Congestion Management Process

2024 Findings and Analysis Report

June 2024

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Acknowledgments

Title	OKI Congestion Management Process: Findings and Analysis
Abstract	This report documents the methodology and findings of evaluating travel-time information for the OKI region's Congestion Management Network, as well as forecasted congestion levels for 2050. Congestion mitigation strategies for selected congested locations are evaluated. The OKI region includes Butler, Clermont, Hamilton and Warren counties in Ohio; Boone, Campbell and Kenton counties in Kentucky and; Dearborn County Indiana.
Date	June 2024
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The preparation of this document was financed cooperatively by the Federal Highway Administration, the Federal Transit Administration, the Indiana Department of Transportation, the Commonwealth of Kentucky Transportation Cabinet, the Ohio Department of Transportation, and the units of local and county government in the OKI region. The opinions, findings, and conclusions expressed in this document are those of the OKI Regional Council of Governments and are not necessarily those of the U.S. Department of Transportation. This report does not constitute a standard, specification, or regulation.

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Chapter 1

Introduction to the CMP: Findings & Analysis Report

The OKI region's quality of life and economic competitiveness are closely related to the degree to which the transportation system is able to provide an acceptable level of mobility. The importance of congestion is reflected in federal transportation rules requiring a Congestion Management Process (CMP) in metropolitan areas. The CMP provides for safe and effective integrated management and operation of the multimodal transportation system and results in performance measures and strategies that can be reflected in the metropolitan transportation plan and TIP.

Congestion management is the application of strategies to improve transportation system performance and reliability by reducing the adverse impacts of congestion on the movement of people and goods. OKI's CMP identifies appropriate performance measures to assess the extent of congestion. It establishes a coordinated program for data collection and system performance monitoring to define the extent and duration of congestion. The CMP also identifies and evaluates appropriate congestion management strategies for the improved safety of the existing and future transportation system.

OKI defined the methods of CMP implementation in the 1995 report "OKI Mobility Management Program (MMP): Manual of Practice". The September 2004 report provided results from the first comprehensive data collection cycle. The second and third findings and analysis reports were completed in September 2007 and November 2011, respectively. The fourth data collection cycle was completed and documented in September 2015, with the most recent report completed in July 2020, with an update in January 2021. This report analyzed data from 2018 to 2021 and utilized anonymous vehicle location data from connected cars and trucks, similar to what was used in the previous two reports.

1.1 Federal Requirements

Federal regulations provide guidance on how Metropolitan Planning Organizations (MPOs), like OKI, should address congestion management. The Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFTEA-LU) developed regulations that have largely been retained through the Moving Ahead for Progress in the 21st Century Act (MAP-21), Fixing America's Surface Transportation Act (FAST), and most recently the Infrastructure Investment and Jobs Act (signed into law in November 2021), require a Congestion Management Process (CMP) for urbanized areas (UZAs) with populations greater than 200,000, known as TMAs. These regulations dictate that the CMP program be implemented as a continuous part of the metropolitan planning process, similar to developing a Metropolitan Transportation Plan, Transportation Improvement Program (TIP), and Unified Planning Work Program (UPWP).

Congestion Mitigation involves reducing travel demand through the implementation of strategies to decrease single occupancy vehicles (SOVs) increasing transit ridership, and improving system management and operation. Regulations require that alternatives to building new SOV road capacity be explored first, and where additional capacity is found to be the best approach, multimodal strategies should be included to obtain the most long-term value from the investment.

Starting with MAP-21 and continuing with the FAST Act and the Infrastructure Investment and Jobs Act, legislation created a performance-based surface transportation program with specific requirements for state Departments of Transportation (DOTs) and MPOs. As part of FAST Act, new federal requirements (23 CFR Part 490 National Performance Management Measures) regarding measuring system performance on the National Highway System (NHS), known as PM3 measures were instituted. These measures are established by state DOTs and UZA, and are integrated into the CMP as applicable.

The statewide PM3 measures used in the CMP are recognized as Level of Travel Time Reliability (LOTTR) and Truck Travel Time Reliability (LOTTTR). LOTTR assesses the performance of the NHS, while LOTTTR addresses the freight movement on the interstate system, which is part of the NHS. The LOTTR and LOTTTR measures are established by the state DOTs in coordination with MPOs, such as OKI, and other planning partners.

Other performance measures are monitored at the UZA level: Peak Hour Excessive Delay (PHED) and Percent Non-Single Occupancy Vehicle (Non-SOV) travel, and total NOx and VOC emissions reductions from CMAQ projects. Both PHED and percent Non-SOV travel are required to be established in UZAs with a population over one million that are, in all or part, of a designated nonattainment or maintenance area for air quality conformity under the Clean Air Act.

1.2 Definition of Congestion

Congestion is the level at which transportation system performance is no longer acceptable due to traffic interference. The level of acceptable system performance will vary by type of transportation facility, location within the region and time of day. The level of acceptable system performance depends upon transportation and development goals for the region and reflects public perception of traffic interference. This traffic interference may be recurring or non-recurring congestion. Recurring congestion is caused by consistently excessive travel demand as compared to available roadway capacity. Sometimes, poor signal timings, poor access management and roadway geometric deficiencies contribute to reduced capacity. Non-recurring congestion occurs due to traffic incidents, adverse weather or road construction.

1.3 National Perspectives on Congestion

According to a 2020 FHWA report, “Traffic Congestion and Reliability: Trends and Advanced Strategies for Congestion Mitigation”, physical bottlenecks account for about 40% of all congestion. The remaining congestion is the result of traffic incidents (25%), poor weather (15%), work zones (10%), poor signal timing (5%) and special events (5%). Congestion in the OKI region can be viewed in a national context to see how we stand compared to other major metropolitan areas in the United States.

The Texas A&M Transportation Institute has been documenting the growth of congestion levels in the nation's urban areas since the 1980's. Their mission has been to document mobility trends and highlight numerous issues associated with roadway congestion. In their most recent report[1], the Texas A&M Transportation Institute's findings are drawn from traffic speed data collected by INRIX on urban streets and highways, along with highway performance data from the Federal Highway Administration (FHWA). The report contains several interesting mobility statistics from 2017 to 2020 for the Cincinnati Urban Area:

- Cincinnati is the 31st most congested urban area in the U.S using annual hours of delay per auto commuter.
- 25% of travel occurs under congested conditions.
- A Cincinnatian auto traveler is delayed 26 hours a year.
- On a per person basis, congestion wastes 12 gallons of fuel each year.
- The annual cost in delay and fuel in 2020 due to congestion was $608 per peak auto commuter.

More recently, INRIX has published a global scorecard that identifies congestion and mobility trends in more than 200 cities, across 38 countries. INRIX collects and aggregates data points from connected cars and mobile devices, cameras and roadway sensors, and data from a state's Department of Transportation. According to the 2022 data:

- Cincinnati is the 713th most congested urban area in the world.
- Cincinnati is the 135th most congested urban area in the U.S.
- Cincinnati drivers lost 11 hours in congestion.
- Congestion cost Cincinnati drivers $182 per capita.

The Texas A&M study and INRIX data reflect the average condition of roadways in the entire urban area, not specific facilities and locations. The OKI effort attempts to better pinpoint congestion problems within the urban area. It provides a level of analysis that allows for more informed decision-making in the transportation planning process.

1.4 CMP Study Area and Transportation Network

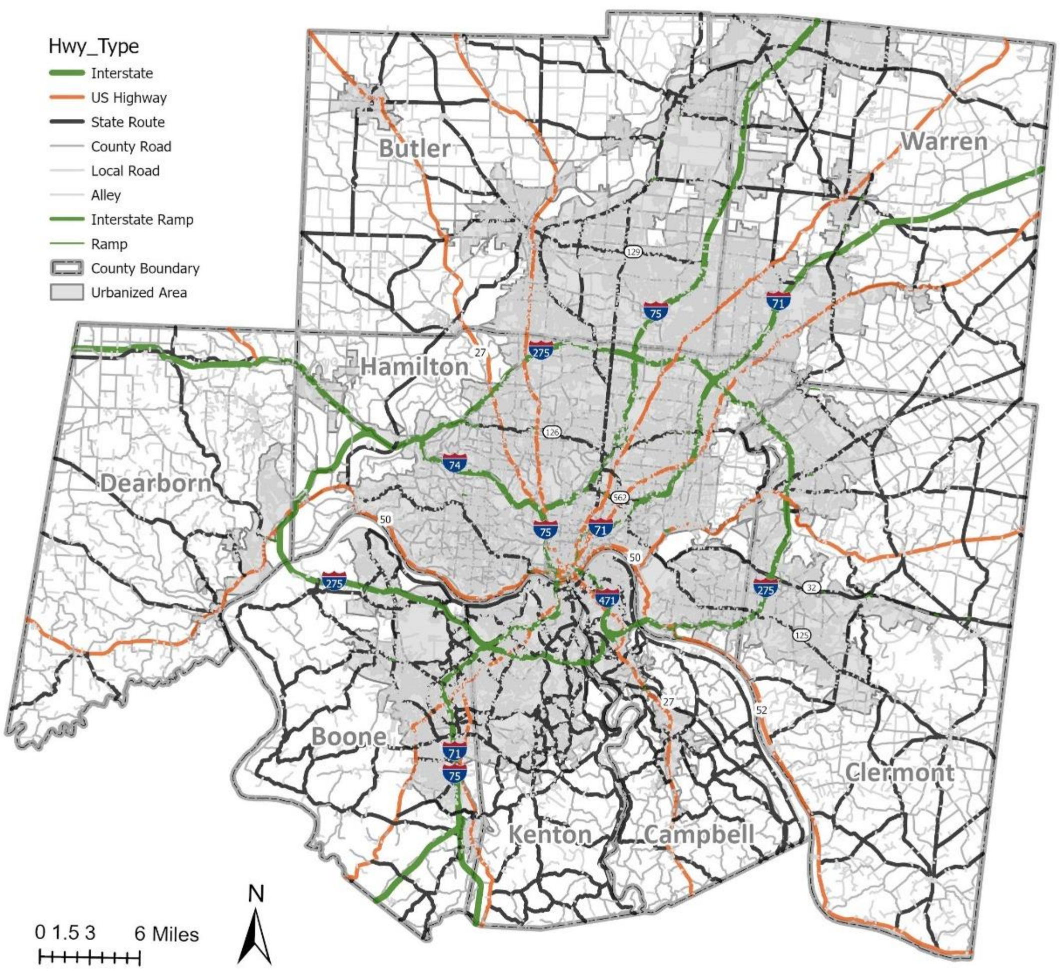
The Ohio-Kentucky-Indiana Regional Council of Governments (OKI) is the planning agency designated as the Metropolitan Planning Organization (MPO) for the greater Cincinnati area. Although OKI currently maintains an interdisciplinary staff dealing with planning issues in the environmental and regional development sectors, among others, the agency was initially formed to assist the region in meeting the "continuing, comprehensive and cooperative" transportation planning requirements of the 1962 Federal-Aid Highway Act.

The OKI region is composed of eight counties in three states: Butler, Clermont, Hamilton and Warren counties in Ohio; Boone, Campbell and Kenton counties in Kentucky; and Dearborn

1 *The 2021 Urban Mobility Report*, Texas A&M Transportation Institute, August 2019.

County in Indiana. It is home to an estimated 2.12 million people and employs more than 750,000 people (by place of residence) according to the American Community Survey 5-Year Estimates. The region has a comprehensive transportation network that includes the interstates I-71, I-74, I-75, I-275, and I-471, and U.S. routes US-22, US-25, US-27, US-42, US-50, US-52, US-127 (See Figure 1-1). Extensive bus networks exist in the region with Southwest Ohio Regional Transit Authority (Metro), Transit Authority of Northern Kentucky (TANK), and Butler County Regional Transit Authority (BCRTA) providing more than 15 million trips annually. The City of Cincinnati also offers a free service via the Cincinnati Streetcar that, in 2023, provided more than 1 million trips, connecting The Banks, downtown, and Over-the-Rhine neighborhoods. Major freight lines that provide goods movement in the region include CSX and Norfolk Southern. The Cincinnati/Northern Kentucky International Airport (CVG) in Hebron, KY has become a global freight hub with Amazon Air, Atlas Air, ABX, Kalitta Air, and DHL Aviation shipping more than 8 billion pounds of cargo in 2021. Some locations in the region are experiencing growth, while others remain unchanged. Given this, it is important that the CMP congestion mitigation strategies reflect the challenges and opportunities that are unique to each location.

Figure 1-1 OKI Region

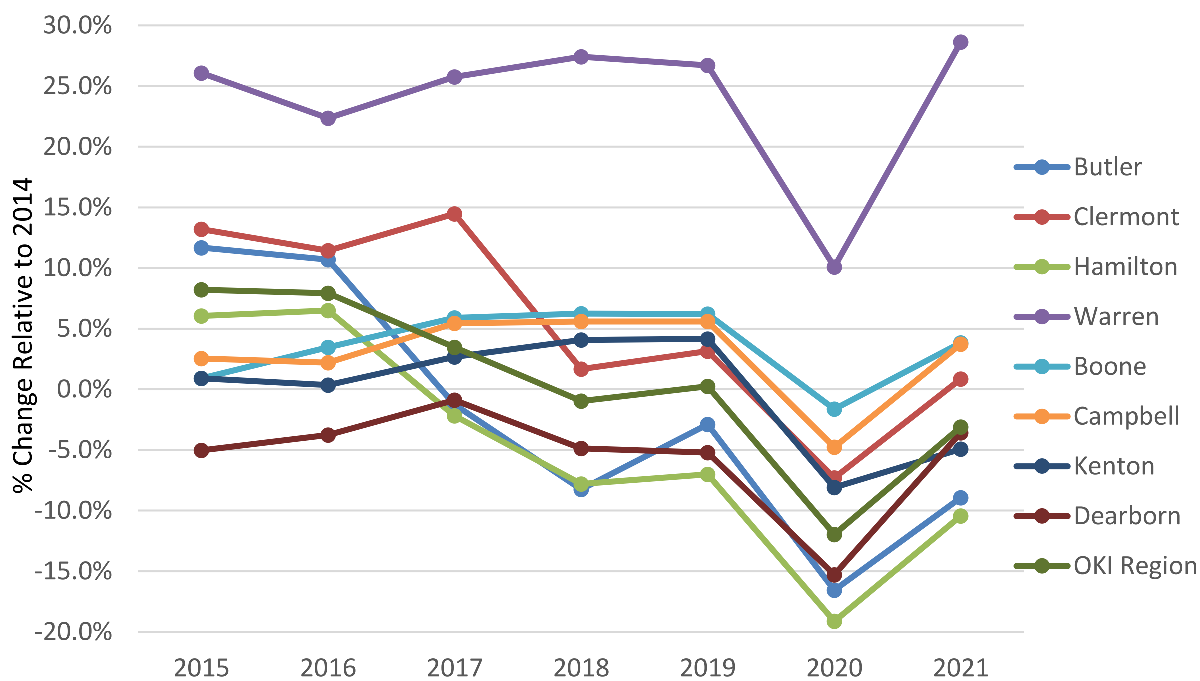


1.5 Regional Trends

Vehicle miles of travel (VMT) is a primary way FHWA measures travel activity on the nation's roadways. Typically, when there is more travel on the roadways, congestion increases. From 2014-2021, VMT decreased by 3.1 percent in the OKI region (see Figure 1-2), but there were variations during this period. From 2014 to 2017, VMT increased, but has steadily decreased each year since, with the exception of 2019. In 2020, VMT decreased the most (-12 percent), due to the Covid-19 Pandemic. Of the eight counties in the OKI region, Warren is the only county to increase in VMT each year from 2014-2021.

Population and employment are projected to increase according to OKI forecasts. Population is projected to increase by 134,157 from 2020 to 2050, and employment by 62,247 jobs over the same time period. Given these trends, increased levels of traffic congestion will likely occur, unless mitigation strategies, programs, and policies are developed.

Figure 1-2 Regional VMT

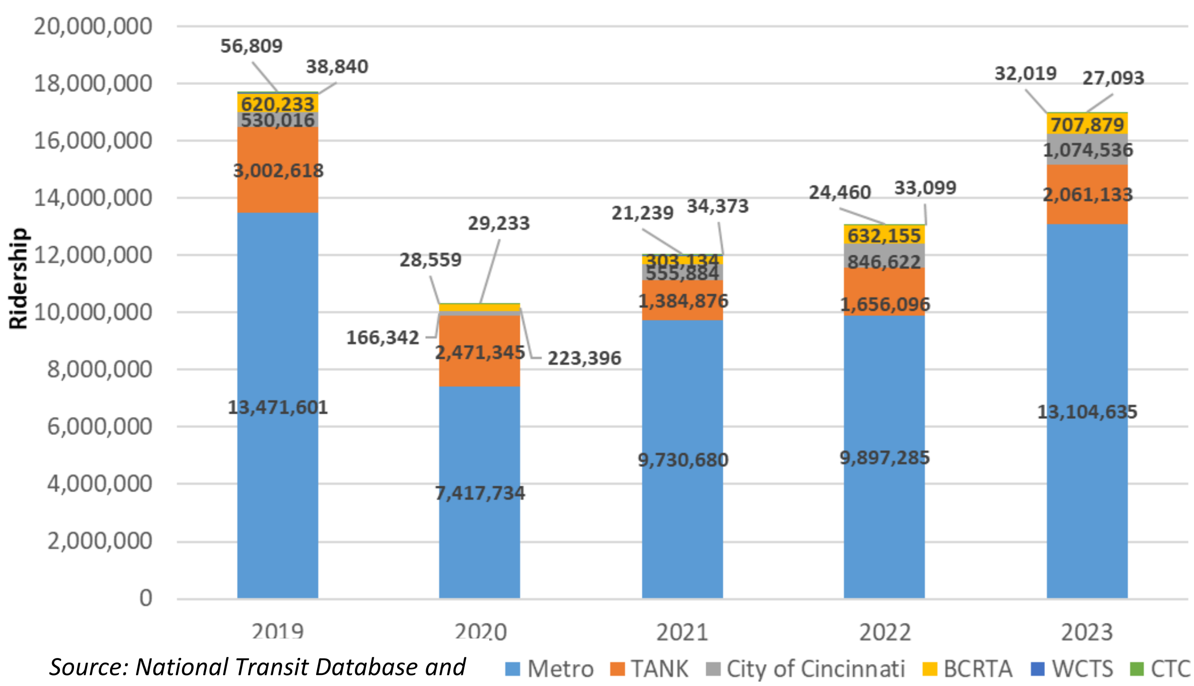


Source: ODOT Office of Technical Services, KYTC HIS Database, INDOT Traffic Data

Transit ridership and other Non-SOV modes are important factors to consider in reducing traffic congestion. A bus can significantly carry more people than a sedan or even a minivan. A full size bus filled to capacity with riders replaces approximately 44 automobiles that would otherwise be on the roadway in the form of single-occupant vehicles (SOV).

There are six major public transit systems that currently provide bus service in the OKI region. The Southwest Ohio Regional Transit Authority (Metro), Transit Authority of Northern Kentucky (TANK), Clermont Transportation Connection (CTC), Warren County Transit System (WCTS), City of Cincinnati (Streetcar) and the Butler County Regional Transit Authority (BCRTA) operate fixed route and/or demand response transit service. In the next few years Metro will be rolling out two BRT lines (Hamilton Avenue and Reading Road Corridors) with two more in the planning stages. Each of the eight OKI counties is served by at least one public transit agency – Dearborn County is served by Catch-A-Ride, which was not included in ridership totals. Since 2019, public bus transport in the OKI region has experienced an overall decline in ridership of more than 700,000 passengers, a roughly four percent drop in ridership between 2019 and 2023. However, ridership has increased 30 percent between 2022 and 2023, resulting in a healthier public transportation network than many other communities have experienced throughout the country. Bus transit providers are faced with many challenges in their goal to provide safe and efficient transit service. Funding for staff and vehicles is often the critical factor which impacts ridership. A portion of the transit trips occur on the Congestion Management Network; therefore, highway congestion directly impacts transit travel. Increasing transit ridership helps reduce demand on the highway system. The OKI travel demand model estimates that public transportation eliminates less than 10,000 daily person trips by automobile.

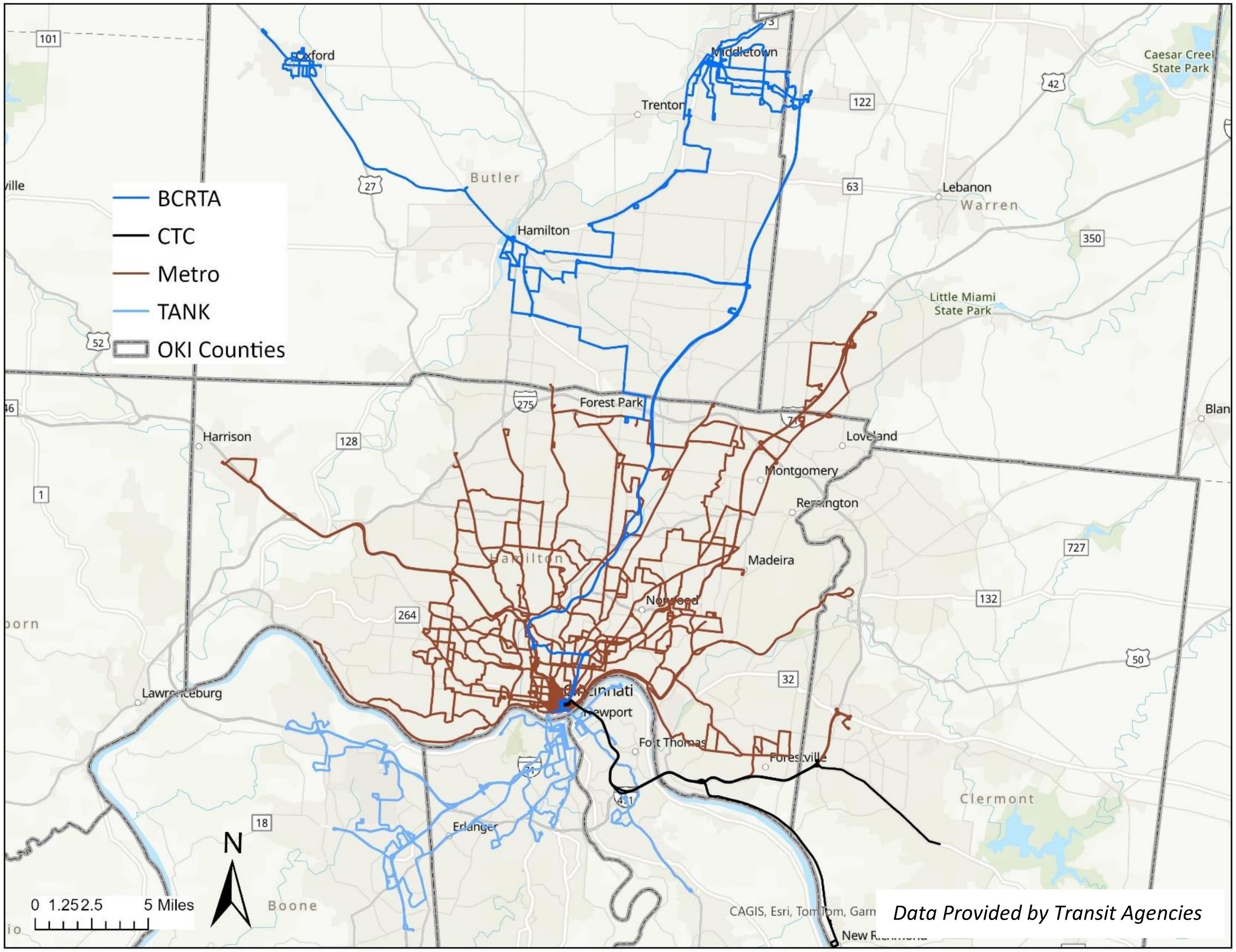
Figure 1-3 Transit Ridership



Source: National Transit Database and transit agencies

The CMP considers public transportation improvements as mitigation strategies to address roadway congestion. The expansion of bus transit service, the introduction of rail transit service, new or expanded park-and-ride facilities, adding transit signal priority, bus rapid transit and reserved bus travel lanes or expanded bus-on-shoulder are all possible strategies. The expansion of transit traveler information systems would also make transit more attractive for users.

Figure 1-4 Transit Fixed Routes



Chapter 2

Goals and Objectives

2.1 Goals

- Improve livability and economic vitality of the regional by improving the quality of transportation facilities, limiting congestion and increasing accessibility to jobs
- Improve safety of the transportation system through better planning, design and incident response.
- Monitor and evaluate transportation system performance
- Develop strategies, including multimodal alternatives, to facilitate the mobility of people and goods within the region.
- Manage congestion, reducing its incidence in corridors where reduced travel time is deemed to be desirable.
- Contribute to the process of transportation decision-making and policy-making by providing information on the transportation system
- Reinforce the region's transportation goals and objectives as adopted by OKI in its Metropolitan Transportation Plan.

2.2 Performance Objectives

- Reduce the hours of recurring congestion
- Improve travel time reliability
- Improve incident clearance time on routes served by ODOT's Ohio Traffic Incident Management (OTIM), KYTC's Incident Management Task Force (IMTF), and INDOT
- Reduce the hours of delay on the OKI portion of the National Freight Network.
- Increase transit ridership, reducing the demand for travel by auto.

OKI continues to work with the state DOT's to develop and refine the performance measures and specific targets for each measure.

Chapter 3

Performance Measures

The federal transportation bill Moving Ahead for Progress in the 21st Century Act (MAP-21) outlined the need for states and MPOs to establish performance and outcome-based, multimodal programs in order to strengthen the U.S. Transportation system. The current federal law, the Infrastructure Investment and Jobs Act, was enacted in November 2021 and continues those provisions laid out in MAP-21. The objective of such programs is to ensure that states invest resources in projects that collectively make progress towards achieving national transportation goals. These goals are outlined in Title 23 of the Code of Federal Regulations (CFR), Part 490.

