2050 Metropolitan Transportation Plan

TECHNICAL REPORT #2

State of Current System

December 2023

Prepared by:

NEEL-SCHAFFER

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1.0 Introduction

The 2050 Metropolitan Transportation Plan (MTP) is the long-range transportation plan for the Clarksville Metropolitan Planning Area (MPA) and replaces the 2045 MTP.

The 2050 MTP sets a regional vision and course of action for addressing the transportation needs of the Clarksville MPA over the next twenty-seven years.

1.1 Metropolitan Planning Organization Purpose and Primary Function

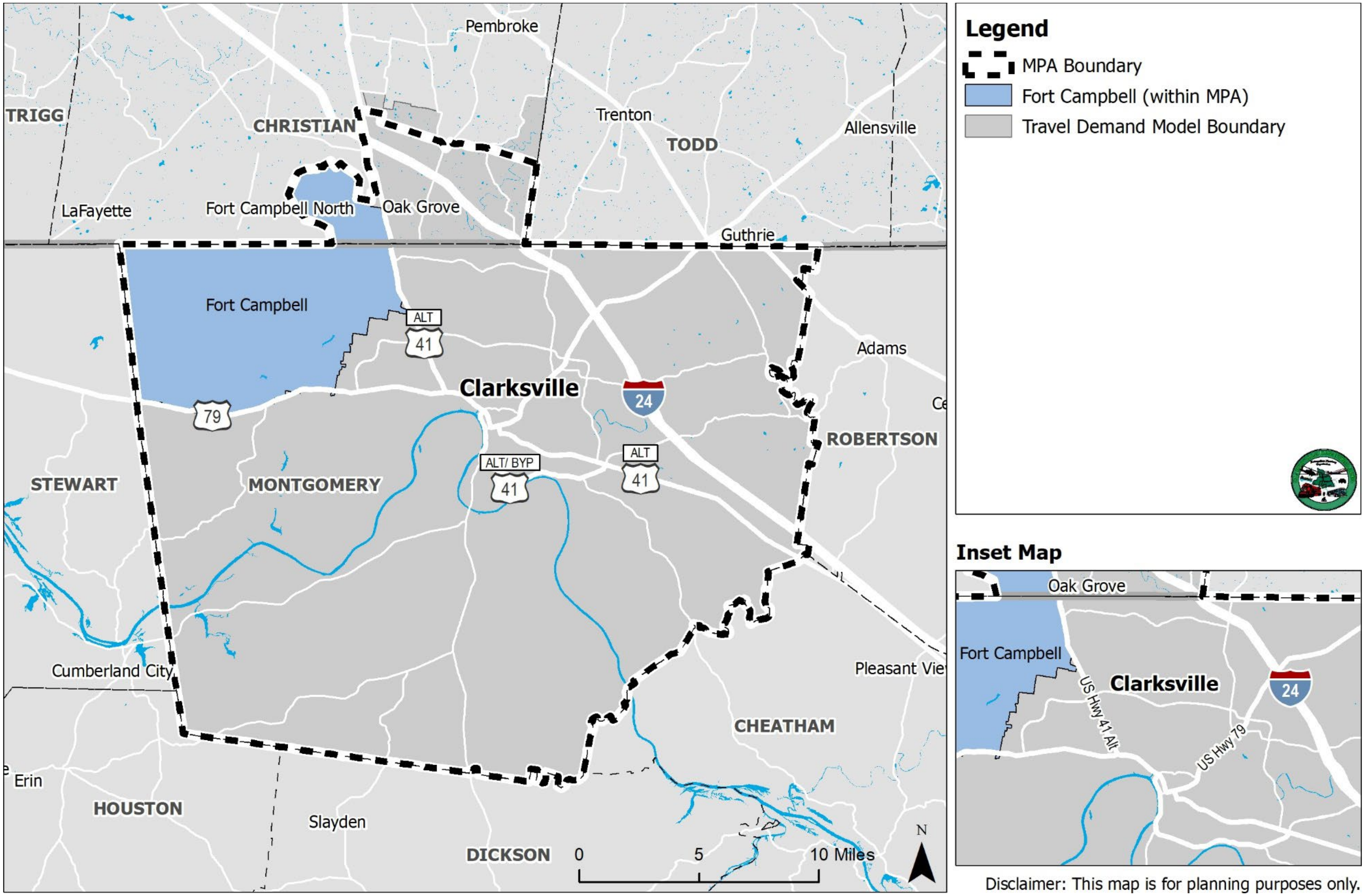
A Metropolitan Planning Organization (MPO) is a federally mandated transportation policy-making body that is made up of representatives from local governments and transportation agencies who have authority and responsibility within an MPA.

With the passage of the Federal-Aid Highway Act of 1962, Congress made metropolitan transportation planning a condition for the receipt of federal funds for transportation projects in urban areas with a population of 50,000 or greater. That legislation, and those that have followed, encouraged a continuing, cooperative, and comprehensive (3-C) transportation planning process. This 3-C process is conducted between MPOs, states, and public transit providers in these urban areas.

The Clarksville Urbanized Area MPO (CUAMPO) provides the 3-C approach to transportation planning for the Clarksville MPA, with exception to Fort Campbell which is responsible for its own planning. Since the MPO's creation, the City of Clarksville has become the fifth (5th) largest city in Tennessee. The region is also home to Fort Campbell and Austin-Peay State University. Beyond being an MPO – Clarksville is a Transportation Management Area due to the area's population exceeding 200,000 people.

The MPA, shown in **Figure 1.1**, encompasses almost the entirety of the Travel Demand Model area, as well as Fort Campbell in both Tennessee and Kentucky. Due to Fort Campbell having responsibility for its own planning, it has been excluded from the Travel Demand Model area. However, the installation's impact on travel and roadway needs are considered by including the travel at the access gates as external stations. For security reasons, socioeconomic, roadway, land use, and travel data for Fort Campbell are not included in the MTP tables and figures.

Figure 1.1: Metropolitan Planning Area



Performance-Based Planning Approach

Performance based planning and programming (PBPP) is the application of performance management to the long-range planning and programming process. PBPP uses data-derived indicators about the current and desired transportation system and use them to determine how best to analyze and allocate limited funds. The indicators are also used to evaluate program outcomes.

Key participants within the planning process include:

- City of Clarksville, Tennessee
- Montgomery County, Tennessee
- Oak Grove, Kentucky
- Christian County Kentucky
- City of Hopkinsville, Kentucky
- Public Transportation Providers
- TDOT
- KYTC
- The Federal Highway Administration (FHWA)
- The Federal Transit Administration (FTA)
- Other Stakeholders

Organizational Structure and Committees

Two (2) bodies shape the decision-making process of the MPO. The first is the Executive Board (EB), which is the MPO's official decision-making body and policy board. The second is the Technical Coordinating Committee (TCC), which provides recommendations to the EB.

The Executive Board

The EB reviews the recommendations from the TCC and makes final decisions regarding all documents and products produced by the MPO. These items include, but are not limited to:

- the Unified Planning Work Program (UPWP),
- MTP,
- Participation Plan (PP), and
- the TIP.

Technical Coordinating Committee

The TCC serves as an advisory committee that makes recommendations to the EB regarding the documents and products produced by the MPO. The committee is a group of transportation professionals comprised of:

- engineers;
- transportation and land use planners from federal, state, and local agencies; and
- representatives for transit, air, bicycle/pedestrian, and rail travel.

Information about the composition and members serving on the EB and the TCC can be obtained at www.cuampo.com.

CUAMPO Staff

The CUAMPO staff is housed at the Clarksville-Montgomery County Regional Planning Commission and are responsible for the MPO's planning and administrative functions. The staff also serve as a bridge of communication between the:

- MPO's Committees
- KYTC,
- TDOT,
- Federal Partners
- Local Governments, and
- Other Groups and Members of the General Public

1.2 The Metropolitan Transportation Plan

Beginning with the 1962 Federal-Aid Highway Act, federal legislation has required MTPs for urban areas with a population of at least 50,000 as a condition for receipt of surface transportation funds.

According to the FHWA's website at https://www.fhwa.dot.gov/planning/processes/metropolitan/

"Metropolitan transportation planning is the process of examining travel and transportation issues and needs in metropolitan areas. It includes a demographic analysis of the community in question, as well as an examination of travel patterns and trends. The planning process includes an analysis of alternatives to meet projected future demands, and for providing a safe and efficient transportation system that meets mobility while not creating adverse impacts to the environment."

The primary purpose of metropolitan transportation planning is to ensure that transportation planning in urbanized areas is carried out through a 3-C planning process, which ensures that transportation planning is:

- based on the most current information,
- reflects regional needs and priorities that are consistent with those of the state,
- considers all modes of transportation, and
- consistent with other planning efforts.

MTP adoption is the first step towards the implementation of any transportation project using federal funds. It is also required for any regionally significant transportation project, regardless of funding source. Following the formal adoption of the plan, a project can be programmed in the TIP for design, right-of-way acquisition, or construction. The TIP is used to identify funding sources, fiscal year(s) of implementation, and the estimated amount of funding to be used.

Federal Requirements

Federal law requires every MPO to prepare and update a transportation plan for its MPA. Additionally, the MTP must provide for consideration and implementation of projects, strategies, and services that will address the following ten (10) planning factors:

1. Support the economic vitality of the metropolitan area, especially by enabling global competitiveness, productivity, and efficiency.
2. Increase the safety of the transportation system for motorized and non-motorized users.
3. Increase the security of the transportation system for motorized and non-motorized users.
4. Increase accessibility and mobility of people and freight.
5. Protect and enhance the environment, promote energy conservation, improve the quality of life, and promote consistency between transportation improvements and state and local planned growth and economic development patterns.
6. Enhance the integration and connectivity of the transportation system, across and between modes, for people and freight.
7. Promote efficient system management and operation.
8. Emphasize the preservation of the existing transportation system.
9. Improve the resiliency and reliability of the transportation system and reduce or mitigate stormwater impacts of surface transportation; and
10. Enhance travel and tourism.

Transportation Management Areas and the Congestion Management Process

Urbanized areas with populations greater than 200,000 persons typically have more complex transportation systems, and associated challenges, than smaller regions. These larger areas are designated as Transportation Management Areas (TMA) and have additional planning responsibilities.

The major MTP-related requirement for TMAs is the development of a Congestion Management Process (CMP), which is intended to address congestion through a process that provides effective transportation system management and operations. A CMP is also based on cooperatively developed travel demand reduction and operational management strategies. The CMP establishes a systematic method to identify and evaluate transportation improvement strategies, including operations and capital projects.

Projects and strategies from the CMP should be considered for inclusion in the MTP and subsequently, the TIP. The Clarksville Urbanized Area has only recently met the population threshold and was recently designated as a TMA. The CUAMPO and its partner agencies will need to develop a CMP by December 5, 2024.

Air Quality Attainment

Areas exceeding air quality standards for transportation-related pollutants are designated as either an air quality nonattainment area or maintenance area. If an MPO includes nonattainment or maintenance areas, it must ensure that it's MTP, TIP, and federally funded projects conform to the purpose of the state's air quality plan, known as the State Implementation Plan (SIP). Areas designated as air quality nonattainment areas must also update their plans every four (4) years, as opposed to every five (5) years.

Even though Montgomery and Christian counties are in attainment for air quality standards, the U.S. Environmental Protection Agency, (EPA), periodically updates their quality standards. In the future, the MPO could become a non-attainment area if standards are made more stringent or pollution becomes worse in the region. In particular, the CUAMPO must monitor 8-hour Ozone and PM 2.5. In 2015, the Clarksville MPO did not have to demonstrate conformity for the 2008 8-hour ozone standard due to the revocation of the 1997 8-hour ozone standard by EPA. However, this was vacated by the South Coast II Decision on Feb. 16, 2018, via USCA Case No. 15-1123. As a result, the Clarksville MPO must demonstrate conformity for the MTP and TIP.

Consistency with Other Plans

A major federal requirement of the MTP is consistency with other plans, which extends to:

- the statewide transportation planning process,
- the state's Strategic Highway Safety Plan,
- other safety and security plans,
- the STIP, and
- the TIP

Before any changes can be made to the MPO's TIP or the state's STIP, they must be made in the MTP. The MTP should also be developed to be consistent with:

- the coordinated public transit human services transportation plan (section 5310 Program of the FTA)
- the regional Intelligent Transportation Systems (ITS) architecture, and
- locally adopted planning documents

1.3 Transportation Equity

Federal legislation and executive orders prohibit discrimination and/or exclusion from participation in any program or activity receiving federal financial assistance on the basis of race, color, national origin, disability, income, minority-status, or limited-English Proficiency. The MPO's PP[1] specifies the manner in which the MPO prevents discrimination and accommodates these populations. The PP is available from the MPO.

Title VI of the Civil Rights Act of 1964 ensures that no person is excluded from participation in, denied the benefit of, or subjected to discrimination under any program or activity receiving federal financial assistance on the basis of race, color, or national origin. The Rehabilitation Act of 1973 and the Americans with Disabilities Act (ADA) of 1990 encourages the participation of people with disabilities in the development of transportation and paratransit plans and services.

Executive Order 12898: Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, was signed by President Clinton in 1994. There are three fundamental Environmental Justice (EJ) principles:

- To avoid, minimize, or mitigate disproportionately high and adverse human health and environmental effects, including social and economic effects, on minority populations and low-income populations.
- To ensure the full and fair participation by all potentially affected communities in the transportation decision-making process.
- To prevent the denial of, reduction in, or significant delay in the receipt of benefits by minority and low-income populations.

Executive Order 13166: Improving Access to Services for Persons with Limited English Proficiency was signed by President Clinton in 2000. Along with Title VI of the Civil Rights Act of 1964, the federal government requires federal agencies to:

- examine the services they provide,
- identify any need for service to those with Limited English Proficiency (LEP), and
- develop and implement a system to provide those services so LEP persons can have meaningful access to them.

[1] cuampo.com/wp-content/uploads/2022/10/Participation-Plan-2020.pdf

For recipients of federal financial assistance, such as MPOs, the federal government requires provision of meaningful access to their LEP applicants and beneficiaries.

1.4 Plan Adoption and Amendment Process

Plan Adoption

The development of the MTP is a time-consuming process that requires a large amount of data and information. The process provides several opportunities for the general public and the stakeholders within the area to participate and shape the plan and determine its needs and priorities. *Technical Report #5: Plan Development* describes the activities undertaken to involve the public and stakeholders.

The plan process also includes a formal review of the draft MTP. The draft MTP is provided to the general public and contains a 30-day public review and commenting period. After the public review process on the draft MTP, there are one (1) or more advertised public meetings to review and obtain final comments from the public. Following this stage, the comments are considered and addressed. The MPO will then endorse or adopt the plan for approval, where it is then sent to the appropriate federal agencies for determination of compliance with the federal planning requirements. Once it has been determined that the MTP is compliant, the plan becomes an approved document.

CUAMPO defines the exact situations and procedures for when a formal amendment would be appropriate. 23 CFR 450.104 provides the following definition:

> "Amendment means a revision to a long-range statewide or metropolitan transportation plan, TIP, or STIP that involves a major change to a project included in a metropolitan transportation plan, TIP, or STIP, including the addition or deletion of a project or a major change in project cost, project/project phase initiation dates, or a major change in design concept or design scope (e.g., changing project termini or the number of through traffic lanes or changing the number of stations in the case of fixed guideway transit projects). Changes to projects that are included only for illustrative purposes do not require an amendment. An amendment is a revision that requires public review and comment and a redemonstration of fiscal constraint. If an amendment involves "non-exempt" projects in nonattainment and maintenance areas, a conformity determination is required."

2.0 Demographic Profile

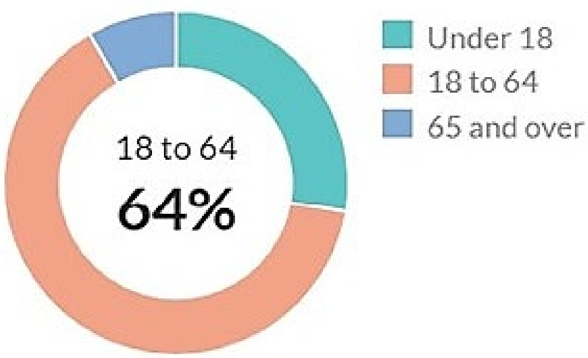
2.1 Population

Historically, the MPA has shown a steady increase in population and employment. Population values from the 2020 Census show a continuation of these trends within the MPA. However, while Montgomery County is experiencing population growth, Christian County is experiencing a decline.

Age/Race

Within the MPA, more than half (51 percent) the residents within Christian County fall within the age group of 20-59 years old. This value increases to 56 percent within Montgomery County. **Figure 2.1** displays the age breakdowns within the MPA counties. The Counties that comprise the MPA are predominately made up of individuals identifying White, as shown in **Figure 2.2**.

Figure 2.1: Population by Age Category



Source: Census Reporter, Census profile: Clarksville, TN--KY urbanized area 2021

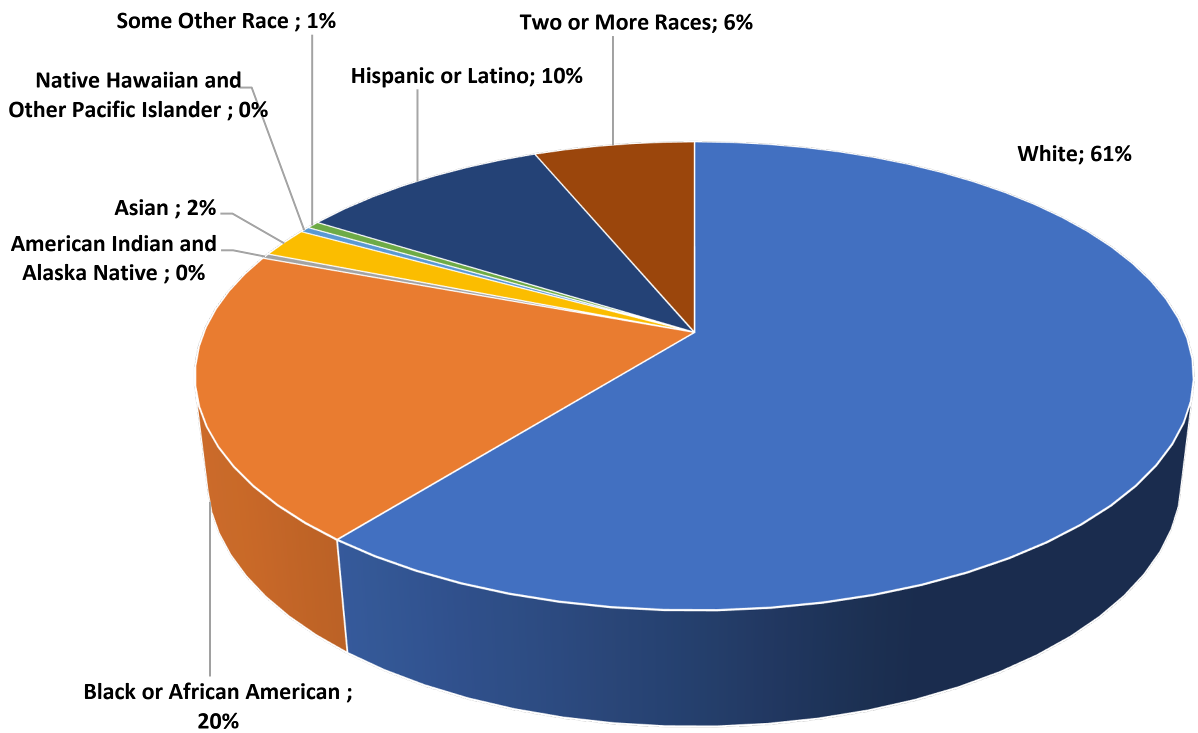
Table 2.1 displays the household and population data used within the Travel Demand Model study area by county. It is important to note that the model socioeconomic data will not match American Community Survey estimates for Montgomery County due to the exclusion of Fort Campbell, which is responsible for its own transportation planning. Additional information about the TDM and its development can be found in *Technical Report #1: Model Development.*

Table 2.1: Study Area Households and Population, Base Year 2019

Variable	Montgomery County	Christian County	Model Study Area Total
Dwelling Units	81,778	4,761	86,539
Occupied Dwelling Units	77,135	3,301	80,436
Household Population	206,468	8,672	215,140

Source: CUAMPO, NSI, 2019

Figure 2.2: Race Within Clarksville MPA Counties



Source: Census 2020

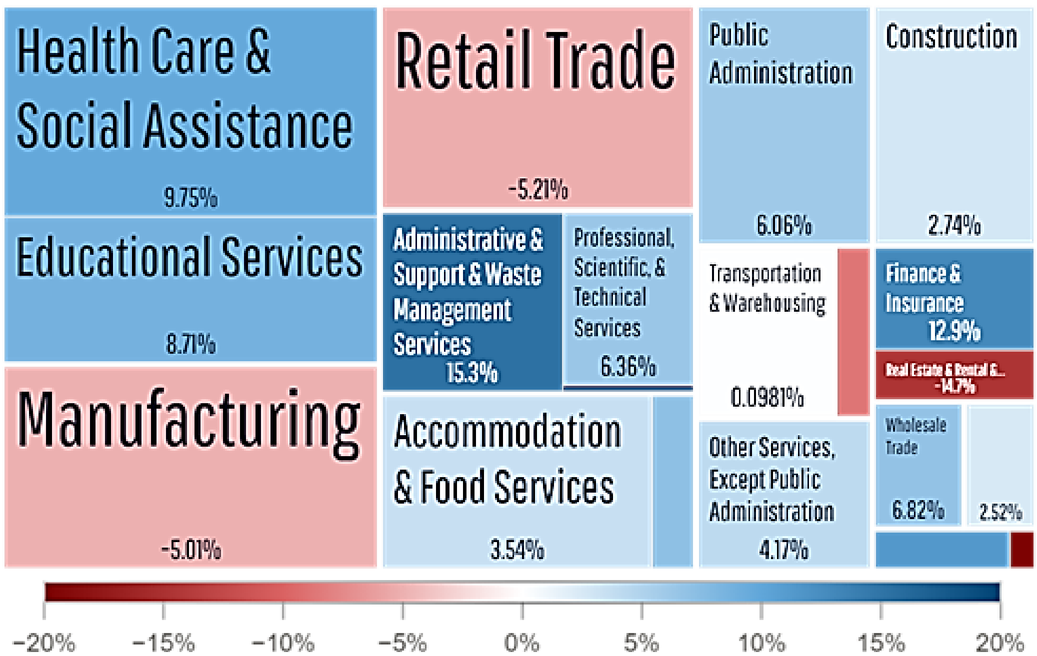
Home Ownership

The majority of households, 59 percent, within the MPA are occupied by people who own the home. The highest density of renters, the remaining 41 percent of the population, is located within the urban core, near Downtown Clarksville.

