lanes can be added to existing roadways through restriping. Abandoned rail rights-of-way and existing parkland can be used for medium-to-long distance bicycle trails, improving safety, and reducing travel times. Increasing sidewalk connectivity encourages pedestrian traffic for short trips.	Yes; Implementation of new Regional Bikeways and Trails as well as Designated Bicycle Lanes on Facilities and Routes at the local level. Implementation of the federally-funded Safe Routes to School program provides 100 percent funding to communities to invest in pedestrian and bicycle infrastructure surrounding elementary schools. A Bikeshare program implemented in Dayton in spring of 2015.	High.	
Travel Demand Management Strategies				
Transportation demand management (TDM) strategies are used to reduce travel during the peak, commute period. They are also used to help agencies meet air quality conformity standards, and are intended to provide ways to provide congestion relief/mobility improvements without high cost infrastructure projects.				
Alternative Work Hours	There are three main variations: staggered hours, flex-time, and compressed work weeks.	Yes; Alternative Work Hours are becoming more common. WPAFB, the Region's largest employer, allows a variety of work schedules.	Medium to High.	
Intelligent Transportation Systems (ITS) Strategies				
The strategies in ITS use new and emerging technologies to mitigate congestion while improving safety and environmental impacts. Typically, these systems are made up of many components, including traffic sensors, electronic signs, cameras, controls, and communication technologies.				
Dynamic Messaging	Dynamic Messaging uses changeable message signs to warn motorists of downstream queues; it provides travel time estimates, alternate route information, and information on special events, weather, or accidents.	The Dayton/Springfield Freeway Management System (http://www.mvrpc.org/transportation/long-range/its), combines technological and operational solutions to manage congestion growth. It also enhances existing incident and traffic management activities on the regional freeway network and provide timely and accurate traveler information to motorists. In 2013, ODOT launched a new website (www.ohgo.com) designed to provide motorists with real-time travel information using ITS technology on Ohio's roadways. In 2015, GDRTA implemented a mobile app project which allows app users to select their route to see real-time tracking data on all running buses.	High.	
Advanced Traveler Information Systems (ATIS)	ATIS technology provides access to an extensive amount of data to travelers, such as real-time speed estimates and information on alternate route options.		High.	
Transportation System Management Strategies				
Traffic Signal Coordination	Signals can be pre-timed and isolated, pre-timed and synchronized, actuated by events, set to adopt one of several pre-defined phasing plans or set to calculate an optimal phasing plan based on current conditions.	Yes. There are numerous examples throughout the Region. This strategy is particularly well-suited for built-up urban areas where capacity expansion is difficult or unfeasible.	High.	
Other Miscellaneous Strategies				
Traffic Incident Management	This strategy addresses primarily non-recurring congestion, typically includes video monitoring and dispatch systems, and may also include roving service patrol vehicles.	Yes; ODOT, in collaboration, with State Farm, launched the State Farm Safety Patrol Program that provides for freeway incidence response vehicles to improve traffic flow and reduce traffic congestion due to stalled vehicles as well as offers roadway assistance to mortorists in need.	High.	

* To view the complete congestion mitigation matrix, see Table 5.1 in MVRPC's *2015 Congestion Management Process Technical Report.* (http://www.mvrpc.org/transportation/long-range-planning-lrtp/congestion-management-process)