OKI worked with local, state and federal partners to establish transportation performance measures and targets for all performance goals areas, including:

- Subpart B
    - Number of fatalities
    - Fatality rate per 100 million vehicle miles traveled (mvmt)
    - Number of serious injuries
    - Serious injury rate per 100 mvmt
    - Number of non-motorized fatalities and serious injuries.
- Subpart C
    - Percent of interstate pavement in good condition (2- and 4-year targets)
    - Percent of interstate pavement in poor condition (2- and 4-year targets)
    - Percent of non-interstate pavement in good condition (2- and 4-year targets)
    - Percent of non-interstate pavement in poor condition (2- and 4-year targets)
- Subpart D
    - Percent of National Highway System (NHS) bridges in good condition (2- and 4-year targets)
    - Percent of NHS bridges in poor condition (2- and 4-year targets)
- Subpart E
    - Percent reliable interstate miles traveled (2- and 4-year targets)
    - Percent reliable non-interstate miles traveled (2- and 4-year targets)
- Subpart F
    - Truck travel time reliability index (2- and 4-year targets)
- Subpart G
    - Annual hours of peak hour excessive delay (PHED) per capita (2- and 4-year targets)
    - Percent of non-single occupancy vehicle travel (2- and 4-year targets)
- Subpart H
    - Total NOx and VOC emissions reductions from CMAQ projects (2- and 4-year targets)

As of September 2022, the targets for each state were adopted and are presented in the tables below:

Figure 3-5 ODOT Performance Measures Summary (2023)

CATEGORY	MEASURES	TARGETS			
		Baseline	Annual	2 Year	4 Year
PM1 – SAFETY[1]	# of Fatalities	1,220.0	1,172.0		
	Fatality Rate per 100 MVMT	1.09	1.05		
	Number of Serious Injuries	7,529.4	7,270		
	Serious Injury Rate per 100 MVMT	6.78	6.51		
	# of Non-Motorized Fatalities & Serious Injuries	869.2	835		
PM2 - INFRASTRUCTURE	% of Int. Pavements in Good Condition	60.1%			55.0%
	% of Int. Pavements in Poor Condition	0.1%			1.0%
	% of Non-Int. Pavements in Good Condition	47.1%		40.0%	40.0%
	% of Non-Int. Pavements in Poor Condition	1.1%		2.0%	2.0%
	% of NHS Bridges in Good Condition	64.9%		55.0%	55.0%
	% of NHS Bridges in Poor Condition	4.0%		3.0%	3.0%
	% of NHS Conduit in Good Condition	64.8%		50.0%	50.0%
	% of NHS Conduit in Poor Condition	2.7%		5.0%	5.0%
PM3 - System Performance	% of Reliable Int. Miles Traveled	98.4%		85.0%	85.0%
	% of Reliable Non-Int. Miles Traveled	95.5%			80.0%
	Int. Truck Travel Time Reliability Index	1.19		1.5	1.5
	Annual Hours of Excessive Delay Per Capita			9.0	9.0
	% of Non SOV Urbanized Area Travel	18.5%		18.5%	18.5%
	VOC Total Emission Reduction (kg/day)	52.70		60.00	60.00
	NOx Total Emission Reduction (kg/day)	253.67		250.00	250.00
	PM 2.5 Total Emission Reduction (kg/day)	99.57		30.00	30.00

1. 2024 Safety Performance Targets

Figure 3-6 KYTC Performance Measure Summary (2023)

CATEGORY	MEASURES	TARGETS			
		Baseline	Annual	2 Year	4 Year
PM1 – SAFETY[1]	# of Fatalities	757.2	757.0		
	Fatality Rate per 100 MVMT	1.567	1.560		
	Number of Serious Injuries	2,756.6	2,644		
	Serious Injury Rate per 100 MVMT	5.700	5.52		
	# of Non-Motorized Fatalities & Serious Injuries	297.8	297.0		
PM2 - INFRASTRUCTURE	% of Int. Pavements in Good Condition	66.2%		55.0%	60.0%
	% of Int. Pavements in Poor Condition	0.9%		4.0%	3.0%
	% of Non-Int. Pavements in Good Condition	58.6%		35.0%	40.0%
	% of Non-Int. Pavements in Poor Condition	1.3%		6.0%	5.0%
	% of NHS Bridges in Good Condition	28.6%		31.0%	27.0%
	% of NHS Bridges in Poor Condition	3.8%		3.7%	3.6%
	% of NHS Conduit in Good Condition	3.8%		3.7%	3.2%
	% of NHS Conduit in Poor Condition	3.8%		3.7%	3.2%
PM3 - System Performance	% of Reliable Int. Miles Traveled	97.6%		95.0%	93.0%
	% of Reliable Non-Int. Miles Traveled	93.7%		91.0%	91.0%
	Int. Truck Travel Time Reliability Index	1.26		1.3	1.35
	Annual Hours of Excessive Delay Per Capita	7.1		9.0	9.0
	% of Non SOV Urbanized Area Travel	20.0%		18.5%	18.5%
	VOC Total Emission Reduction (kg/day)	43.995		100.00	200.00
	NOx Total Emission Reduction (kg/day)	101.98		100.0	200.0
	PM 2.5 Total Emission Reduction (kg/day)				

1. 2024 Safety Performance Targets

Figure 3-7 INDOT Performance Measure Summary (2023)

CATEGORY	MEASURES	TARGETS			
		Baseline	Annual	2 Year	4 Year
PM1 – SAFETY[1]	# of Fatalities		876.3		
	Fatality Rate per 100 MVMT		1.072		
	Number of Serious Injuries		3,281.1		
	Serious Injury Rate per 100 MVMT		3.987		
	# of Non-Motorized Fatalities & Serious Injuries		399.6		
PM2 - INFRASTRUCTURE	% of Int. Pavements in Good Condition			60.0%	62.0%
	% of Int. Pavements in Poor Condition			1.0%	1.0%
	% of Non-Int. Pavements in Good Condition	68.3%		50.0%	48.0%
	% of Non-Int. Pavements in Poor Condition	5.3%		1.5%	1.5%
	% of NHS Bridges in Good Condition	50.0%		49.0%	47.5%
	% of NHS Bridges in Poor Condition	2.3%		3.0%	3.0%
	% of NHS Conduit in Good Condition	2.3%		2.6%	2.6%
	% of NHS Conduit in Poor Condition	2.3%		2.6%	2.6%
PM3 - System Performance	% of Reliable Int. Miles Traveled	94.0%		93.0%	93.5%
	% of Reliable Non-Int. Miles Traveled				93.5%
	Int. Truck Travel Time Reliability Index	1.23		1.32	1.30
	Annual Hours of Excessive Delay Per Capita				
	% of Non SOV Urbanized Area Travel				
	VOC Total Emission Reduction (kg/day)	1,010.30		590	600
	NOx Total Emission Reduction (kg/day)	3,484.76		690	725
	PM 2.5 Total Emission Reduction (kg/day)	179.165		3	4

1. 2024 Safety Performance Targets

Chapter 4

Travel Time Data Collection and Process to Monitor System Performance

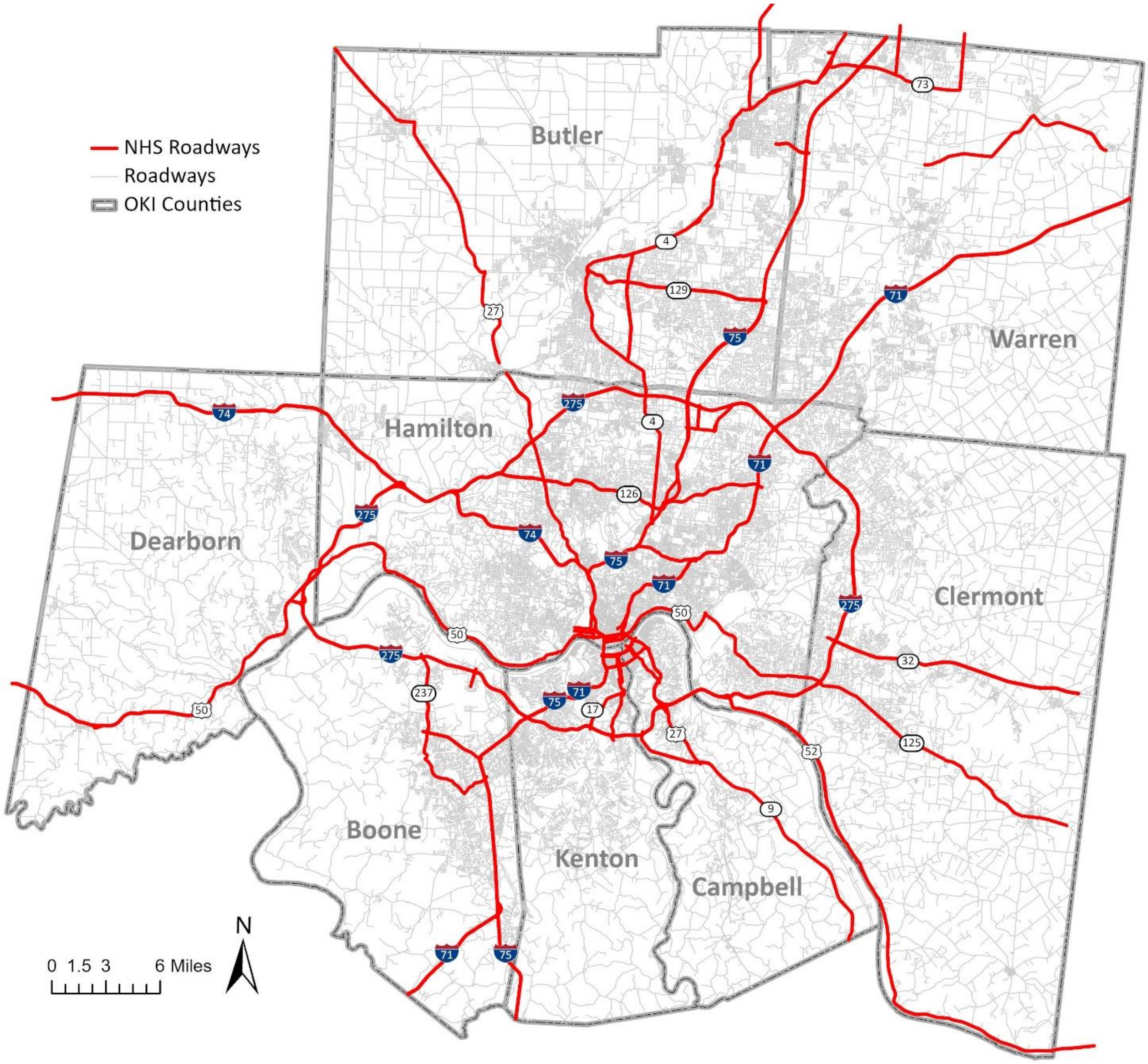
4.1 Congestion Management Network

The focus of the Congestion Management Process is on the movement of people and goods over interstates, principal arterials and other transportation facilities. These segments serve as the backbone to the region's transportation network, and provide connectivity among the region's transportation facilities, intermodal facilities, and activity centers.

OKI selected the facilities comprising the region's Congestion Management Network according to several key factors. 1) The network must be extensive enough to allow for the identification of both existing and potential recurring congestion. 2) Network continuity is important to ensure that the network structure is rational. 3) Network must include all routes on the NHS. 4) Travel speed information must be available from the FHWA, National Performance Research Data Set. Where the network crosses state boundaries, it is important to maintain consistency in the management of mobility. All elements of existing and potential significance to state or metropolitan area travel are included in the network.

Figure 4-1 presents the OKI Congestion Management Network (CMN), which is comprised of all facilities on the NHS along with major roadways and all other routes determined to be essential to regional mobility and continuity. The network consists of more than 1,480 miles and carries 55 percent of regional traffic.

Figure 4-1 CMN Map



4.2 Data Collection of Roadway Travel Times and Speeds

The Congestion Management Network was divided into 89 facilities grouped into 22 discrete corridors. A list of the corridors and the facilities included in each corridor is shown in Figure 4-2. The previous CMP Findings and Analysis Report was completed in 2020, with the network divided into fourths, to allow for data collection of the entire network every four years. With the availability of large travel speed data sets, such as NPRMDS and INRIX, this CMP utilizes data for the same time period for all routes.

Figure 4-2 CMN Corridors and Primary Facilities

Corridor	Primary Facilities	Between		NHS
1 Eastern				
1.1	US-50	Cinti CBD	OH-125 (Beechmont Ave.)	Yes
1.2a	OH-125	US-50	Five Mile	Yes
1.2b	OH-125	Five Mile	I-275	Yes
1.2c	OH-125	I-275	Brown County Line	Yes
1.3	US-52	I-275	OH-133	Yes
1.4a	OH-32	I-275	Glen-Este Withamsville	Yes
1.4b	OH-32	Glen-Este Withamsville	Brown County Line	Yes
2 Southwest (I-71/75 Corridor)				
2.1a	I-71/75	Ohio Line	I-275	Yes
2.1b	I-71/75	I-275	US-42	Yes
2.1c	I-71/75	US-42	I-71/75 Split	Yes
2.2	US-42	I-71/75	KY-237	Yes
2.3a	US-25 (Dixie Hwy)	I-71/75	I-71/75	No
2.3b	US-25 (Dixie Hwy)	I-71/75	I-275	No
2.3c	US-25 (Dixie Hwy)	I-275	US-42/127	No
2.4	I-71	I-71/75	Boone County Line	Yes
2.5	I-75	I-71/75	Grant County Line	Yes
2.6	Brent Spence Bridge	Ohio Line	Kentucky Line	Yes
3 Northern (I-75 Corridor)				
3.1a	I-75	Ohio River	I-74	Yes
3.1b	I-75	I-74	OH-562	Yes
3.1c	I-75	OH-562	I-275	Yes
3.1d	I-75	I-275	OH-122/Warren Cty Line	Yes
3.2a	US-42 (Reading Rd.)	OH-562	OH-126 (Ronald Reagan Hwy)	No
3.2b	US-42 (Reading Rd.)	OH-126 (Ronald Reagan Hwy)	Sharon Rd.	No
3.2c	US-42 (Reading Rd.)	I-275	OH-741	No

Corridor	Primary Facilities	Between		NHS
3.3a	OH-4	I-75	I-275	Yes
3.3b	OH-4	I-275	OH-129	Yes
3.3c	OH-4	OH-129	OH-73	Yes
3.3d	OH-4	OH-4/OH-73	Montgomery County Line	Yes
3.4a	OH-4 Bypass	OH-4	OH-129	Yes
3.4b	OH-4 Bypass	OH-129	OH-4	Yes
3.5a	OH-747	OH-4	I-275	No
3.5b	OH-747	I-275	OH-129	No
3.5c	OH-747	OH-129	OH-4	No
4 Western				
4.1a	I-74	Indiana Line	I-275	Yes
4.1b	I-74	I-275	I-75	Yes
4.2	Western Hills Viaduct	I-75	Harrison Ave.	No
4.3a	Harrison Ave	Western Hills Viaduct	Boudinot Ave.	No
4.3b	Harrison Ave	Boudinot Ave.	I-74	No
4.4	I-275	Indiana Line	I-74	Yes
4.5	Freeman Ave.	US-50	I-75	Yes
4.6	Dalton Ave.	Eighth St.	Western Hills Viaduct	Yes
4.7	Gest St.	US-50	State Ave.	Yes
4.8	Eighth St.	Freeman Ave.	State Ave.	Yes
4.9	Queen City Ave.	Beekman St.	Werk Rd.	No
4.10	Glenway Ave.	W. 8th St.	Bridgetown Rd.	No
5 Hamilton North (I-275 North Corridor)				
5.1a	I-275	I-275/I-74 Interchange	OH-126	Yes
5.1b	I-275	OH-126	I-75	Yes
5.1c	I-275	I-75	I-71	Yes
5.2a	Kemper Rd.	US-27	OH-747	No
5.2b	Kemper Rd.	OH-747	US-27	No
5.3	Mosteller Rd.	Sharon Rd.	I-275	Yes
5.4	Sharon Rd.	US-42 – Reading Rd.	I-75	Yes
5.5	US-42	Sharon Rd.	I-275	Yes
6 Northeast (I-71 Corridor)				
6.1a	I-71	I-75	OH-562	Yes
6.1b	I-71	OH-562	I-275	Yes
6.1c	I-71	I-275	Clinton County Line	Yes
6.2a	US-22/OH-3	Cinti CBD	OH-562	No
6.2b	US-22/OH-3	OH-562	I-71	No

Corridor	Primary Facilities	Between		NHS
6.2c	US-22/OH-3	I-71	I-275	No
6.3	US-42	Old Route 122	OH-73	Yes
6.4	US-42 - Reading Rd.	Cinti CBD	OH-562	No
6.5	Red Bank Rd.	US-50	I-71	No
7 Northern Kentucky North (I-275 South Corridor)				
7.1a	I-275	Indiana Line	I-71/75	Yes
7.1b	I-275	I-71/75	I-471	Yes
7.1c	I-275	I-471	Ohio Line	Yes
8 I-275 East				
8.1a	I-275	I-71	OH-32	Yes
8.1b	I-275	OH-32	Ohio River	Yes
9 Northwest (US-27/US-127 Corridor)				
9.1a	US-127 (Hamilton Ave.)	Ezzard Charles Dr.	Ludlow Ave.	No
9.1b	US-127 (Hamilton Ave.)	Ludlow Ave.	OH-126	No
9.1c	US-127 (Hamilton Ave.)	OH-126	I-275	No
9.2a	US-27 (Colerain Ave.)	I-74	OH-126	Yes
9.2b	US-27 (Colerain Ave.)	OH-126	OH-129	Yes
9.2c	US-27 (Colerain Ave.)	OH-129	Indiana Line	Yes
10 Southern (KY-16/KY-17 Corridor)				
10.1	KY-16	KY-17	Pride Pkwy	Yes
10.2	KY-17	Ohio Line	I-275	Yes
11 Southeast				
11.1	KY-8	I-71/75	Newport CBD	Yes
11.2	I-471	US-27	I-71	Yes
11.3a	US-27	I-471	KY-9	Yes
11.3b	US-27	Ohio Line	I-471	Yes
11.4	KY-9	I-275	Campbell County Line	Yes
11.5	KY-1120	I-71/75	I-471	Yes
12 Clermont East/West (OH-28/OH-131 Corridor)				
12.1	OH-28	US-50	OH-132	No
12.2	OH-131	US-50	Newtonsville-Hutchinson Rd	No
13 Hamilton Central (Cross County/Norwood Lateral Corridor)				
13.1a	OH-126 (Cross County Hwy)	I-275	Colerain Ave.	Yes
13.1b	OH-126 (Cross County Hwy)	Colerain Ave.	I-75	Yes
13.1c	OH-126 (Cross County Hwy)	I-75	I-71	Yes
13.2	OH-562 (Norwood Lateral)	I-75	Ridge Ave.	Yes

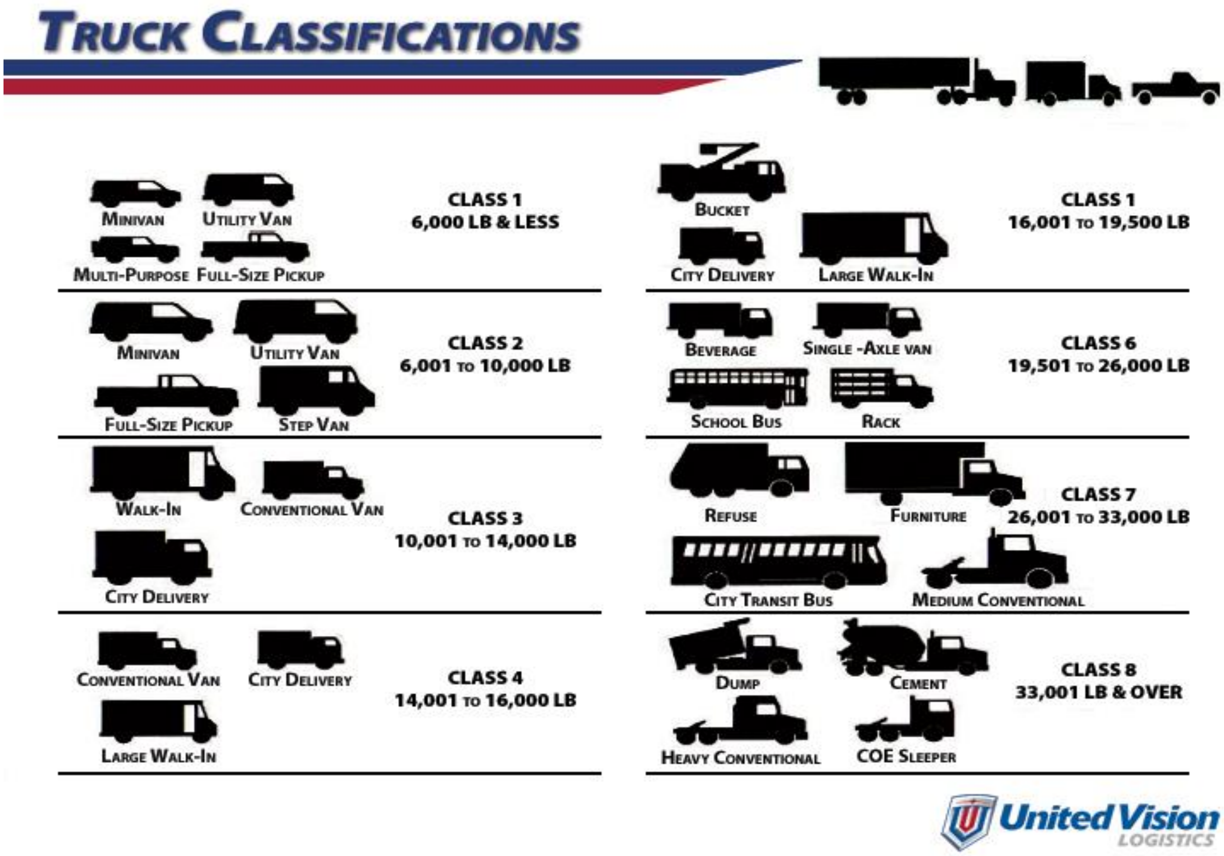
Corridor	Primary Facilities	Between		NHS
13.3	North Bend Rd.	I-74	OH-4	No
13.4	Vine St.	Mitchell Ave.	OH-4	No
14 Butler-Warren North (OH-73 Corridor)				
14.1	OH-741	OH-73	Montgomery County Line	Yes
14.2a	OH-73	OH-4	Dixie Hwy	Yes
14.2b	OH-73	S. River Rd.	OH-741	Yes
14.2c	OH-73	OH-741	OH-48	Yes
14.2d	OH-73	US-42	Clinton County Line	Yes
15 Butler-Warren Central (OH-63/OH-129 Corridor)				
15.1	OH-63	OH-4	OH-123	No
15.2a	OH-129	OH-4	OH-4 Bypass	Yes
15.2b	OH-129	OH-4 Bypass	I-75	Yes
15.3	OH-48	OH-73	Montgomery County Line	Yes
15.4	Tylersville Rd.	OH-747	I-71	No
16 Clermont-Warren Central (Clermont North/South Corridor)				
16.1	OH-73/OH-123	OH-73	Montgomery County Line	Yes
16.2a	OH-122	Hart Rd	US-42	Yes
16.2b	OH-122	I-75	S. Breiel Blvd.	Yes
16.3	Glen Este-Withamsville Rd	OH-125	Old State Route 74	No
17 US- 50 West				
17.1	US-50	Indiana Line	Cincinnati CBD	Yes
18 Boone County				
18.1	KY-20	KY-237	KY-212	No
18.2	KY-842	US-25	KY-18	No
18.3	KY-212	CVG airport	KY-20	Yes
18.4a	KY-237	I-275	KY-18	Yes
18.4b	KY-237	KY-18	US-127/US-42	Yes
18.5	KY-18	KY-237	I-71/75	Yes
19 Hamilton South				
19.1	MLK Dr.	US-127/Central Ave.	Victory Pkwy	No
19.2	Taft Rd/Calhoun St.	Clifton Ave.	US-50	No
19.3	McMillan Ave.	Central Pkwy	Taft Rd.	No
19.4a	Madison Rd.	Victory Pkwy	Edwards Rd.	No
19.4b	Madison Rd.	Edwards Rd.	Red Bank Rd.	No
19.5	Clifton Ave.	E McMillan St.	MLK Dr.	No
20 Northern Kentucky Central (N. KY East/West Corridor)				
20.1	KY-547	KY-10	KY-8	No

Corridor	Primary Facilities	Between		NHS
20.2	KY-536	US-42	KY-17	No
21 Cincinnati CBD				
21.1	Central Pkwy	Ezzard Charles Dr.	Ludlow Ave.	No
21.2	Second St.	Central Ave.	Main St.	No
21.3	Third St.	Central Ave.	I-71	No
21.4	Sixth St.	Central Ave.	Broadway St.	Yes
21.5	Vine St.	Central Parkway	Second St.	No
21.6	Mehring Way	US-50	US-52	No
21.7	Broadway St.	3rd St.	Eggleston Ave.	No
21.8	Eggleston Ave.	US-50	Broadway St.	No
21.9	Sycamore St.	3rd St.	Central Pkwy	No
21.10	Fifth St.	Main St.	I-75	Yes
21.11	US-42 - Reading Rd.	Elsinore Place	Eggleston Ave.	Yes
22 Dearborn County				
22.1	I-74	Dearborn County Line	Ohio Line	Yes
22.2	I-275	Kentucky Line	Ohio Line	Yes
22.3a	US-50	Ohio Line	IN-1	Yes
22.3b	US-50	IN-1	IN-350	Yes
22.3c	US-50	IN-350	Dearborn County Line	Yes
22.4	US-52	I-74	(north)	No

4.3 National Performance Management Research Data Set (NPMRDS)

NPMRDS is a historical archive of speed and average travel times by calendar day in 15-minute increments covering, at a minimum, the NHS. Data is released on a monthly basis. The data is provided by the University of Maryland Center for Advanced Transportation Technology Laboratory (CATT Lab), utilizing OEM on-board navigation systems, GPS positional information from smartphone applications, and fleet vehicle location systems. It includes travel times for passenger vehicles, freight vehicles and all vehicles by road segment. Road segmentation is by Traffic Message Channel (TMC) code. TMC began as a technology for delivering traffic and travel information to motor vehicle drivers. Passenger times are based on a collection of data, sourced from anonymous in-vehicle navigation system, mobile phone location data, and other connected vehicle data. Freight times are based on GPS probe data from the American Transportation Research Institute sourced from class 7 and 8 trucks.