2.2 Employment

The Clarksville area maintained a strong regional employment growth that is also expected to continue in the future. Common jobs throughout the study area include Health care and Social Assistance (16,636 employees), Manufacturing (16,075 employees), and Retail Trade (13,444 employees).

Figure 2.3: Clarksville Area Common Jobs



Source: Data USA, Clarksville, TN-KY 2021) ACS 5-Year Estimates, 2015-2019

Table 2.2 displays the employment classifications within the TDM study area by county.

Table 2.2: Study Area Employment Classifications, Base Year 2019

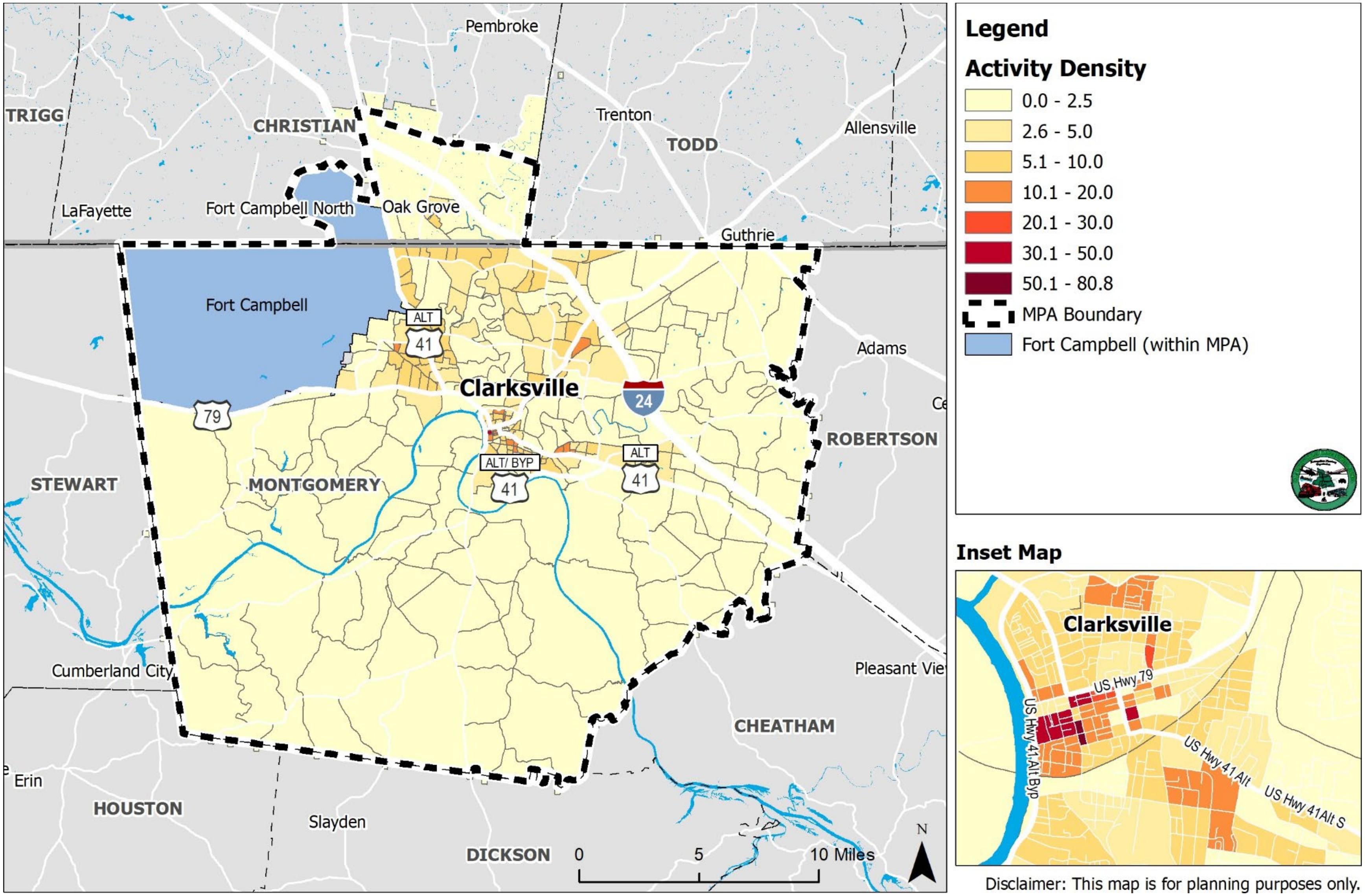
Variable	Description	Montgomery County	Christian County	Model Study Area Total
TOT_EMP	Total Employment	55,987	1,530	57,517
OTH_EMP	Other Employment	9,223	62	9,285
RET_EMP	Retail Employment	12,652	656	13,308
SE_EMP	Service Employment	34,112	812	34,924

Source: NSI, AxleGroup, Bureau of Labor Statistics, 2019

2.3 Activity Density

An area's activity density is based on the combined total of population and employment. This statistic reveals areas that may not have a significantly high population or employment density alone, but still generate significant activity. By looking at these combined factors, one gets a better understanding of the impact of mixed-use areas. Shown in **Figure 2.4**, the greatest activity densities in the MPA are Downtown Clarksville and Austin Peay State University.

Figure 2.4: MPA Activity Density



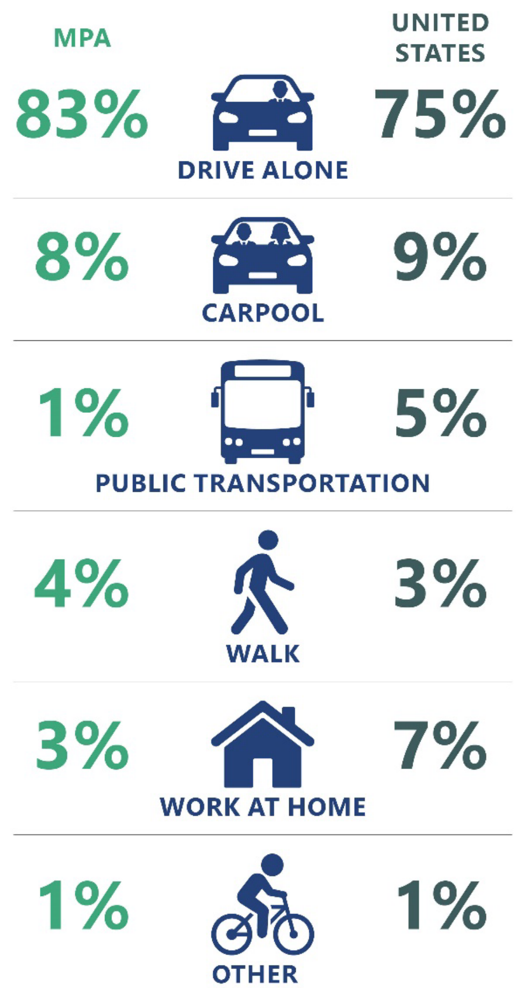
2.4 Existing Travel Patterns

Commuting patterns can provide insight into overall travel patterns. Data obtained from the ACS 5-Year Estimates shows that the travel time to work is relatively short within the MPA. Virtually all workers reside in tracts that have mean commute times under 30 minutes.

Over 80 percent of commuters in the MPA counties drove alone to work and less than 10 percent carpooled. Walking, biking, or using public transit to commute to work was uncommon, as shown in **Figure 2.5**.

Areas with higher rates of commuting by transit and walking are mostly located around Austin Peay State University and the area immediately surrounding the City of Clarksville. These areas appear to relate to the percentage of households that lack regular access to a vehicle.

Figure 2.5: Means of Transportation to Work



Source: ACS 2020 5-Year Estimates

3.0 Roadways and Bridges

3.1 Introduction

83%

Households in the Clarksville MPA that commute by motor vehicle and drive alone.

The region's roadways and bridges are used by personal motor vehicles, public and private transportation providers, bicyclists, and freight trucks. These roadways can also be used to provide access to other transportation modes. This section discusses the general use of the MPA's roadways and bridges. The existing conditions for biking, walking, public transit, and freight will be further discussed in greater detail later in this report.

For households in urbanized areas, like Clarksville, traveling by motor vehicle is the primary means of transportation. The most recent American Community Survey (ACS) 5-year estimates show that commuting by motor vehicle without carpooling is the most common method of commuting within the MPA. This means the overwhelming majority of household travel is affected by the condition of the MPA's roadways and bridges.

3.2 The Roadway Network

Several federal and state highways serve the study area and comprise its main roadway network. The most significant of these facilities are shown in **Table 3.1**.

Table 3.1: Significant Roadway Facilities in the Clarksville MPA

Road	Description
	I-24 begins at I-75 in Chattanooga, TN and travels northwest to I-57 near Pulleys Mill, IL. It travels through the study area from southeast to northwest on the northern side of the study area.
	US 41 Alternate (US 41A) proceeds from southeast to northwest through the study area and is an alternate route to US 41. The highway begins in Monteagle, TN and ends in Hopkinsville, KY. There is also a bypass of the highway around Downtown Clarksville. In Tennessee, the highway also carries the unsigned designations of SR 12 north of Downtown Clarksville, SR 13 near Downtown Clarksville, and SR 112 south of Downtown Clarksville.
	US 79 begins at I-35 in Round Rock, TX and travels northeast to US 68 in Russellville, KY. It travels through the study area from southwest to northeast. In Tennessee, the highway also carries the unsigned designations of SR 76 southwest of Downtown Clarksville and SR 13 northeast of Downtown Clarksville.
	SR 12 begins in Nashville, TN at US 41A and proceeds through the study area from southeast to northwest, ending at the Kentucky State Line. This route is unsigned along a portion of US 41A in the study area.
	SR 13 begins at the Alabama State Line (where it becomes Alabama SR 17) and proceeds through the study area from southwest to northeast, ending at the Kentucky State Line. This route is unsigned along portions of US 41A and US 79 in the study area.
	SR 48 begins at SR 13 in Wayne County and travels from south to north through the study area, ending at the Kentucky State Line.
	SR 374 is an east-west arterial highway within the study area, beginning at US 79 in the west and ending at US 41A in the east. It is known as Paul B. Huff Memorial Parkway, Purple Heart Parkway, 101st Airborne Division Parkway, Warfield Boulevard, and Memorial Drive.

Roadways by Functional Classification

Each type of roadway serves a function in the overall roadway network. Roadways are divided into functional classes based on their intended balance of mobility (speed) and access to adjacent land. Their designs vary in accordance with this functional classification. **Table 3.2** summarizes this information by centerline miles and lane miles. **Figure 3.1** illustrates the functional classification of the Clarksville MPA's roadways.

Interstate

- Divided highways with full access control and grade separations at all intersections.
- The controlled access character results in high lane capacities, three times greater than the individual lane capacities of urban arterials.

Expressways

- Provides for movement of large volumes of traffic at relatively high speed, and are primarily intended to serve long trips.
- Have some grade separated intersections, while the majority of the intersections are widely spaced and signalized.

Arterials

- Serve both as feeders to Interstates and expressways, and as principal travel ways between major lane use concentrations within the study area.
- Typically divided facilities (undivided where right-of-way limitations exist) with relatively high traffic volumes and traffic signals at major intersections.
- The primary function of arterials is to move traffic; they are the main means of local travel, with a secondary function of land access.

Collectors

- Provide both land service and traffic movement functions.
- Serve as intermediate feeders between arterials and local streets and primarily accommodate short distance trips.
- Generally not continuous for any great length since they serve few through trips.

Local Streets

- Provide access to immediately adjacent land.
- WIthin the local street classification, three subclasses are established to indicate the type of area served: residental, industrial, and commercial.

Arterials are further subdivided into principal and minor subclassifications. Principal arterials in both rural and urban areas serve as high volume traffic corridors. They provide access to the major centers of activity of a metropolitan area from its furthest points. Minor arterials connect the principal arterials and provide a lower level of travel mobility for shorter travel lengths.

Collectors are further subdivided into major and minor subclassifications. Major collectors are those collectors that carry low-medium traffic volumes and connect arterials and local streets. These roadways typically carry more volume and minor collectors. Minor collectors perform the same function as major collectors but carry less volume.

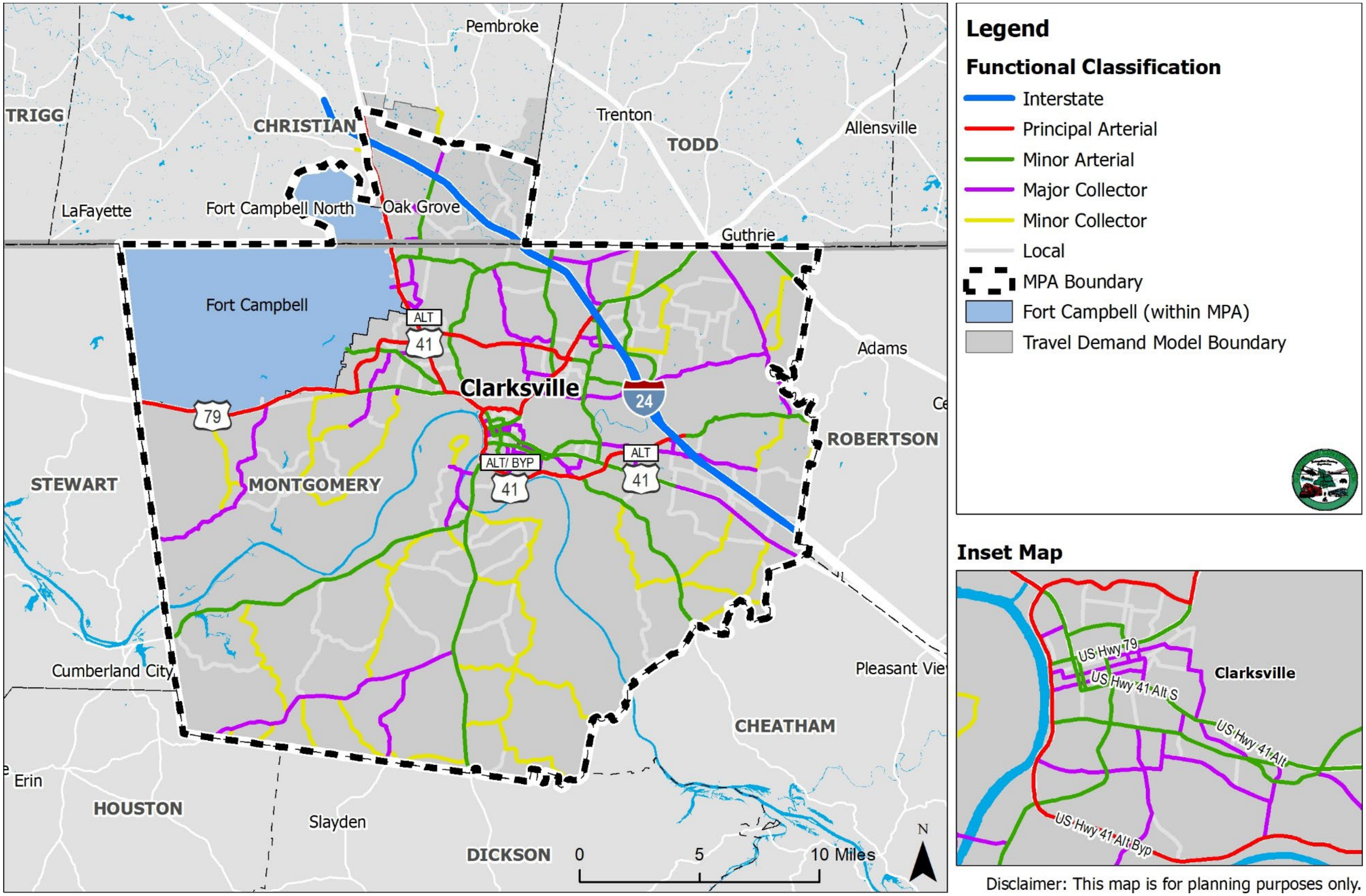
Table 3.2: Roadway Model Network Lane Mileage by Functional Class, 2019

Functional Classification	Centerline Miles		Lane Miles	
	Miles	Percent	Miles	Percent
Interstate	27.6	4.6%	110.3	7.6%
Principal Arterial	53.7	9.0%	229.0	15.8%
Minor Arterial	114.8	19.3%	304.2	21.0%
Major Collector	106.5	17.9%	217.2	15.0%
Minor Collector	120.6	20.3%	242.4	16.7%
Local	171.8	28.9%	348.2	24.0%
Total	**595.0**	**100.0%**	**1,451.3**	**100.0%**

Note: Centerline miles do not include ramps

Source: Clarksville Travel Demand Model

Figure 3.1: Functional Classification of Roadways, 2019



Disclaimer: This map is for planning purposes only.

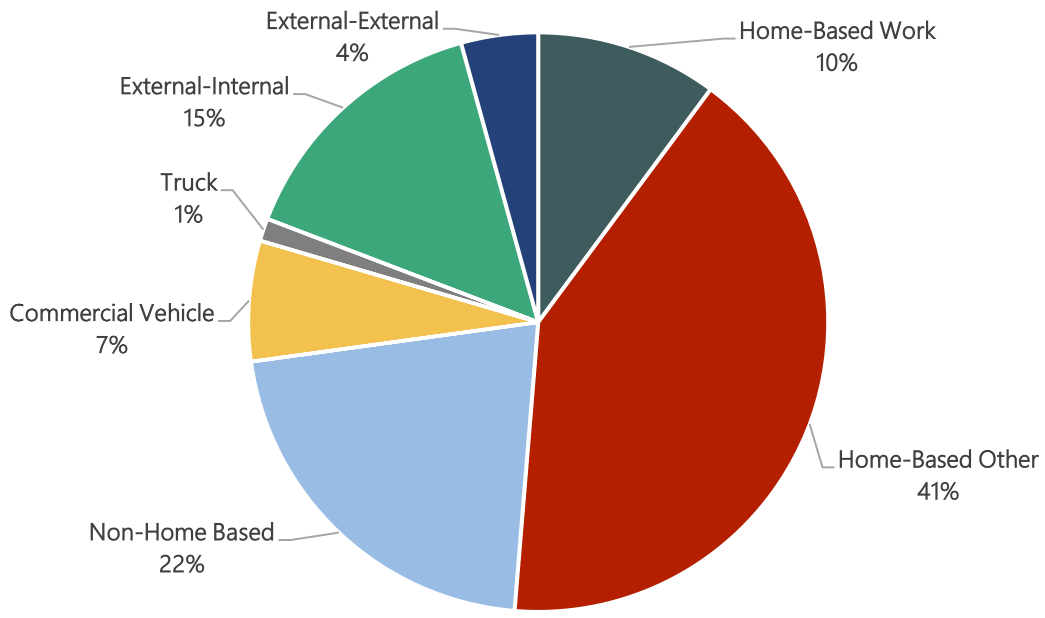
Source: TDOT, KYTC

3.3 Traffic and Congestion

The number of daily trips estimated by the Travel Demand Model, by trip purpose, in 2019 is summarized in the graph below. Approximately four (4) percent of vehicle trips pass through the MPA. Internal commercial and freight vehicle trips (e.g., truck, taxi, etc.) account for about eight (8) percent of vehicle trips.

879,406

Daily trips within the MPA



Source: Clarksville Travel Demand Model

Table 3.3 displays how these trips are distributed onto the modeled transportation network. Approximately one fifth to one fourth of vehicle miles travelled, vehicle hours travelled, and delay occur on I-24. However, more than 62 percent of the delay is estimated to occur on the principal and minor arterials. This coincides with where the most vehicle miles travelled, and vehicle hours travelled occur. There is comparatively little delay estimated to occur on collectors and local roads.