Figure 4-3 Truck Classifications



4.4 Reporting of Travel Time Results

Hourly average speed, delay per vehicle, delay per vehicle per mile and total vehicle delay have been calculated at the road section (TMC) level. The appendix lists all the travel time data by facility, direction and road section.

Figure 4-4 details the data definitions and sources used in this findings portion of the analysis.

Figure 4-4 Data Definitions

Term	Definition and Source
TMC ID	Unique identification number of each roadway section.
	Source: NPMRDS
Facility	Route or road name.
	Source: NPMRDS
Direction	Direction of travel for the facility - eastbound, westbound, southbound, northbound.
	Source: NPMRDS
From	Beginning intersecting roadway or intersection name.
	Source: NPMRDS

Term	Definition and Source
To	Ending intersecting roadway or intersection name.
	Source: NPMRDS
AADT	Average annual daily traffic for both directions of travel.
	Source: NPMRDS, ODOT, KYTC, INDOT or OKI traffic counts. OKI estimates where count not available.
Distance	Units: Miles
	Source: NPMRDS
Reference speed	Maximum average hourly daytime speed (6 AM-9 PM) or OKI adjusted speed.
	Source: Calculated from NPMRDS or OKI adjusted.
Reference travel time	Travel time while at reference speed.
	Units: Hours:minutes:seconds
Travel Time Index (TTI)	Units: Percent
	Source: Calculated using travel time at reference speed and travel time at observed speed. Reference travel time/travel time. If reference travel time is less than or equal to average travel time, travel time index is 1.
Level of Travel Time Reliability (LOTTR) Index	Units: Percent
	Source: Calculated as a ratio of the longer travel time (80th percentile) to the normal travel time (50th percentile). If the longer travel time is greater than or equal to 1.5, the roadway segment or corridor is considered unreliable.
Level of Truck Travel Time Reliability (LOTTTR) Index	Units: Percent
	Source: Calculated as a ratio of the longer truck travel time (95th percentile) to the normal truck travel time (50th percentile). If the longer truck travel time is greater than or equal to 1.5, the roadway segment or corridor is considered unreliable.
AM travel time Index (TTI)	Units: Hours:minutes:seconds
	Source: Maximum hourly average travel time during the period of 6-9 AM. Hourly average travel time is the average of the NPMRDS 15-minute average travel times during that hour. NPMRDS travel times are for weekday travel only, for all sample vehicles, during the month and year indicated.
AM travel time (LOTTR and LOTTTR) Index	Units: Percent
	Source: Maximum hourly average travel time during the period of 6-10 AM. Hourly average travel time is the average of the NPMRDS 15-minute average travel times during that hour. NPMRDS travel times are for weekday travel only, for all sample vehicles, during the month and year indicated.
AM speed	AM travel time average speed.
	Units: Miles per hour
	Source: Distance divided by the average AM travel time.
	Units: Percent

Term	Definition and Source
Midday travel time (LOTTR and LOTTTR) Index	Source: Maximum hourly average travel time during the period of 10 AM-4 PM. Hourly average travel time is the average of the NPMRDS 15-minute average travel times during that hour. NPMRDS travel times are for weekday travel only, for all sample vehicles, during the month and year indicated.
Midday speed	Midday travel time average speed.
	Units: Miles per hour
	Source: Distance divided by the average midday travel time.
PM travel time (TTI)	Units: Hours:minutes:seconds
	Source: Maximum hourly average travel time during the period of 4-7 PM. Hourly average travel time is the average of the NPMRDS 15-minute average travel times during that hour. NPMRDS travel times are for weekday travel only, for all sample vehicles, during the month and year indicated.
PM travel time (LOTTR and LOTTTR) Index	Units: Percent
	Source: Maximum hourly average travel time during the period of 4-8 PM. Hourly average travel time is the average of the NPMRDS 15-minute average travel times during that hour. NPMRDS travel times are for weekday travel only, for all sample vehicles, during the month and year indicated.
PM speed	PM travel time average speed.
	Units: Miles per hour
	Source: Distance divided by the average PM travel time.
Weekend travel time (LOTTR and LOTTTR) Index	Units: Percent
	Source: Maximum hourly average travel time during the period of 6 AM-8 PM. Hourly average travel time is the average of the NPMRDS 15-minute average travel times during that hour. NPMRDS travel times are for weekend travel only, for all sample vehicles, during the month and year indicated.
Weekend speed	Weekend travel time average speed.
	Units: Miles per hour
	Source: Distance divided by the average PM travel time.
Overnight travel time (LOTTTR) Index	Units: Percent
	Source: Maximum hourly average travel time during the period of 8 PM-6 AM. Hourly average travel time is the average of the NPMRDS 15-minute average travel times during that hour. NPMRDS travel times are for weekday truck travel only, for all sample vehicles, during the month and year indicated.
Overnight speed	Overnight travel time average speed.
	Units: Miles per hour
	Source: Distance divided by the average PM travel time.
Maximum LOTTTR Index	Units: Percent
	Source: Identifies the maximum LOTTTR during the five time periods.

Term	Definition and Source
Total Vehicle Delay	Units: Hours
	Source: Calculated by multiplying the delay per vehicle for each hour by the estimated volume for that hour. Delay per vehicle in each hour is the difference between reference travel time and average hourly travel time from NPMRDS. AADT is multiplied by an hourly VMT distribution developed by OKI.
Intersection Delay	Units: Seconds
	Source: Duration for average vehicle to travel through the intersection.
Peak Hour Excessive Delay (PHED)	Units: Hours
	Source: Based on travel time at 20 miles per hour or 60 percent of the posted speed limit travel time, whichever is greater, during peak AM (6-10 AM) and PM (4-8 PM) time periods and will be measured in 15-minute intervals. The total excessive delay metric is then multiplied by AADT and occupancy. Vehicle occupancy is calculated using the national occupancy rate of 1.7.

Although it is felt that the data collected and presented in the figures and graphics are accurate and useful, users of the information should be aware of the shortcomings. The user should note how traffic volumes (AADT) and travel time information were collected.

4.5 Methodology for Collecting Intersection Turning Movement Counts

Data collection at regionally significant intersections occurred in summer of 2019 and 2021, and summer and fall of 2022. One set of AM peak (7-9 AM) and PM peak (4-6 PM) counts were video recorded at each intersection using Miovision Scout video collection units. Depending on the geometry of the intersection, 1-2 Scout units were affixed and raised to utility poles to capture all turning movements. The fisheye lens-effect of each Scout unit would allow for capture of a portion of turning movement activity. For the purposes of this count, data was classified by vehicle type (cars, trucks, and buses). Once all data was recorded for peak periods at each location, it was sent to Miovision for processing to identify turning movements by classified vehicle type.

After processing, the turning movement count data was used to analyze capacity and to determine delay and level of service for signalized intersections utilizing the software program TransModeler SE. Intersection delay is the average time needed for a vehicle to pass through the intersection. Intersection delay is reported in seconds and is the cumulative delay of all vehicles. Each intersection is assigned a level-of-service based on the delay.

Figure 4-5 CMN Selected Regionally Significant Intersections

State	County	Location
Indiana	Dearborn	US-50 @ IN-350
Indiana	Dearborn	US-50 @ IN-1 (Belleview)
Indiana	Dearborn	US-50 @ Arch Street
Indiana	Dearborn	US-50 @ Front Street
Kentucky	Boone	KY-18 @ KY-842
Kentucky	Boone	US-42 @ KY-842
Kentucky	Boone	US-42 @ Quadrant Road
Kentucky	Boone	KY-842 @ Quadrant Road
Kentucky	Boone	US-25 @ KY-536
Kentucky	Campbell	US-27 @ I-471 and Sunset Drive
Kentucky	Kenton	KY-17 @ KY-1072
Ohio	Butler	OH-747 @ Muhlhauser Road
Ohio	Butler	OH-4 @ Muhlhauser Road
Ohio	Butler	OH-4 @ OH-4 Bypass
Ohio	Butler	Diversion @ OH-4 Bypass
Ohio	Butler	OH-4 @ Diversion
Ohio	Butler	OH-4 @ SR 129
Ohio	Butler	OH-4 @ OH-4 Bypass (Northern Section)
Ohio	Butler	Liberty Way @ Cox Road
Ohio	Clermont	OH-32 @ Glen Este-Withamsville Road
Ohio	Clermont	US-50 @ SR-131
Ohio	Hamilton	US 50 @ Delta Ave
Ohio	Hamilton	Beechmont Avenue @ Five Mile Road
Ohio	Hamilton	US 22 @ Kenwood Road
Ohio	Hamilton	US-42 @ Galbraith Road
Ohio	Hamilton	OH-747 @ Kemper Road
Ohio	Warren	Mason-Montgomery Road @ Tylersville Road

Chapter 5

Findings: Existing Conditions

5.1 Federal Performance Measures

The Fixing America's Surface Transportation (FAST) Act requires that state departments of transportation (DOT) and MPO's, including OKI, incorporate five new performance measures into the CMP. These five performance measures include:

- Level of Travel Time Reliability (LOTTR)
- Level of Truck Travel Time Reliability (LOTTTR)
- Peak Hour Excessive Delay Per Capita (PHED)
- Percent of Non-Single Occupancy Vehicle Travel
- Total Congestion Mitigation and Air Quality (CMAQ) Emissions

5.1.1 Level of Travel Time Reliability

The variability or change in congestion on a day-to-day basis provides a measure of reliability. Recurring congestion is generally predictable, regularly occurring, and typically caused by excess demand compared to the capacity of the system. On the other hand, non-recurring congestion causes unreliable travel times and is caused by transient events such as traffic incidents, weather conditions, work zones, or special events. This form of congestion is often the most frustrating for travelers. National estimates indicate that nearly 50% of all congestion is non-recurring[2].

LOTTR assesses the consistency or dependability of travel times from day to day or across different times of the day on the Interstate and Non-Interstate NHS systems. FHWA defines LOTTR as the percent of person-miles on the Interstate and NHS that are reliable. LOTTR is calculated as the ratio of the longer travel times (80th percentile) to a "normal" travel time (50th percentile), using NPMRDS or equivalent data.

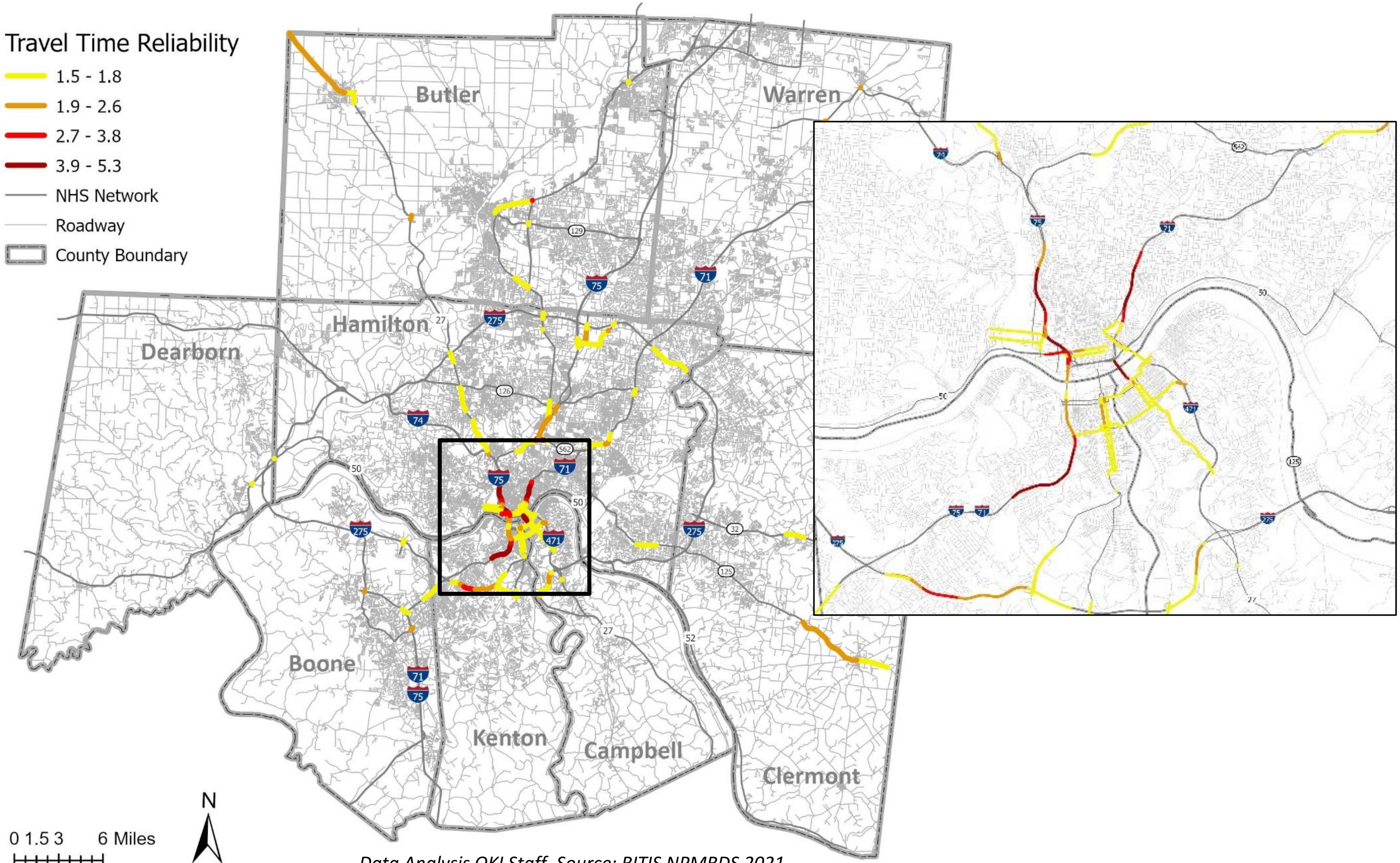
Data was collected in 15-minute segments during all time periods between 6 AM and 8 PM. Reliability measures were grouped into three weekday time periods (6-10 AM, 10 AM - 4 PM, 4-8 PM) and one weekend time period (6 AM – 8 PM). Any roadway segment or corridor that has a LOTTR of 1.5 or greater during any time period is considered to be unreliable.

For example, a roadway segment with a free-flow speed of 60 mph where the observed average travel speed during one of the time periods is 40 mph would have a LOTTR value of 1.5.

In the OKI Region, 57 interstate segments (TMCs) and 122 non-interstate TMCs on the NHS were considered unreliable in 2021, for a total of 25.7 and 77.9 centerline miles, respectively. Of those TMCs, 81 percent were located in Ohio.

2 "Reducing Non-Recurring Congestion" Federal Highway Administration, October 2022

Figure 5-1 Unreliable NHS Segments (2021)



Data Analysis OKI Staff. Source: RITIS NPMRDS 2021

Figure 5-2 presents LOTTR by direction for 14 high volume interstate highway corridors during all three weekday time periods and on the weekend. Corridors were developed by grouping TMCs and weighting them together to determine an overall LOTTR. Data is from 2021 NPMRDS. Highly reliable periods are shown in shades of green (low LOTTR index), lesser reliable periods are shaded light red, and unreliable periods shaded dark red.

Four interstate corridors were considered unreliable during 2021. In Kentucky, westbound I-275 between I-71/75 and I-471 and northbound I-71/75 between I-275 and the Ohio line had at least one time period with an LOTTR index greater than 1.5. In Ohio, southbound I-71 between I-75 and the Norwood Lateral and southbound I-75 between the Ohio River and I-74 had at least one time period with an LOTTR index greater than 1.5.

Figure 5-2 Level of Travel Time Reliability for Selected Interstate Corridors (2021)

Corridor		Miles	LOTTR Index 2021					
			Weekday			Weekend	Percent of Person-Miles	
			6-10AM	10AM-4PM	4-8PM	6AM-8PM	Reliable	Unreliable
IN	I275 NB: Kentucky Line to Ohio Line	3.28	1.03	1.02	1.03	1.04	100.0%	0.0%
IN	I275 SB: Kentucky Line to Ohio Line	3.31	1.03	1.02	1.03	1.03	100.0%	0.0%
IN	I74 EB: Dearborn Line to Ohio Line	15.47	1.02	1.02	1.03	1.03	100.0%	0.0%
IN	I74 WB: Dearborn Line to Ohio Line	15.47	1.04	1.03	1.04	1.04	100.0%	0.0%
KY	I275 EB: Indiana Line to I71/75	14.19	1.03	1.03	1.07	1.03	100.0%	0.0%
KY	I275 WB: Indiana Line to I71/75	14.32	1.03	1.03	1.03	1.03	100.0%	0.0%
KY	I275 EB: I71/75 to I471	7.94	1.10	1.23	1.69	1.19	27.9%	72.1%
KY	I275 WB: I71/75 to I471	8.67	1.03	1.10	1.23	1.04	95.2%	4.8%
KY	I275 EB: I471 to Ohio Line	2.32	1.03	1.04	1.04	1.04	100.0%	0.0%
KY	I275 WB: I471 to Ohio Line	1.70	1.02	1.02	1.04	1.02	100.0%	0.0%
KY	I471 NB: US27 to I71	5.76	1.17	1.06	1.08	1.09	93.1%	6.9%
KY	I471 SB: US27 to I71	5.72	1.06	1.06	1.11	1.07	99.8%	0.2%
KY	I71 NB: Boone Line to I75	6.42	1.02	1.02	1.03	1.04	100.0%	0.0%
KY	I71 SB: Boone Line to I75	6.53	1.03	1.04	1.02	1.02	100.0%	0.0%
KY	I71/75 SB: I275 to Ohio Line	6.78	1.04	1.04	1.05	1.05	100.0%	0.0%
KY	I71/75 NB: I275 to Ohio Line	7.15	1.37	1.47	1.62	2.01	58.8%	41.2%
KY	I71/75 SB: I275 to US42	4.32	1.02	1.04	1.05	1.04	100.0%	0.0%
KY	I71/75 NB: I275 to US42	4.31	1.04	1.30	1.17	1.26	65.9%	34.1%
KY	I71/75 SB: I71/75 Split to US42	7.51	1.02	1.02	1.03	1.02	100.0%	0.0%
KY	I71/75 NB: I71/75 Split to US42	6.65	1.02	1.03	1.03	1.04	100.0%	0.0%
KY	I75 SB: I71/75 to Grant Line	6.49	1.02	1.04	1.04	1.02	100.0%	0.0%
KY	I75 NB: I71/75 to Grant Line	6.45	1.02	1.02	1.03	1.03	100.0%	0.0%
KY	Brent Spence Bridge NB	0.20	1.17	1.21	1.20	1.46	100.0%	0.0%
KY	Brent Spence Bridge SB	0.20	1.28	1.13	1.14	1.26	100.0%	0.0%
OH	I275 EB: I275/I74 to OH126	5.17	1.02	1.02	1.03	1.03	100.0%	0.0%

	Corridor	Miles	LOTTR Index 2021					
			Weekday			Weekend	Percent of Person-Miles	
			6-10AM	10AM-4PM	4-8PM	6AM-8PM	Reliable	Unreliable
OH	I275 WB: I275/I74 to OH126	5.46	1.03	1.02	1.03	1.03	100.0%	0.0%
OH	I275 EB: OH126 to I75	12.06	1.03	1.02	1.04	1.04	100.0%	0.0%
OH	I275 WB: OH126 to I75	13.03	1.03	1.03	1.06	1.04	100.0%	0.0%
OH	I275 EB: I75 to I71	5.44	1.04	1.04	1.29	1.04	100.0%	0.0%
OH	I275 WB: I75 to I71	5.67	1.03	1.02	1.08	1.04	100.0%	0.0%
OH	I275 EB: I71 to OH32	15.16	1.02	1.02	1.19	1.02	79.7%	20.3%
OH	I275 WB: I71 to OH32	14.23	1.04	1.02	1.03	1.02	100.0%	0.0%
OH	I275 SB: OH32 to Ohio River	9.47	1.02	1.02	1.02	1.02	100.0%	0.0%
OH	I275 NB: OH32 to Ohio River	9.35	1.02	1.02	1.03	1.03	100.0%	0.0%
OH	I275 NB: Indiana Line to I74	7.71	1.03	1.02	1.02	1.03	100.0%	0.0%
OH	I275 SB: Indiana Line to I74	6.78	1.02	1.02	1.02	1.03	100.0%	0.0%
OH	I71 NB: I75 to OH562	7.92	1.04	1.04	1.09	1.04	100.0%	0.0%
OH	I71 SB: I75 to OH562	7.94	1.05	1.12	1.72	1.05	77.8%	22.2%
OH	I71 NB: OH562 to I275	8.87	1.03	1.04	1.39	1.03	73.4%	26.6%
OH	I71 SB: OH562 to I275	8.95	1.03	1.02	1.05	1.03	100.0%	0.0%
OH	I71 NB: I275 to Clinton Line	24.97	1.02	1.01	1.02	1.02	100.0%	0.0%
OH	I71 SB: I275 to Clinton Line	24.99	1.02	1.01	1.02	1.02	100.0%	0.0%
OH	I74 EB: Indiana Line to I275	6.50	1.09	1.09	1.03	1.03	100.0%	0.0%
OH	I74 WB: Indiana Line to I275	6.51	1.02	1.02	1.03	1.03	100.0%	0.0%
OH	I74 EB: I275 to I75	9.95	1.05	1.03	1.05	1.04	100.0%	0.0%
OH	I74 WB: I275 to I75	10.07	1.04	1.03	1.04	1.05	100.0%	0.0%
OH	I75 NB: Ohio River to I74	4.56	1.04	1.04	1.06	1.05	100.0%	0.0%
OH	I75 SB: Ohio River to I74	4.32	1.32	1.87	2.34	1.70	32.9%	67.1%
OH	I75 NB: I74 to OH562	3.38	1.04	1.09	1.50	1.04	54.5%	45.5%
OH	I75 SB: I74 to OH562	3.51	1.02	1.07	1.39	1.03	84.4%	15.6%
OH	I75 NB: OH562 to I275	9.11	1.03	1.09	1.38	1.04	73.3%	26.7%
OH	I75 SB: OH562 to I275	6.93	1.17	1.13	1.22	1.03	93.1%	6.9%
OH	I75 NB: I275 to OH122/Warren Line	15.36	1.02	1.02	1.04	1.03	100.0%	0.0%
OH	I75 SB: I275 to OH122/Warren Line	15.16	1.03	1.02	1.03	1.02	100.0%	0.0%
Total		**449.7**	**1.04**	**1.06**	**1.12**	**1.06**	**94.9%**	**5.1%**
Data Analysis OKI Staff. Data Source: RITIS NPMRDS 2021								

Figure 5-3 provides LOTTR by time period for the Non-Interstate corridors on the NHS in the OKI region.

Figure 5-3 NHS Non-Interstate LOTTR (2021)

In the OKI region, 92 percent of all person miles on the interstate system in 2021 were considered reliable, as were 90 percent of the non-interstate NHS network.

Figure 5-4 Reliability by Person-Miles Traveled on the NHS Network (2021)

NHS Network	Person-Miles Traveled			
	Total		Percent	
	Reliable	Unreliable	Reliable	Unreliable
Interstate	7,662,155,659	646,398,194	92.2%	7.8%
Non-Interstate	1,974,460,122	226,679,211	89.7%	10.3%
Total	**9,636,615,781**	**873,077,405**	**91.7%**	**8.3%**
Data Analysis OKI Staff. Data Source: RITIS NPMRDS 2021				

5.1.2 Truck Travel Time Reliability

FHWA defines Level of Truck Travel Time Reliability (LOTTTR) as the percent of truck-miles on the Interstate System that are reliable. LOTTTR is calculated as the ratio of the longer travel times (95^{th} percentile) to a “normal” travel time (50^{th} percentile), using NPMRDS or equivalent data.

Data are collected in 15-minute segments during all time periods throughout the day. Reliability measures were grouped into three weekday time periods (6-10 AM, 10 AM-4 PM, 4-8 PM), one weekend time period (6 AM – 8 PM), and one overnight time period for all days (8 PM-6 AM). Any roadway segment or corridor that has a LOTTTR of 1.5 or greater during any time period is considered to be unreliable.

To determine the reliability of the freight network as a whole, a ratio of the maximum LOTTTR for each road segment to the total miles of the OKI interstate network provides a reliability index. In 2021, the OKI freight network, as a whole, was considered reliable, as it registered an LOTTTR index of 1.48.