Table 3.3: Roadway System Travel Characteristics, 2019

Functional Class	Daily Vehicle Miles Travelled (VMT)		Daily Vehicle Hours Travelled (VHT)		Daily Vehicle Hours of Delay (VHD)	
	Number	Percent	Number	Percent	Number	Percent
Interstate	1,381,216	27.0%	33,731	21.1%	12,956	25.1%
Principal Arterial	1,318,249	25.8%	43,666	27.3%	15,767	30.5%
Minor Arterial	1,436,072	28.1%	49,280	30.8%	16,365	31.7%
Major Collector	478,789	9.4%	16,773	10.5%	3,831	7.4%
Minor Collector	177,996	3.5%	4,884	3.1%	390	0.8%
Local	314,434	6.2%	11,539	7.2%	2,371	4.6%
Total	**5,106,756**	**100.0%**	**159,873**	**100.0%**	**51,680**	**100.0%**

Source: Clarksville Travel Demand Model

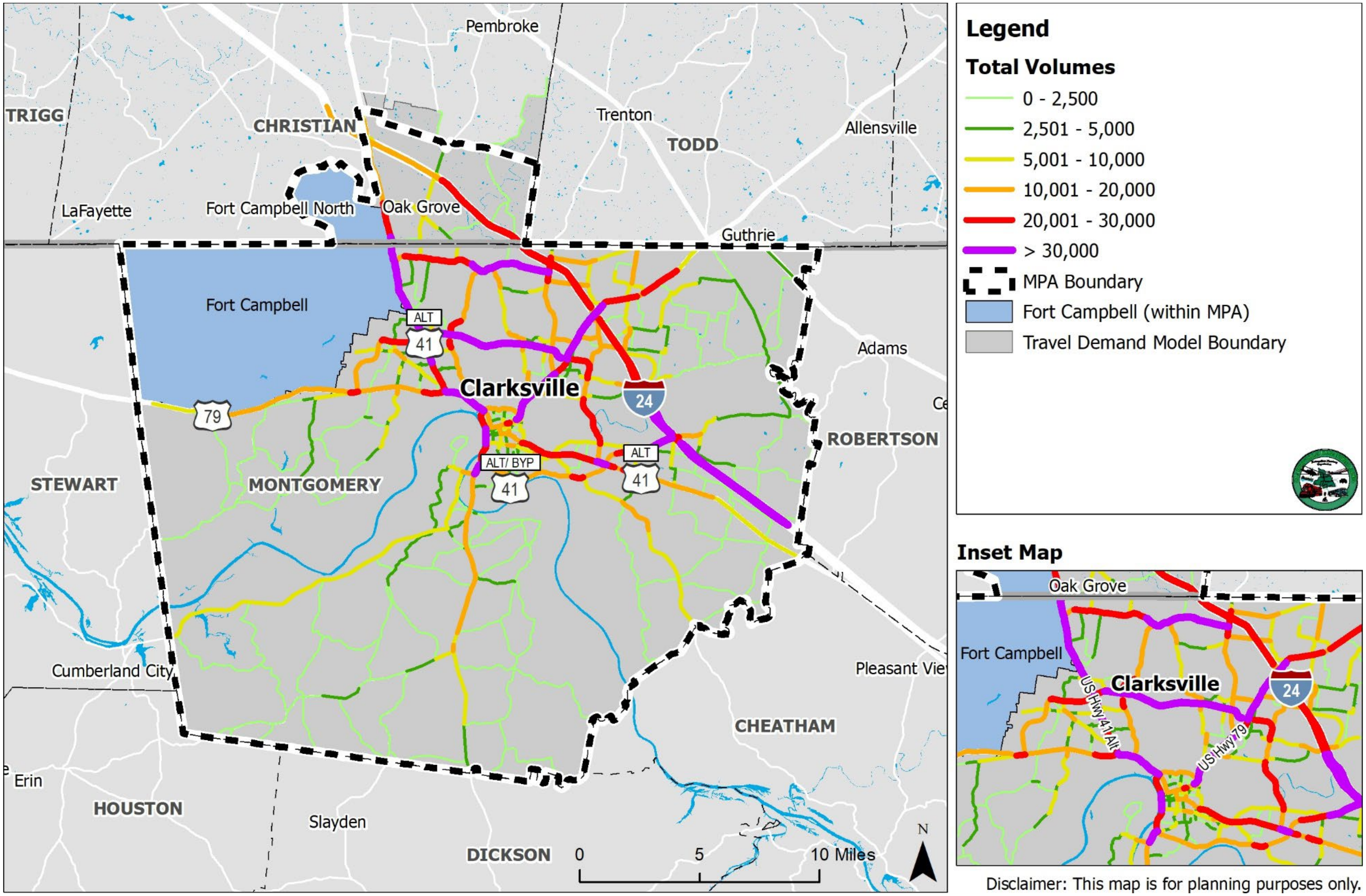
Figure 3.2 displays the vehicular traffic in the MPA, which is greatest on:

- I-24
- US 41A from SR 76 to Crossland Ave and from US 79 to Fort Campbell
- US 79 (Wilma Rudolph Blvd) from College St to I-24
- SR 13/SR 48 from Zinc Plant Rd to College St
- SR 236 (Tiny Town Rd) from Allen Rd to SR 48
- SR 374 from Evans Rd to US 79

These areas have estimated average daily volumes exceeding 25,000 vehicles.

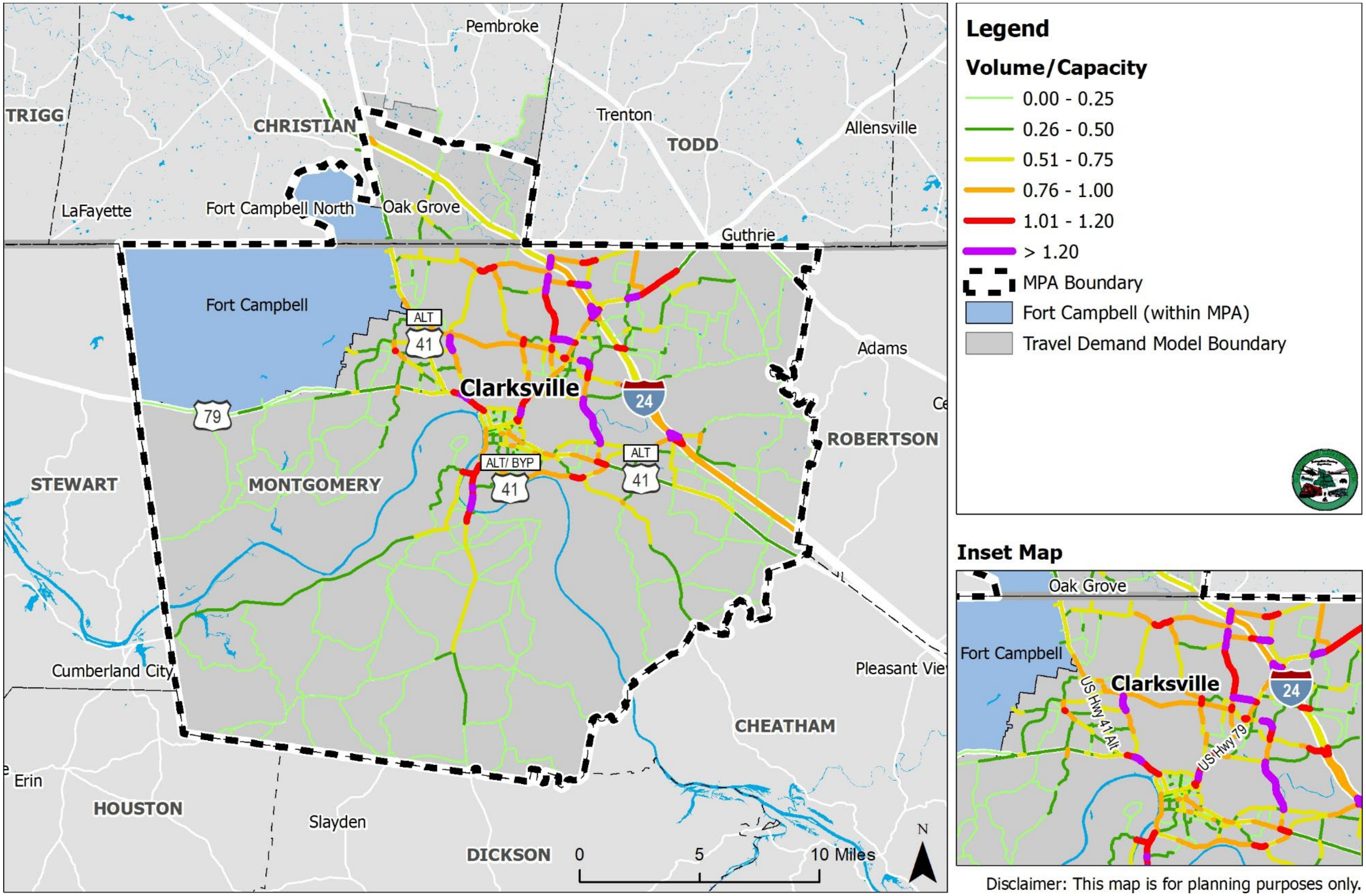
Figure 3.3 displays the volume to capacity (V/C) ratios for the major roadways in the MPA. Currently, there are several roadway segments in the MPA that experience a V/C ratio of 1.0 or greater, representing congested segments. **Table 3.4** displays those segments that experience a V/C ratio of 1.0 or greater. Several of these segments are near the intersections of roadways and/or at interstate interchanges with high traffic volumes. This suggests that peak period congestion is currently an issue in the Clarksville MPA.

Figure 3.2: Average Daily Traffic on Roadways, 2019



Source: Travel Demand Model

Figure 3.3: Existing Roadway Congestion, 2019



Disclaimer: This map is for planning purposes only.

Source: Travel Demand Model

Table 3.4: Roadway Corridors with Volumes Exceeding Capacity, 2019

Roadway	Segment	Length (miles)
Dunlop St	Alexander Blvd to International Blvd	0.36
Evans Rd	Garrettsburg Rd to Lafayette Rd	0.04
Hornberger Ln	Franklin St to SR 48/College St	0.10
I-24 Eastbound Off-Ramp	@ SR 76	0.25
I-24 Eastbound Off-Ramp	@ US 79 (SR 13)	0.37
I-24 Eastbound On-Ramp	@ SR 237	0.24
I-24 Eastbound On-Ramp	@ SR 76	0.42
I-24 Westbound Off-Ramp	@ SR 237	0.26
I-24 Westbound Off-Ramp	@ SR 76	0.34
I-24 Westbound Off-Ramp	@ US 79 (SR 13)	0.35
I-24 Westbound On-Ramp	@ SR 76	0.33
Meriwether Rd	Glenhurst Way to Oakland Rd	0.76
Needmore Rd	SR 48/Trenton Rd to US 79 (SR 13)/Wilma Rudolph Blvd	0.96
Peachers Mill Rd	Mill Creek Rd to Hertiage Park Sports Complex	0.57
SR 13/SR 48	SR 149 to US 41A Bypass (SR 12)	2.34
SR 236/Tiny Town Rd	Peachers Mill Rd to Needmore Rd	0.68
SR 237/Rossview Rd	Dunbar Cave Rd to Powell Rd	0.43
SR 374 Eastbound Off-Ramp	@ US 79 (SR 13)/Wilma Rudolph Blvd	0.07
SR 374 Westbound On-Ramp	@ US 79 (SR 13)/Wilma Rudolph Blvd	0.12
SR 374/Warfield Blvd	Memorial Dr to Dunbar Cave Rd	2.08
SR 374/Warfield Blvd	SR 237/Rossview Rd to Stokes Rd	1.00
SR 48/College St	Hornberger Ln to US 79 (SR 13)/Kraft St	0.30
SR 48/Trenton Rd	SR 374 (101st Airborne Division Pkwy) to Lowes Dr	0.12
SR 48/Trenton Rd	Needmore Rd to Branson Way	2.65
SR 48/Trenton Rd	I-24 Eastbound Ramps to Tylertown Rd	0.40
SR 76	Sango Rd to I-24 Eastbound Ramps	0.07
Tylertown Rd	McClain Rd to Old Tylertown Ln	0.54
US 41A (SR 112)/Madison St	Richview Rd to US 41A Bypass (SR 76)	0.39
US 41A (SR 12)/US 79 (SR 76)	Cedar Ct to US 79 (SR 13)/Kraft St	1.50
US 41A Bypass (SR 12)	Old Ashland City Rd to SR 12	0.46

Roadway	Segment	Length (miles)
US 79 (SR 13)/Guthrie Hwy	International Blvd/Solar Way to 1.09 miles east of Hampton Station Rd	2.37
US 79 (SR 13)/ Wilma Rudolph Blvd	Holiday Dr to Alfred Thun Rd	0.48
US 79 (SR 13)/ Wilma Rudolph Blvd	0.19 miles west of Dunbar Cave Rd to Dunbar Cave Rd	0.19
US 79 (SR 13)/ Wilma Rudolph Blvd	SR 48/Kraft St to Old Trenton Rd	0.73
Whitfield Rd	SR 374 (101st Airborne Division Pkwy) to Needmore Rd	0.22
Zinc Plant Rd	River Rd to SR 13/SR 48	0.53

Source: Clarksville MPO Travel Demand Model

3.4 Roadway Reliability

Most of the region's roadways do not have daily volumes that exceed their daily capacities. However, as noted above, there are congestion issues at specific times, notably peak periods. Travel time reliability is a measure of how congested travel times compare to free-flow conditions. The Level of Travel Time Reliability (LOTTR) is defined as:

$$\text{Segment LOTTR} = \frac{\text{"Longer" 80th Percentile Travel Time}}{\text{"Normal" 50th Percentile Travel Time}}$$

The LOTTR of each roadway segment is calculated for four time periods (including AM and PM peaks), with the worst LOTTR being used to determine segment reliability. The most recent LOTTR data available, year 2022, was obtained from FHWA's National Performance Management Research Data Set (NPMRDS). Roadway segments with an LOTTR less than 1.5 are defined by the FHWA as reliable. **Figure 3.4** displays the LOTTR of the monitored segments within the MPA.

It should be noted that the current NPMRDS for the Clarksville MPA meets the full Enhanced NHS and is reflected in this report.

88.1%

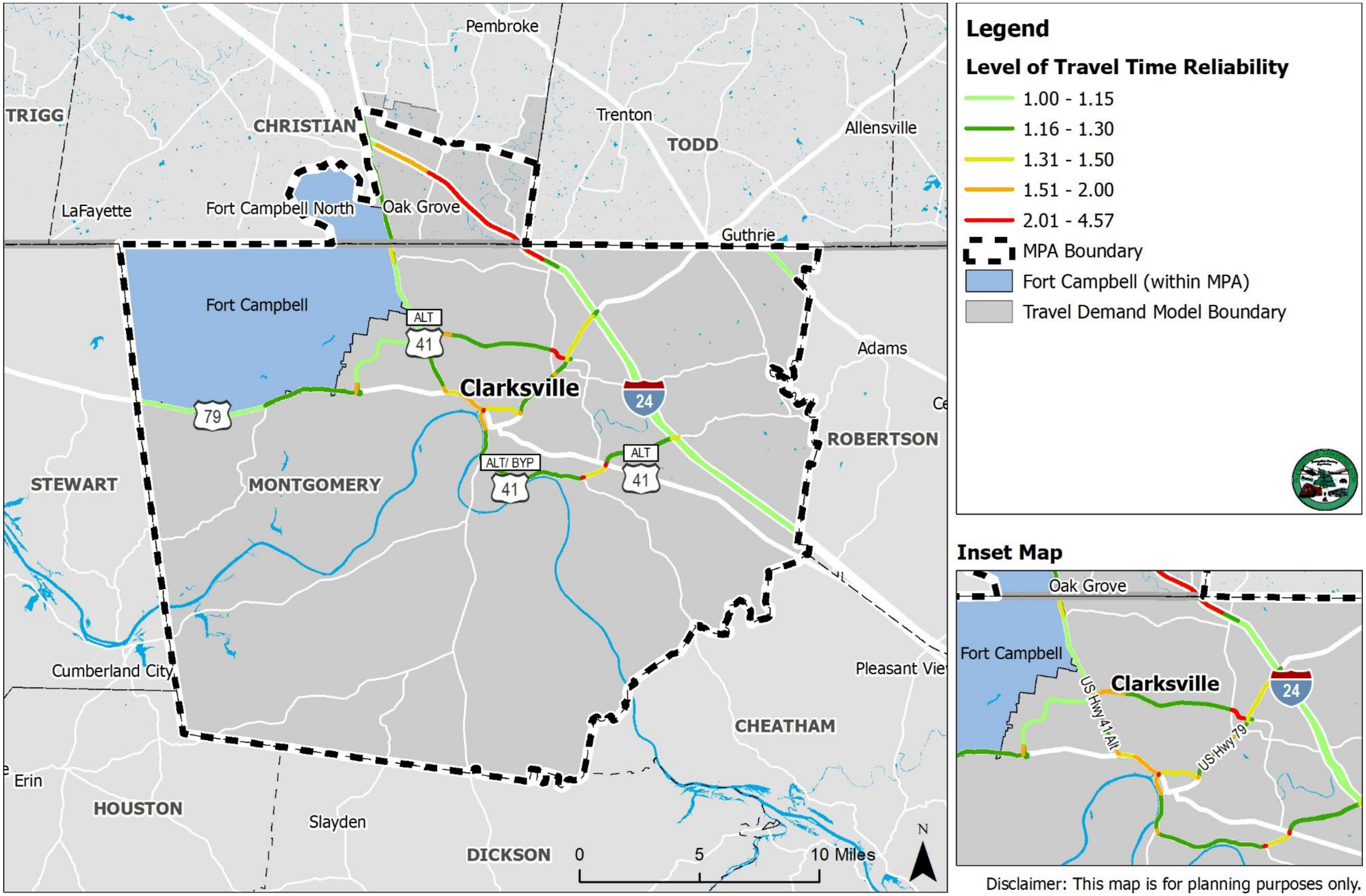
Interstate NPMRDS reported NHS person-miles travelled that are reliable.

93.8%

Non-Interstate NPMRDS reported NHS person-miles travelled that are

The NPMRDS data shows that both the Interstate and non-Interstate NHS systems within the MPA are reliable but have begun to see a decrease in reliability. However, the 2022 NPMRDS data showed that I-24 Westbound had several roadway segments with an LOTTR greater than 1.5, which indicated that those roadway segments were not reliable. This was a result of a lane closure due to road construction on I-24 Westbound between the Kentucky/Tennessee State Line and US 41A/Fort Campbell Blvd.

Figure 3.4: Level of Travel Time Reliability (LOTTR) on National Highway System (NHS) Routes, 2022



Source: NPMRDS

3.5 Pavement Conditions

Maintaining sufficient pavement conditions ensures that roadways operate at their full capacity. Good pavement conditions provide roadways users with safe, comfortable travel experiences, while minimizing vehicle wear and tear.

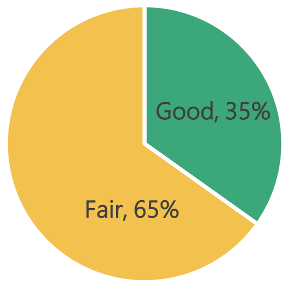
Pavement condition ratings for the MPA's roadways were obtained from data submitted by the Tennessee Department of Transportation (TDOT) and Kentucky Transportation Cabinet (KYTC) and found in the Highway Performance Monitoring System (HPMS). The HPMS is a national level highway information system that includes data on the:

- extent,
- condition,
- performance, and
- use and operating characteristics of the nation's highways.

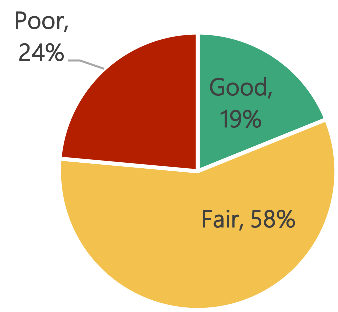
The HPMS data is a sample dataset collected across the entire federal-aid eligible system for interstate, arterial, and collector networks.

The HPMS pavement condition is based on the International Roughness Index (IRI), cracking, rutting, and faulting.

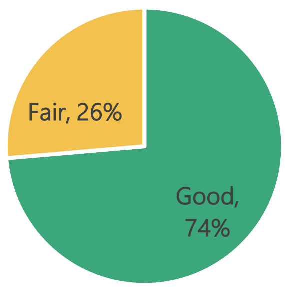
Interstate Pavement Condition
Tennessee Portion



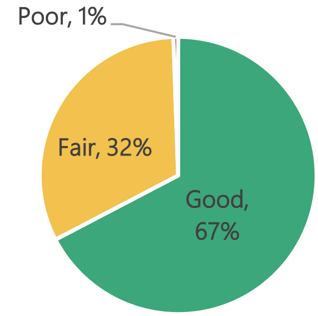
Interstate Pavement Condition
Kentucky Portion



Non-Interstate NHS
Pavement Condition
Tennessee Portion



Non-Interstate NHS
Pavement Condition
Kentucky Portion

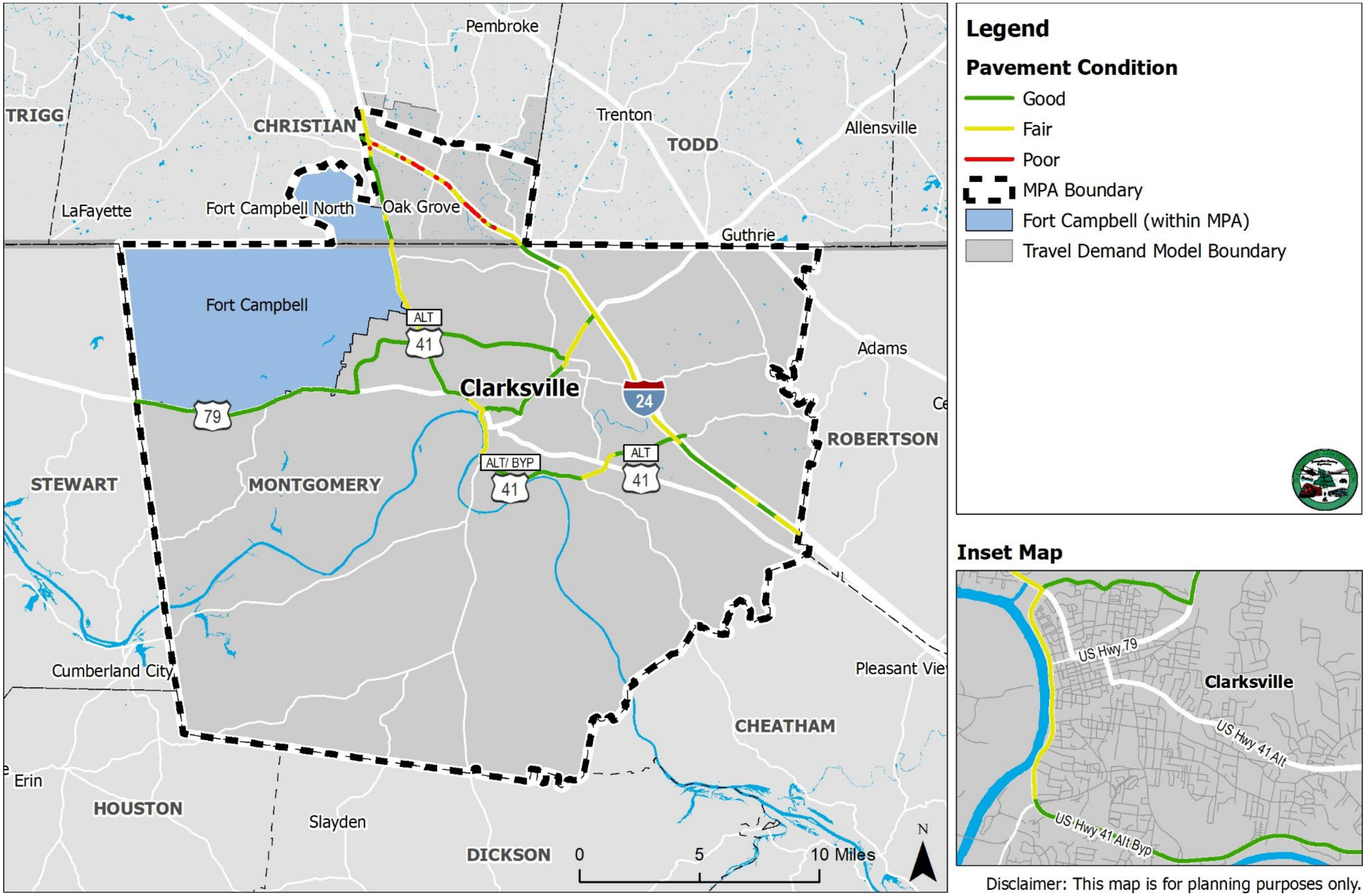


Currently, within the Kentucky portion of the MPA, 24 percent of Interstate lane-miles are classified as Poor while one (1) percent of Non-Interstate NHS pavements in the Kentucky portion of the MPA are classified as Poor. Within the Tennessee portion of the MPA, there are no Interstate or Non-Interstate pavements classified as Poor.