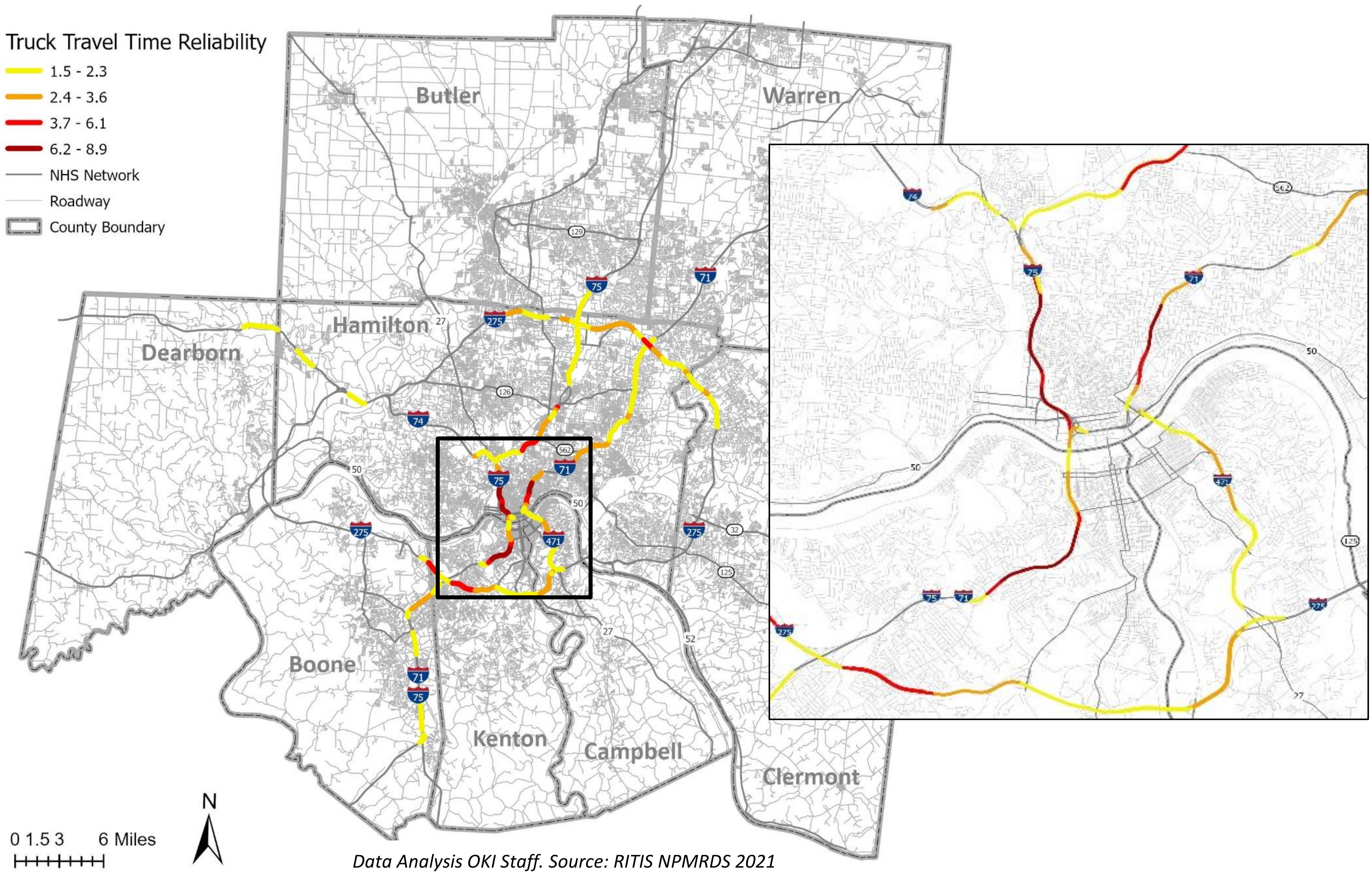
Figure 5-5 Level of Truck Travel Time Reliability for Full Extent of Interstate Network (2021)

NHS Network	Freight Reliability - Interstate Network	
	Total NHS Miles	LOTTTR Index
Interstate	448.80	1.48
Data Analysis OKI Staff. Data Source: RITIS NPMRDS 2021		

Figure 5-6 presents a map of the unreliable freight network TMCs in the OKI Region while Figure 5-7 presents the truck travel time reliability by direction for the 14 high volume interstate highway corridors. Highly reliable periods are shown in shades of green (low LOTTTR index), lesser reliable periods are shaded light red, and unreliable periods shaded dark red. More than half (67 percent) of all roadway segments (179 TMCs) on the OKI freight network are considered to be unreliable while 76.5 percent of person miles traveled on the freight network were considered to be reliable in 2021.

With a LOTTTR index of 4.40 during the 4-8 PM time period I-75 southbound between the Ohio River and I-74 in Ohio was the most unreliable truck corridor during any time period in 2021. In Kentucky, other interstate corridors registering a LOTTTR index greater than 2.0 during at least one time period included I-71/75 northbound between I-275 and the Ohio River (3.32) and between I-275 and US-42 (2.03), and I-275 east and westbound between I-71/75 and I-471 (2.83 and 2.08, respectively). In Ohio, other corridors included I-275 eastbound between I-71 and I-75 (2.30), I-71 southbound between I-75 and the Norwood Lateral (2.67), and I-75 north and southbound between I-74 and the Norwood Lateral (2.61 and 2.10, respectively).

Figure 5-6 Unreliable Freight Segments (2021)



Data Analysis OKI Staff. Source: RITIS NPMRDS 2021

Figure 5-7 Level of Truck Travel Time Reliability for Selected Interstate Corridors (2021)

Corridor		Miles	LOTTTR Index 2021					
			Weekday			Weekend	Overnight	Max LOTTTR
			6-10AM	10AM-4PM	4-8PM	6AM-8PM	8PM-6AM	
IN	I275 NB: Kentucky Line to Ohio Line	3.28	1.06	1.05	1.10	1.08	1.10	1.10
IN	I275 SB: Kentucky Line to Ohio Line	3.31	1.06	1.05	1.07	1.08	1.09	1.09
IN	I74 EB: Dearborn Line to Ohio Line	15.47	1.09	1.06	1.06	1.06	1.07	1.09
IN	I74 WB: Dearborn Line to Ohio Line	15.47	1.07	1.07	1.13	1.07	1.08	1.13
KY	I275 EB: Indiana Line to I71/75	14.19	1.08	1.20	1.39	1.09	1.12	1.39
KY	I275 WB: Indiana Line to I71/75	14.32	1.09	1.06	1.10	1.09	1.12	1.12
KY	I275 EB: I71/75 to I471	7.94	1.32	1.87	2.83	1.53	1.17	2.83
KY	I275 WB: I71/75 to I471	8.67	1.11	1.63	2.08	1.13	1.15	2.08
KY	I275 EB: I471 to Ohio Line	2.32	1.10	1.10	1.14	1.13	1.13	1.14
KY	I275 WB: I471 to Ohio Line	1.70	1.10	1.09	1.13	1.15	1.17	1.17
KY	I471 NB: US27 to I71	5.76	1.68	1.03	1.10	1.08	1.10	1.68
KY	I471 SB: US27 to I71	5.72	1.05	1.10	1.41	1.08	1.11	1.41
KY	I71 NB: Boone Line to I75	6.42	1.06	1.05	1.07	1.08	1.07	1.08
KY	I71 SB: Boone Line to I75	6.53	1.12	1.16	1.12	1.08	1.10	1.16
KY	I71/75 SB: I275 to Ohio Line	6.78	1.10	1.08	1.27	1.12	1.11	1.27
KY	I71/75 NB: I275 to Ohio Line	7.15	1.87	2.16	2.55	3.32	1.45	3.32
KY	I71/75 SB: I275 to US42	4.32	1.07	1.09	1.17	1.08	1.08	1.17
KY	I71/75 NB: I275 to US42	4.31	1.17	1.96	1.77	2.03	1.07	2.03
KY	I71/75 SB: I71/75 Split to US42	7.51	1.06	1.06	1.14	1.05	1.07	1.14
KY	I71/75 NB: I71/75 Split to US42	6.65	1.07	1.14	1.17	1.44	1.08	1.44
KY	I75 SB: I71/75 to Grant Line	6.49	1.11	1.17	1.19	1.06	1.09	1.19
KY	I75 NB: I71/75 to Grant Line	6.45	1.05	1.04	1.05	1.06	1.08	1.08
KY	Brent Spence Bridge NB	0.20	1.26	1.24	1.25	1.39	1.58	1.58
KY	Brent Spence Bridge SB	0.20	1.54	1.30	1.32	1.69	1.22	1.69
OH	I275 EB: I275/I74 to OH126	5.17	1.06	1.05	1.19	1.13	1.11	1.19
OH	I275 WB: I275/I74 to OH126	5.46	1.09	1.07	1.26	1.13	1.15	1.26
OH	I275 EB: OH126 to I75	12.06	1.09	1.07	1.19	1.11	1.15	1.19
OH	I275 WB: OH126 to I75	13.03	1.08	1.07	1.42	1.11	1.14	1.42
OH	I275 EB: I75 to I71	5.44	1.15	1.19	2.30	1.15	1.18	2.30
OH	I275 WB: I75 to I71	5.67	1.11	1.09	1.35	1.11	1.15	1.35
OH	I275 EB: I71 to OH32	15.16	1.08	1.09	1.67	1.12	1.19	1.67
OH	I275 WB: I71 to OH32	14.23	1.39	1.06	1.10	1.09	1.17	1.39
OH	I275 SB: OH32 to Ohio River	9.47	1.08	1.07	1.09	1.10	1.13	1.13
OH	I275 NB: OH32 to Ohio River	9.35	1.08	1.06	1.11	1.10	1.14	1.14
OH	I275 NB: Indiana Line to I74	7.71	1.06	1.05	1.07	1.08	1.11	1.11
OH	I275 SB: Indiana Line to I74	6.78	1.06	1.05	1.07	1.08	1.11	1.11
OH	I71 NB: I75 to OH562	7.92	1.09	1.11	1.44	1.10	1.12	1.44
OH	I71 SB: I75 to OH562	7.94	1.20	1.83	2.67	1.18	1.14	2.67
OH	I71 NB: OH562 to I275	8.87	1.11	1.37	1.99	1.10	1.12	1.99
OH	I71 SB: OH562 to I275	8.95	1.24	1.08	1.65	1.10	1.13	1.65
OH	I71 NB: I275 to Clinton Line	24.97	1.05	1.05	1.07	1.06	1.08	1.08
OH	I71 SB: I275 to Clinton Line	24.99	1.07	1.04	1.09	1.06	1.07	1.09

Corridor		Miles	LOTTTR Index 2021					
			Weekday			Weekend	Overnight	Max LOTTTR
			6-10AM	10AM-4PM	4-8PM	6AM-8PM	8PM-6AM	
OH	I74 EB: Indiana Line to I275	6.50	1.21	1.19	1.14	1.09	1.13	1.21
OH	I74 WB: Indiana Line to I275	6.51	1.06	1.06	1.11	1.07	1.09	1.11
OH	I74 EB: I275 to I75	9.95	1.30	1.11	1.18	1.17	1.23	1.30
OH	I74 WB: I275 to I75	10.07	1.15	1.12	1.20	1.19	1.24	1.24
OH	I75 NB: Ohio River to I74	4.56	1.12	1.16	1.24	1.13	1.14	1.24
OH	I75 SB: Ohio River to I74	4.32	1.96	3.67	4.40	2.69	1.14	4.40
OH	I75 NB: I74 to OH562	3.38	1.22	1.67	2.61	1.10	1.11	2.61
OH	I75 SB: I74 to OH562	3.51	1.09	1.56	2.10	1.10	1.12	2.10
OH	I75 NB: OH562 to I275	9.11	1.15	1.57	1.88	1.11	1.11	1.88
OH	I75 SB: OH562 to I275	6.93	1.54	1.33	1.86	1.15	1.12	1.86
OH	I75 NB: I275 to OH122/Warren Line	15.36	1.06	1.06	1.17	1.09	1.12	1.17
OH	I75 SB: I275 to OH122/Warren Line	15.16	1.16	1.11	1.18	1.07	1.10	1.18
Total		**449.71**	**1.15**	**1.20**	**1.40**	**1.17**	**1.13**	1.40
Data Analysis OKI Staff. Data Source: RITIS NPMRDS 2021								

Figure 5-8 presents reliability measures by segment for the 14 interstate highway truck corridors and the NHS network as a map.

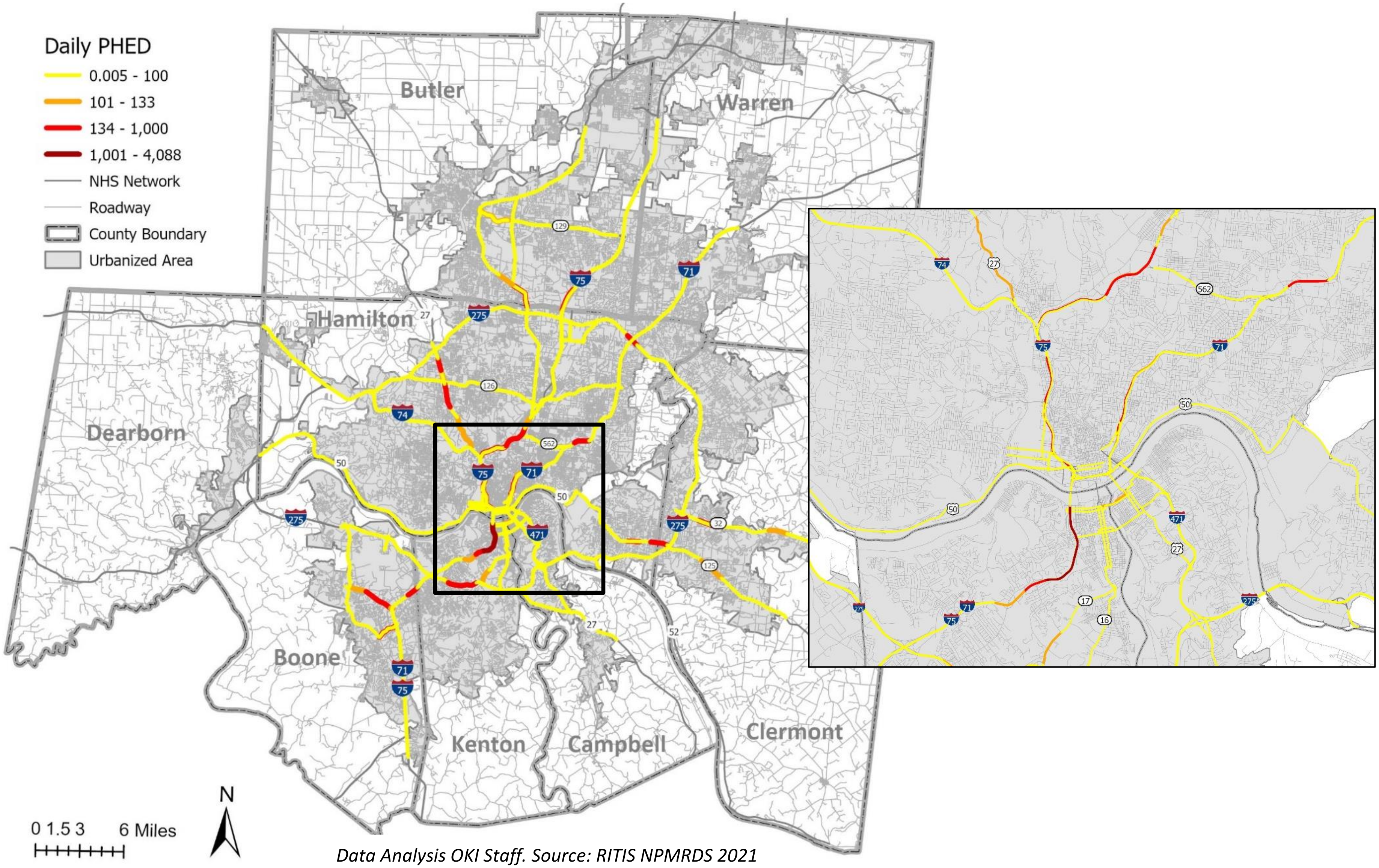
Figure 5-8 – LOTTR/LOTTTR Map

5.1.3 Peak-Hour Excessive Delay Per Capita

The extent of traffic congestion is measured by the number of transportation system users that are affected by congestion. FHWA measures this by the annual hours of peak hour excessive delay (PHED) per capita on the NHS in the Cincinnati, OH-KY-IN Urbanized Area. The threshold for excessive delay is based on the travel times at 20 miles per hour or 60 percent of the posted speed limit travel time, whichever is greater, and is measured in 15-minute intervals. Peak travel hours are defined as 6-10 AM each weekday morning and 3-7 PM each weekday afternoon/evening. The total excessive delay metric is weighted by vehicle volumes and occupancy. FHWA provided average vehicle occupancy (AVO) metrics for passenger vehicles (1.7), buses (8.1) and trucks (1.3)[3].

[3] *Average Vehicle Occupancy Factors for Computing Travel Time Reliability Measures and Total Peak Hour Excessive Delay Metrics*, Federal Highway Administration, April 2018.

Figure 5-9 Peak Hours of Excessive Delay Per Capita (2021)



Data Analysis OKI Staff. Source: RITIS NPMRDS 2021

Figure 5-10 presents those NHS segments with more than 100 total daily hours of peak hour excessive delay. Interstate 75 in Ohio represented 34 percent of the 59 segments with more than 100 daily hours of excessive delay in 2021. The top four segments on the NHS with the highest daily PHED were in Kentucky along northbound I-71/75, with the highest located between Kyles Lane (exit 189) and Pike Street (exit 191), with 4,088 daily peak hours of excessive delay per capita. Of the 59 segments with more than 100 total daily hours of delay, 23 were located on roadways other than interstates.

When considering the entire NHS within the Cincinnati urbanized area, both interstate and non-interstate roadways, the annual hours of excessive delay per capita was 6.4, in 2021.

Figure 5-10 Total Delay

5.1.4 Percent Non-SOV Travel

The measurement of non-single occupancy vehicle (SOV) travel within an urbanized area recognizes investments within the Cincinnati region that increase multimodal solutions and vehicle occupancy levels as strategies to reduce both criteria pollutant emissions and congestion. Modes of transportation recognized are carpool, vanpool, public transportation, walking, bicycling, and telecommuting. This measure utilized data from the 2017-2021 American Community Survey 5-Year Estimates.

Figure 5-11 Non-SOV Travel by County (2021)

Mode	Ohio				Kentucky			Indiana	OKI
	Butler	Clermont	Hamilton	Warren	Boone	Campbell	Kenton	Dearborn	Region
Drove alone	81.6%	81.5%	75.4%	80.1%	80.4%	77.3%	79.2%	84.6%	**78.6%**
Carpooled	7.2%	8.0%	8.0%	6.0%	7.6%	8.1%	7.5%	7.9%	**7.6%**
Public transit	0.4%	0.2%	2.9%	0.4%	0.5%	1.1%	1.5%	0.3%	**1.5%**
Walked	1.7%	0.9%	2.8%	0.7%	0.4%	2.7%	1.5%	1.0%	**1.9%**
Bicycle	0.3%	0.0%	0.2%	0.1%	0.0%	0.2%	0.3%	0.0%	**0.2%**
Other means	0.4%	0.4%	1.1%	0.8%	1.5%	0.9%	1.5%	0.4%	**0.9%**
Worked at home	8.5%	8.9%	9.6%	12.0%	9.6%	9.8%	8.5%	5.7%	**9.4%**
Non-SOV Travel	**18.5%**	**18.4%**	**24.6%**	**20.0%**	**19.6%**	**22.8%**	**20.8%**	**15.3%**	**21.5%**
Source: 2017-2021 American Community Survey 5-Year Estimates									

5.1.5 Total CMAQ Emissions

The 2015 Cincinnati ozone area includes portions of the Ohio counties of Butler, Clermont, Hamilton, and Warren; and the Kentucky counties of Boone, Campbell, and Kenton. On June 9, 2022, The U.S. Environmental Protection Agency (EPA) found that the Ohio portion of the Cincinnati ozone area had attained 2015 ozone National Ambient Air Quality Standard (NAAQS) and has been redesignated to a maintenance area. In July 2023, EPA found that the Kentucky portion of the Cincinnati ozone area had attained 2015 ozone NAAQS and has been redesignated to a maintenance area. With those new designations the OKI region is still required to maintain 2015 ozone standards and complete air quality conformity for both the Transportation Improvement Program (TIP) and the Metropolitan Transportation Plan (MTP). Ozone is formed through chemical reactions induced when sunlight reacts with volatile organic compounds (VOC's) and oxides of nitrogen (NOx).

Forty-six CMAQ-funded transportation projects within the OKI region from 2017-2021 provided quantitative emissions benefits. These projects included traffic operations and safety improvements; roadway relocations and widenings; new turn lanes; bicycle and pedestrian facility improvements and additions; and bus replacements. These 46 projects were estimated to reduce daily VOC and NOx emissions by 77.06 kg and 459.76 kg, respectively.

Figure 5-12 Daily Emissions Reduction for CMAQ-funded Projects (2017-2021)

Fiscal Year	Daily Emissions Reduction (kg) for CMAQ-funded Projects	
	VOC	NOx
2017	45.85	207.62
2018	12.74	132.34
2019	3.53	14.74
2020	7.49	22.86
2021	7.45	82.20
2-Year	**58.59**	**339.96**
5-Year	**77.06**	**459.76**

5.1.6 Summary of Federal Performance Measures

Starting with MAP-21 and continuing with the FAST Act and the Infrastructure Investment and Jobs Act, legislation created a performance-based surface transportation program with specific requirements for state Departments of Transportation (DOTs) and MPOs. These requirements include measuring system performance on the National Highway System (NHS), known as PM3 measures. These federal performance measures are established by state DOTs and UZA and are integrated into the Congestion Management Process (CMP) and include Level of Travel Time Reliability (LOTTR), Truck Travel Time Reliability (LOTTTR), Peak Hour Excessive Delay (PHED) and Percent Non-Single Occupancy Vehicle (Non-SOV) travel, and total NOx and VOC emissions reductions from CMAQ projects. Figure 5-13 provides a summary of the federal performance measures.

Figure 5-13 Summary of Federal Performance Measures

Federal Performance Measure	Year	Value
Percent of reliable person-miles traveled - NHS Interstate Network[1]	2021	92.2%
Percent of reliable person-miles traveled - Non-Interstate NHS Network[1]	2021	89.7%
Percent of reliable freight network miles - NHS Interstate Network[1]	2021	77.6%
Annual Peak Hours of Excessive Delay per Capita - NHS Network[1]	2021	6.4
Daily Hours of Excessive Truck Delay on Freight Network[1]	2021	23,050
Percent Non-SOV Travel[2]	2021	21.5%
Total Daily Emissions Reductions for CMAQ-funded Projects - VOC	2017-2021	77.06 kg
Total Daily Emissions Reductions for CMAQ-funded Projects - NOx	2017-2021	459.76 kg
1. Source: NPMRDS 2021		
2. 2017-2021 American Community Survey (ASC) 5-Year Estimates		

5.2 Additional CMP Performance Measures

OKI continues to incorporate several additional congestion management performance measures within the CMP to further assess congestion and identify areas for transportation improvement. These additional performance measures are:

- Travel Speed
- Travel Speed Index
- Roadway Level of Service (LOS)
- Travel Time Index (TTI)
- Intersection Delay
- Intersection Level-of-Service (LOS)
- Peak Period Travel Times between Major Destinations
- Incident Clearance Time

5.2.1 Travel Speed

Travel speed is a typical measure of performance for a roadway segment. The level of service (LOS) for a roadway or highway segment is determined using average-speed data. Both NPMRDS and INRIX data were used to determine travel speed during both morning (6-10 AM) and evening (4-8 PM) peak periods.

Limited-Access Highways

During the morning peak period most of the slower speeds have occurred closer to the urban core of the OKI region. Speeds were slower on I-71/75 and I-75 on both sides of the Ohio River and Brent Spence Bridge, along Fort Washington Way, and along Columbia Parkway (US-50). Other locations with slower speeds include southbound I-74 near Mt. Airy, southbound I-75 near Ronald Reagan Highway (OH-126), both east and westbound OH-32 in Eastgate, and along US-52. Overall, the average morning peak period travel speed on limited-access highways in 2021 was 64 mph.

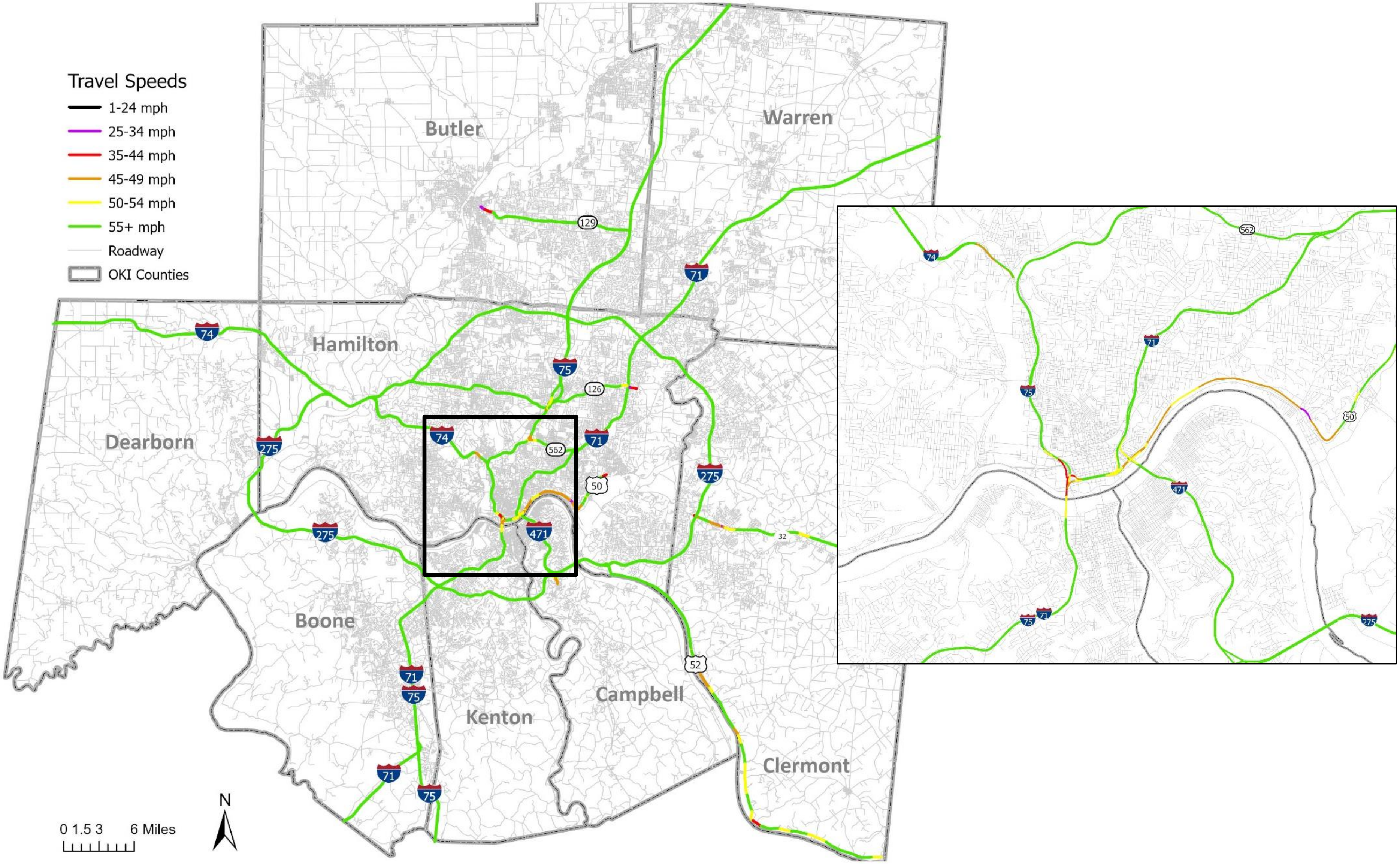
During the evening peak period most of the slower speeds were located closer to the urban core of the OKI region. Speeds were slower along I-71/75 from Kyles Lane north to Hopple Street in Ohio. Other locations include both east and west I-71 along Fort Washington Way and from Fort Washington Way to Martin Luther King Jr. Drive, Columbia Parkway (US-50) from downtown to Columbia Tusculum, I-75 from the Norwood Lateral (OH-562) to Ronald Reagan Highway (OH-126), OH-32 in Eastgate, and along US-52. Overall, the average evening peak period travel speed on limited-access highways was slightly slower than the morning peak period, at 62 mph.