Figure 3.5 illustrates the most recent pavement condition data for the TDOT and KYTC monitored roadways within the MPA. Poor pavement conditions within the MPA occur at various points along:

- I-24 between US 41A/Fort Campbell Blvd and Tennessee/Kentucky State Line
- US 41A/Fort Campbell Blvd between KY 117 and I-24

Figure 3.5: Roadway Pavement Conditions, 2022



Source: TDOT, KYTC

3.6 Bridge Conditions

Bridges are a critical part of the overall transportation network. They must be maintained and upgraded as needed to ensure that they are not safety or environmental hazards, bottlenecks, or limitations to freight movement.

Bridges serve as important connections over waterways, provide grade separation between roadways and other transportation facilities, and connect transportation facilities to each other.

There are nearly 177 bridges within, or in close proximity to, the Clarksville MPA. Most of these cross waterways. However, bridges can also be structures that cross over other roadways and railroads.

Bridge Conditions and Scoring

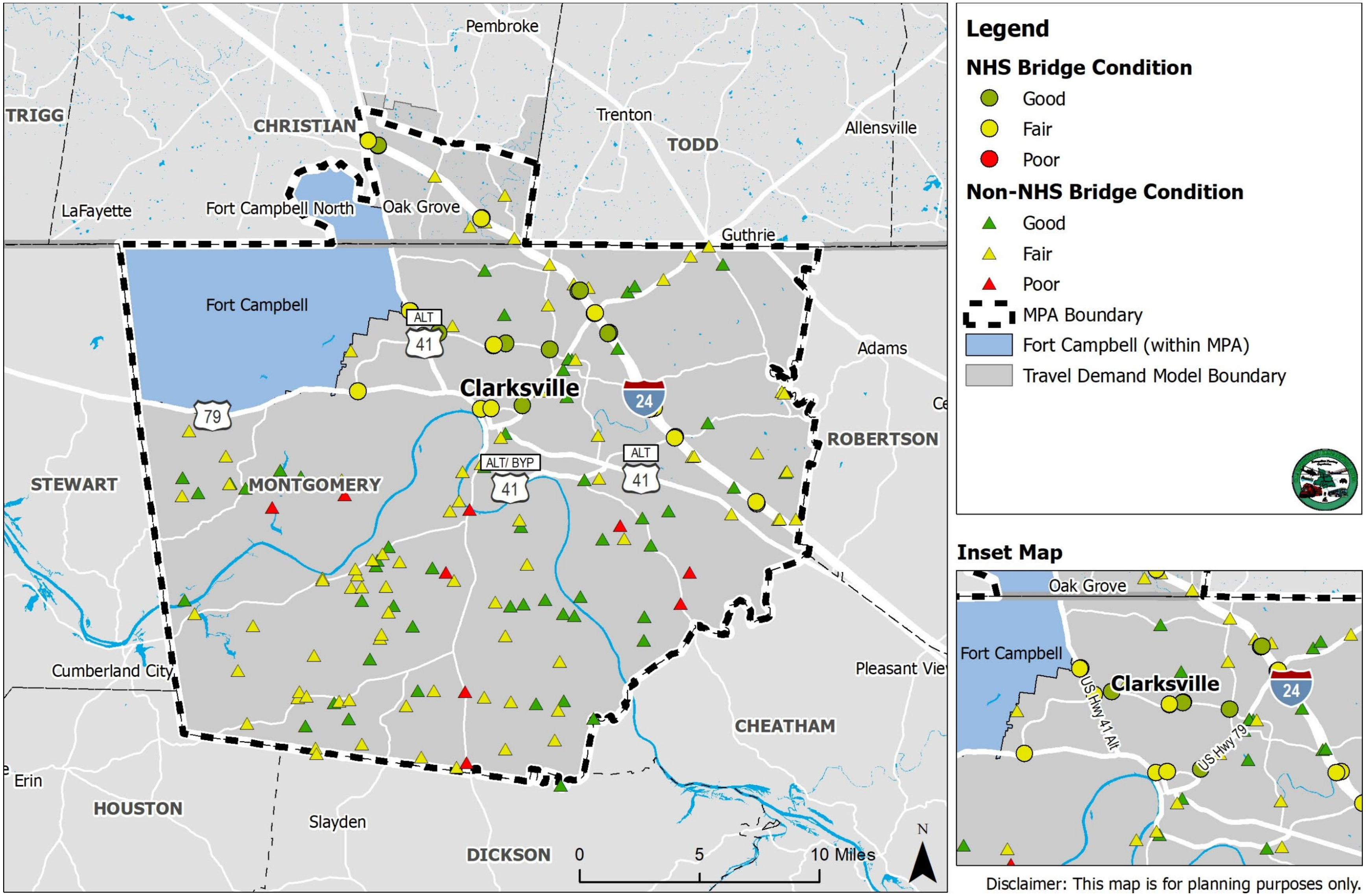
The National Bridge Inventory (NBI) provides bridge conditions for all bridges in the United States with public roads passing above or below them. The NBI also defines bridges to include bridge-length culverts. The condition of the bridge is determined by the lowest rating of deck, superstructure, substructure, or culvert. If the lowest rating of these categories is greater than or equal to seven (7), the bridge is classified as good. If the score of the bridge is less than or equal to four (4), the classification is poor. The MTP uses data from the 2022 NBI, the most recent year available.

31.5%
NBI defined NHS Bridges in Good Condition

0.0%
NBI defined NHS Bridges in Poor Condition

Figure 3.6 displays the condition of each bridge within the MPA. It should be noted that these include bridges that are a part of the National Highway System (NHS) and bridges that are not.

Figure 3.6: Bridge Conditions in the MPA, 2022



Disclaimer: This map is for planning purposes only.

Source: National Bridge Inventory

Structurally Deficient and Functionally Obsolete Bridges

All bridges in the nation are evaluated to determine if they are "structurally deficient". Structural deficiency is characterized by deteriorated conditions of significant bridge elements and potentially reduced load-carrying capacity. A structurally deficient bridge typically requires significant maintenance and repair to remain in service. These bridges would eventually require major rehabilitation or replacement to address the underlying deficiency. These bridges are those that are defined as having a score of four (4) or less on any of the scoring components described above. There are 9 structurally deficient bridges in the MPA, none of which are on the reported sections of the NHS.

3.7 Roadway Safety

The Metropolitan Transportation Plan (MTP) safety analysis focused on gathering and analyzing available safety data and identifying hazardous locations. Due to the limited scope of this study, location-specific recommendations for the identified hazardous locations have not been developed.

> "Disclaimer: This document and the information contained herein is prepared solely for the purpose of identifying, evaluating, and planning safety improvements on public roads which may be implemented utilizing federal aid highway funds; and is therefore exempt from discovery or admission into evidence pursuant to 23 U.S.C. 409."

Supporting Documents

<u>Highway Safety Improvement Program (HSIP)</u>

The Infrastructure Investment and Jobs Act (IIJA) requires each state to maintain an annually updated Highway Safety Improvement Program (HSIP). The HSIP must include the FHWA performance measures for roadway safety and the development of a Strategic Highway Safety Plan (SHSP). The required safety performance measures, state targets, and the Metropolitan Planning Organization's (MPO) existing performance are discussed in *Technical Report #3: Transportation Performance Management*.

Strategic Highway Safety Plan (SHSP)

A SHSP is a statewide coordinated safety plan developed and maintained by each state to reduce fatalities along all state highways and public roads. Both Tennessee and Kentucky updated their respective SHSPs in 2020[2,3]. Both SHSPs, developed by their respective DOTs, use the 4Es of traffic safety:

- Engineering
- Enforcement
- Emergency Response
- Education

The Tennessee SHSP emphasis areas, and their strategies, are shown in **Table 3.5**. The Kentucky SHSP emphasis areas and strategies are shown in **Table 3.6** and **Table 3.7**, respectively.

Table 3.5: Tennessee SHSP Emphasis Areas

Emphasis Area	Strategies
Data Collection and Analysis	1. Improve traffic data collection systems, hardware, and technology to provide data in a more timely and efficient manner. 2. Improve data collection in the field and data distribution to expedite and improve delivery of relevant data for safety analysis, infrastructure improvements, and law enforcement. 3. Enhance the ability of and encourage the use of predictive safety analysis for Tennessee roadway projects.
Driver Behavior	1. Reduce the number of impaired drivers on Tennessee's roadways. 2. Reduce aggressive driving practices among motorized road users. 3. Increase the usage of proper vehicle occupant restraint. 4. Increase Education & Enforcement Targeted at Reducing Distracted Driving. 5. Reduce Crashes Involving Teen Drivers.

[2] https://www.tn.gov/content/dam/tn/tdot/strategic/SHSP-2020.pdf

[3] https://transportation.ky.gov/HighwaySafety/Documents/2020%20SHSP%20SAFE%20KY%20Highway%20Safety%20Plan%20Final%205-20.pdf

	6. Pursue programs in accordance with NHTSA Highway Safety Program Guideline No. 13 to reduce the frequency and severity of crashes involving senior and medically at-risk drivers and pedestrians.
Infrastructure Improvements	1. Reduce the likelihood and severity of crashes involving roadway and lane departures. 2. Reduce the likelihood and severity of intersection-related crashes. 3. Reduce the likelihood of conflict between trains and vehicles at railroad crossings with improvements to geometry, traffic control, and visibility. 4. Educate roadway users and local agencies to raise awareness about contributing factors linked to severe injury crashes. 5. Reduce the lengths of interchange exit ramp queues. 6. Improve the safety of senior drivers by reducing roadway geometric deficiencies.
Vulnerable Road Users	1. Improve infrastructure for bicyclists and pedestrians. 2. Increase awareness of vulnerable road users. 3. Improve safety of vulnerable road users on existing routes. 4. Increase the effectiveness of enforcing current laws protecting vulnerable road users. 5. Assess growing needs and concerns of vulnerable road users. 6. Improve and strengthen laws pertaining to vulnerable road users. 7. Reduce Motorcycle Related Fatalities and Serious Injuries.
Operational Improvements	1. Reduce the number and severity of secondary roadway crashes by effective emergency response. 2. Develop inter-agency memorandums of understanding to support safe and expedited clearance of incidents. 3. Improve incident response and reduce the clearance time for crashes. 4. Reduce the severity and number of crashes occurring in work zones.

	5. Mitigate regular and non-reoccurring congestion to decrease the likelihood of severe crashes. 6. Reduce the severity of crashes involving senior drivers.
Motor Carrier Safety	1. Reduce occurrence of CMV crashes. 2. Improve CMV safety inspections. 3. Increase inspections and training for CMV hazardous material safety. 4. Ensure that the activities that the state will execute to meet the requirements of 49 CFR 350.213(b) – All troopers receive training to detect drivers under the influence.

Source: 2020 Tennessee SHSP

Table 3.6: Kentucky SHSP Emphasis Areas

Emphasis Area	Description
Aggressive Driving	Driving behavior characterized by speeding, disregarding traffic control, following too closely, weaving in traffic, failure to yield the right of way, or improper passing.
Distracted Driving	Driving behavior characterized by cell phone usage, distraction, or inattention.
Impaired Driving	Driving while under the influence of alcohol or drugs.
Occupant Protection	Failure to use eat belt or child restraint while driving or riding in a vehicle.
Roadway Departure	A crash type that results from a vehicle leaving its lane to the left or right.
Vulnerable Road Users	Crashes involving pedestrians, bicycles, motorcycles, electric scooters, or other vehicles besides cars and trucks.

Source: 2020 Kentucky SHSP

Table 3.7: Kentucky SHSP Strategies

Strategy Category	Strategies	Applicable Emphasis Area
Education	• Publicize victim impacts • Support drivers education in schools • Judicial Outreach Liaison	• Roadway Departure • Aggressive Driving • Distracted Driving • Impaired Driving • Occupant Protection • Vulnerable Road Users
EMS	• Support Quick Clearance • Conduct an EMS assessment	• Roadway Departure • Aggressive Driving • Distracted Driving • Impaired Driving • Occupant Protection • Vulnerable Road Users
Enforcement	• High visibilty enforcement: "Nighthawk" • Advanced Roadside Impaired Driving Enforcement (ARIDE) • Drug Evaluation and Classification (DEC) Program: DRE Certification	• Aggressive Driving • Distracted Driving • Impaired Driving • Occupant Protection
Engineering	• Rural road corridor improvements in partnership with local agencies • Pedestrian Refuge Islands at intersections • Access management	• Roadway Departure • Aggressive Driving • Distracted Driving • Impaired Driving • Occupant Protection • Vulnerable Road Users
Legislative	• Develop fines/penalties proportional to safety impact • Including list of drugs and impairing substances to KY's per se DUI law • Statutory approval for work zone automated enforcement	• Aggressive Driving • Distracted Driving • Impaired Driving • Occupant Protection

Source: 2020 Kentucky SHSP

Crash Impacts

According to the most recent Fatal Accident Crash Reporting System (FARS) data, an average of 37,459 people were killed annually from 2016 through 2020. Every crash, regardless of the severity, costs money and time in damages, emergency services, and delays. These costs affect both governments and taxpayers. One of the goals of the MTP process is to improve travel safety by reducing the risk of crashes on the roadways. This was accomplished by analyzing the data and determining the most hazardous locations in the MPA.

The crash records used in the analysis were obtained from TDOT's Tennessee Integrated Traffic Analysis Network (TITAN) and KYTC's Collision Reporting Analysis for Safer Highways (CRASH) and cover all reported crashes from 2017 through 2021.

The crash records include the:

- Severity
- Number of fatalities or severe injuries
- Location
- Vehicle type
- Roadway surface condition
- Collision type

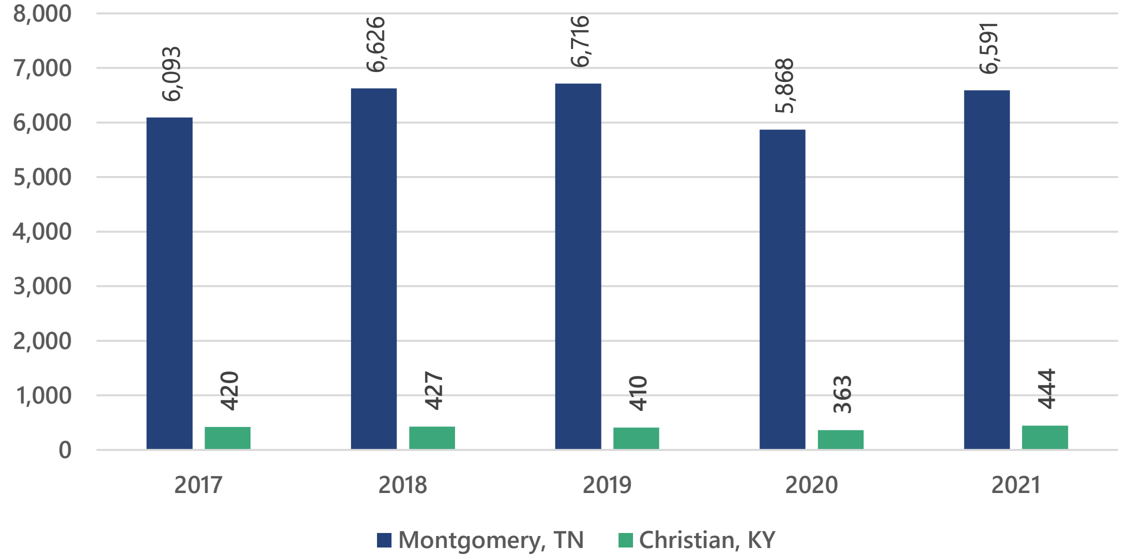
MPA Crash Trends

This section discusses the observed trends regarding all crashes that occurred within the MPA during the analysis period.

Crashes by Year

From 2017 through 2021, there were a total of 33,958 crashes within the MPA. **Figure 3.7** displays the total number of crashes within the MPA by year.

Figure 3.7: MPA Crashes by Year and County, 2017 – 2021



Source: TITAN (TN), 2022; CRASH (KY) 2022

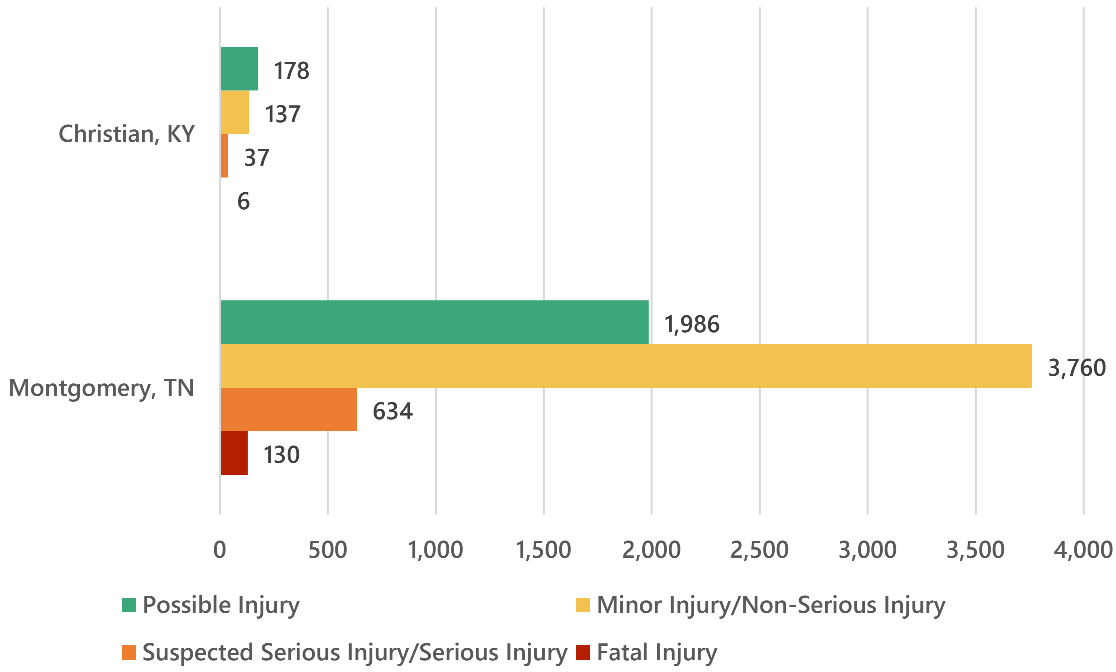
<u>Crash Severity</u>

Crash severity reveals the extent to which crashes in the MPA pose a safety risk to roadway users. Within the MPA, there were 136 fatal crashes and 671 serious injury or suspected serious injury crashes during the analysis period. Nearly three (3) percent of the total crashes resulted in a fatality or serious injury. **Figure 3.8** displays the severity of the fatal/injury crashes within the MPA.

79.8%

Crashes with Property Damage Only

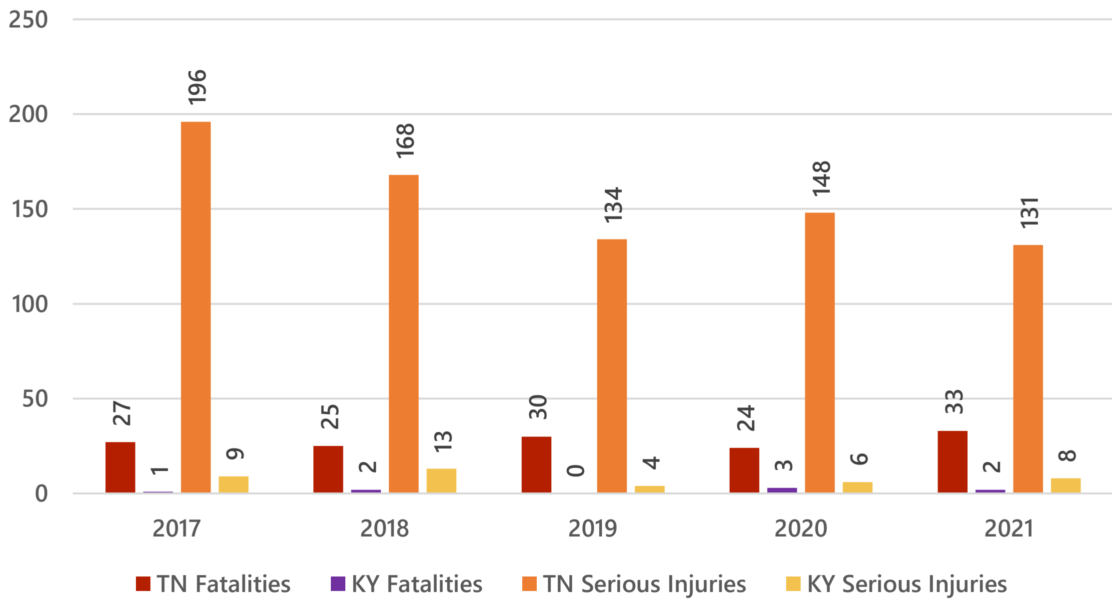
Figure 3.8: Severity of Fatal/Injury Crashes, 2017 – 2021



Source: TITAN (TN), 2022; CRASH (KY) 2022

These crashes resulted in a total of 147 deaths and 817 severe injuries, which are shown by year in **Figure 3.9**.

Figure 3.9: Fatalities and Severe Injuries, 2017 – 2021



Source: TITAN (TN), 2022; CRASH (KY) 2022

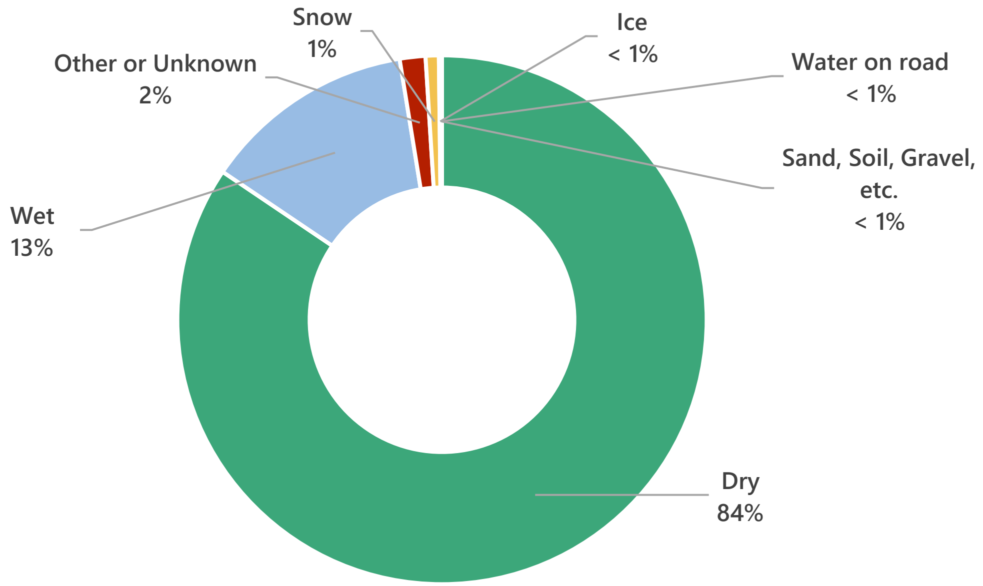
Driving Under the Influence (DUI) Crashes

From 2017 through 2021, there were 1,084 crashes that involved drivers under the influence of a substance (alcohol, drugs, etc.). As a results, just over three (3) percent of the crashes within the MPA were related to DUI. However, these crashes resulted in 24 percent of fatal crashes and 27 percent of the fatalities within the area.

Roadway Surface Condition

The roadway surface can also contribute to a crash through adverse conditions such as rain, oil, debris, or other sources. These conditions temporarily reduce the safety of the roadway and can lead to a crash. However, more than 84 percent of the crashes occurred during dry conditions. This means the roadway surface condition is not a contributing factor in most crashes. The distribution of crashes by surface condition is displayed in **Figure 3.10**.

Figure 3.10: Crashes by Roadway Surface Condition, 2017 – 2021



Source: TITAN (TN), 2022; CRASH (KY) 2022

Collision Type

This study also considers collision types that occurred. **Table 3.8** displays the crashes by collision type.

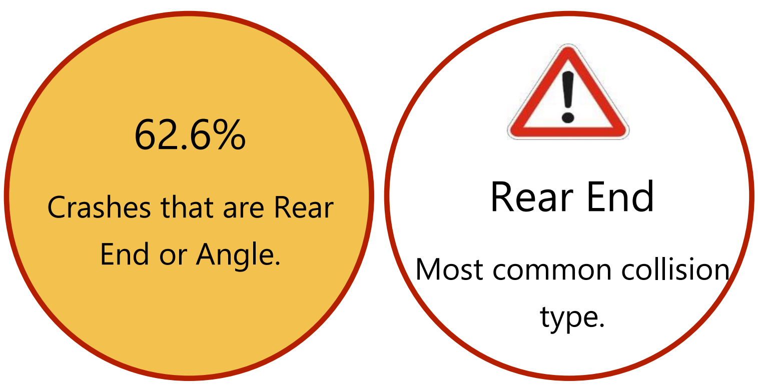


Table 3.8: Crashes by Collision Type, 2017 – 2021

Collision Type	County		Total Crashes
	Montgomery, TN	Christian, KY	
Angle	9,260	301	9,561
Head On	580	52	632
No Collision with Vehicle or Single Vehicle	7,162	547	7,709
Opposing Left Turn	0	59	59
Other or Unknown	791	0	791
Rear End	11,025	676	11,701
Rear To Rear	57	18	75
Rear To Side or Backing	314	69	383
Sideswipe Opposite Direction	471	73	544
Sideswipe Same Direction	2,234	269	2,503

Source: TITAN (TN), 2022; CRASH (KY) 2022

Crash Locations

The nature of this study is only to identify trends; thus, it did not attempt to analyze each hazardous location and corresponding crash records for specific solutions. However, it features an identification of locations that experience the highest crash frequencies or rates. Crash frequencies reflect how often crashes occur at a given location and are expressed in crashes per year. Crash rates reflect the number of crashes compared to the traffic volumes a roadway experiences and are expressed as crashes per million vehicle miles traveled for roadway segments. Intersection crash rates are expressed as crashes per million vehicles entering the intersection.

The hazardous locations shown in this report are not a ranking of these locations, but merely a list developed for informational purposes.

Segment Crashes

For this study, roadway segments are defined in two ways:

- A roadway link between two significant roadways.
- A roadway link between a significant roadway and a specific distance from that point.

Crashes on segments can occur due to roadway design, pavement condition, lighting, or other factors. A segment identified in this analysis should be further analyzed in additional studies to determine what contributes to the high crash frequency and/or crash rate it experiences. These studies should also be used to develop site-specific countermeasures.

Crash Frequencies

Table 3.9 displays the roadway segments in the MPA that have the highest crash frequencies and a breakdown of the severity of the crashes. These locations are shown in **Figure 3.11**.

9.2 percent of all MPA crashes occur on the top 20 crash frequency segments.

Crash Rates

Crash rates for the study area were based on the model network layer and existing year (2019) volumes obtained from the Clarksville travel demand model. The length of each segment and the corresponding daily traffic volumes from the model are used in the crash rate equation.

The segment crash rate equation is:

$$Segment\ Crash\ Rate = \frac{N \times 10^6}{365 \times ADT \times L}$$

Where: Segment Crash Rate = crashes per million vehicle miles traveled

N = average annual crash frequency of the segment

ADT = average daily traffic of the segment based on the 2019 Travel Demand Model

L = length of the model segment in miles

Table 3.10 displays the roadway segments in the MPA that have the highest crash rates. These locations are shown in **Figure 3.11**.

Table 3.9: Top Crash Frequency Segments and Severity by State, 2017 – 2021

Tennessee

Route	Location	Length (miles)	Total Crashes	Average Annual Crash Frequency	Severity: Fatal	Severity: Serious	Severity: Minor/ Non-Serious	Severity: Possible	Severity: Property Damage Only
I-24 Eastbound	US 79 (SR 13) On-Ramp to 1.27 miles southeast of US 79 (SR 13) Boulevard On-Ramp	1.27	291	58.2	0	1	27	20	243
SR 236/Tiny Town Road	Heritage Point Drive to SR 48/Trenton Road	0.35	237	47.4	0	1	28	16	192
I-24 Eastbound	SR 237/Rossview Road On-Ramp to SR 76/Martin Luther King Parkway Off-Ramp	2.14	215	43.0	1	5	17	3	189
US 41A (SR 12)/US 79 (SR 76)/Providence Boulevard	Chapel Street to Quarry Road	0.63	207	41.4	1	1	28	21	156
US 41A (SR 112)/Madison Street	Denny Road to US 41A Bypass (SR 76)/Martin Luther King Parkway/Ashland City Road	0.19	191	38.2	1	1	26	9	154
US 79 (SR 13)/Wilma Rudolph Boulevard	Morris Road to Fair Brook Place	0.16	155	31.0	1	0	17	10	127
US 41A (SR 12)/Fort Campbell Boulevard	Hermitage Road to Millswood Drive	0.14	154	30.8	0	1	15	20	118
SR 48/Trenton Road	Northfield Drive to I-24 Eastbound Off-Ramp	0.16	149	29.8	0	1	10	10	128
US 41A (SR 12)/US 79 (SR 76)/Providence Boulevard	Peachers Mill Road to Chapel Street	0.31	147	29.4	1	7	15	10	114
Needmore Road	0.24 miles west of US 79 (SR 13)/Wilma Rudolph Boulevard to US 79 (SR 13)/Wilma Rudolph Boulevard	0.24	139	27.8	0	1	9	8	121
US 41A (SR 112)/Madison Street	US 41A Bypass (SR 76)/Martin Luther King Parkway/Ashland City Road to Country Lane	0.27	137	27.4	0	0	19	8	110
SR 236/Tiny Town Road	Sandpiper Drive to Heritage Point Drive	0.38	133	26.6	2	4	21	12	94
US 79 (SR 13)/Wilma Rudolph Boulevard	Terminal Road to South Hampton Place	0.14	128	25.6	0	2	10	11	105
I-24 Eastbound	SR 48/Trenton Road On-Ramp to US 79 (SR 13)/Wilma Rudolph Boulevard Off-Ramp	2.33	127	25.4	0	4	18	3	102
I-24 Westbound	2.22 miles east of SR 76/Martin Luther King Parkway Off-Ramp to SR 76/Martin Luther King Parkway Off-Ramp	2.22	125	25.0	3	5	13	4	100
US 41A (SR 12)/Fort Campbell Boulevard	Quin Lane to Eagle Court	0.24	122	24.4	1	3	10	12	96
US 41A Bypass (SR 12/SR 13)/North Riverside Drive	0.17 miles south of US 41A/US 79 (SR 76)/North Second Street to US 41A/US 79 (SR 76)/North Second Street	0.17	121	24.2	1	1	7	8	104
I-24 Westbound	SR 76/Martin Luther King Parkway On-Ramp to SR 237/Rossview Road Off-Ramp	2.16	118	23.6	2	10	16	2	88
US 41A (SR 12)/US 79 (SR 76)/Providence Boulevard	Quarry Road to US 41A Bypass (SR 12/SR 13)/North Riverside Drive	0.24	118	23.6	1	0	10	8	99
US 79 (SR 13)/Wilma Rudolph Boulevard	SR 374/Warfield Road/101st Airborne Division Parkway to Forest Hills Drive	0.23	117	23.4	0	0	8	13	96
		Tennessee TOTAL	3,131	626.2	15	48	324	208	2,536

Kentucky

Route	Location	Length (miles)	Total Crashes	Average Annual Crash Frequency	Severity: Fatal	Severity: Serious	Severity: Minor/ Non-Serious	Severity: Possible	Severity: Property Damage Only
I-24 Eastbound	Red River to Tennessee State Line	2.13	86	17.2	0	1	3	10	72
KY 911/Thompsonville Lane	Lynn Street to Catin Renee Lane	0.77	85	17.0	0	2	2	11	70
US 41A/Fort Campbell Boulevard	KY 400/State Line Road to Screaming Eagle Boulevard	0.27	75	15.0	0	3	2	3	67
I-24 Westbound	Tennessee State Line to Red River	2.14	74	14.8	1	0	2	9	62
US 41A/Fort Campbell Boulevard	KY 911/Thompsonville Lane to Tuckaway Lane	0.44	67	13.4	0	0	2	9	56
		Kentucky TOTAL	387	77.4	1	6	11	42	327

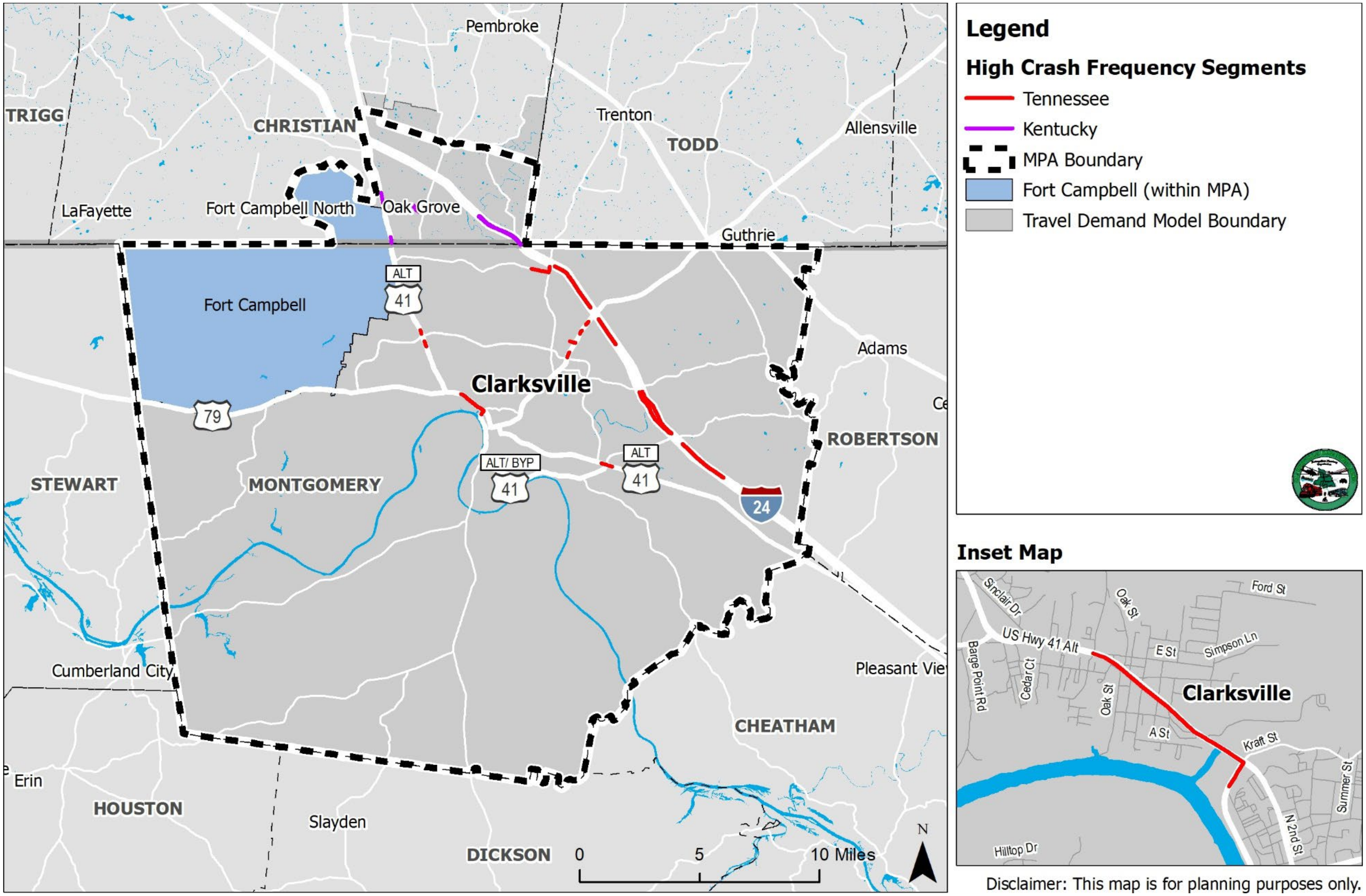
Source: TITAN (TN), 2022; CRASH (KY) 2022

Table 3.10: Top Crash Rate Segments by State, 2017 – 2021

Route	Location	Length (miles)	Total Crashes	Average Annual Crash Frequency	ADT	Crash Rate
Tennessee						
Dover Crossing Road	US 79 (SR 76)/Dover Road to 0.14 miles north of US 79 (SR 76)/Dover Road	0.14	31	6.2	3,496	33.67
Franklin Street	Public Square to South Second Street	0.15	16	3.2	1,858	32.30
Needmore Road	0.24 miles west of US 79 (SR 13)/Wilma Rudolph Boulevard to US 79 (SR 13)/Wilma Rudolph Boulevard	0.24	139	27.8	11,343	28.10
North Liberty Church Road	0.64 miles north of US 79 (SR 76)/Dover Road to 1.12 miles north of US 79 (SR 76)/Dover Road	0.48	15	3.0	744	23.01
Alfred Thun Road	Corporate Parkway Boulevard to US 79 (SR 13)/LG Highway	0.56	42	8.4	2,016	20.30
Ringgold Road	SR 374/101st Airborne Division Parkway to Ishee Drive	0.55	26	5.2	1,323	19.47
US 41A (SR 12)/Fort Campbell Boulevard	Hermitage Road to Millswood Drive	0.14	154	30.8	31,401	19.47
Holiday Drive	US 79 (SR 13)/Wilma Rudolph Boulevard to Clay Lewis Road	0.15	53	10.6	10,595	18.50
Red River Street	Artic Street to Stacker Drive	0.15	3	0.6	600	18.19
SR 48/Trenton Road	Northfield Drive to I-24 Eastbound Off-Ramp	0.16	149	29.8	27,829	18.09
Jack Miller Boulevard	0.26 miles west of Outlaw Field Road to Outlaw Field Road	0.26	26	5.2	3,123	17.74
Old Russellville Pike	Stone Container Drive to US 79 (SR 13)/Wilma Rudolph Boulevard	0.13	13	2.6	3,295	16.98
Old Farmers Road	Trelawny Drive to SR 76/Martin Luther King Parkway	0.44	53	10.6	3,931	16.66
Old Trenton Road	Garth Road to US 79 (SR 13/SR 48)/Wilma Rudolph Boulevard	0.16	14	2.8	2,982	16.25
US 41A Bypass (SR 12/SR 13)/North Riverside Drive	0.17 miles south of US 41A/US 79 (SR 76)/North Second Street to US 41A/US 79 (SR 76)/North Second Street	0.17	121	24.2	23,452	16.20
US 41A (SR 76)/North Second Street	US 41A Bypass/US 79 (SR 12/SR 13)/North Riverside Drive to Tennessee Avenue	0.10	48	9.6	15,972	15.98
Marion Street	Robb Avenue to Drane Street	0.11	12	2.4	3,754	15.82
US 79 (SR 13)/Kraft Street	Parham Drive to Ladd Drive	0.15	47	9.4	10,668	15.70
US 41A (SR 48)/College Street	North Fourth Street to Browning Drive	0.12	52	10.4	15,245	15.50
US 41A (SR 112)/Madison Street	Denny Road to US 41A Bypass (SR 76)/Martin Luther King Parkway/Ashland City Road	0.19	191	38.2	36,674	15.06
Kentucky						
Route	**Location**	**Length (miles)**	**Total Crashes**	**Average Annual Crash Frequency**	**ADT**	**Crash Rate**
KY 400/State Line Road	US 41A/Fort Campbell Boulevard to Durrett Drive	0.28	41	8.2	1,292	61.21
KY 400/State Line Road	Arvin Road to Mandarin Drive	0.18	18	3.6	1,593	34.28
KY 115/Pembroke Oak Grove Road	0.15 miles south of I-24 Eastbound Off-Ramp to I-24 Eastbound Off-Ramp	0.15	33	6.6	9,624	12.69
I-24 Eastbound	On-Ramp from US 41A/Fort Campbell Boulevard Southbound	0.33	6	1.2	791	12.56
KY 400/State Line Road	0.33 miles west of Patton Place to Patton Place	0.33	9	1.8	1,593	9.31

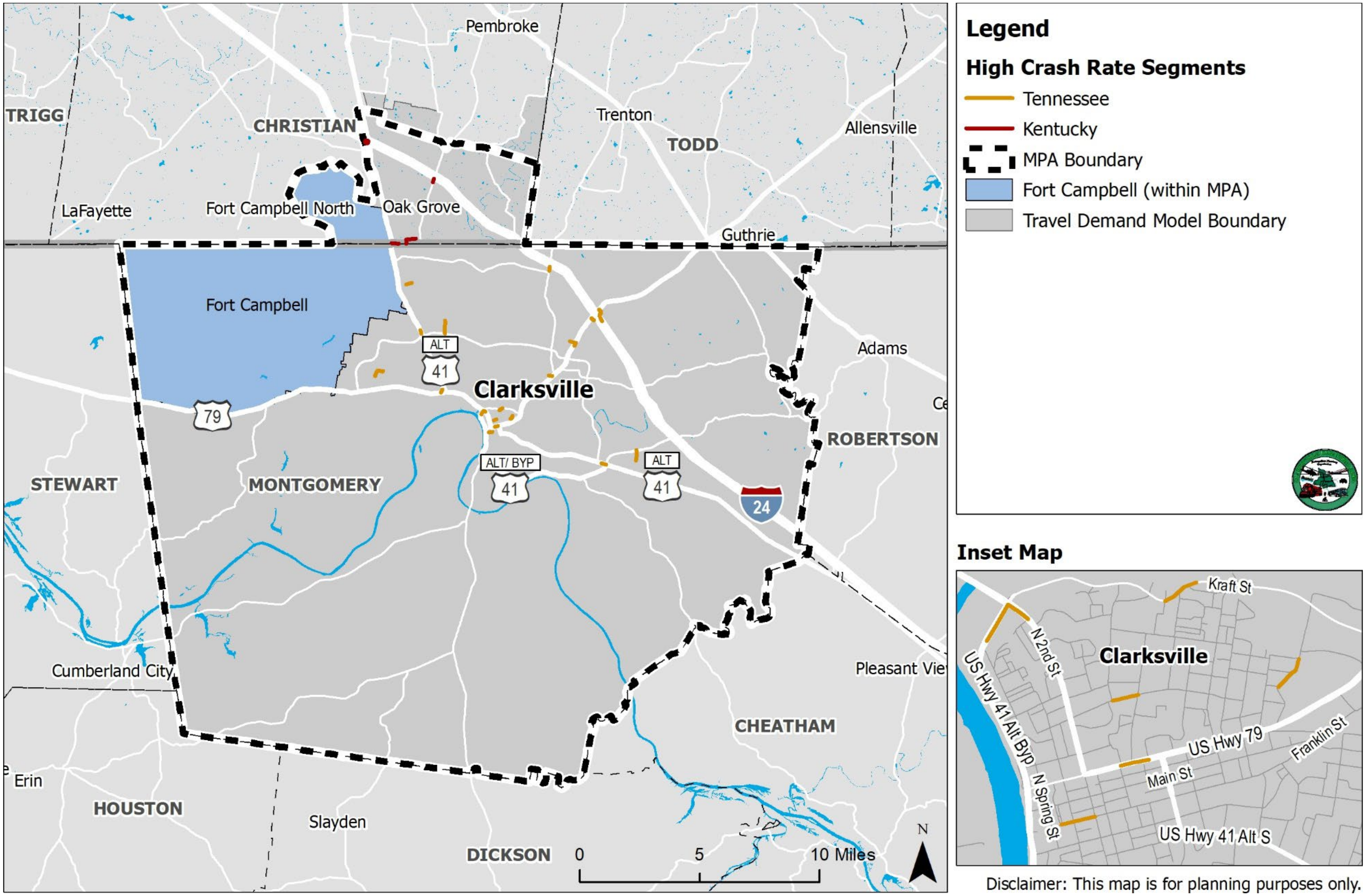
Source: TITAN (TN), 2022; CRASH (KY) 2022

Figure 3.11: High Crash Frequency Segments, 2017 – 2021



Source: TITAN (TN), 2022; CRASH (KY) 2022

Figure 3.12: High Crash Rate Segments, 2017 – 2021



Source: TITAN (TN), 2022; CRASH (KY) 2022

Intersection Crashes

There were nearly 9,100 intersection crashes in the MPO Region from 2017 to 2021.