Arterial Roadways

Similar to where slower speeds occurred on limited-access highways, arterial roadways with slower speeds during the morning peak period occurred closer to the urban core of the OKI region. As expected, average speeds were slower than 30 mph on all arterials in downtown Cincinnati, Covington, and Newport. While average speeds increased further out from the urban core for most arterials, speeds along both Gilbert Avenue (US-22) and Reading Road (US-42) averaged 28 mph, while US-127 averaged 29 mph. Overall, the average morning peak period travel speed on arterial roadways in 2021 was 35 mph.

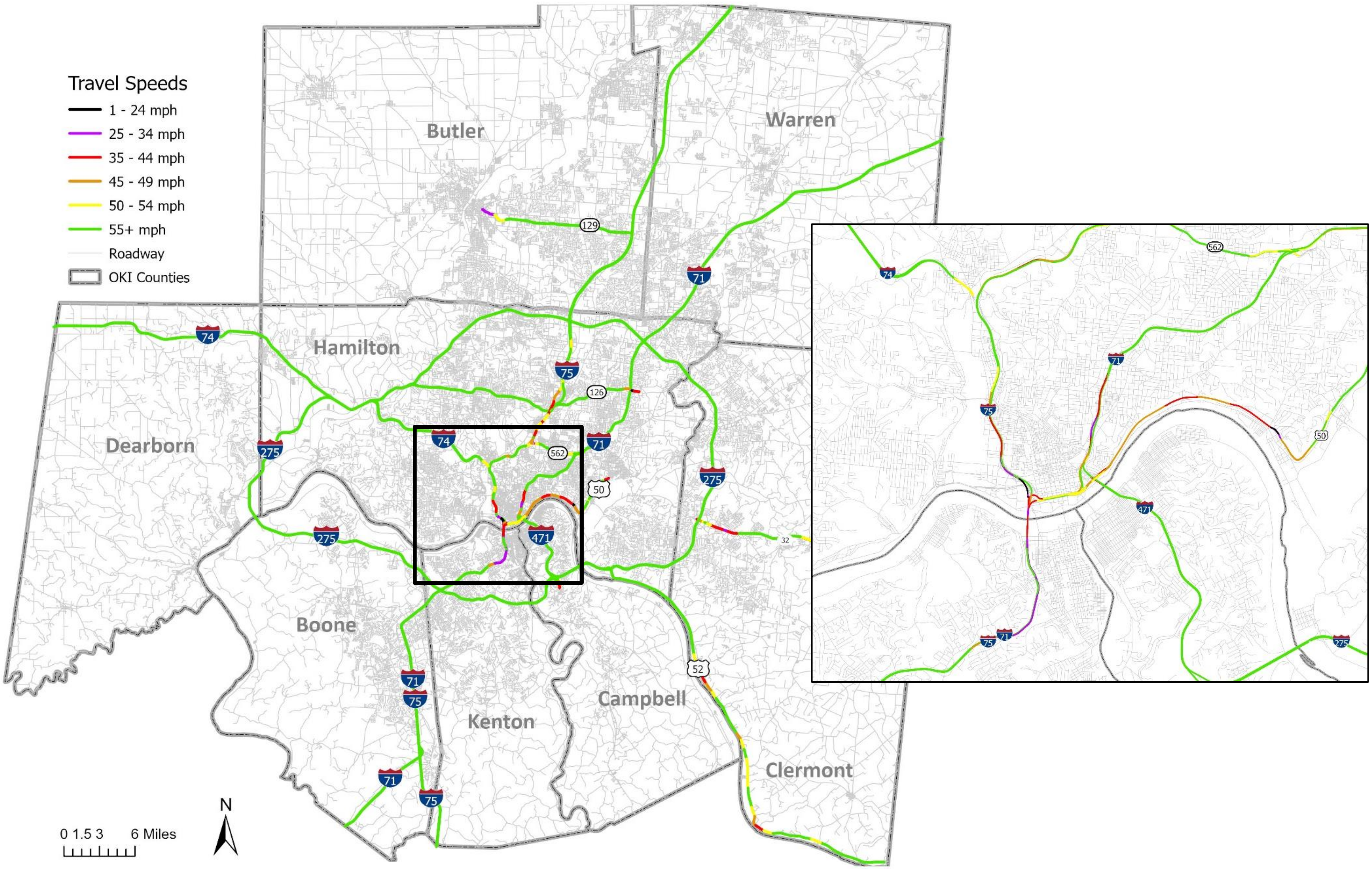
During the evening peak period most of the slower speeds were located closer to the urban core of the OKI region. As expected, average speeds were slower than 30 mph on all arterials in downtown Cincinnati, Covington, and Newport. Similar to the morning peak period, average speeds increased further out from the urban core for most arterials. Of note, speeds along both Gilbert Avenue (US-22) and Reading Road (US-42) averaged 28 mph and 25 mph. Overall, the average evening peak period travel speed on arterial roadways in 2021 was 37 mph.

Figure 5-14 Average Daily AM Peak Period Travel Speed – Limited-Access Highways (2021)



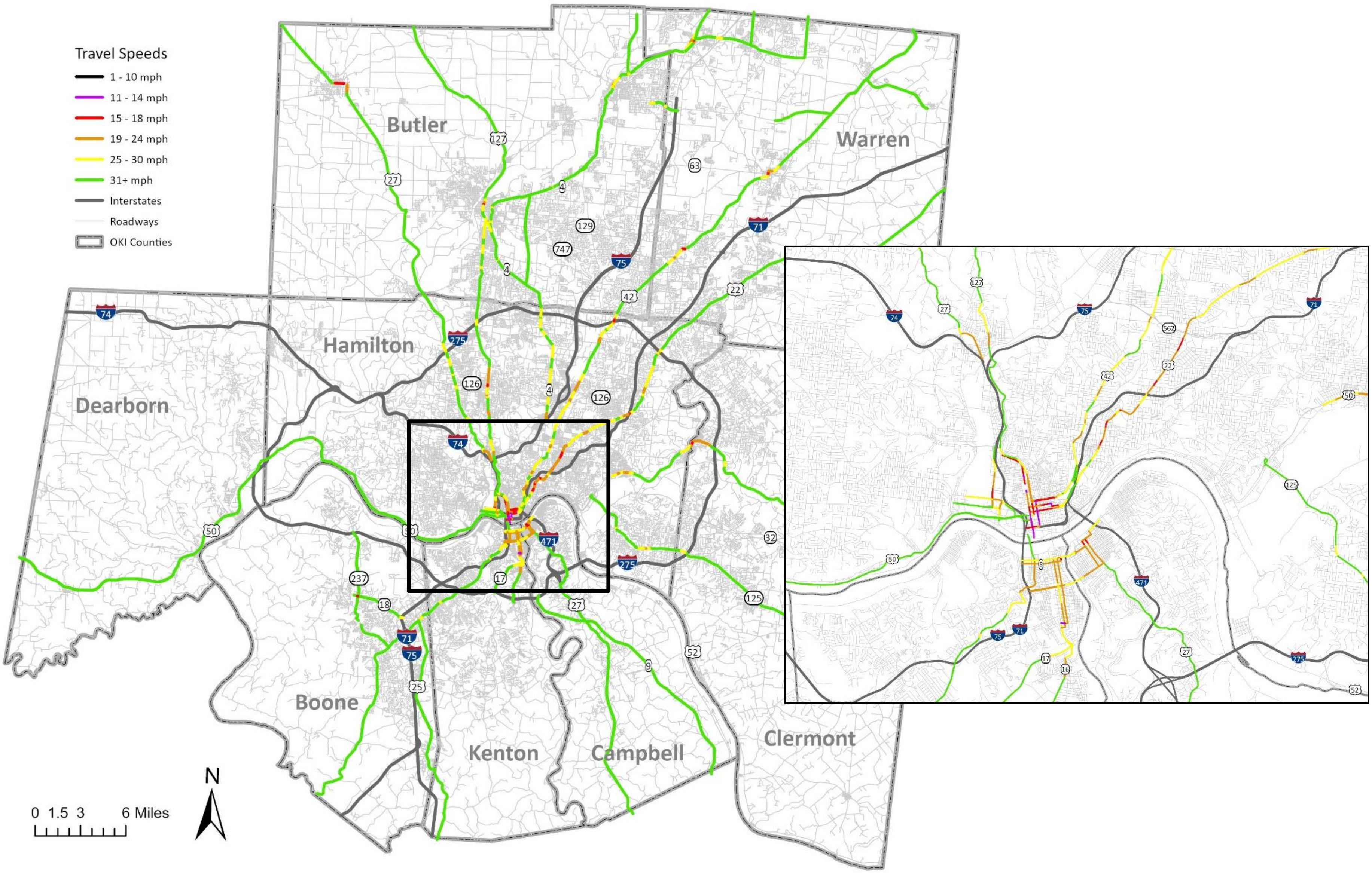
Data Analysis OKI Staff. Source: RITIS NPMRDS 2021

Figure 5-15 Average Daily PM Peak Period Travel Speed – Limited-Access Highways (2021)



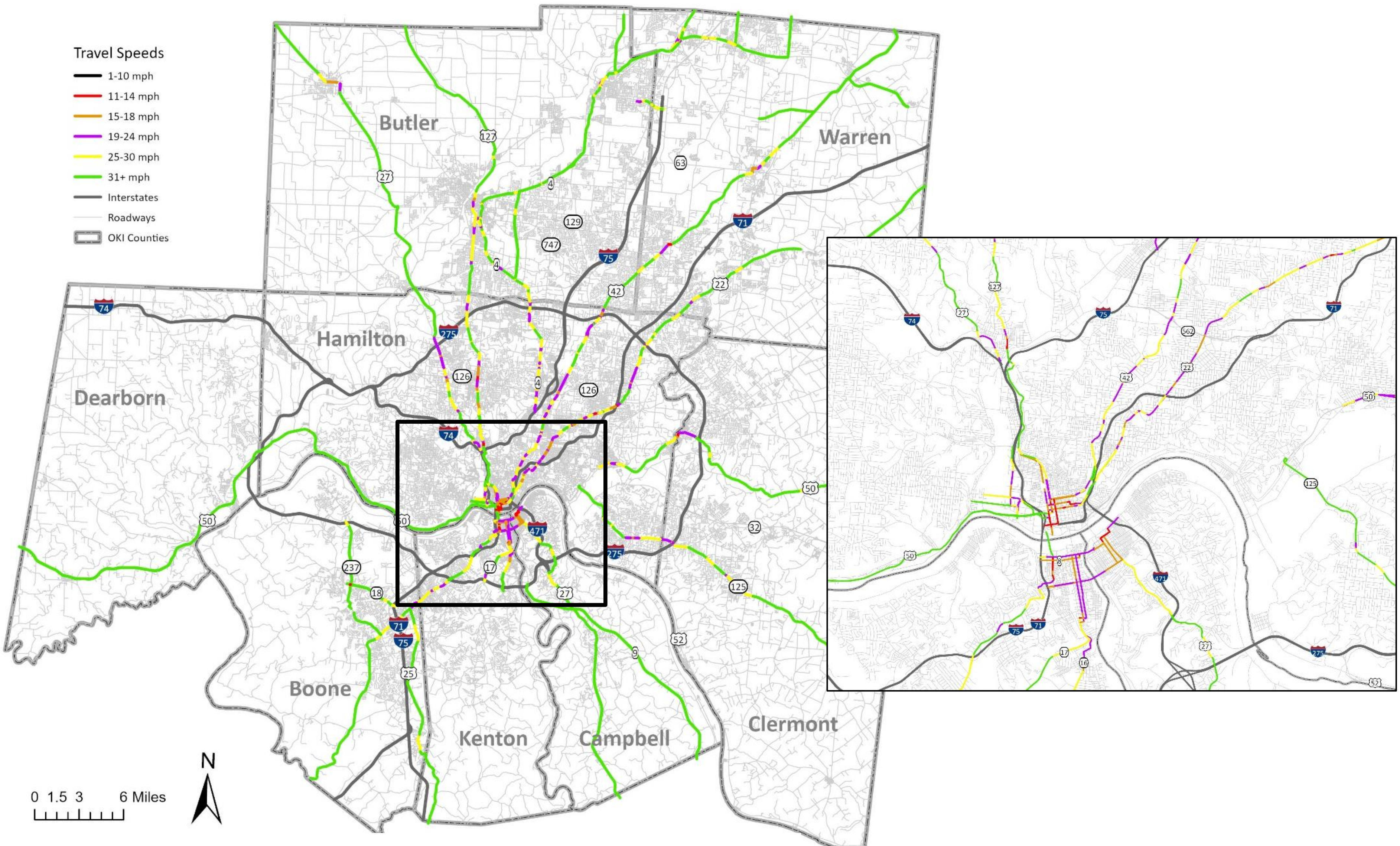
Data Analysis OKI Staff. Source: RITIS NPMRDS 2021

Figure 5-16 Average Daily AM Peak Period Travel Speed – Arterial Roadways (2021)



Data Analysis OKI Staff. Source: RITIS NPMRDS 2021

Figure 5-17 Average Daily PM Peak Period Travel Speed – Arterial Roadways (2021)



Data Analysis OKI Staff. Source: RITIS NPMRDS 2021

5.2.2 Travel Speed Index

Travel speed index (or speed index) is a ratio that is calculated by dividing a roadway segment's average travel speed by the posted speed limit for that roadway segment. For example, if the speed limit is 50 miles per hour and the average observed travel speed is 40 miles per hour, the speed index is 0.80.

Limited-Access Highways

During the morning peak period most of the lower speed indexes occurred closer to the urban core as well as where roadway construction is prevalent including southbound I-75 at the Lockland split, I-74/75 interchange, and OH-32 through Eastgate. More than 70 percent of all limited-access highway segments had speed indexes above 100 percent of posted speed limits during the AM peak period in 2021, meaning vehicles were going above the posted speed limit.

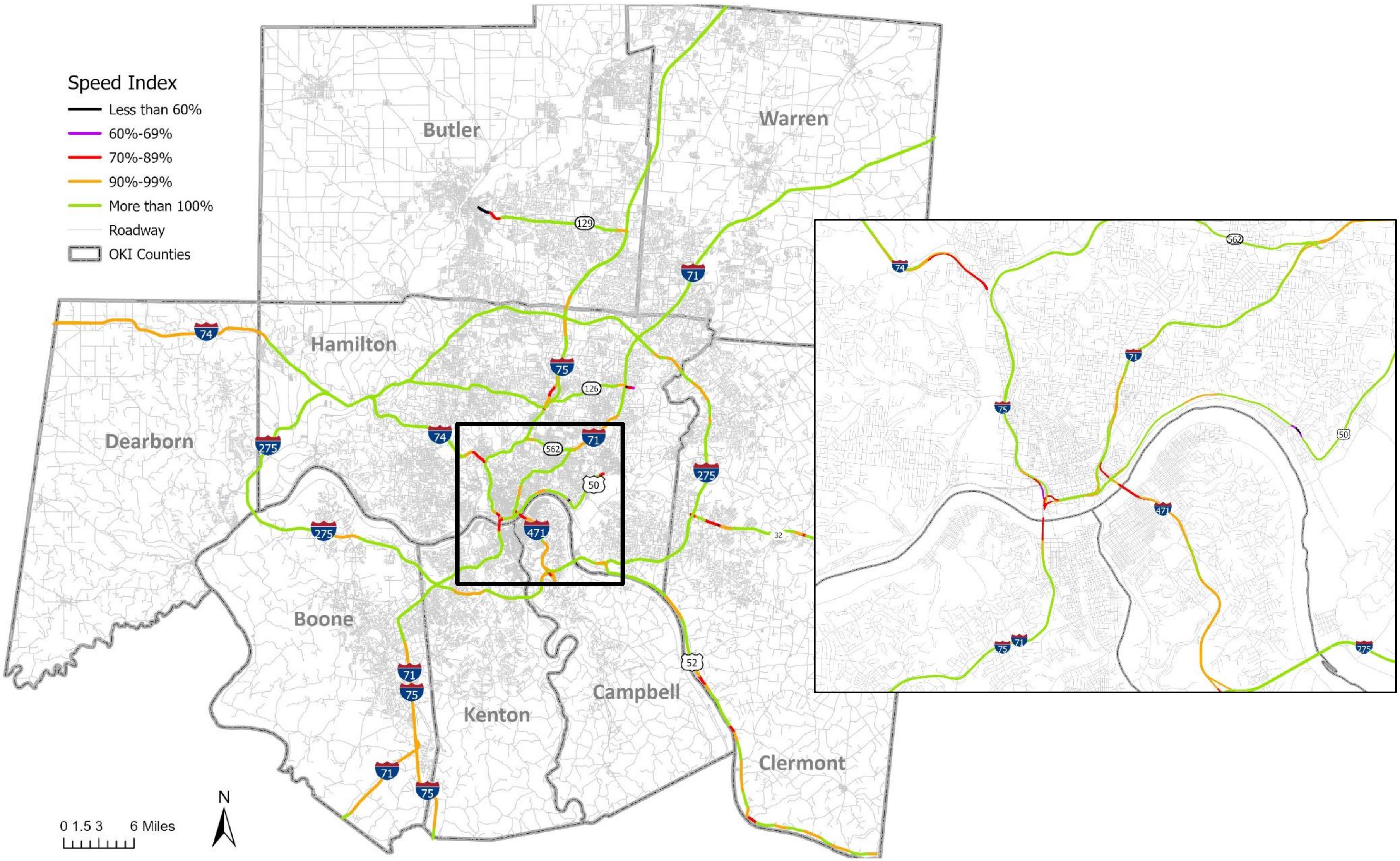
Similar to the morning peak, the lower speed indexes during the evening peak period occurred closer to the urban core including I-75 southbound from the Western Hills Viaduct to the Brent Spence Bridge and northbound I-71/75 from Kyles Lane to the Brent Spence Bridge. Other locations include where roadway construction is prevalent including southbound I-75 at the Lockland split, I-74/75 interchange, and OH-32 through Eastgate. Sixty seven percent of all limited-access highway segments had speed indexes above 100 percent of posted speed limits during the PM peak period in 2021.

Arterial Roadways

During the morning peak period most of the lower speed indexes occurred closer to the urban core. The majority of speed indexes less than 60 percent of posted speed limits occurred on arterials in Ohio. Long stretches of Montgomery Road (US-22), Reading Road (US-42), and Central Parkway/Hamilton Avenue (US-127) in Hamilton County had speed indexes lower than 60 percent. In Kentucky, rural portions of Dixie Highway (US-25), US-27, US-127, and AA Highway had speed indexes above 100 percent. Overall, the average speed index for all arterials during the AM peak in 2021 was 86 percent.

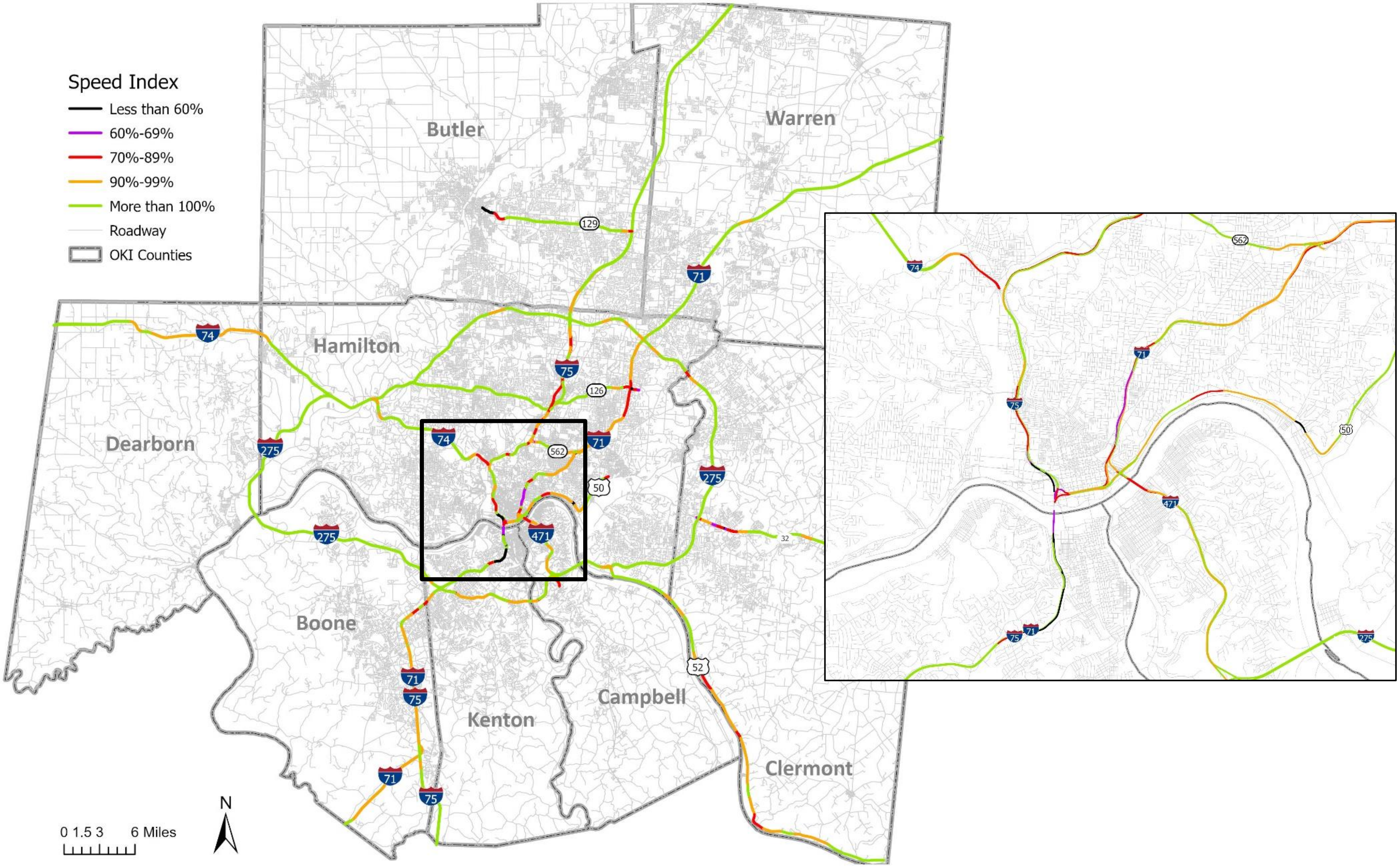
Lower speed indexes during the evening peak occurred on most arterials within the I-275 beltway, with the lowest indexes being near the urban core. Rural stretches of US-50 in Indiana; OH-3, US-50, Hamilton Avenue (US-27) and Hamilton Eaton Road (US-127) in Ohio; and AA Highway (KY-9), Alexandria Pike (US-27), Dixie Highway (US-25), and US-127 in Kentucky. Overall, the average speed index for all arterials during the PM peak in 2021 was 79 percent.