26.8%

Of crashes in the MPA occur at intersections.

Crash Frequencies

Table 3.11 shows the 20 intersections in the MPA with the highest crash frequency and their severity. **Table 3.12** shows the collision types that occurred at these intersections. These locations are also displayed in **Figure 3.13**.

Additional studies should be conducted on these intersections to identify the cause of the crashes and how to reduce the severity and types of crashes they experience.

36.5%

Of intersection crashes occur at the Top 20 crash frequency locations.

Crash Rates

The intersection crash rate equation is:

$$Intersection\ Crash\ Rate = \frac{N \times 10^6}{365 \times ADT}$$

Where:

Intersection Crash Rate = crashes per million vehicles entering

N = average annual crash frequency of the intersection

ADT = average daily traffic entering the intersection based on the 2019 Travel Demand Model

Table 3.13 shows the ten (10) intersections in the Tennessee portion of the MPA and five (5) intersections in the Kentucky portion of the MPA with the highest crash frequencies in the study area and their corresponding crash rates.

Table 3.11: Top Intersections with High Crash Frequency by Severity, by State, 2017 – 2021

Intersection	Total Crashes	Average Annual Crash Frequency	Severity: Fatal	Serious	Minor/Non-Serious	Possible	Property Damage Only
Tennessee							
SR 374/101st Airborne Division Parkway at Peachers Mill Road	375	75.0	2	1	44	26	302
SR 374/101st Airborne Division Parkway at North Whitfield Road	268	53.6	0	3	44	14	207
SR 48/Trenton Road at SR 236/Tiny Town Road	265	53.0	0	0	33	27	205
SR 374/101st Airborne Division Parkway at SR 48/Trenton Road	216	43.2	0	4	26	24	162
US 79 (SR 13)/Wilma Rudolph Boulevard at Holiday Drive/Westfield Court	178	35.6	0	2	17	13	146
US 79 (SR 13)/Wilma Rudolph Boulevard at SR 48/Trenton Road	172	34.4	0	0	17	17	138
US 41A/US 79 (SR 12/SR 76)/North Second Street at US 41A Bypass/US 79 (SR 13)/North Riverside Drive/Kraft Street	162	32.4	0	5	23	9	125
US 41A/US 79 (SR 12/SR 76)/Providence Boulevard at Peachers Mill Road	144	28.8	0	7	14	14	109
US 41A (SR 76/SR 112)/Madison Street at US 41A Bypass (SR 76)/Ashland City Road/Martin Luther King Parkway	144	28.8	1	2	13	7	121
US 41A (SR 76/SR 112)/Madison Street at Memorial Drive	143	28.6	0	6	22	13	102
US 41A (SR 12)/Fort Campbell Boulevard at Britton Springs Road/Ringgold Road	137	27.4	1	2	21	11	102
SR 76/Martin Luther King Parkway at Sango Road	136	27.2	0	0	14	14	108
SR 374/Warfield Boulevard at SR 237/Rossview Road	136	27.2	0	4	15	13	104
SR 374/Warfield Boulevard at Memorial Drive	135	27.0	0	0	9	6	120
US 41A (SR 12)/Fort Campbell Boulevard at Jack Miller Boulevard/William C. Lee Road	128	25.6	0	1	21	10	96
US 79 (SR 13)/Wilma Rudolph Boulevard at Needmore Road/Old Russellville Pike	124	24.8	0	1	18	6	99
SR 48/Trenton Road at Hazlewood Road	123	24.6	0	0	15	11	97
US 79 (SR 13)/Wilma Rudolph Boulevard at Athletic Avenue	120	24.0	1	1	22	8	88
SR 48/Trenton Road at Needmore Road	113	22.6	0	0	8	9	96
US 79 (SR 13)/Wilma Rudolph Boulevard at Dunbar Cave Road	112	22.4	1	2	10	12	87
Tennessee TOTAL	3,331	666.2	6	41	406	264	2,614
Kentucky							
Intersection	**Total Crashes**	**Average Annual Crash Frequency**	**Severity: Fatal**	**Serious**	**Minor/Non-Serious**	**Possible**	**Property Damage Only**
US 41A/Fort Campbell Boulevard at Screaming Eagle Boulevard	62	12.4	0	0	5	6	51
US 41A/Fort Campbell Boulevard at KY 400/State Line Road	59	11.8	0	1	6	3	49
KY 115/Pembroke Oak Grove Road at KY 911/Thompsonville Lane/Hugh Hunter Road	49	9.8	0	0	4	5	40
US 41A/Fort Campbell Boulevard at KY 911/Thompsonville Lane	47	9.4	0	0	5	7	35
US 41A/Fort Campbell Boulevard at KY 788/Gate 7 Road	43	8.6	0	1	4	6	32
Kentucky TOTAL	260	52.0	0	2	24	27	207

Source: TITAN (TN), 2022; CRASH (KY) 2022

Table 3.12: Top Intersections with High Crash Frequency by Collision Type, by State, 2017 – 2021

Tennessee												
Intersection	Total Crashes	Average Annual Crash Frequency	Crash Type									
			Angle	Head On	No Collision with Vehicle	Opposing Left Turn	Other or Unknown	Rear End	Rear to Rear	Rear to Side or Backing	Sideswipe Opposite	Sideswipe Same
SR 374/101st Airborne Division Parkway at Peachers Mill Road	375	75.0	87	7	18	0	4	232	0	1	1	25
SR 374/101st Airborne Division Parkway at North Whitfield Road	268	53.6	30	0	26	0	2	195	0	0	0	15
SR 48/Trenton Road at SR 236/Tiny Town Road	265	53.0	107	6	6	0	2	132	0	0	1	11
SR 374/101st Airborne Division Parkway at SR 48/Trenton Road	216	43.2	47	5	13	0	3	139	0	0	0	9
US 79 (SR 13)/Wilma Rudolph Boulevard at Holiday Drive/Westfield Court	178	35.6	85	5	2	0	3	69	0	0	0	14
US 79 (SR 13)/Wilma Rudolph Boulevard at SR 48/Trenton Road	172	34.4	25	4	3	0	2	131	0	0	0	7
US 41A/US 79 (SR 12/SR 76)/North Second Street at US 41A Bypass/US 79 (SR 13)/North Riverside Drive/Kraft Street	162	32.4	40	2	9	0	2	84	0	1	3	21
US 41A/US 79 (SR 12/SR 76)/Providence Boulevard at Peachers Mill Road	144	28.8	44	3	13	0	0	68	2	1	3	10
US 41A (SR 76/SR 112)/Madison Street at US 41A Bypass (SR 76)/Ashland City Road/Martin Luther King Parkway	144	28.8	30	2	10	0	4	88	0	1	0	9
US 41A (SR 76/SR 112)/Madison Street at Memorial Drive	143	28.6	77	3	7	0	0	50	0	0	0	6
US 41A (SR 12)/Fort Campbell Boulevard at Britton Springs Road/Ringgold Road	137	27.4	59	2	3	0	4	59	0	0	0	10
SR 76/Martin Luther King Parkway at Sango Road	136	27.2	56	1	4	0	0	69	1	0	0	5
SR 374/Warfield Boulevard at SR 237/Rossview Road	136	27.2	51	3	7	0	1	65	0	0	1	8
SR 374/Warfield Boulevard at Memorial Drive	135	27.0	16	4	3	0	0	105	0	0	1	6
US 41A (SR 12)/Fort Campbell Boulevard at Jack Miller Boulevard/William C. Lee Road	128	25.6	49	2	2	0	2	65	0	0	0	8
US 79 (SR 13)/Wilma Rudolph Boulevard at Needmore Road/Old Russellville Pike	124	24.8	59	2	2	0	4	40	0	0	0	17
SR 48/Trenton Road at Hazlewood Road	123	24.6	38	2	10	0	3	65	0	1	2	2
US 79 (SR 13)/Wilma Rudolph Boulevard at Athletic Avenue	120	24.0	33	3	4	0	3	64	0	2	0	11
SR 48/Trenton Road at Needmore Road	113	22.6	35	5	5	0	5	58	0	0	0	5
US 79 (SR 13)/Wilma Rudolph Boulevard at Dunbar Cave Road	112	22.4	30	3	5	0	1	66	0	1	0	6
Tennessee TOTAL	3,331	666.2	998	64	152	0	45	1,844	3	8	12	205

Kentucky												
Intersection	Total Crashes	Average Annual Crash Frequency	Crash Type									
			Angle	Head On	No Collision with Vehicle	Opposing Left Turn	Other or Unknown	Rear End	Rear to Rear	Rear to Side or Backing	Sideswipe Opposite	Sideswipe Same
US 41A/Fort Campbell Boulevard at Screaming Eagle Boulevard	62	12.4	6	0	0	6	0	35	2	2	0	11
US 41A/Fort Campbell Boulevard at KY 400/State Line Road	59	11.8	18	3	3	2	0	22	0	1	2	8
KY 115/Pembroke Oak Grove Road at KY 911/Thompsonville Lane/Hugh Hunter Road	49	9.8	15	2	2	12	0	13	0	0	0	5
US 41A/Fort Campbell Boulevard at KY 911/Thompsonville Lane	47	9.4	15	0	2	1	0	16	0	0	4	9
US 41A/Fort Campbell Boulevard at KY 788/Gate 7 Road	43	8.6	11	2	3	1	0	21	1	1	0	3
Kentucky TOTAL	260	52.0	65	7	10	22	0	107	3	4	6	36

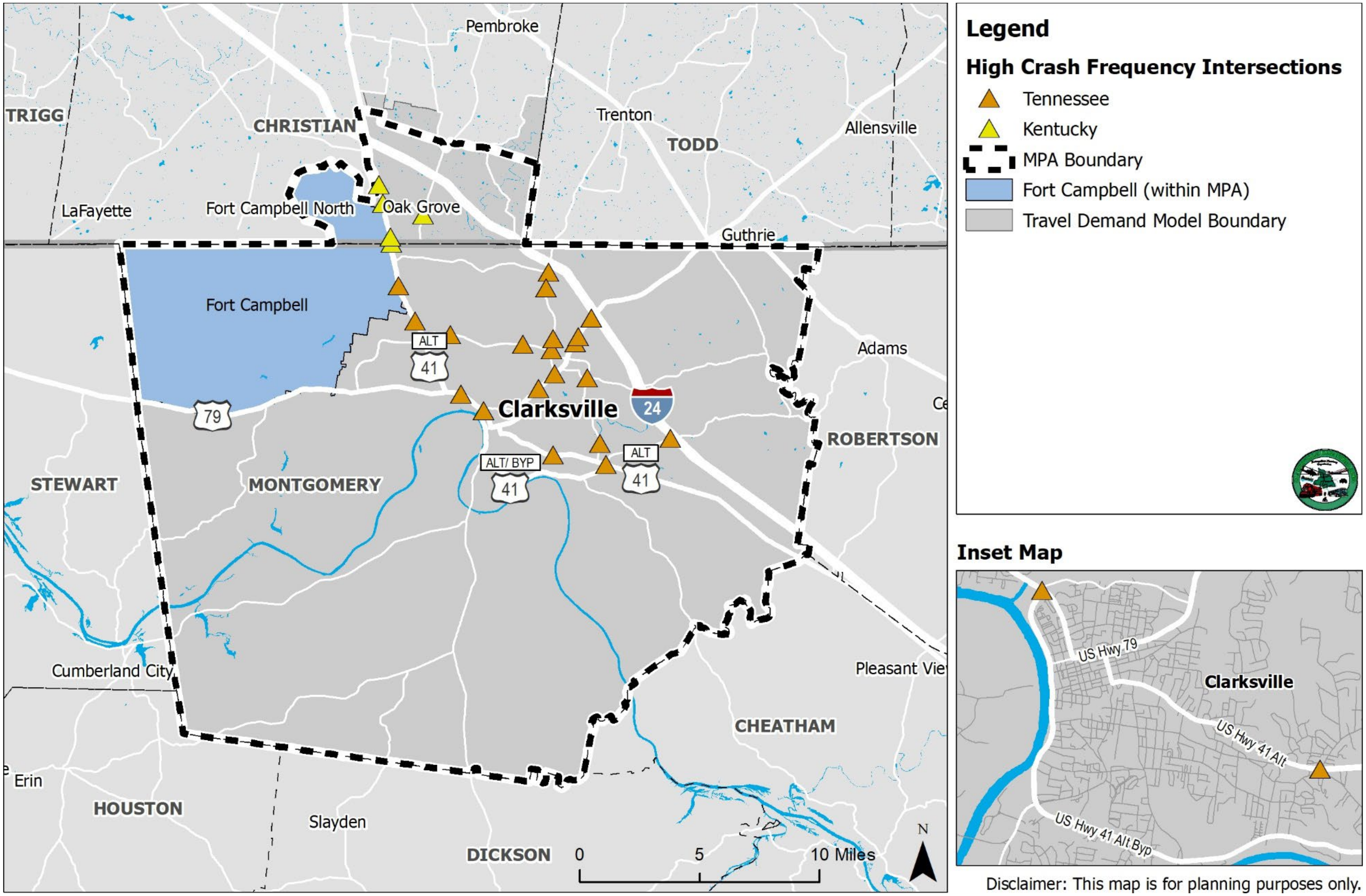
Source: TITAN (TN), 2022; CRASH (KY) 2022

Table 3.13: Top 10 High Crash Frequency Intersections and Crash Rates, 2017 – 2021

Intersection	Total Crashes	Average Annual Crash Frequency	ADT	Crash Rate
Tennessee				
SR-374/101st Airborne Division Parkway at Peachers Mill Road	375	75.0	61,828	3.32
SR-374/101st Airborne Division Parkway at North Whitfield Road	268	53.6	53,414	2.75
SR-48/Trenton Road at SR-236/Tiny Town Road	265	53.0	43,418	3.34
SR-374/101st Airborne Division Parkway at SR-48/Trenton Road	216	43.2	54,152	2.19
US 79 (SR-13)/Wilma Rudolph Boulevard at Holiday Drive/Westfield Court	178	35.6	52,922	1.84
US 79 (SR-13)/Wilma Rudolph Boulevard at SR-48/Trenton Road	172	34.4	38,253	2.46
US 41A/US 79 (SR-12/SR-76)/North Second Street at US 41A Bypass/US 79 (SR-13)/ North Riverside Drive/Kraft Street	162	32.4	61,828	1.44
US 41A/US 79 (SR-12/SR-76)/Providence Boulevard at Peachers Mill Road	144	28.8	46,887	1.68
US 41A (SR-76/SR-112)/Madison Street at US 41A Bypass (SR-76)/Ashland City Road/ Martin Luther King Parkway	144	28.8	46,866	1.68
US 41A (SR-76/SR-112)/Madison Street at Memorial Drive	143	28.6	34,515	2.27
Kentucky				
Intersection	**Total Crashes**	**Average Annual Crash Frequency**	**ADT**	**Crash Rate**
US 41A/Fort Campbell Boulevard at Screaming Eagle Boulevard	62	12.4	32,904	1.03
US 41A/Fort Campbell Boulevard at KY-400/State Line Road	59	11.8	30,825	1.05
KY-115/Pembroke Oak Grove Road at KY-911/Thompsonville Lane/Hugh Hunter Road	49	9.8	16,355	1.64
US 41A/Fort Campbell Boulevard at KY-911/Thompsonville Lane	47	9.4	16,355	1.57
US 41A/Fort Campbell Boulevard at KY-788/Gate 7 Road	43	8.6	19,949	1.18

Source: TITAN (TN), 2022; CRASH (KY) 2022
Note: Crash Rate determines eligibility for safety funding.

Figure 3.13: High Crash Frequency Intersections, 2017 – 2021



Source: TITAN (TN), 2022; CRASH (KY) 2022

3.8 Security

While safety and security are closely related, they are differentiated by the cause of the harm from which the transportation system and its users are being protected.

Safety encompasses the prevention of unintentional harm to system users or their property. This includes vehicular crashes, train derailments, slope failures, sudden destruction of roadways, or non-motorized user injuries. Security involves the prevention, management, and response to intentional harm to the transportation system or its users. This includes:

- theft or dismemberment of elements of the transportation infrastructure,
- assault on users of the system, or
- large-scale attacks intended to completely disrupt the movement of people and goods.

Security concerns can include natural disasters, acts of violence, and terrorism.

MPO Role in Security

The MPO's main role in planning for security is to coordinate with relevant agencies, such as:

- emergency management officials
- police and sheriff's departments
- fire departments
- other first responders

MPOs can take certain measures to improve security prevention, protection, response, and recovery.

Prevention

When discussing security, prevention refers to efforts to limit access to resources that may be compromised or efforts to increase surveillance. Examples of prevention measures include:

- access control systems
- Closed Circuit Television (CCTV) systems
- security alarms
- fencing
- locks
- architectural barriers

The design of facilities and public spaces can also incorporate features that deter security breaches.

Protection

High vulnerability risk facilities should have additional design measures considered. These measures would mitigate potential security risks, should they occur. Protection efforts could also include law enforcement where necessary, such as theft, damage to traffic equipment, etc.

Response

Redundancy of transportation facilities should be encouraged in capital project planning. This assists in emergency evacuations or detours should a particular segment of the transportation network become unavailable. The use of Intelligent Transportation Systems (ITS) to control traffic signals and other controls also assists in responding to security.

Recovery

Transportation decision-makers should be familiar with both short-term and long-term recovery plans for the MPA. This includes everything from evacuations to restoring local businesses and neighborhoods. Both TDOT and KYTC maintain an emergency operations plan for their entire state.

In the Clarksville MPO area, Montgomery and Christian Counties each have their own emergency management bodies. More information can be found on each county's operations at:

Montgomery County, TN

https://mcgtn.org/ema

Christian County, KY

http://www.christiancountyky.gov/emergency-management

Key Security Participants

As stated previously, the MPO coordinates with relevant agencies and is in a support role when security issues arise. The MPO can serve as a medium of communication between the various agencies involved. Several key participants to the security management process have been identified below.

State and Local Governments

TDOT's Office of Emergency Operations maintains a preparedness program that includes planning, training, and exercises regarding emergency response activities. The department also provides traffic control, manpower, and equipment to TEMA upon request. There is an additional emergency services coordinator who provides assistance to TEMA for emergencies involving railroads that are Class 1, Class 2, or Class 3. TDOT also maintains a Freeway Incident Management Program, called "HELP".

Freeway Incident Management Programs have also been established and maintained by KYTC and TDOT. These programs coordinate with state and local emergency officials on freeway traffic control when incidents arise and respond to motorist emergencies. They are called "Safe Patrol" in Kentucky, and "HELP" in Tennessee; however, neither service currently operates within the MPA.

Tennessee Emergency Management Agency (TEMA)

A division of the Tennessee Department of Military, TEMA is also an additional provider for emergency management in the MPO Region. TEMA defines its mission as:

"To coordinate preparedness, response, and recovery from man-made, natural, and technological hazards in a professional and efficient manner in concert with our stakeholders."

The TEMA website (https://www.tn.gov/tema.html) provides information, planning advice, and information to the public and the emergency management communities.

Kentucky Emergency Management Agency (KYEM)

A division of the Kentucky Department of Military Affairs, KYEM is also an additional provider for emergency management in the MPO Region. KYEM defines its vision as:

"A resilient commonwealth that is safe, secure, and prepared for emergencies and disasters, because of the programs and efforts of a superior emergency management team that is staffed and led by professional managers and administrators."

The KYEM website (https://kyem.ky.gov/Pages/default.aspx) provides information, planning advice, and information to the public and the emergency management communities.

Austin Peay State University

The university maintains an Emergency Action Plan that allows it to coordinate with state and local agencies. The plan contains transportation elements that allow for the evacuation, emergency transportation services, and clearance/restoration of roads on campus.

More information can be found at:

http://www.apsu.edu/police/emergency-procedures-plan

Integration of Intelligent Transportation Systems (ITS)

Through their ITS architecture Plan, the MPO supports investment in ITS technologies that includes surveillance and security related elements.

Strategic Highway Network (STRAHNET)

The STRAHNET is a portion of the NHS considered vital to the nation's strategic defense. The current STRAHNET is about 61,000 miles long and links military installations with roadways that provide for the mobility of strategic military assets. All Interstate highways, including I-24 within the MPA, are included as part of the STRAHNET. Within the MPA, the following routes in the MP Aare part of STRAHNET:

- I-24
- US 41A/Fort Campbell Blvd from Screaming Eagle Blvd (Fort Campbell, Gate 4) north to I-24

The STRAHNET routes need additional considerations, which include maintenance of bridge capability, pavement conditions, and congestion management. The use of ITS along these corridors, particularly dynamic message signs, will allow for better management of the traffic related to military convoys.

4.0 Freight

4.1 Introduction

The movement of freight throughout the MPA affects both the regional and national economy. The region is a major generator of freight, as well as a distribution and processing center for many goods. It is home to many freight facilities including Class I railroads and major highways.

4.2 Supporting Plans and Goals

Federal

Increasingly, federal legislation has provided incentives for states to focus on freight transportation investments. The provisions embodied in the 2021 *Infrastructure Investment and Jobs Act* (IIJA) established new dedicated freight programs and funding sources, intended to address freight needs that produce public benefits.