Figure 5-18 Travel Speed Index AM Peak Period – Limited-Access Highways (2021)



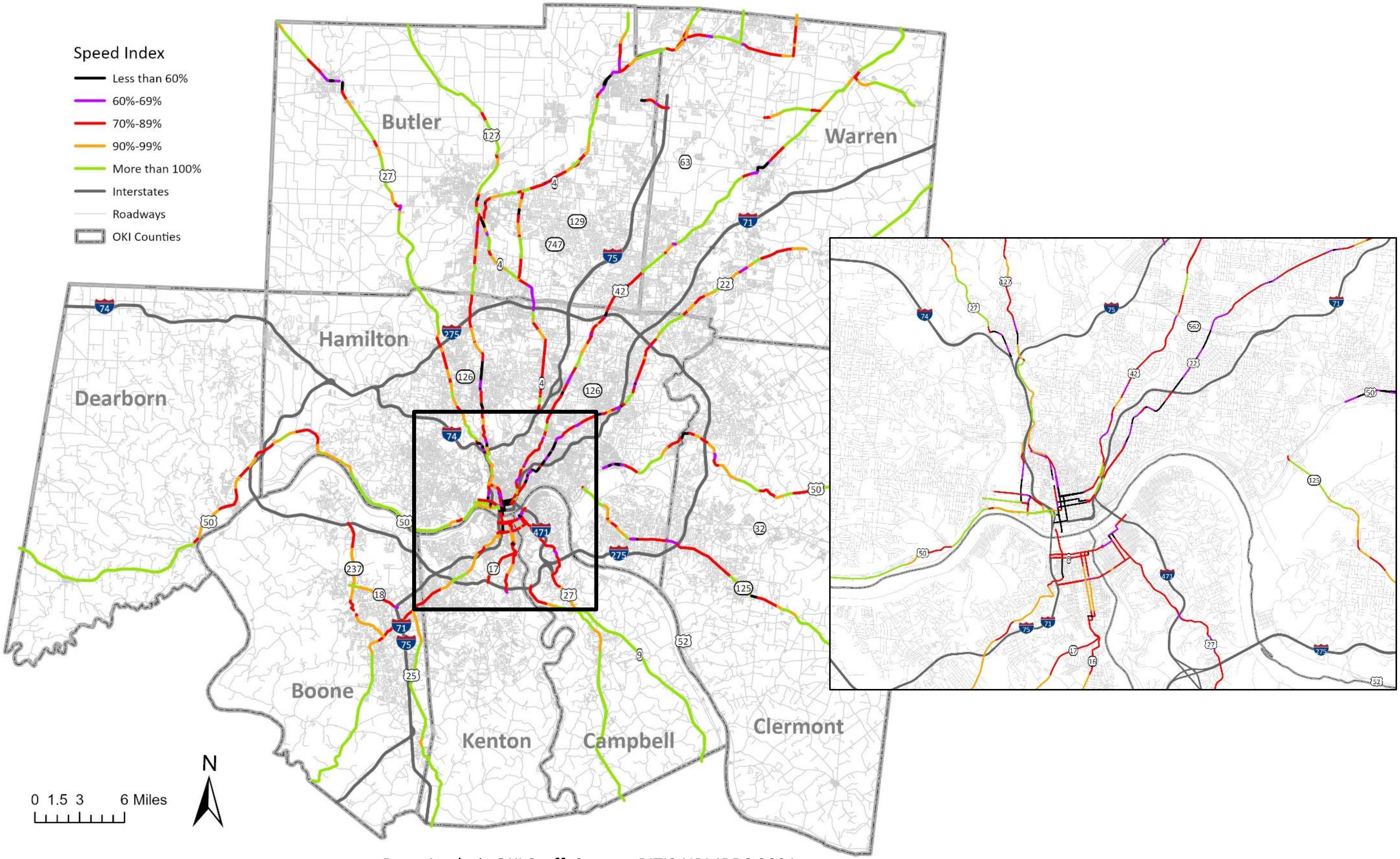
Data Analysis OKI Staff. Source: RITIS NPMRDS 2021

Figure 5-19 Travel Speed Index PM Peak Period – Limited-Access Highways (2021)



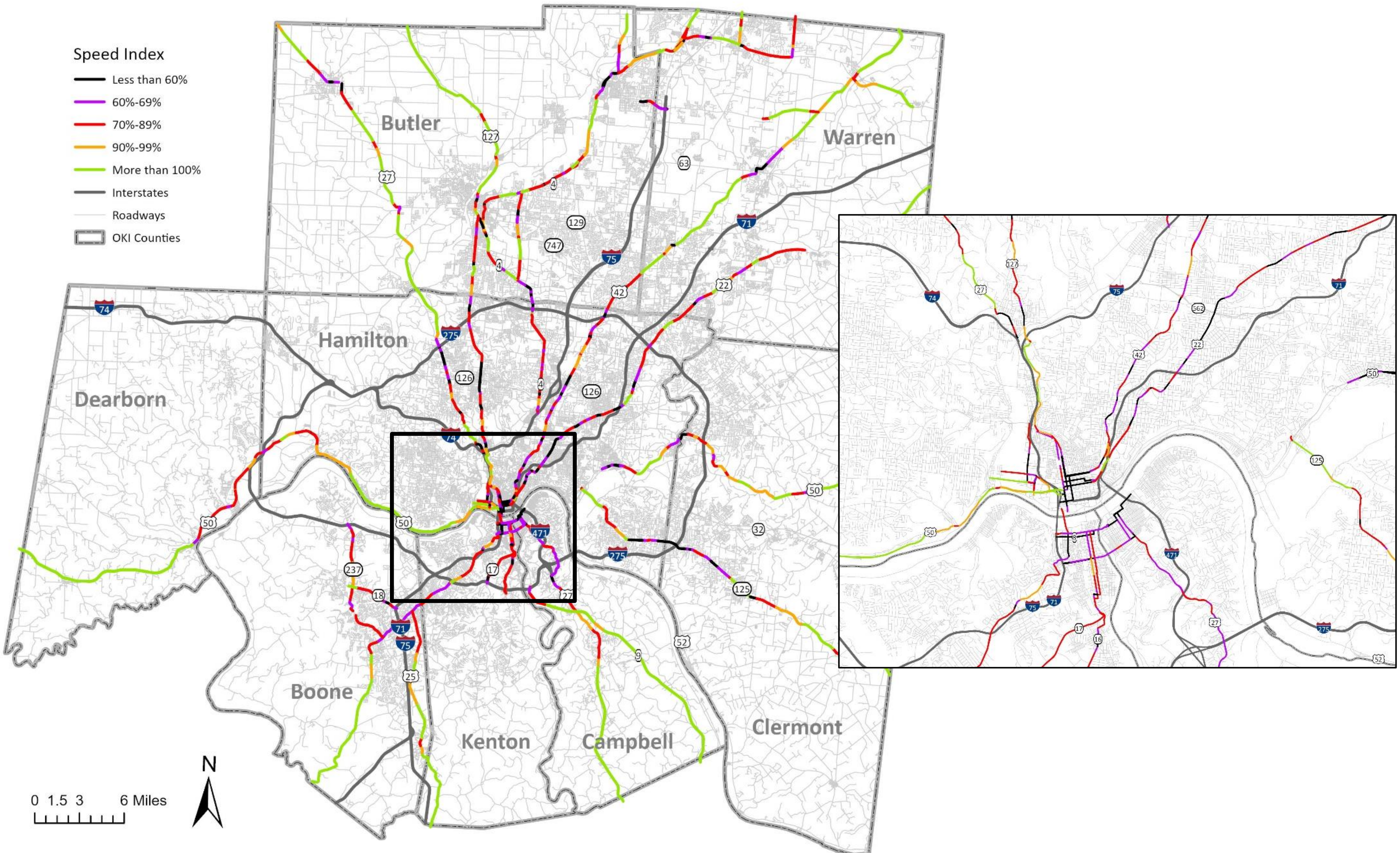
Data Analysis OKI Staff. Source: RITIS NPMRDS 2021

Figure 5-20 Travel Speed Index AM Peak Period – Arterial Roadways (2021)



Data Analysis OKI Staff. Source: RITIS NPMRDS 2021

Figure 5-21 Travel Speed Index PM Peak Period– Arterial Roadways (2021)



Data Analysis OKI Staff. Source: RITIS NPMRDS 2021

5.2.3 Roadway Level of Service

Roadway level of service (LOS) is based on the daily traffic volume on roadway segments. The approaches provided by FHWA guidance were used to estimate the LOS. The volume range for each LOS A through F depends on the facility type, number of lanes, area type, speed limit, and truck percentage. LOS A and B provides a traveler with the best travel with little to no friction with other vehicles. LOS C indicates more traffic volume with a small decline in mobility. Each letter grade after indicates worse roadway traffic conditions, with LOS F indicating gridlock and very low traffic speeds.

Limited-Access Highways

Of the 823 limited-access roadway segments in the OKI region that were measured for level of service, only seven percent were considered to be a LOS F, of which the majority of segments were located within the I-275 beltway, including all but two northbound I-71/75 segments from the Kenton County line to the Brent Spence Bridge were a LOS F. On the other end of the spectrum, 14 percent of all roadways that were measured for LOS were a level A, meaning the best travel times and no friction with the vehicles. This includes the entire stretch of US-52 from I-275 to the Brown County line and US-50 from I-71/I-471 to Fairfax.

Arterial Roadways

Only one percent of the more than 2,100 arterial roadway segments in the OKI region were a LOS F. All but two of those segments were located in Butler or Warren counties. Conversely, more than half (59 percent) of arterial roadway segments had a LOS A including the AA Highway from US-27 to the Pendleton County line and US-50 from downtown Cincinnati to IN-1 in Dearborn County.

Figure 5-22 Roadway Level of Service (2020)

Level of Service	Limited-Access Highways		Arterial Roadways	
	Segments	Percent	Segments	Percent
A	116	14.1%	1,279	59.0%
B	245	29.8%	709	32.7%
C	213	25.9%	81	3.7%
D	143	17.4%	48	2.2%
E	51	6.2%	27	1.2%
F	55	6.7%	22	1.0%

Figure 5-23 Roadway Level of Service – Limited-Access Highways (2020)

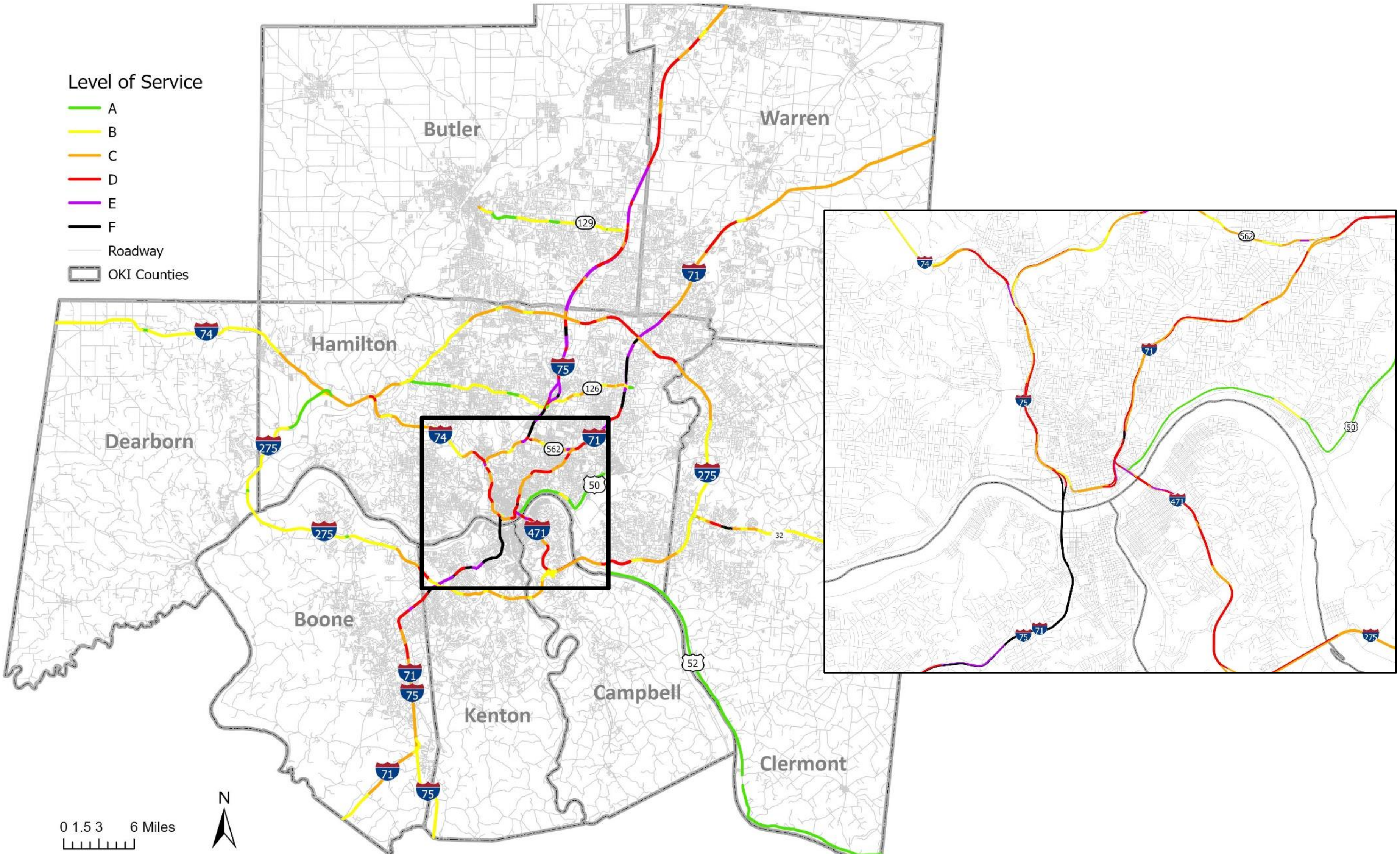


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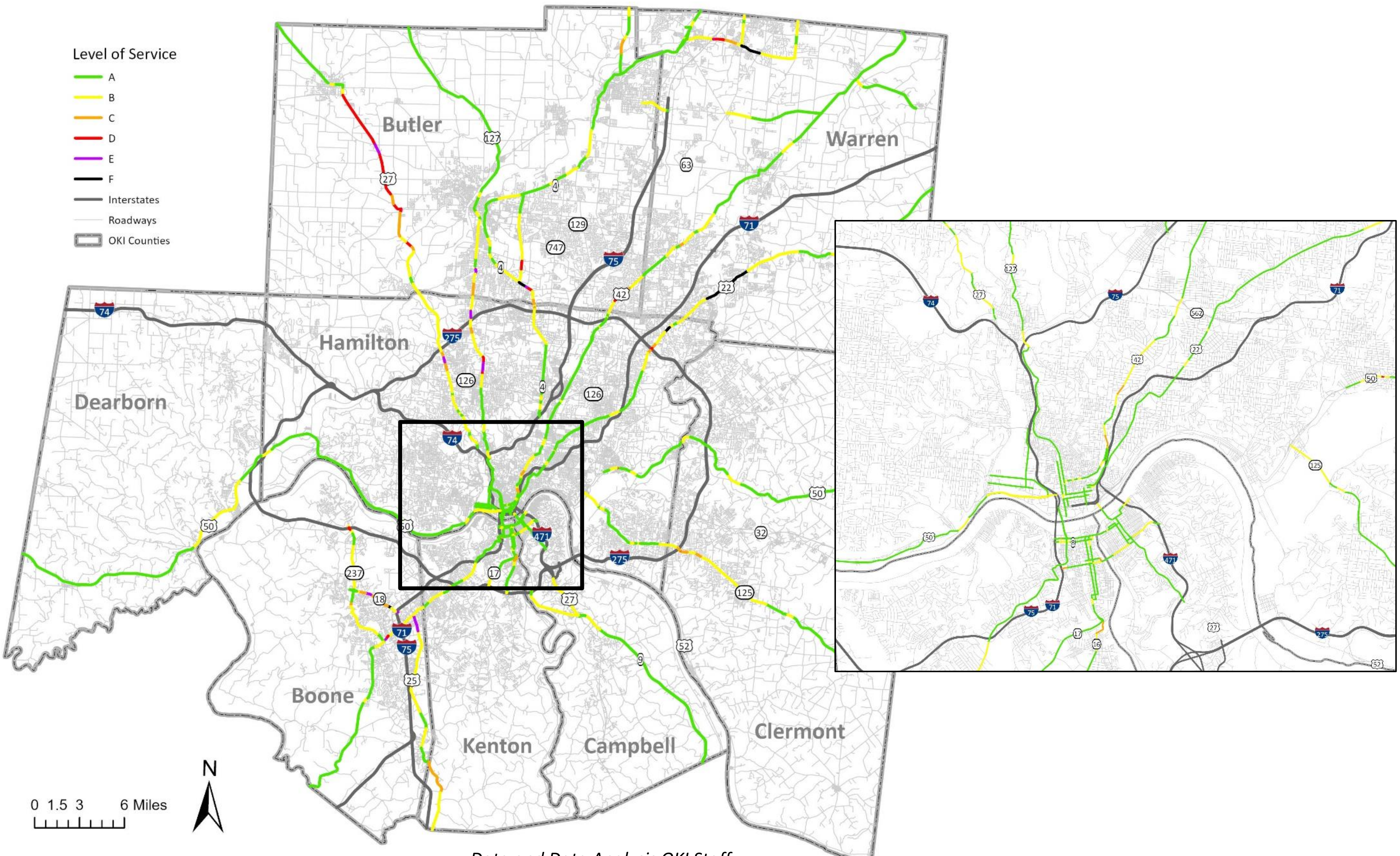
Figure 5-24 Roadway Level of Service– Arterial Roadways (2020)



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5.2.4 Travel Time Index

The relative severity of travel congestion is measured by travel time, speed and the calculated measure called travel time index (TTI). Figures 5-25 to 5-28 show the weekday AM Peak (6-9 AM) and PM Peak (4-7 PM) period travel time, speed, and travel time index for 2021. Figures 5-25 and 5-26 (interstate segments by direction) and Figures 5-27 to 5-28 (non-freeway NHS segments by direction) with a minimum of a 1.5 travel time index or a minimum of one minute of delay. The sections are sorted by state and facility name, clustering contiguous segments of delay.

Figure 5-25 shows three contiguous freeway bottlenecks during the weekday AM peak. The Kentucky AM bottlenecks were I-71/75 northbound from KY-1072 (Kyles Lane/Exit 189) to Pike Street (12th Street/Exit 191) and Pike Street (12th Street/Exit 191) to 5th Street (Exit 192).

Figure 5-25 AM TTI Interstates (2021)

Figure 5-26 shows four contiguous freeway bottlenecks during the weekday PM peak in Kentucky and 19 in Ohio. The Kentucky PM bottlenecks I-71/75 northbound from KY-1072 (Kyles Lane/Exit 189) to Pike Street (12th Street/Exit 191), Pike Street (12th Street/Exit 191) to 5th Street (Exit 192) and from US-127 (US-25/Exit 188) to Kyles Lane (Exit 189). Ohio PM bottlenecks were I-75 southbound from the Ohio River to the Western Hill Viaduct, southbound I-75 from Towne Street to the Norwood Lateral (OH-562), and southbound I-71 from William Howard Taft Road to Gilbert Avenue.

Figure 5-26 PM TTI Interstates (2021)

Figures 5-27 and 5-28 show congested non-interstate sections of the NHS during weekday AM and PM peak periods. There was one non-interstate segment in Indiana, westbound US-50 from IN-56 to IN-82, which had more than one minute of delay during the AM peak period. During the PM peak period, Indiana had three congested segments: westbound US-50 from the CSX Railroad to IN-56 and from IN-1 to the CSX Railroad, and eastbound US-50 from IN-56 to the CSX Railroad. In Kentucky, high congestion in the AM occurred on northbound section of the Taylor Southgate Bridge, northbound KY-237 from Petersburg Road to I-275 and southbound from Camp Ernst Road to US-42, north and southbound sections of KY-17 from Kyles Lane to I-275, and southbound US-27, from East 3rd Street to 5th Street. In Ohio, north and southbound sections of US-27, OH-4, OH-125, Freeman Avenue; east and westbound sections of OH-122 and Sharon Road; Dalton Avenue southbound from the Western Hills Viaduct to 8th Street; Eggelston Avenue northbound from Pete Rose Way to Court Street; Gest Street eastbound from OH-264 to Freeman Avenue; Mosteller Road northbound from Sharon Road to I-275; OH-32 westbound from Old OH-74 to Glen Este-Withamsville Road; Reading Road northbound from Broadway Street to Eden Park Drive; and US-42 northbound from Kemper Road to I-275 showed high congestion during AM peak. During PM peak in Indiana, sections of east and westbound US-50 had a TTI greater than 1.5 and more than one minute of delay. In Kentucky, north and southbound sections of US-27, US-42, KY-8, KY-17, KY-237; east and westbound sections of KY-18 and KY-1120; KY-9 southbound from Johns Hill to I-275; and KY-212 northbound from KY-236 (Donaldson Highway) to I-275 had TTI's greater than 1.5 or a minimum of one minute of delay. In Ohio, north and southbound sections of US-27, US-42, OH-4, OH-4 Bypass, OH-73, OH-125, Mosteller Road; east and westbound sections of OH-122, OH-129, Sharon Road; eastbound sections of 5th Street, Gest Street, OH-126, US-50; westbound sections of OH-32 and OH-562; southbound sections of Freeman Avenue and US-50; and northbound section of Eggelston Avenue showed high PM congestion.

Figure 5-27 AM TTI Non-Interstates (2021)

Figure 5-28 PM TTI Non-Interstates (2021)

Figure 5-29 is an web map of weekday peak period travel time index values for all roadway sections in the Congestion Management Network, based on the NPMRDS travel time data for 2021.

Figure 5-29 TTI Map

Congestion also occurs outside of the peak hours and vary in intensity within the hour. The duration relates to the amount of time the congested conditions persist before returning to an uncongested state. For selected freeway corridors, Figure 5-30 shows the travel time index for each 15-minute time interval for Interstate corridors and Figure 5-31 shows the travel time index for the NHS non-interstate corridors.

Figure 5-30 Interstate TTI_15_Minute (2021)

Figure 5-31 NHS Non-Interstate TTI 15 Minute (2021)

5.2.5 Intersection Delay and Level-of-Service

The results of the intersection capacity analysis are shown in Figure 5-32. Peak period turning movement counts during the summers of 2019 and 2021 and fall of 2022 were used as input in TransModeler SE. During the 7-9 AM peak period, the intersection at US 50 @ IN 350 in 2019 showed the most overall delay (71.7 seconds of delay per vehicle), with a level-of-service E. During the 4-6 PM peak period, the intersection at Mason-Montgomery Road @ Tylersville Road in 2019 showed the most overall delay (100.5 seconds of delay per vehicle), with level-of-service F.

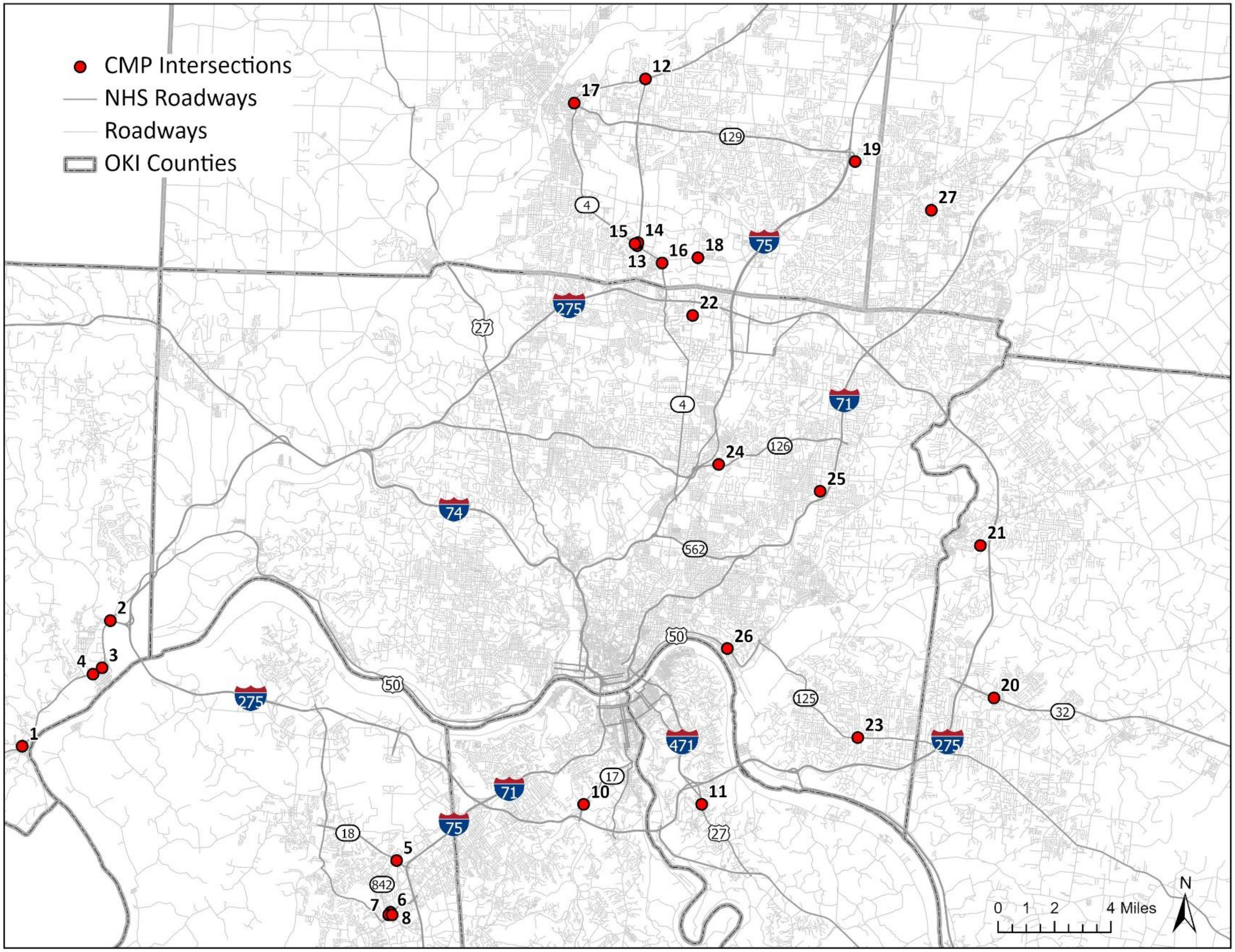
Over the last few years, some of the intersections have undergone redesigns to improve traffic flow. The most notable were OH-4 @ OH-4 Bypass in Butler County and US-42 @ KY-842 in Boone County, which were both redesigned to include a “jug handle” or bypass road, eliminating left turns at the main intersection of OH-4 @ OH-4 Bypass and US-42 @ KY-842. The redesign created a total of three intersections that make up the OH-4 @ OH-4 Bypass interchange (Diversion @ OH-4 Bypass, OH-4 @ Diversion) and US-42 @ KY-842 interchange (US-42 @ Quadrant Road and KY-842 @ Quadrant Road). Analysis indicated that after the redesign each intersection’s level-of-service improved to an A, B or C during both AM and PM peak periods.