<u>National Freight Goals</u>

The current transportation legislation is the IIJA. Per 49 U.S.C. 70101 (b) of the FAST Act, which was amended in the IIJA, there are ten (10) National Multimodal Freight Policy Goals, which are to:

1. Identify infrastructure improvements, policies, and operational innovations that –
    a. Strengthen the contribution of the National Multimodal Freight Network to the economic competitiveness of the United States.
    b. Reduce congestion and eliminate bottlenecks on the National Multimodal Freight Network.
    c. Increase productivity, particularly for domestic industries and businesses that create high-value jobs.
2. Improve the safety, security, efficiency, and resiliency of multimodal freight transportation.
3. Achieve and maintain a state of good repair on the National Multimodal Freight Network.
4. Use innovation and advanced technology to improve the safety, efficiency, and reliability of the National Multimodal Freight Network.

5. Improve the economic efficiency and productivity of the National Multimodal Freight Network.
6. Improve the reliability of freight transportation.
7. Improve the short- and long-distance movement of goods that –
    a. Travel across rural areas between population centers.
    b. Travel between rural areas and population centers.
    c. Travel from the Nation's ports, airports, and gateways to the National Multimodal Freight Network.
8. Improve the flexibility of States to support multi-State corridor planning and the creation of multi-State organizations to increase the ability of States to address multimodal freight connectivity.
9. Reduce the adverse environmental impacts of freight movement on the National Multimodal Freight Network.
10. Pursue the goals described in this subsection in a manner that is not burdensome to State and local governments.

State

Tennessee

The *Tennessee Statewide Multimodal Freight Plan*[4] is Tennessee's statewide comprehensive freight plan and was most recently updated in 2019. Freight transportation, including air, water, road, and rail systems, is a critical part of economic development, job creation, and global growth for the state of Tennessee. Efficient movement of goods to, from, and through Tennessee is also closely linked with manufacturing, which supports jobs throughout the state. Due to the heavy reliance of the state's economy on freight transportation, TDOT established a guiding principle to provide for the efficient movement of people and freight. TDOT recognizes the importance of planning, designing, constructing, and maintaining freight related projects to sustain mobility and accessibility for the future growth of the state's population and industries.

[4] Tennessee Statewide Multimodal Freight Plan https://www.tn.gov/content/dam/tn/tdot/freight-and-logistics/TDOT_2023_StatewideMultimodalFreightPlan_FullReport_Final,%202023%2005%2030.pdf

The purpose of this freight plan is threefold:

1. Define strategic goals for the Tennessee freight system.
2. Establish a strategy to achieve freight-related goats that align with TDOT's guiding principles.
3. Fulfill the requirements of the FAST Act and subsequent IIJA.

Kentucky

The *Kentucky Freight Plan*[5] is Kentucky's statewide comprehensive freight plan and was most recently updated in 2017; however, an updated plan for 2022 is currently in the works[6]. Kentucky's Freight Plan is a high-level inventory and policy guidance document. The purposes of the plan are to present information about the current state of operations of freight in Kentucky and to develop system-wide strategies and policies consistent with the goals of the KYTC Strategic Plan, the Kentucky Long Range Strategic Transportation Plan, and the United States National Freight Policy.

4.3 Trucking

The MPA contains several roadways that serve freight. Within the MPA, one (1) roadway is part of the National Primary Freight Network (NPFN)[7,8] and the National Multimodal Freight Network (NMFN)[9,10]: I-24.

There are no active intermodal terminal facilities or roadways designated as intermodal connections in the MPA.

In addition to the NMFN, there are several TDOT and KYTC designated freight corridors in the MPA, shown in **Table 4.1**. TDOT has identified all interstates and state-owned arterials as key components of their freight network.

[5] Kentucky Freight Plan https://transportation.ky.gov/MultimodalFreight/Documents/2022%20Kentucky%20Freight%20Plan.pdf
[6] https://transportation.ky.gov/MultimodalFreight/Pages/FREIGHT.aspx
[7] https://ops.fhwa.dot.gov/freight/infrastructure/ismt/state_maps/states/tennessee.htm
[8] https://ops.fhwa.dot.gov/freight/infrastructure/ismt/state_maps/states/kentucky.htm
[9] Tennessee NMFN https://www.transportation.gov/sites/dot.gov/files/docs/State_interimMFN_xlandscape_Tennessee_alt_text.pdf
[10] Kentucky NMFN https://www.transportation.gov/sites/dot.gov/files/docs/State_interimMFN_xlandscape_Kentucky_alt_text.pdf

The KYTC has chosen a 4-tier structure for the Kentucky Highway Freight Network[5]. The following criteria were used to develop this network:

- Tier 1 – National Regional Significane
  - USDOT designated PFN
  - Any segment of road (regardless of functional class) that has 7,000 ≥ AADTT
  - Manual revisions to ensure freight network connectivity
- Tier 2 – Statewide Significance
  - All remaining segments of interstate or parkway not on the PFN
  - Any segment of road (regardless of functional class) with AADTT of 4,000 to 7,000
  - Manual revisions to ensure freight network connectivity
- Tier 3 – Statewide Regional Significance
  - NHS Intermodal connectors recognized by/filed with the FHWA
  - Arterials and collectors with AADTT of 500 to 4,000
- Tier 4 – Local Access Significance
  - Access to major freight generators
  - Local access for freight (first mile, last mile)
  - Manual reviisons to ensure network connectivity

The highways on the Tennessee and Kentucky state freight networks are shown in **Figure 4.1**.

Table 4.1: MPA Significant Freight Truck Corridors

Roadway	Limits	State Criteria
24	Robertson/Montgomery County Line to US 41A/Fort Campbell Boulevard	TDOT Interstate/KYTC Tier 1
41	Robertson/Montgomery County Line to Tennessee/Kentucky State Line	TDOT Arterial (US Highway)
41A	McAdoo Creek Rd/Sango Dr to KY 1453	TDOT Arterial (US Highway)/KYTC Tier 3 (South of I-24), KYTC Tier 2 (North of I-24)
79	Stewart/Montgomery County Line to Tennessee/Kentucky State Line	TDOT Arterial (US Highway)
12	Cheatham/Montgomery County Line to US 41A Bypass/Ashland City Road	TDOT Arterial (State Highway)
13	SR 48 to US 41A Bypass/Ashland City Road	TDOT Arterial (State Highway)
48	Dickson/Montgomery County Line to US 41A Bypass/Ashland City Road; US 41A/University Avenue to US 79/Kraft Street; US 79/Wilma Rudolph Boulevard to Tennessee/Kentucky State Line	TDOT Arterial (State Highway)
76	US 41A/Madison Street to Montgomery/Robertson County Line	TDOT Arterial (State Highway)
149	Stewart/Montgomery County Line to SR 13/SR 48	TDOT Arterial (State Highway)
236	US 41A/Fort Campbell Boulevard to SR 48	TDOT Arterial (State Highway)
237	US 79/Wilma Rudolph Boulevard to International Blvd	TDOT Arterial (State Highway)
374	US 79/Dover Road to US 41A/Madison Street	TDOT Arterial (State Highway)
115	Tennessee/Kentucky State Line to KY 1453	KYTC Tier 3

Source: TDOT, KYTC

There are no active intermodal terminal facilities listed by the Bureau of Transportation Statistics within the MPA. Beyond intermodal terminal facilities, there are many trucking establishments within the MPA. These establishments provide both local and long-distance trucking services.

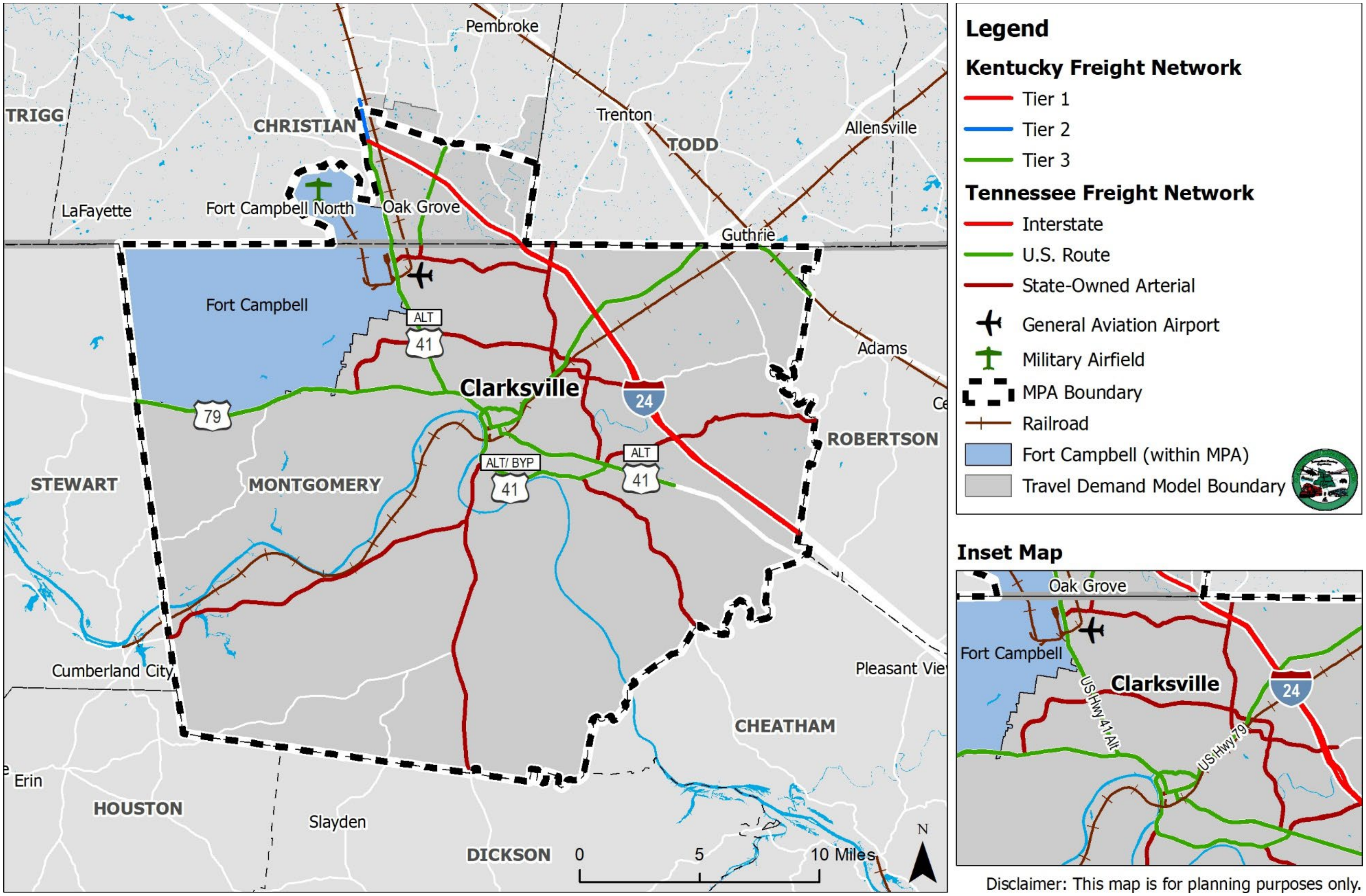
Volumes

To better understand the MPA's freight needs, the travel demand model's daily truck volumes were used, and these estimated volumes are illustrated in **Figure 4.2**.

The estimated freight truck volumes suggest that freight truck traffic is highest on:

- I-24 through the MPA
- US 41A (SR 112) from US 41A Bypass/SR 76 to S 10th Street
- US 41A and US 41A Bypass (SR 12) from SR 13/SR 48 to SR 236/Tiny Town Road
- US 79 (SR 13) and SR 48/College St from 8th Street to 1.09 miles east of Hampton Station Road
- SR 13/SR 48 from Zinc Plant Rd to US 41A Bypass (SR 12)
- SR 76 between Memorial Drive and Vaughn Road
- SR 236/Tiny Town Road from Allen Road to SR 48/Trenton Road
- SR 374 from US 41A (SR 12) to Memorial Drive
- Ted Crozier Boulevard from SR 374 to Athletic Avenue
- Athletic Avenue from Dunlop Lane to Ted Crozier Boulevard
- Dunlop Lane from Ted Crozier Boulevard to International Boulevard

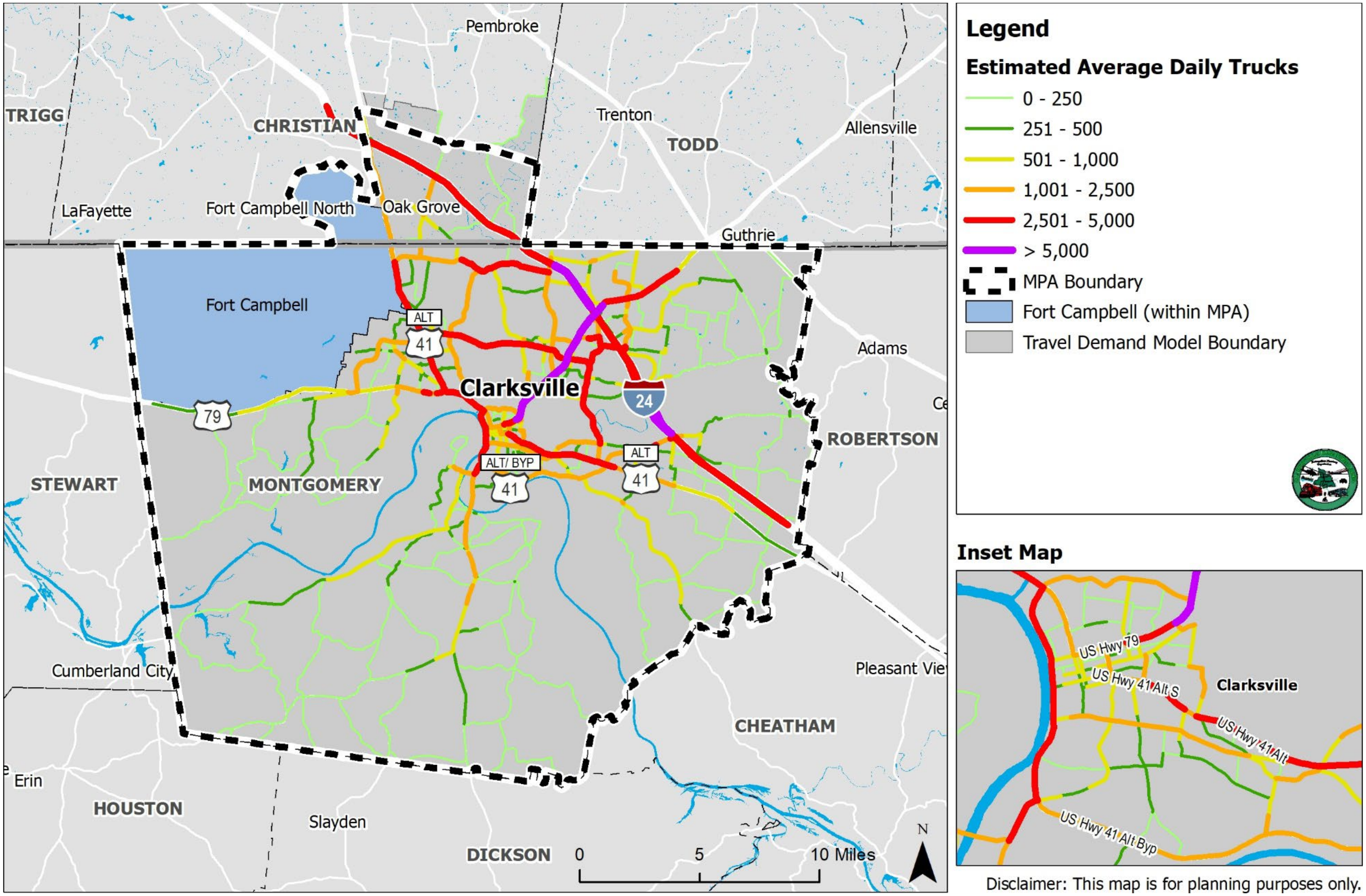
Figure 4.1: Freight Truck Network and Facilities



Disclaimer: This map is for planning purposes only.

Source: USDOT; TDOT; KYTC

Figure 4.2: Freight Truck Traffic, 2022



Source: Travel Demand Model

Commodity Flows

Because of Clarksville's size, the FHWA's Freight Analysis Framework (FAF) commodity flow data is not available for the Clarksville MPA. However, we can glean some information from the State of Tennessee and the State of Kentucky commodity flows. While the amount of actual commodities being moved through an area likely vary considerable throughout the state, the means of transporting freight is more uniform.

Table 4.2 shows that, in Tennessee, the truck mode accounts for nearly 77 percent of all freight tonnage originating in Tennessee. In Kentucky, the truck mode accounts for approximately 57 percent of all freight tonnage originating in Kentucky.

Table 4.2: Means of Transporting Freight Originating in Tennessee and Kentucky, 2019

Mode	Tennessee		Kentucky	
	Thousand Tons	Percent	Thousand Tons	Percent
Truck	294,059	76.5%	194,193	57.3%
Rail	18,492	4.8%	35,143	10.4%
Water	9,370	2.4%	35,589	10.5%
Air (including truck-air)	588	0.2%	326	0.1%
Multiple modes & mail	7,392	1.9%	7,012	2.1%
Pipeline	54,172	14.1%	66,585	19.6%
Other and unknown	113	<0.1%	271	0.1%
Total (All Modes)	**384,185**	**100.0%**	**339,119**	**100.0%**

Source: Freight Analysis Framework 5

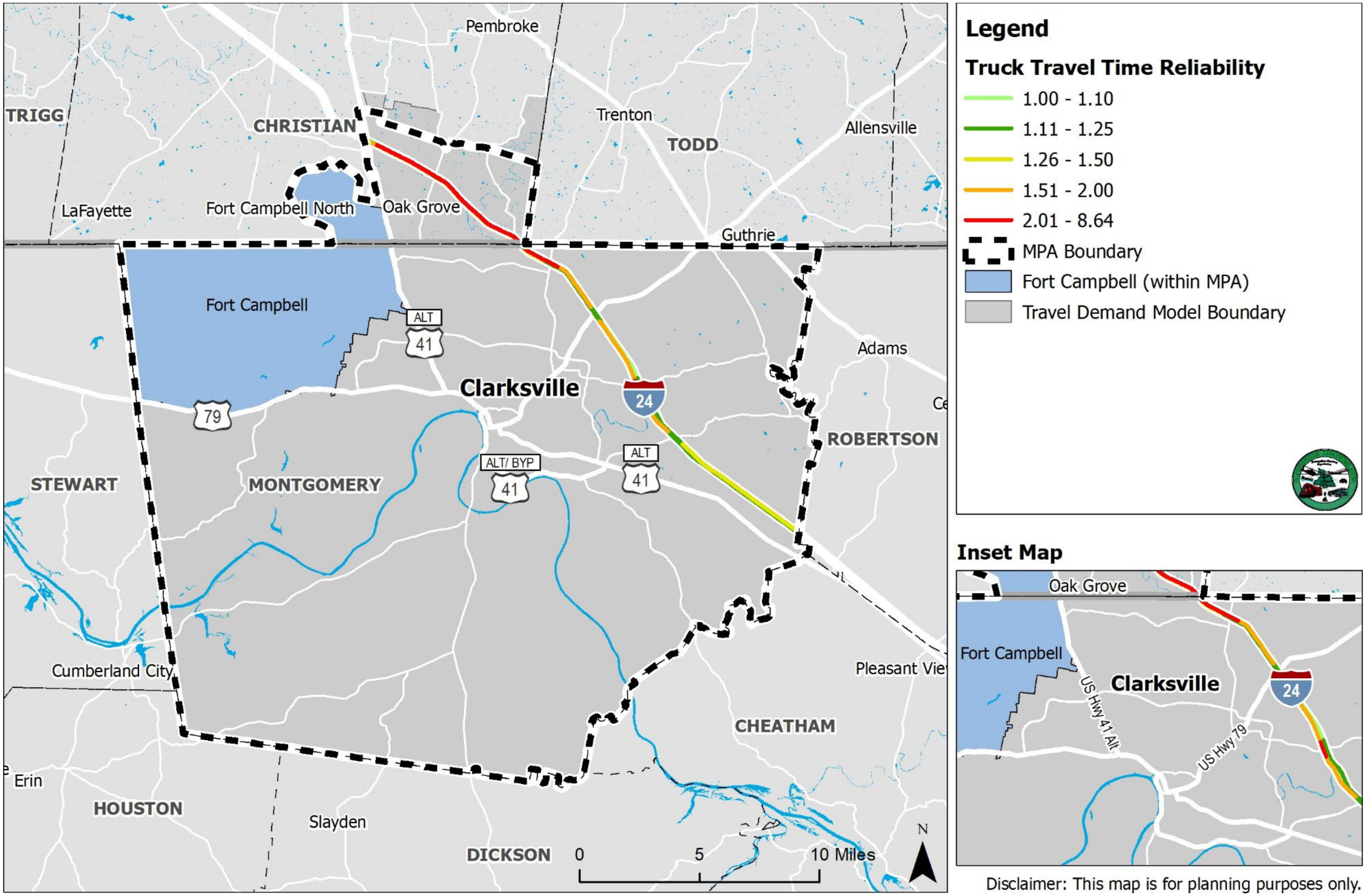
Truck Travel Time Reliability

The FHWA has established a freight performance measure to capture truck travel time reliability on the MPA's Interstate highway system: the Truck Travel Time Reliability (TTTR) index[11]. The 2022 TTTR on each I-24 segment is shown in **Figure 4.3**. The state's freight performance measures, and the MPO's progress towards them, are discussed in the MPO's Performance Report.

The 2022 NPMRDS data indicates that I-24, the MPA's only Interstate, has an overall TTTR of 1.83. However, I-24 westbound from the Tennessee/Kentucky to US 41A was under construction in 2022, and there was a lane closure on these segments, resulting in high TTTR values on these segments. These high TTTR values resulted in an overall higher TTTR value.