Figure 5-32 Intersection Delay

Intersection	Map ID	County	7 - 9 AM						4 - 6 PM					
			2019[1]		2021[2]		2022[3]		2019[1]		2021[2]		2022[3]	
			Delay (s/veh)	Level of Service	Delay (s/veh)	Level of Service	Delay (s/veh)	Level of Service	Delay (s/veh)	Level of Service	Delay (s/veh)	Level of Service	Delay (s/veh)	Level of Service
US-50 @ IN-350	1	Dearborn	71.7	E	31.6	C	34.5	C	46.4	D	30.9	C	54.2	D
US-50 @ IN-1 (Belleview)	2	Dearborn	25.4	C	26.1	C	21.2	C	33.6	D	36.7	D	32.6	C
US-50 @ Arch St.	3	Dearborn	N/A		N/A		8.9	A	N/A		N/A		12.2	B
US-50 @ Front St.	4	Dearborn	N/A		N/A		10.0	B	N/A		N/A		17.4	B
KY-18 @ KY-842	5	Boone	34	C	33.3	C	34.4	C	50.5	D	50.9	D	52.3	D
US-42 @ KY-842	6	Boone	40.5	D	19.7	B	19.8	B	51.6	D	31.8	C	31.8	C
US-42 @ Quadrant Rd	7	Boone	N/A		17.3	B	17.8	B	N/A		23.8	C	25.1	C
KY-842 @ Quadrant Rd	8	Boone	N/A		19.1	B	19.4	B	N/A		28.3	C	43.5	D
US-25 @ KY-536	9	Boone	31	C	29.2	C	28.8	C	40.5	D	40.3	D	39	D
KY-17 @ KY-1072[4]	10	Kenton	32.7 26.6	C C	25.3	C	30.4	C	37.2	C	28	C	33.7	C
US-27 @ I-471 and Sunset Dr.	11	Campbell	23	C	22.5	C	22.1	C	32.8	D	30.5	C	33.6	D
OH-4 @ OH-4 Bypass (Northern Section)	12	Butler	N/A		N/A		28.1	C	N/A		N/A		30.7	C
OH-4 @ OH-4 Bypass (Southern Section)	13	Butler	6.3	A	14.2	B	16.3	B	12.1	A	18.1	B	20.3	B
Diversion @ OH-4 Bypass	14	Butler	10.2	A	9.5	A	10.0	A	12.1	A	12.4	A	12.1	A
OH-4 @ Diversion	15	Butler	14.3	B	12.0	A	14.5	B	13.5	B	11.9	A	13.1	A
OH-4 @ Muhlhauser Rd	16	Butler	24.5	C	22.6	B	22.6	B	34.8	C	30.2	C	29.1	C
OH-4 @ SR 129	17	Butler	43.6	D	38.9	C	39.9	D	48.5	D	47.8	D	46.8	D
OH-747 @ Muhlhauser Rd	18	Butler	41.5	D	37.0	C	36.5	C	49.9	D	44.1	D	45.3	D
Liberty Way @ Cox Rd.	19	Butler	N/A		N/A		25.7	C	N/A		N/A		36.2	C
OH-32 @ Glen Este-Withamsville	20	Clermont	38	C	37.5	C	38.1	C	44.1	D	43	D	41.5	D
US-50 @ SR-131	21	Clermont	29.8	C	35.9	C	27.6	C	30.3	C	43.4	D	31.6	C
OH-747 @ Kemper Rd	22	Hamilton	30.8	C	36.2	C	33.1	C	40.5	D	45.5	D	39	C
OH-125 (Beechmont Ave) @ Five Mile Rd	23	Hamilton	33.2	D	27.7	C	23.0	C	34.51	D	41.5	D	39.9	D
US-42 @ Galbraith Rd	24	Hamilton	36.8	C	32.5	C	31.6	C	41.2	D	36	C	35	C
US 22 @ Kenwood Rd	25	Hamilton	35.6	C	27.6	C	29.8	C	46.3	D	38.3	C	41.8	D
US 50 @ Delta Ave[5]	26	Hamilton	18	B	17.4	B	19.2	B	22.6 26	B C	21.6 24.7	B C	22.1 24.5	B C
Mason-Montgomery @ Tylersville Rd	27	Warren	54.2	D	49.0	D	51.0	D	100.5	F	62.8	E	65.7	E

1. Turning movement counts collected in Summer 2019.
2. Turning movement counts collected in Summer 2021.
3. Turning movement counts collected in Fall 2022.
4. AM Signal timing changes at 8:30 AM.
5. PM Signal timing changes at 4:30 PM.

Figure 5-33 Location of Regionally Significant Intersections



5.2.6 Peak Period Travel Times between Major Destinations

Travel times between major destinations within the OKI region are shown in Figure 5-34. The major destinations selected include the Greater Cincinnati/Northern Kentucky International Airport (CVG), downtown Cincinnati, Eastgate shopping area, Northern Kentucky University, University of Cincinnati, Xavier University, Kings Island and Sharonville Convention Center. PM peak travel times are shown because PM is typically more congested. The travel times are average weekday PM peak hour travel times for 2018 and 2021. Times are for a route on the shortest interstate highway path between destinations and only include travel to the section ending nearest the destination, therefore a small amount of additional travel time, not reflected here, may be necessary to reach the destination. In 2021, the average PM peak period travel time between major destinations was 20 minutes. This value was 21 minutes in the 2018. Travel times observed for 2018 are shown in parenthesis, with boxes shaded in red indicating increased travel times. Improved travel times are shaded in green.

Figure 5-34 PM Peak Period Observed Travel Times between Major Destinations (2018 and 2021)

From ▶ To ▼	CVG Airport	Downtown Cincinnati	Eastgate	Northern KY Univ.	Kings Island	Sharonville	Univ. of Cincinnati	Xavier Univ.
CVG Airport	X	17 (14)	25 (26)	18 (15)	41 (39)	33 (32)	21 (21)	23 (23)
Downtown Cincinnati	13 (16)	X	18 (21)	10 (11)	24 (24)	20 (18)	9 (11)	8 (9)
Eastgate	25 (29)	19 (19)	X	15 (17)	22 (22)	23 (25)	22 (25)	24 (28)
Northern KY Univ.	17 (17)	10 (8)	15 (19)	X	33 (32)	29 (30)	15 (16)	15 (20)
Kings Island	39 (39)	25 (23)	24 (24)	34 (36)	X	16 (12)	25 (24)	22 (18)
Sharonville	32 (33)	22 (23)	23 (26)	29 (32)	17 (14)	X	18 (17)	15 (13)
Univ. of Cincinnati	21 (26)	10 (12)	26 (28)	14 (18)	25 (25)	18 (18)	X	6 (5)
Xavier Univ.	21 (23)	7 (9)	24 (27)	16 (20)	22 (22)	16 (16)	6 (6)	X

Source: INRIX 2018 and 2021

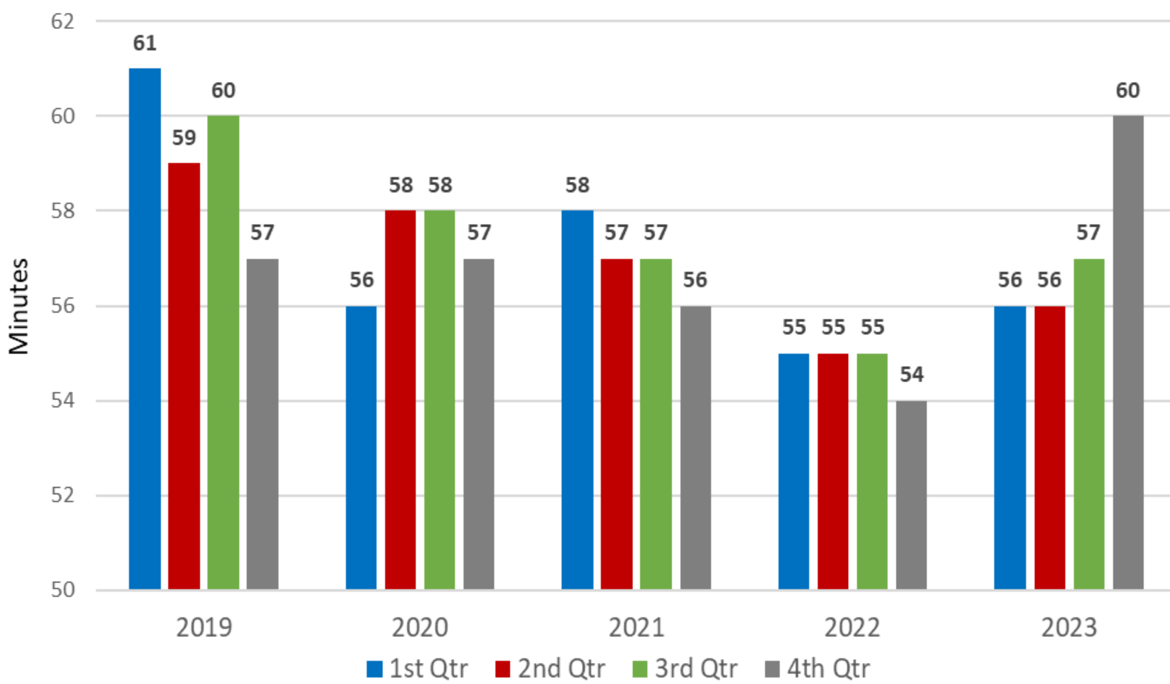
5.2.7 Incident Clearance Time

ODOT's Ohio Traffic Incident Management (OTIM), is the state's traffic incident management program comprised of ODOT, local and state law enforcement agencies, Fire, EMA, and towing and recovery services. Traffic incident management is the process of coordinating resources to detect, respond to, and clear traffic incidents as safely and quickly as possible to reduce the impacts of crashes and congestion.

Incident management consists of a planned and coordinated multi-disciplinary process to detect, respond to, and clear traffic incidents so that traffic flow may be restored as safely and quickly as possible. Effective incident management dramatically reduces the duration and impacts of traffic incidents. The ODOT Traffic Operations Control Center in Columbus monitors traffic with over 80 cameras in the OKI region and facilitates communication among law enforcement and emergency responders.

In 2023, ODOT logged over 43,000 traffic incidents in the OKI region, with an average incident clearance time of 57 minutes. That is two minutes less than the average incident clearance time for all of 2019 (59 minutes).

Figure 5-35 Trend in Incident Clearance Time (2019-2023)



Source: Ohio Traffic Incident Management

5.2.8 Impact on Freight

The OKI region is a major link in America's freight transportation network. More than 172 million tons of freight flowed into, out of and through the region in 2017, totaling more than $255 million in value. More than 45 percent of this freight is inbound, destined for major businesses in the region such as General Electric, AK Steel, Toyota, and Schwan Food Company. For these and hundreds of other businesses, transportation is their lifeblood. Fortunately, from an economic development standpoint, the OKI region provides a powerful nexus for truck, rail, barge, and air transportation. More than 67 percent of the region's freight tonnage and 74 percent of freight value moves by truck, so major highways and local roads are vital to regional commerce. Interstate 75, running north-south through the region, is one of the heaviest truck corridors in the United States. The remaining 33 percent of the region's freight tonnage is moved by rail, barge, air and pipeline. Much of the region's congested locations occur in areas that also have a high volume of freight traffic. These congestion impacts costs to shippers and ultimately, the consumer. There are critical links in the system that dramatically impact freight mobility. Most notable is the Brent Spence Bridge, which carries I-71/75 across the Ohio River. Freight traffic can now back up many miles because of congestion on the bridge, having negative effects on business, employment, and regional income.

Truck hours of delay is a measure of the regional accumulated time that trucks are delayed on regional roadways included in the National Freight Network. In 2021, average daily truck hours of peak hour excessive delay in the OKI region was 23,050 hours. Using a value of time of $20.17 an hour for non-commercial travel and $55.24 an hour for commercial travel (truck travel), the daily cost of peak hour delay was $1.7 million in wasted time in 2020.

In addition to the value of time, the delay cost of wasted fuel in the Cincinnati urban area for 2020 was estimated at $90,000 per day. Cost components from the 2021 Urban Mobility Report were used, including value of gasoline and diesel. This equates to nearly $33 Million per year in wasted fuel.

5.2.9 Additional Performance Measures Summary

OKI continues to incorporate several additional congestion management performance measures within the CMP to further assess congestion and identify areas for transportation improvement. Figure 5-35 provides a summary of the additional performance measures OKI have identified as important to understanding congestion and where congested areas are located in the region.

Figure 5-36 Summary of Additional Performance Measures

Additional Performance Measure	Year	Value
Average AM peak speed on limited-access roadway segments[1]	2021	63.54
Average PM peak speed on limited-access roadway segments[1]	2021	62.31
Average AM peak speed on arterial roadway segments[1]	2021	34.47
Average PM peak speed on arterial roadway segments[1]	2021	31.97
Average AM peak speed index of limited-access roadway segments[1]	2021	1.03
Average PM peak speed index of limited-access roadway segments[1]	2021	1.01
Average AM peak speed index of arterial roadway segments[1]	2021	0.86
Average PM peak speed index of arterial roadway segments[1]	2021	0.79
Percent of limited-access roadway segments with LOS A or B - Base Year 2020	2020	43.9%
Percent of arterial roadway segments with LOS A or B - Base Year 2020	2020	91.7%
Percent of limited-access roadway segments with LOS A or B - Future Year 2050	2050	40.4%
Percent of arterial roadway segments with LOS A or B - Future Year 2050	2050	90.1%
Average AM Peak Period Travel Time Index - NHS Network[1]	2021	1.07
Average PM Peak Period Travel Time Index - NHS Network[1]	2021	1.15
Average Intersection Level of Service AM	2022	C
Average Intersection Level of Service PM	2022	C
Average Intersection Delay AM	2022	25.71
Average Intersection Delay PM	2022	34.30

Additional Performance Measure	Year	Value
Average PM Peak Period Travel Time between Major Destinations (Minutes)[1]	2021	20
Average Incident Clearance Time (Minutes)[2]	2022	55
Cost of Delay (Daily Value of Wasted Time)[3]	2020	$1,745,205
Cost of Delay (Daily Value of Wasted Fuel)[3]	2020	$ 90,367
% Daily VMT Operating in Congestion[4]	2023	17.60%
1. Source: INRIX 2021		
2. ODOT Ohio Traffic Incident Management (OTIM)		
3. Texas A&M 2021 Urban Mobility Report		
4. OKI Activity-Based Model		

Chapter 6

Identification and Assessment of Potential CMP Strategies

Congestion management strategies can be divided into four categories.

6.1 Travel Demand Management (TDM)

Strategies can help to provide travelers with more options and reduce the number of vehicles or trips during the peak periods.

- **Congestion pricing** - Under congestion pricing, motorists pay for the use of certain roads and bridges. Motorists may face usage fee schedules ranging from peak-only fees to fees that vary by time of day, facility or level of use. Congestion pricing includes the use of high-occupancy toll (HOT) lanes where SOV motorists may pay a variable fee to use a high occupancy vehicle (HOV) lane.
- **Parking management** – Traveler information on availability of parking spaces, reduced parking fees for high-occupant vehicles or by time of day. The City can also consider the implementation of timed and paid parking along or near high congestion corridors as well as additional parking enforcement resources.
- **Carpools and Vanpools** – Ridesharing in carpools or vanpools reduce single-occupant vehicle (SOV) travel. A carpool generally involves from two to five people sharing a ride in their personal cars. Vans are typically leased through a van pool provider and can accommodate up to twelve people. Public and private parking operators can provide preferred or discounted parking for SOV alternatives.
- **Livability measures** – Development policies that support increased accessibility to bicycle, pedestrian and transit can reduce demand for travel by automobile. This is sometimes achieved through policies that encourage new transit-oriented designs or reinvestment in existing urban centers.
- **Incorporate bicycle facilities** – Optimizing use existing streets by incorporating bicycle facilities in the form of striped bike lanes, shared use paths, or side paths to facilitate road-sharing and encourage bicycle use. Expansion of bike-share programs also encourage bicycle use.
- **Employer Programs** – Work schedules influence commuter travel patterns. In designing work schedules, employers influence peak period travel volumes and employee inclination to use transit, carpools, and other SOV alternatives. Other employer strategies such as allowing flexible scheduling or telecommuting encourage their employees to reduce peak period travel or the amount of travel to and from the work site.
- **Freight efficiency** – Increasing intercity freight rail or port capacity to reduce truck use of highways.

6.2 Telecommuting

- **Telecommuting** – Also known as working from home (WFH), working remotely, or e-commuting—is a work arrangement in which the employee works outside the office. Often this means working from home or at a location close to home, such as libraries, or co-working spaces. Rather than traveling to the office, the employee "travels" via telecommunication links, keeping in touch with coworkers and employers via telephone, online chat programs, video meetings, and email. The worker may occasionally enter the office to attend meetings in-person and touch base with the employer.

6.3 Transportation System Management and Operations (TMSO) and Intelligent Transportation System (ITS)

TSMO is a new system and corridor approach to optimizing mobility.

- **Improved signalization** – Includes applying coordinated and/or adaptive signal systems as exemplified by closed loop and centralized systems. This may also include signal priority for transit vehicles. The benefits of improved signal systems are commonly measured by reductions in travel time, vehicle stops, delay, fuel consumption, and emissions, and increases in travel speed.
- **Expansion of traveler information systems** – Information on travel times and incidents provided in real-time to the traveler via dynamic message signs, a personal electronic device or telephone 511 system. ODOT currently operates dynamic message signs, information thru website or personal electronic device and a 511 system for a large portion of the region's interstate highway system.
- **Active traffic demand management** – An approach for dynamically managing and controlling traffic demand and available capacity of transportation facilities, based on prevailing conditions, using one or a combination of real-time and predictive operational strategies. When implemented together and alongside traditional travel demand management strategies, these operational strategies help to maximize the effectiveness and efficiency of the transportation facility and result in improved safety, trip reliability and throughput. Components of active traffic management may include speed harmonization, temporary shoulder use, queue warning, dynamic merge control, construction zone management, dynamic truck restrictions, dynamic rerouting and traveler information, dynamic lane markings or automated speed enforcement.
- **Ramp metering** - Metering is an effective way to improve traffic flow on interstates without adding additional lanes. The meter allows traffic to enter the freeway at a rate dependent on the conditions of the freeway traffic. Motorists may be delayed at the meter, but freeway speeds and overall travel times are improved.
- **Access management** – Access management controls the design and operation of driveway and street connections onto a highway. Control is achieved by public plans or policies aimed at preserving the functional integrity of the existing roadway system.
- **Improve intersection geometry** – This category may involve increasing the radius of corners to facilitate the movement of trucks and buses through an intersection. High volume locations may require a complete rebuilding of the intersection or interchange with new geometric solutions such as a continuous flow intersection (CFI) or a single-point urban interchange (SPUI).
- **Traffic calming** - Consists of physical design and other measures, including narrowed roads, speed humps, or removing travel lanes (road diet) put in place on roads for the

intention of slowing down or reducing motor-vehicle traffic as well as to improve safety for pedestrians and cyclists.

- **Traffic incident management** – Traffic incident management consists of a planned and coordinated multi-disciplinary process to detect, respond to, and clear traffic incidents so that traffic flow may be restored as safely and quickly as possible. Effective incident management reduces the duration and impacts of traffic incidents and improves the safety of motorists, crash victims and emergency responders. ODOT currently provides incident management for a large portion of the region's interstate highway system.
- **Intersection turn lanes** – The addition of new turn lanes can provide greater capacity for the intersection without modifying the basic geometry of the intersection. This category may also include restricting certain turning movements.
- **Eliminate at-grade rail crossings** – In a few areas of the region, at-grade rail crossings reduce traffic flow on major arterials. The separation of rail and roadway travel improves congestion and safety.
- **Work zone management** – Effective work zone management includes assessing work zone impacts and documenting strategies for mitigating the impacts in a transportation management plan (TPM).
- **Integrated corridor management –** The vision of integrated corridor management is that transportation networks will realize significant improvements in the efficient movement of people and goods through institutional collaboration and aggressive, proactive integration of existing infrastructure along major corridors. Through an ICM approach, transportation professionals manage the corridor as a multimodal system and make operational decisions to the benefit of the corridor as a whole.
- **Improved bicycle and pedestrian crossings -** Expanding and improving bicycle and pedestrian infrastructure means ensuring that a network of infrastructure is in place to make bicycling or walking viable modes of travel. It also means ensuring that the infrastructure is safe and comfortable to use.
- **Road weather management -** Road weather management strives to mitigate weather related impacts by implementing three types of strategies: advisory, control, and treatment. Advisory strategies involve predicting weather conditions and providing that information to transportation managers and travelers. Control strategies involve regulating or restricting traffic flow. Treatment strategies supply resources to roadways to reduce or eliminate weather impacts (e.g., providing snowplows and salt trucks).

6.4 Public Transportation Improvements

- **Expansion of transit service** – Congestion on a particular facility or corridor may be alleviated with the addition of new fixed-route bus service or expansion of existing service. This may also include extension of the streetcar (Cincinnati Bell Connector) service to Northern Kentucky, as identified in the OKI 2050 MTP.
- **New or expanded park-and-ride facilities or transit centers** – Park-and-ride facilities allow for transfers between SOV's to carpools, vanpools or transit service. Transit centers are facilities where transfers can be made between automobiles and buses, between bus routes, between bus routes and/or rail transit lines, or between different rail transit lines.

- **Bus Rapid Transit (BRT)** – BRT is an integrated system of transit measures that work together to significantly improve bus service. These measures include frequent service, a simplified route structure, limited stops, exclusive bus lanes, branding of vehicles and stop facilities, enhanced stops or stations, special vehicles, off-vehicle fare collection and real time passenger information.
- **Reserved bus travel lanes including bus-on-shoulder** – Travel lanes where only public transit buses are permitted provide the opportunity to avoid known traffic bottlenecks and increase the attractiveness of bus travel. Bus-on-shoulder refers to locations where public transit buses are permitted to use the shoulder of expressways when traffic slows.
- **Mobility on demand** – Mobility on demand is an innovative, user-focused approach which leverages emerging mobility services, integrated transit networks and operations, real-time data, connected travelers, and cooperative Intelligent Transportation Systems (ITS) to allow for a more traveler-centric, transportation system- of-systems approach, providing improved mobility options to all travelers and users of the system in an efficient and safe manner.

6.5 Highway Capacity Expansion

- **Additional travel lanes** – Deficient roadway capacity is a major contributor to congestion. Additional roadway capacity is needed in many areas to keep-up with increased travel demand.
- **Elimination of bottle necks** – Bottle necks occur where short sections of the roadway are of an insufficient width or number of lanes to accommodate the travel demand. Freeway interchange design deficiencies can also be considered a bottleneck.
- **Center turn lanes** – Center turn lanes provide an area where vehicles can move out of the thru lanes and pause while making a left-hand turn.

The OKI 2050 MTP and FY 2021-2024 TIP contain many of the congestion management strategies identified. A breakdown of MTP and TIP projects by strategy are provided in Figure 6-1.

Figure 6-1 OKI 2050 MTP Update and FY 2024-2027 TIP Projects by Primary Congestion Management Strategy

Primary CMP Strategy	Number of 2050 MTP Update and TIP Projects
Travel Demand Management	
Congestion pricing	0
Parking management	6
Carpools/Vanpools	2
Livability	0
Bicycle facilities	36
Employer programs	0
Freight efficiency	8
Telecommuting	

Primary CMP Strategy	Number of 2050 MTP Update and TIP Projects
Telecommuting	0
Transportation System Management and Operations and Intelligent Transportation System	
Improved signalization	39
Intersection/interchange geometry	68
Expansion of traveler information systems	3
Active traffic demand management	1
Ramp metering	2
Access management	29
Traffic calming	5
Traffic incident management	0
Intersection turn lanes	13
Eliminate at-grade rail crossings	6
Work zone management	0
Integrated corridor management	7
Improved bicycle and pedestrian crossings	84
Road weather management	0
Public Transportation Improvements	
Expansion of transit service	4
New or expanded park-n-ride or transit centers	15
Bus Rapid Transit (BRT)	1
Bus-on-shoulder	0
Mobility on demand	5
Highway Capacity Expansion	
Additional travel lanes	67
Elimination of bottle-necks	5
Center turn-lanes	21
None – no congestion strategy	677

6.6 OKI Travel Demand Model Results

OKI's Travel Demand Model, an Activity-Based Model (ABM) was used to evaluate the potential regional-level impact on congestion due to projects in OKI's 2050 Metropolitan Transportation Plan (MTP). The OKI ABM covers the combined planning areas of OKI and the Miami Valley Regional Planning Commission, however, only the OKI planning area output is used for this evaluation. The OKI ABM utilizes the Coordinated Travel – Regional Activity Based Modeling Platform (CT-RAMP) from Citilabs to simulate the travel pattern of all individual travelers in the region. The ABM estimates a schedule and itinerary of daily activities for members of every household in the region based on detailed information for individuals, households, trips, and highway and transit systems. Travel behavior modeling at fine spatial-temporal resolution improves the accuracy of travel pattern estimates and enables the model to evaluate conventional highway and transit projects as well as to test a variety of policies and scenarios.

Travel analysis zones are the basic geographic unit for estimating travel in the OKI model. The region is subdivided into 2408 traffic analysis zones to permit detail as well as manageability.

Figure 6-2 provides the percentage of vehicle miles of travel experiencing congested conditions for the following scenarios in the OKI 2050 MTP:

- **2020** – Existing transportation infrastructure, travel patterns, and OKI socio-economic characteristics.
- **2030 Existing Infrastructure plus Committed (EC)** – Existing transportation infrastructure, TIP FY 2024-2027 projects, and OKI 2030 socio-economic characteristics.
- **2030 Vision** – Existing transportation infrastructure, TIP FY 2024-2027 projects, OKI 2030 socio-economic characteristics, connected and autonomous vehicles (CAV) usage increases to 2.0%, vehicle occupancy increases by 5.0%, person trips generated declines by 5.0%.
- **2040 Plan** – Existing transportation infrastructure, TIP FY 2024-2027 projects, Plan projects through 2039, and OKI 2040 socio-economic characteristics.
- **2040 Vision** – Existing transportation infrastructure, TIP FY 2024-2027 projects, OKI 2040 socio-economic characteristics, connected and autonomous vehicles (CAV) usage increases to 12%, vehicle occupancy increases by 25%, person trips generated declines by 15%.
- **2050 Plan** – Existing transportation infrastructure, TIP FY 2024-2027 projects, all Plan projects, and OKI 2050 socio-economic characteristics.
- **2050 Vision** – Existing transportation infrastructure, TIP FY 2024-2027 projects, all Plan projects, OKI 2050 socio-economic characteristics, connected and autonomous vehicles (CAV) usage increases to 31%, vehicle occupancy increases by 40%, person trips generated declines by 20%.

Projects in the OKI 2050 Plan Update and 2050 Vision are forecasted to have a positive impact on congestion.

Figure 6-2 Percent of Vehicle Miles Traveled Experiencing Congestion in the OKI 2050 MTP (OKI ABM)

Scenario	Total Daily VMT	Congested VMT	Percent Congested
2020 Base	51,040,186	8,844,010	17.33%
2030 EC	53,271,375	9,508,279	17.85%
2030 Vision	48,386,861	7,631,738	15.77%
2040 Plan	54,770,193	9,830,588	17.95%
2040 Vision	37,601,146	4,713,943	12.54%
2050 Plan	56,172,263	10,187,865	18.14%
2050 Vision	32,082,058	3,367,726	10.50%

6.7 Project-Level Evaluation

Eight projects were recently evaluated for their potential to reduce VMT and vehicle delay (Figure 6-3). All of the projects evaluated are eligible for federal funding through the Congestion Mitigation and Air Quality (CMAQ) program. A sketch-planning methodology developed for the Ohio Statewide Urban CMAQ Committee was utilized for this analysis. The methodology compares build and no-build delay per vehicle and multiplies the delay savings by traffic volume. All of these projects have been programmed for implementation in OKI's FY2021-24 TIP.

Figure 6-3 Congestion Reduction Potential of CMAQ Projects

PID	CMAQ Project Name	CMP Strategy	Annual Hours of Delay Reduction	Analysis Year
112173	BCRTA Oxford Multimodal Transportation Facility	New or expanded park-n-ride or transit centers	1,800,000	2024
115277	Cincinnati OTR Signals	Improved signalization	221,023	2024
114042	New Richmond Roundabouts	Traffic calming	16,445	2024
111491	Cincinnati Wasson Way	Improved bicycle and pedestrian crossings	211,000	2024
114214	Sharonville US 42 path	Bicycle facilities	281,000	2024
115942	North College Hill Transit Center	New or expanded park-n-ride or transit centers	12,410,000	2025
117016	Glenwood Gardens to Winton Woods Shared-Use Trail	Improved bicycle and pedestrian crossings	360,000	2025
117001	Oxford Area Trail-Phase 5	Improved bicycle and pedestrian crossings	50,000	2025

Chapter 7

Summary of Existing Conditions and Performance Measures

7.1 Summary: Existing Conditions

Congestion is the level at which transportation system performance is no longer acceptable due to traffic interference. The level of acceptable system performance will vary by type of transportation facility, location within the region and time of day. The level of acceptable system performance depends upon transportation and development goals for the region and reflects public perception of traffic interference.

This report has identified and employed specific measures to determine where congestion is most prevalent throughout the OKI region. These measures were combined to create a congestion index to help identify the most congested corridors and road segments in 2021. The measures included:

- Travel Time Reliability 2021 (AM, PM, Midday, Weekend)
    - Scoring Index: 0 – 1 = **1**, 1 – 1.5 = **2**, 1.5 – 2 = **3**, >2 = **4**
- Truck Travel Time Reliability 2021 (AM, Midday, PM, Weekend, Overnight)
    - Scoring Index: 0 – 1 = **1**, 1 – 1.5 = **2**, 1.5 – 2 = **3**, >2 = **4**
- Travel Time Index 2021 (AM, PM, Overnight, All Hours)
    - Scoring Index: 0 – 1 = **1**, 1 – 1.5 = **2**, 1.5 – 2 = **3**, >2 = **4**
- Peak Hours of Excessive Delay Per Capita 2021
    - Scoring Index: >1 – 1000 = **1**, 1000 – 10000 = **2**, 10000 – 20000 = **3**, 20000 – 50000 = **4**, >50000 = **5**
- Roadway Level of Service 2020
    - Scoring Index: A = **1**, B = **2**, C = **3**, D = **4**, E = **5**, F = **6**

Using the congestion index several individual interstate and non-interstate roadways and corridors stand out as being very congested during 2021. Of the top 20 most congested NHS corridors 13 were located in Ohio and all were interstates, including the Brent Spence Bridge.

Of the 15 most congested interstate segments 11 were located in Ohio and all but two were located on I-75. Of the 14 most congested non-interstate segments 10 were located in Ohio and all but three were located on a US or state route.

Figure 7-1 Most Congested NHS Corridors (2021)

Corridor	State	Miles	Roadway	From	To	Congestion Score
KENTUCKY CORRIDOR # 2.1a	KY	11.76	I-71/75	Ohio State Line	I-275	41
OHIO CORRIDOR # 3.1c	OH	18.5	I-75	OH-562	I-275	39
OHIO CORRIDOR # 6.1b	OH	17.31	I-71	OH-562	I-275	37
KENTUCKY CORRIDOR # 2.1b	KY	11.17	I-71/75	I-275	US-42	36
OHIO CORRIDOR # 3.1b	OH	6.74	I-75	I-74	OH-562	36
KENTUCKY CORRIDOR # 2.6	KY	0.53	Brent Spence Bridge	Kentucky Line	Ohio Line	35
OHIO CORRIDOR # 3.1a	OH	9.14	I-75	Ohio River	I-74	34
OHIO CORRIDOR # 6.1a	OH	16.52	I-71	I-75	OH-562	33
OHIO CORRIDOR # 3.1d	OH	29.68	I-75	I-275	OH-122/Warren County Line	32
OHIO CORRIDOR # 4.1a	OH	13.15	I-74	Indiana Line	I-275	32
KENTUCKY CORRIDOR # 7.1c	KY	3.55	I-275	I-471	Ohio Line	32
KENTUCKY CORRIDOR # 2.1c	KY	13.41	I-71/75	US-42	I-71/75 Split	31
OHIO CORRIDOR # 4.1b	OH	19.69	I-74	I-275	I-75	31
OHIO CORRIDOR # 5.1a	OH	10.44	I-275	I-275/74	OH-126	31
OHIO CORRIDOR # 6.1c	OH	50.12	I-71	I-275	Clinton County Line	31
KENTUCKY CORRIDOR # 7.1b	KY	16.21	I-275	I-71/75	I-471	31
OHIO CORRIDOR # 8.1a	OH	29.86	I-275	I-71	OH-32	31
KENTUCKY CORRIDOR # 11.2	KY	11.69	I-471	US-27	I-71	31
OHIO CORRIDOR # 5.1b	OH	25.99	I-275	OH-126	I-75	30
OHIO CORRIDOR # 8.1b	OH	19.3	I-275	OH-32	Ohio River	30

Figure 7-2 Most Congested NHS Corridors (2021)

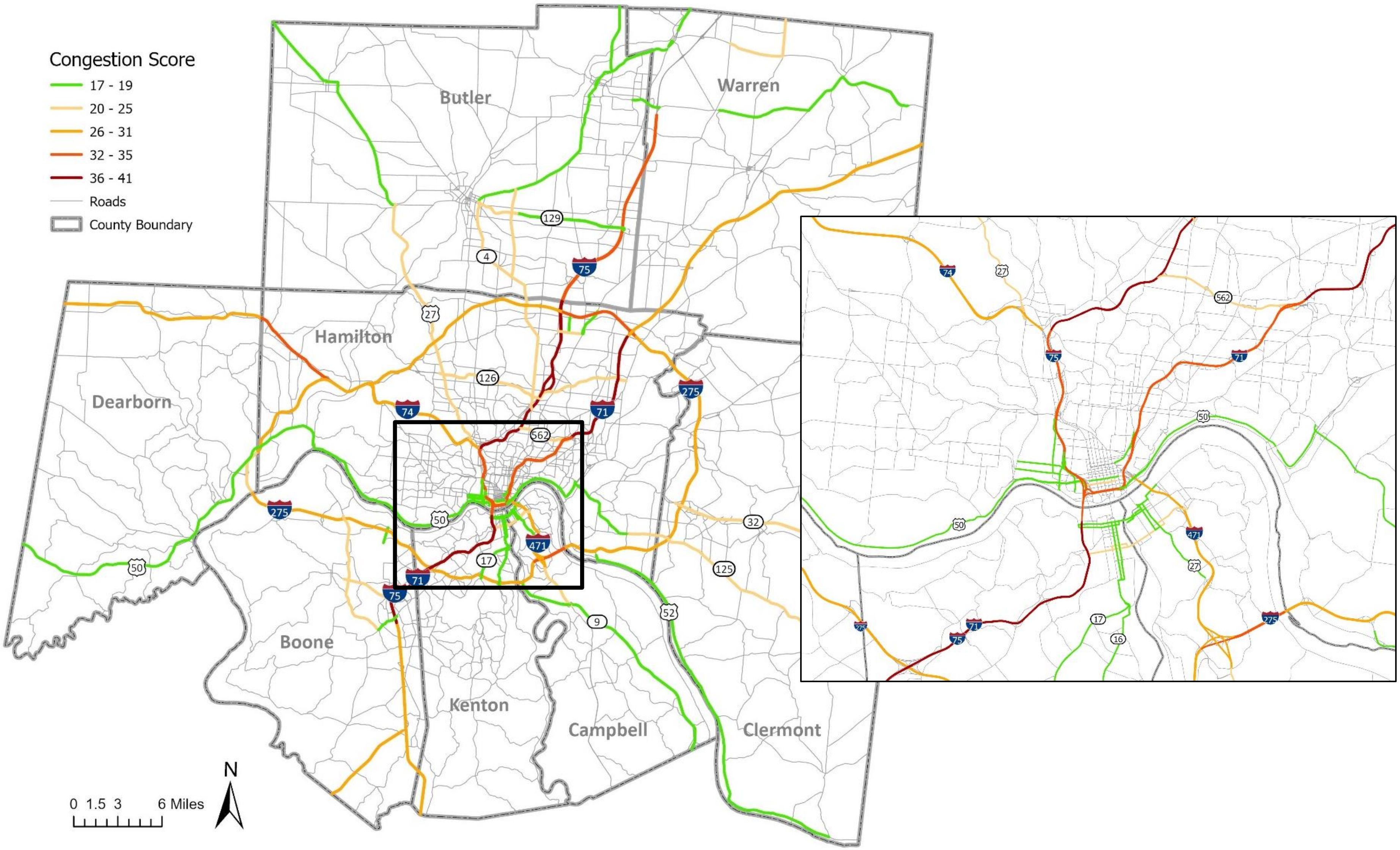


Figure 7-3 Most Congested Interstate Segments (2021)

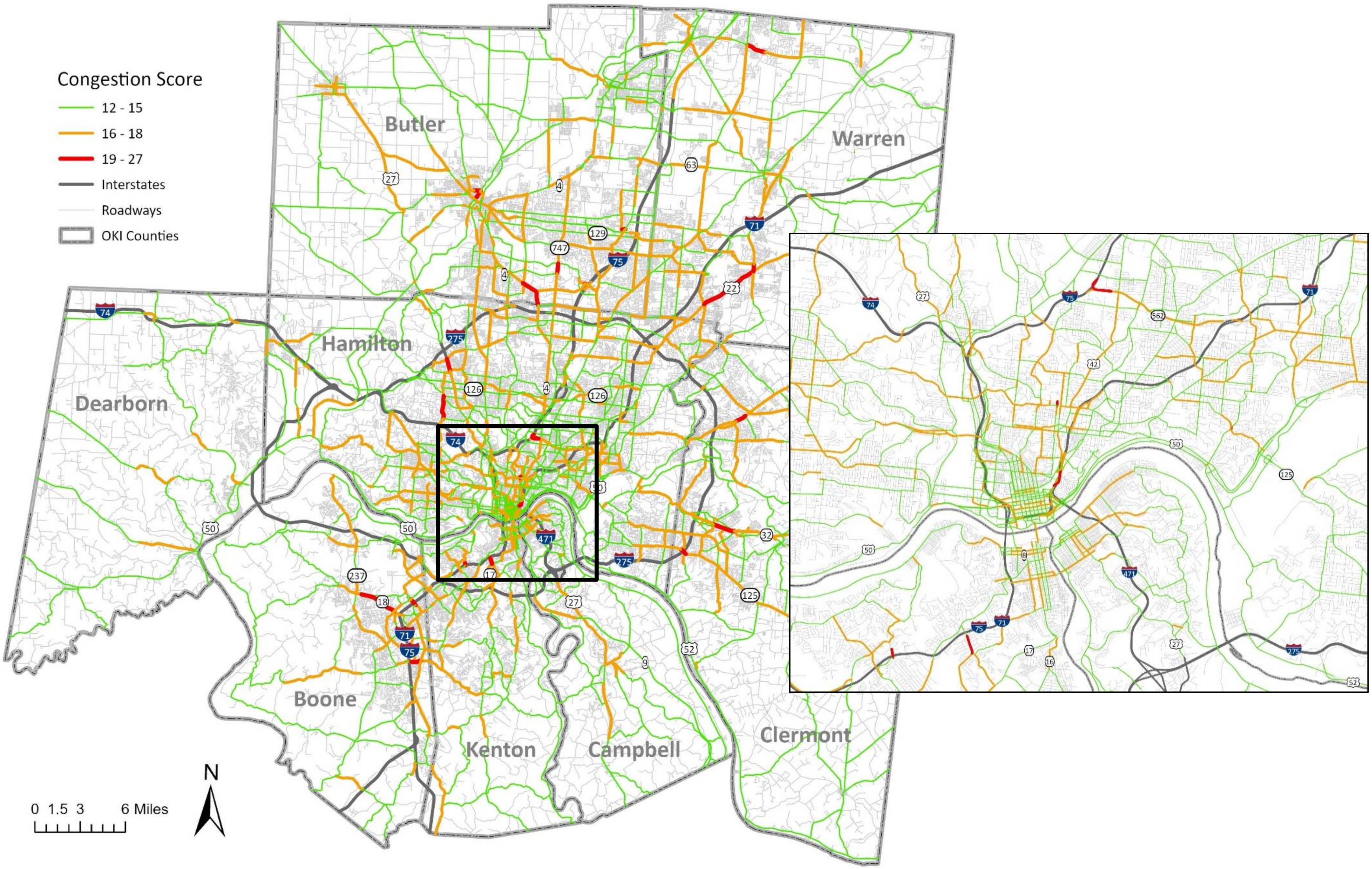
Road Type	State	Direction	From	To	Congestion Score
I 75	OH	SB	Lock St.	E. Galbraith Rd.	47
I 75	OH	SB	E. Galbraith Rd.	OH-126	45
I 75	OH	SB	Eggerding Dr.	Wyoming Ave.	44
I 75	OH	SB	Cross St.	Lock St.	44
I 75	KY	NB/SB	W. 3rd St.	Scenic Dr.	42
I 75	KY	NB/SB	Scenic Dr.	St. James Ave.	42
I 71/75	KY	NB/SB	Ashton Rd.	Crescent Springs Pike	41
I 75	OH	NB/SB	Shepherd Ln.	Smalley Rd.	41
I 71	OH	NB/SB	OH-126	E. Galbraith Rd.	41
I 75	OH	NB/SB	Towne St.	OH-562	41
I 75	OH	NB/SB	Towanda Ter.	Murray Rd.	40
I 75	OH	NB/SB	Wabash Ave.	Shepherd Ln.	40
I 75	OH	NB	Cooper St.	Eggerding Dr.	40
I 71	OH	NB/SB	Red Bank Rd.	Ridge Ave.	40
I 75	KY	NB/SB	E. Orchard Rd.	Grandview Dr.	40

Figure 7-4 Most Congested Non-Interstate Segments (2021)

Road Type	State	Direction	From	To	Congestion Score
B St	OH	NB/SB	Main St.	Black St.	30
Norwood Lateral	OH	WB	Paddock Rd.	I-75	26
Burlington Pike	KY	EB/WB	Houston Rd.	Greenview Rd.	25
Dixie Hwy	OH	NB/SB	Muhlhauser Rd.	OH-4 Bypass	25
Burlington Pike	KY	EB/WB	Aero Pkwy.	Limaburg Rd.	25
Highland Ave	OH	NB/SB	MLK	UC Campus	24
SR 32	OH	EB/WB	Batavia Pike	Glen Este Withamsville Rd.	24
SR 73	OH	EB/WB	Red Lion 5 Points Rd.	S. Main St.	24
Colerain Ave	OH	NB/SB	Compton Rd.	Springdale Rd.	24
SR 562	OH	EB	Paddock Rd.	I-75	24
Union Centre Blvd	OH	EB	Muhlhauser Rd.	I-75	22
Mt Zion Rd	KY	WB	Sam Neace Dr.	I-71	22
US 22	OH	NB/SB	Kings Mills Rd.	OH-48	22
Kyles Ln	KY	NB/SB	Highland Pike	I-71/75	22

Figure 7-5 Most Congested Road Segments – Interstates (2021)

Figure 7-6 Most Congested Road Segments – Non-Interstate Roadways (2021)



Chapter 8

Integration of CMP into Transportation Planning Process and Implementing Strategies

The CMP has been integrated into OKI's transportation planning process. OKI has developed a scoring system intended to assist selection of worthy capacity related highway and transit projects for the OKI 2050 MTP. Public input and the OKI Board of Directors determine the final recommended list of projects. A similar, but distinct and more rigorous scoring system, has been developed for the TIP. The level of congestion is an important criterion in the roadway project scoring. The scoring system was originally adopted by the OKI Intermodal Coordinating Committee and Board of Trustees in 2000 to evaluate Transportation Improvement Program (TIP) and ODOT Transportation Review Advisory Committee (TRAC) projects. Since that time, the scoring system has been modified to fit the nature of the OKI 2050 MTP Update and FY 2024-2027 TIP. The latest modification incorporated regional performance measures. The process makes best use of available data and emphasizes the use of a performance-based planning approach. It provides a systematic methodology to ranking the numerous projects that need to be evaluated in the development of a financially constrained metropolitan transportation plan and TIP. Routine maintenance projects are not included since they are of high importance and are assumed to be part of the Plan.

A numeric ranking for each project is determined for a relative comparison with other projects. The scoring system consists of scoring criteria to accommodate each mode (roadway, transit, bicycle/pedestrian, or freight) and a set of criteria that applies to all projects.

NPMRDS and INRIX data are used to assist in scoring congestion for roadway projects. Level of Travel Time Reliability (LOTTR) values for all roadway projects and Level of Truck Travel Time Reliability (LOTTTR) values for freight projects are utilized to determine their impact on congestion. All projects under consideration are located on a regional map given points corresponding to the congestion category.

During the development of the 2050 MTP Update, it is recognized that an increase in highway capacity is not always the most appropriate or preferred solution for a congestion problem. Travel demand management strategies, Telecommuting, Transportation Systems Management and Operations (TSMO) and ITS technologies and expanded public transportation are also considered.

The CMP is further integrated into the transportation planning process by utilizing the observed speeds, collected as part of the CMP, in the validation and calibration of OKI's Activity-Based Model.

Figure 8-1 lists transportation projects and studies planned or underway along the roadway sections identified as having the most congestion, as discussed in Chapter 9. The projects listed are either committed projects or studies in OKI's FY 2024-2027 TIP or recommended as part of the OKI 2050 MTP Update.

Figure 8-1 Transportation Projects Planned for Most Congested Corridors[1]

County	Facility	TIP ID # or MTP	Location	Description	CPM Strategy
Boone	I-75	2050 MTP	US-42	Complete an Interchange Modification Study and reconstruct the interchange as recommended. Includes a dedicated bicycle and pedestrian facility across the interchange.	Mobility - Intersection improvements
Boone	KY 18	2050 MTP	KY-237 to I-71/75	Convert to Super Street. Includes MUP from KY-237 to Aero Pkwy and Limaburg intersection improvements.	Environment - Access management
Butler	OH-4	2050 MTP	Seward Rd Intersection	Intersection improvement at OH-4 and Seward Rd.	Safety - Interchange improvements
Campbell	I-471	2050 MTP	US-27 to Ohio State Line	Reduce congestion along the I-471 corridor.	Mobility - Additional travel lanes
Campbell	I-471	2050 MTP	I-275 to Ohio River	TSMO Corridor 7 Smart Lane - Install/improve fiber, DMS, minor shoulder pavement, cameras, poles, ramp metering, hard shoulder running, and power along 5.6-mile corridor.	Mobility - Additional travel lanes
Hamilton	I-275	2050 MTP	Bifurcated section of I-275 (southeastern Hamilton County). US-52 to Five Mile Rd.	Widen from 4 to 6 lanes to improve capacity.	Mobility - Additional travel lanes
Hamilton	I-75	TIP 117167	Galbraith Road to Shepard Lane	Add a fourth lane, construct C-D for Galbraith/Anthony Wayne and SB I-75 to WB SR-126 ramp and unify both directions of I-75 onto existing SB alignment.	Mobility - Additional travel lanes
Hamilton	I-75	2050 MTP	OH-562 to SR-126	Widening and associated improvements.	Mobility - Additional travel lanes
Hamilton	I-74	2050 MTP	I-74 and Dry Fork Interchange	Improve interchange to address congestion issues and future development.	Mobility - Intersection improvements
Hamilton	I-71	2050 MTP	McMillan Ave. to I-275	TSMO Corridor 9 Smart Lane - Install hard shoulder running (HSR) smart lane with fiber, DMS, cameras, poles, and power.	Mobility - Additional travel lanes

County	Facility	TIP ID # or MTP	Location	Description	CPM Strategy
Hamilton	US-27	2050 MTP	Struble Rd. to Blue Rock Rd.	TSMO Corridor 8 Smart Corridor - Interconnected and adaptive signal upgrade.	Mobility - ITS
Hamilton	I-75	TIP 77889	Begin south of OH-562 interchange and at the OH-126 interchange, 7.85 to 10.30	Phase 8 of the Mill Creek Expressway Project. Project will widen for additional through lanes, rehabilitate existing pavement and bridges. Reconstruct SR-562 interchange, remove the Towne Ave. interchange.	Mobility - Additional travel lanes
Hamilton	I-71	TIP 89077	Part of the Brent Spence Bridge project	Ohio's share of design and construction of the new Ohio River Bridge	Mobility - Additional travel lanes
Hamilton	I-75	TIP 88133	Northbound between Galbraith Rd and Shepherd Ln.	Phase 6 of the Thru the Valley Project--add 4th lane and auxiliary lane (includes part of Phase 7)	Mobility - Additional travel lanes
Hamilton	I-75	TIP 88132	Southbound between Galbraith Rd and Shepherd Ln.	Phase 5 of the Thru the Valley Project-add 4th lane (includes part of Phase 7)	Mobility - Additional travel lanes
Hamilton	I-75	TIP 114161	Findlay Street to just south of Marshall Avenue	Reconstruction of the northern section of the Brent Spence Bridge on I-75, including the construction of new interchange on I-75 connecting the new Western Hills Viaduct.	Mobility - Additional travel lanes
Hamilton	I-75	TIP 117526	From OH-562 to OH-126/Galbraith Rd.	Phase 8B of the Mill Creek Expressway Project. Project will construct a new Pump Station and Combined Sewer Overflow for the widening of I-75	Mobility - Additional travel lanes
Hamilton	I-75	TIP 117525	From Regina Graeter Way to OH-126/Galbraith Rd. area.	Phase 8C of the Mill Creek Expressway Project. Project will widen for additional through lanes, rehabilitate existing pavement and bridges. Complete minor improvements to the Paddock Road interchange.	Mobility - Additional travel lanes
Hamilton/ Butler	I-75 & I-275	2050 MTP	I-75 and I-275 Interchange and I-75 north to Union Centre Boulevard	Construction of a flyover ramp from SB I-75 to EB I-275 to eliminate weaving movements at the interchange, and addition of an additional NB auxiliary lane from I-75 to Union Centre Boulevard to increase capacity.	Mobility - Intersection improvements

County	Facility	TIP ID # or MTP	Location	Description	CPM Strategy
Hamilton/ Clermont	I-275	TIP 115417	US-42 to OH-28	Capacity improvements to the I-71 and I-275 interchange, addition of a smart lane (hard shoulder running) in both directions of I-275 with variable speed limits to increase capacity.	Mobility - Additional travel lanes
Kenton	I-275	2050 MTP	I-71/75 to Combs-Hehl Bridge	TSMO Corridor 6 Smart Lane - Install/improve fiber, DMS, minor shoulder pavement, cameras, poles, ramp metering, hard shoulder running, power along 10-mile corridor.	Mobility - Additional travel lanes
Kenton	I-71/75	2050 MTP	Ohio River to I-275	TSMO Corridor 5 Smart Lane - Install/improve fiber, DMS, minor shoulder pavement, cameras, poles, ramp metering, hard shoulder running, power along 7-mile corridor.	Mobility - Additional travel lanes
Warren	I-71	2050 MTP	I-275 to US-48	TSMO Corridor 10 Smart Lane - Implement smart lane westbound I-275 from Loveland-Madeira to Reed Hartman Highway.	Mobility - Additional travel lanes

1. Reference Figures 7-1 through 7-6.

8.1 Maintenance and Update Cycle

Acquisition of travel time data from NPMRDS continues on an ongoing basis. Regional congestion information on travel delay, travel reliability and incident clearance times are updated quarterly and provided through OKI's Performance Management website. Intersection turning movement counts are taken periodically, with all regionally significant intersections counted a minimum of once during the four-year update cycle. This documentation of CMP findings and analysis is scheduled on a four-year cycle so as to provide timely information for the OKI Regional Transportation Plan. The most recent update to OKI's Metropolitan Transportation Plan began in May 2023 and was adopted by OKI's Board of Trustees in June 2024.

Chapter 9
Appendix

Complete peak period travel time reliability data for all TMC's on the NHS network within the OKI region can be found in Appendix A.

Appendix A Travel Time Reliability by TMC

Complete peak period truck travel time reliability data for all TMC's on the interstates within the OKI region can be found in Appendix B.

Appendix B Truck Travel Time Reliability by TMC

Complete peak hour excessive delay per capita data for all TMC's on the NHS network within the OKI region can be found in Appendix C.

Appendix C PHED by TMC

Complete peak period travel time data for all TMC's on the NHS network and selected non-NHS roadways within the OKI region can be found in Appendix D.

Appendix D Travel Time by TMC

Complete congestion score index for roadway segments within the OKI region can be found in Appendix E.

Appendix E Congestion Score by Roadway Segment