[11] https://www.fhwa.dot.gov/tpm/rule/pm3/freight.pdf

Figure 4.3: Truck Travel Time Reliability, 2022



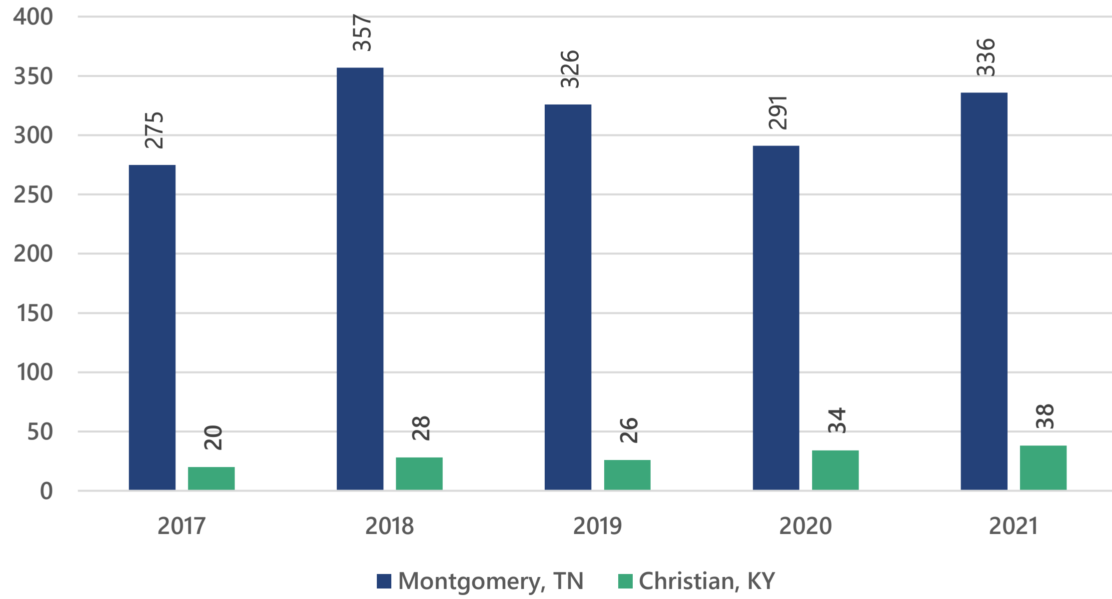
Disclaimer: This map is for planning purposes only.

Source: NPMRDS

Safety

Crashes involving heavy vehicles were analyzed using crash records from 2017 to 2021 obtained from TDOT and KYTC. A total of 1,731 crashes involving heavy vehicles occurred within the Clarksville MPA during the five-year study period. **Figure 4.4** shows the number of heavy vehicle crashes during the study period.

Figure 4.4: Heavy Vehicle Crashes by Year, 2017 – 2021



Source: TITAN (TN), 2022; CRASH (KY) 2022

Between 2017 and 2021, fatal crashes involving heavy vehicles comprised slightly more than one (1) percent of heavy vehicle crashes. However, more than 13 percent of all fatal crashes in the study area involved a heavy vehicle.

Since heavy vehicle crashes represented just five (5) percent of the total crashes during the study period, many locations experienced few, if any, heavy vehicle crashes. The intersections and segments with the greatest number of heavy vehicle crashes in the MPA are shown in **Table 4.3** and **Table 4.4**, respectively.

Table 4.3: Top Heavy Vehicle Crash Frequency Intersections

Intersection	State	Number of Crashes (2017 – 2021)
US 79 (SR-13)/SR-48/College Street at US 79 (SR-13)/Kraft Street	Tennessee	14
US 41A/US 79 (SR-12/SR-76)/North Second Street at US 41A Bypass/US 79 (SR-13)/North Riverside Drive/Kraft Street	Tennessee	13
US 41A/US 79 (SR-12/SR-76)/Providence Boulevard at Peachers Mill Road	Tennessee	12
US 41A (SR-76/SR-112)/Madison Street at US 41A Bypass (SR-76)/Ashland City Road/Martin Luther King Parkway	Tennessee	12
SR-48/Trenton Road at Tylertown Road	Tennessee	11
SR-76/Martin Luther King Parkway at Sango Road	Tennessee	10
SR-48/Trenton Road at SR-236/Tiny Town Road	Tennessee	8
US 79 (SR-13)/Wilma Rudolph Boulevard at Needmore Road/Old Russellville Pike	Tennessee	7
US 41A/SR-48/College Street at US 41A (SR-76)/North Second Street	Tennessee	7
SR-374/101st Airborne Division Parkway at Peachers Mill Road	Tennessee	6
US 41A (SR-12)/Fort Campbell Boulevard at Lafayette Road	Tennessee	6
SR-374/101st Airborne Division Parkway at North Whitfield Road	Tennessee	6
US 41A (SR-12)/Fort Campbell Boulevard at SR-236/Tiny Town Road	Tennessee	6
US 41A Bypass (SR-12)/Ashland City Road at Edmondson Ferry Road	Tennessee	6
US 79 (SR-13)/LG Highway at I-24 Westbound Off-Ramp	Tennessee	6
US 41A Bypass (SR-12/SR-13)/North Riverside Drive at SR-48/College Street	Tennessee	6
US 79 (SR-76)/Dover Road at Dotsonville Road	Tennessee	6
KY 115/Pembroke Oak Grove Road at I-24 Westbound Off-Ramp	Kentucky	6

Source: TITAN (TN), 2022; CRASH (KY) 2022

Table 4.4: Top Heavy Vehicle Crash Frequency Segments

Route	Segment	State	Number of Crashes (2017 – 2021)
I-24 Eastbound	SR-237/Rossview Road On-Ramp to SR-76/Martin Luther King Parkway Off-Ramp	Tennessee	41
I-24 Eastbound	US 79 (SR-13)/Wilma Rudolph Boulevard/LG Highway On-Ramp to 1.27 miles southeast of US 79 (SR-13)/Wilma Rudolph Boulevard/LG Highway On-Ramp	Tennessee	40
I-24 Eastbound	SR-48/Trenton Road On-Ramp to US 79 (SR-13)/Wilma Rudolph Boulevard/LG Highway Off-Ramp	Tennessee	32
I-24 Westbound	2.22 miles east of SR-76/Martin Luther King Parkway Off-Ramp to SR-76/Martin Luther King Parkway Off-Ramp	Tennessee	22
I-24 Westbound	US 79 (SR-13)/Wilma Rudolph Boulevard/LG Highway On-Ramp to SR-48/Trenton Road Off-Ramp	Tennessee	20
I-24 Westbound	SR-76/Martin Luther King Parkway On-Ramp to SR-237/Rossview Road Off-Ramp	Tennessee	19
I-24 Eastbound	Red River to Tennessee State Line	Kentucky	17
I-24 Eastbound	1.15 miles east of SR-76/Martin Luther King Parkway On-Ramp to 2.29 miles east of SR-76/Martin Luther King Parkway On-Ramp	Tennessee	15
I-24 Eastbound	SR-76/Martin Luther King Parkway On-Ramp to 1.15 miles east of SR-76/Martin Luther King Parkway On-Ramp	Tennessee	13
I-24 Westbound	Robertson County Line to 0.59 miles west of Robertson County Line	Tennessee	12
I-24 Westbound	Tennessee State Line to Red River	Kentucky	12

Source: TITAN (TN), 2022; CRASH (KY) 2022

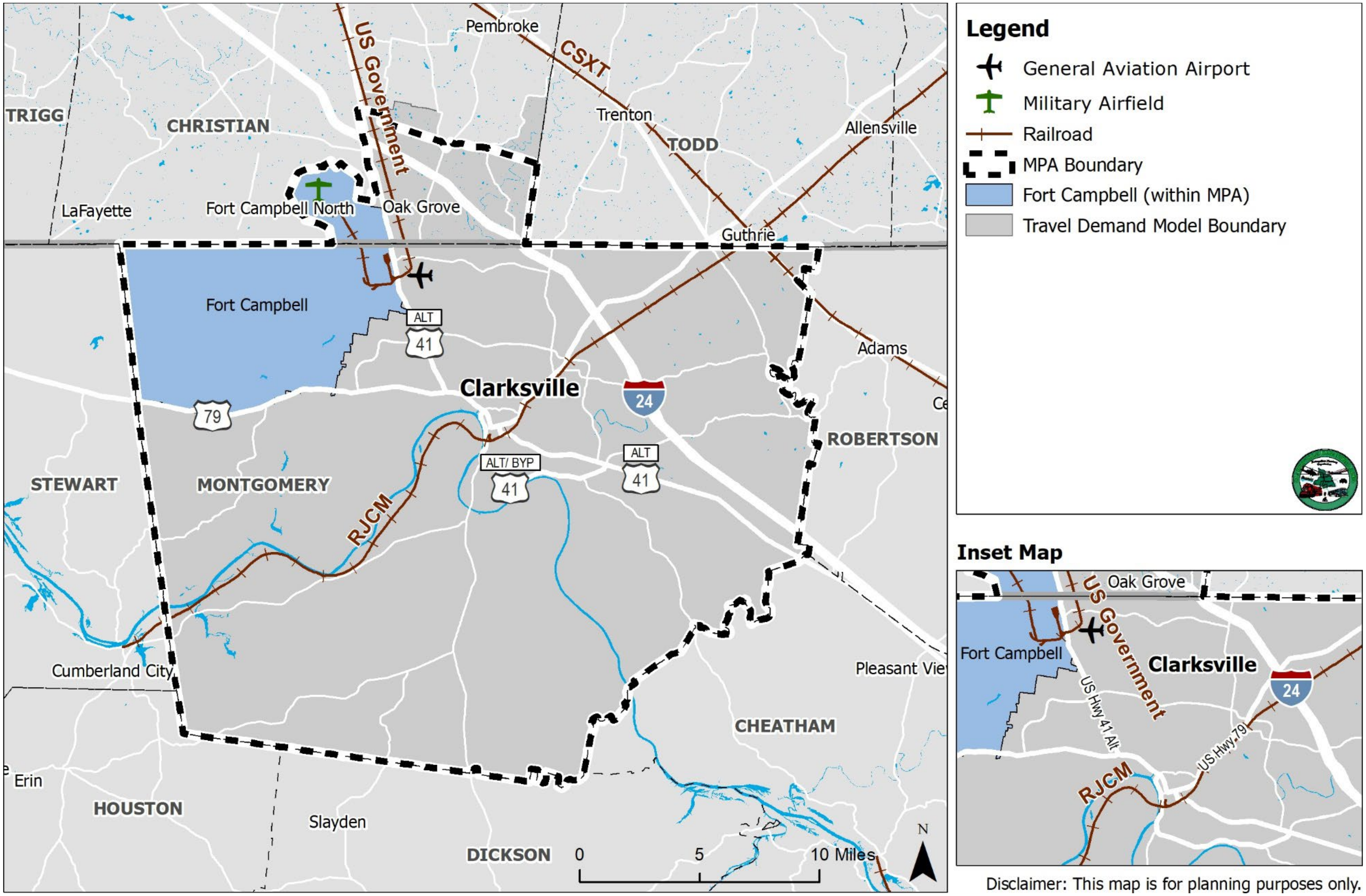
4.4 Railways

There are approximately 45 miles of railroad tracks in the MPA. There is one Class 1 railroad and one Class 3 railroad. Additionally, there is one railroad that connects the CSXT near Hopkinsville, KY to Fort Campbell. The NPFN does not include railroads. However, the Class 1 railroads are part of the NMFN. The significant freight railroads within the MPA are summarized in **Table 4.5**. **Figure 4.4** displays the MPA's railroads.

Table 4.5: Significant Freight Rail Corridors in the MPA

Railroad	Abbreviation	Description
CSX	CSXT	Class 1 Railroad; parallels US 41; connects southeast towards Nashville, TN and northwest towards Hopkinsville, KY.
RJ Corman Railroad Company	RJCM	Class 3 Short Line Railroad; parallels SR 149 and the Cumberland River southwest of Clarksville and US 79 northeast of Clarksville; connects southwest towards Cumberland City, TN and northeast towards Russellville, KY.

Figure 4.5: Freight Rail Network and Facilities



Disclaimer: This map is for planning purposes only.

Source: USDOT; TDOT; KYTC

Commodity Flows

As shown in **Table 4.2**, approximately five (5) percent of freight tonnage that originated in Tennessee in 2019 was transported by rail; approximately ten (10) percent of freight tonnage that originated in Kentucky in 2019 was transported by rail.

Rail-Automobile Collisions

Between 2017 and 2021, there were no crashes involving an automobile and a train.

Train Incidents

According to the Federal Rail Administration (FRA), there were no reported train incidents in the MPA between 2018 and 2022.

Railroad Crossings Control Devices

To avoid collisions, warning/control devices are required at highway-railroad grade crossings. Warning devices are either passive or active. Passive devices include crossbucks, yield or stop signs, and pavement markings. Active devices include flashing lights, bells, and gates, in addition to most passive warning devices. **Table 4.6** shows the breakdown of the MPA's public at-grade highway-railroad crossings.

Table 4.6: MPA Public At-Grade Highway-Railroad Crossings

Crossing Type	Number	Percentage
Active (Flashing lights and gates)	9	39%
Active (Flashing lights, no gates)	9	39%
Passive (Crossbucks and Stop/Yield Signs Only)	3	13%
Passive (Crossbucks Only)	2	9%
Total	23	100%

Source: Federal Rail Administration

4.5 Air Cargo

Inventory

Historically, only a small amount of freight is typically shipped by air. However, the commodities transported this way tend to be high-value and time sensitive. Also, airports tend to serve as distribution and manufacturing hubs.

There is one public use airport in the MPA: the Clarksville Regional Airport, which is also known as Outlaw Field. The airport is located northwest of Downtown Clarksville and east of

US 41A. The airport serves general aviation; the nearest airport with commercial is Nashville International Airport in Nashville, TN. The total number of aircraft based at Clarksville Regional Airport and the aircraft operations are shown in **Table 4.7**[12].

Table 4.7: Based Aircraft and Aircraft Operations at Clarksville Regional Airport

Airport	Based Aircraft	Aircraft Operations	Operations for 12 months ending
Clarksville Regional Airport	86	32,475	July 1, 2020

Source: Federal Air Administration

Commodity Flows

Cargo data is not readily available for Clarksville Regional Airport.

4.6 Waterway Network

Inventory

The major waterway in the MPA is the Cumberland River, an inland navigable waterway corridor through the MPA that is part of the NMFN. However, the river is not part of the Federally Designated Marine Highway system. The nearest waterway that is designated as a Marine Highway is the Tennessee River (M-65).

There are no major port facilities located within the MPA. However, there are four (4) single-purpose port facilities located along the Cumberland River. These ports are for:

- Ingram Materials, Inc. – Located at river mile 126.7 near South Riverside Drive. The facility operates at a water depth of nine feet and a berthing space of 200 feet.
- Nystar Taylor Chemicals – Located at river mile 122.2 near Zinc Plant Road. The facility operates at a water depth of 11 feet and a berthing space of 1,000 feet. A surface railroad track connects the port to the R.J. Corman Railroad.
- Winn Materials, Inc. – Located at river mile 123.7 off Barge Point Road. The facility operates at a water depth of 22 feet and a berthing space of 390 feet. The facility's primary purpose is the loading of crushed limestone onto barges and the unloading of sand.

[12] https://www.gcr1.com/5010ReportRouter/CKV.pdf

- Hopkinsville Elevator Company Inc. – Located at river mile 123.9 off Barge Point Road. The facility operates at a water depth of 22 feet and a berthing space of 800 feet. The facilities primary purpose is to ship grain products.

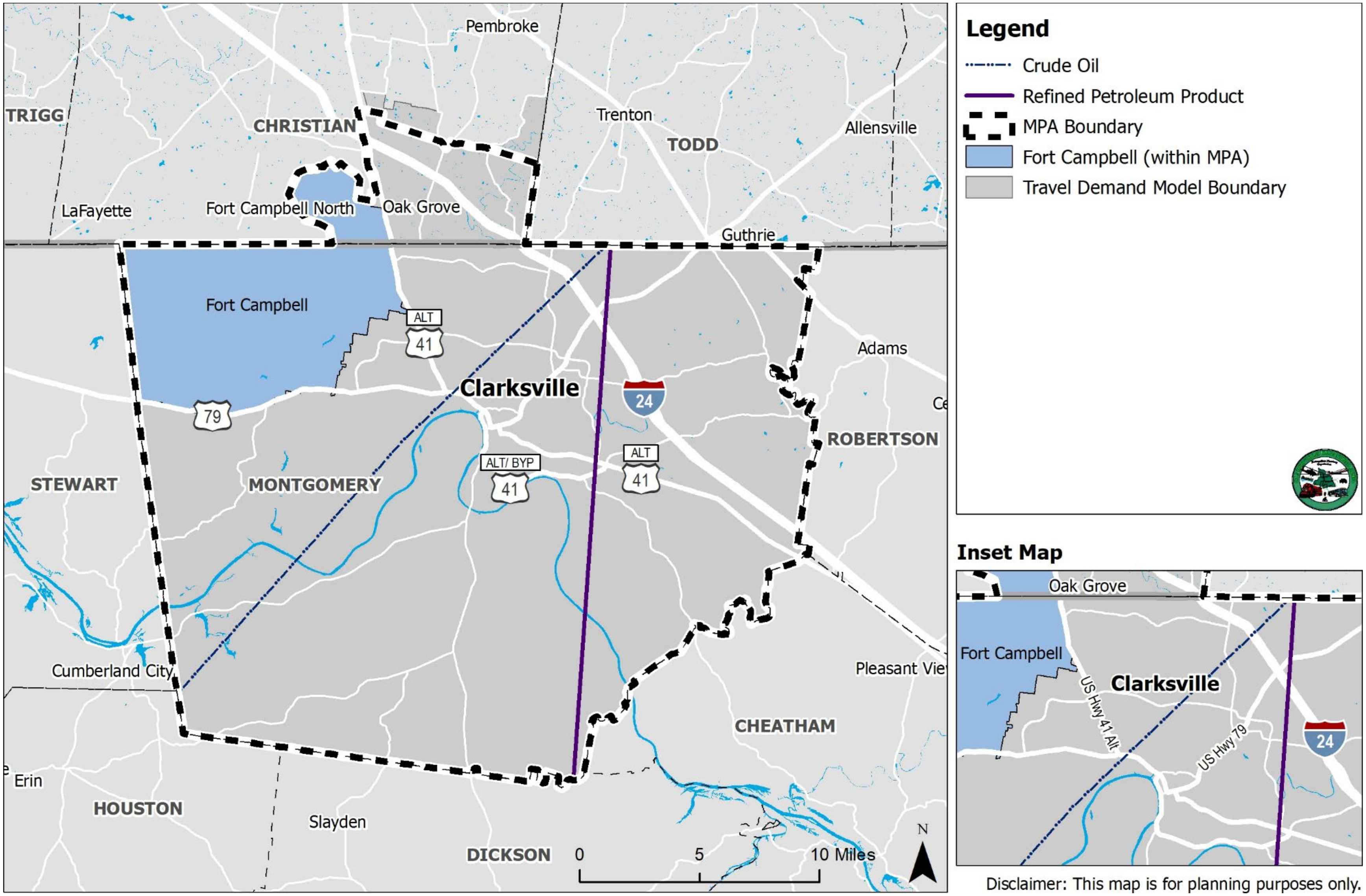
Commodity Flows

According to the U.S. Army Corps of Engineers (USACE) Waterborne Statistics, approximately 14.7 million tons of freight moved on the Cumberland River within the MPA in 2019.

4.7 Pipeline Network

The MPA's pipeline network consists of 60 miles of crude oil and refined petroleum products pipelines as of 2022. By length, approximately 54 percent of pipelines in the MPA carry crude oil, and the remaining 46 percent carry refined petroleum products. The MPA's pipeline network is shown in **Figure 4.7**.

Figure 4.6: MPO Pipeline Network



Source: Energy Information Administration

5.0 Bicycle and Pedestrian

5.1 Classification of Bicycle and Pedestrian Facilities

The bicycle and pedestrian facilities in the Clarksville MPA are grouped into five (5) classifications which include:

- Shared Use/Bike Paths
- Bike Lanes
- Bikeable Shoulders
- Bike Routes
- Sidewalks

Figure 5.1 provides a brief explanation of the different types of bicycle and pedestrian facility classifications.

While each facility type is used to improve accessibility for the travelling public, there is no single bicycle and/or pedestrian facility that suits every user's needs. For example, sidewalks and shared use paths can be found along several roadways throughout the MPA; however, they do not provide the same functionality and thus should not be confused with one another.

Figure 5.1: Bicycle and Pedestrian Facility Type

Shared Use Path/Bike Path

- *Physically separated from motorized vehicular traffic by open space, buffer or barrier.*
- *Typically, between 8 to 10 feet wide.*
- *Used by bicyclists, pedestrians, skaters, users of wheeled mobility devices and other non-motorized device users.*

Bike Lane

- *Portion of a roadway designated by striping, pavement markings and signage for the exclusive use of bicyclists.*
- *Located on both sides of a roadway and typically between 4 to 6 feet in width.*
- *Each lane is one way. Bicyclists travel in the same direction as motor vehicles.*
- *Lanes may be delineated between a travel lane and on street parking, curbs or the edge of pavement.*
- *Though they may be used by pedestrians, bike lanes are designed for the preferential use of bicyclists.*

Bikeable Shoulder

- *Functions similarly to bike lanes. Bikeable shoulders are delineated by using existing striping from the outermost vehicle lane to the edge of the shoulder.*
- *Located on both sides of a roadway. Should provide a minimum of four (4) feet of space for bicyclists from the outermost travel lane to the edge of the pavement.*
- *Each shoulder is one way with bicyclists traveling in the same direction as motor vehicles.*
- *Though they may be used by pedestrians, bikeable shoulders are designed for the preferential use of bicyclists*

Bike Route

- *Both bicyclists and motorists use roadways travel lanes.*
- *No striping delineating a portion of the roadway is set aside for bicyclists.*
- *Identified with appropriate directional and informational markers which read "Bike Route" or "Share the Road."*
- *It is recommended that any roadway classified as a bike route should have a minimum width of 14 feet, but be less than 16 feet, from striped center line.*
- *Routes are used by bicyclists. Pedestrians may use bike routes if there are no other alternatives; however, it is not recommended due to safety concerns.*

Sidewalk

- *Physically separated from motorized vehicular traffic by open space, buffer or barrier.*
- *Typically located within public right of way.*
- *Minimum width recommended by AASHTO and FHWA is five (5) feet. Preferred width, to improve pedestrian mobility, is six (6) feet.*
- *Should be continuous, unobstructed and located on both sides of a roadway.*
- *Mainly used by pedestrians. Bicycle usage should be kept to a minimum.*

Several plans, codes, and ordinances exist that address the cycling and pedestrian needs of the community, including the:

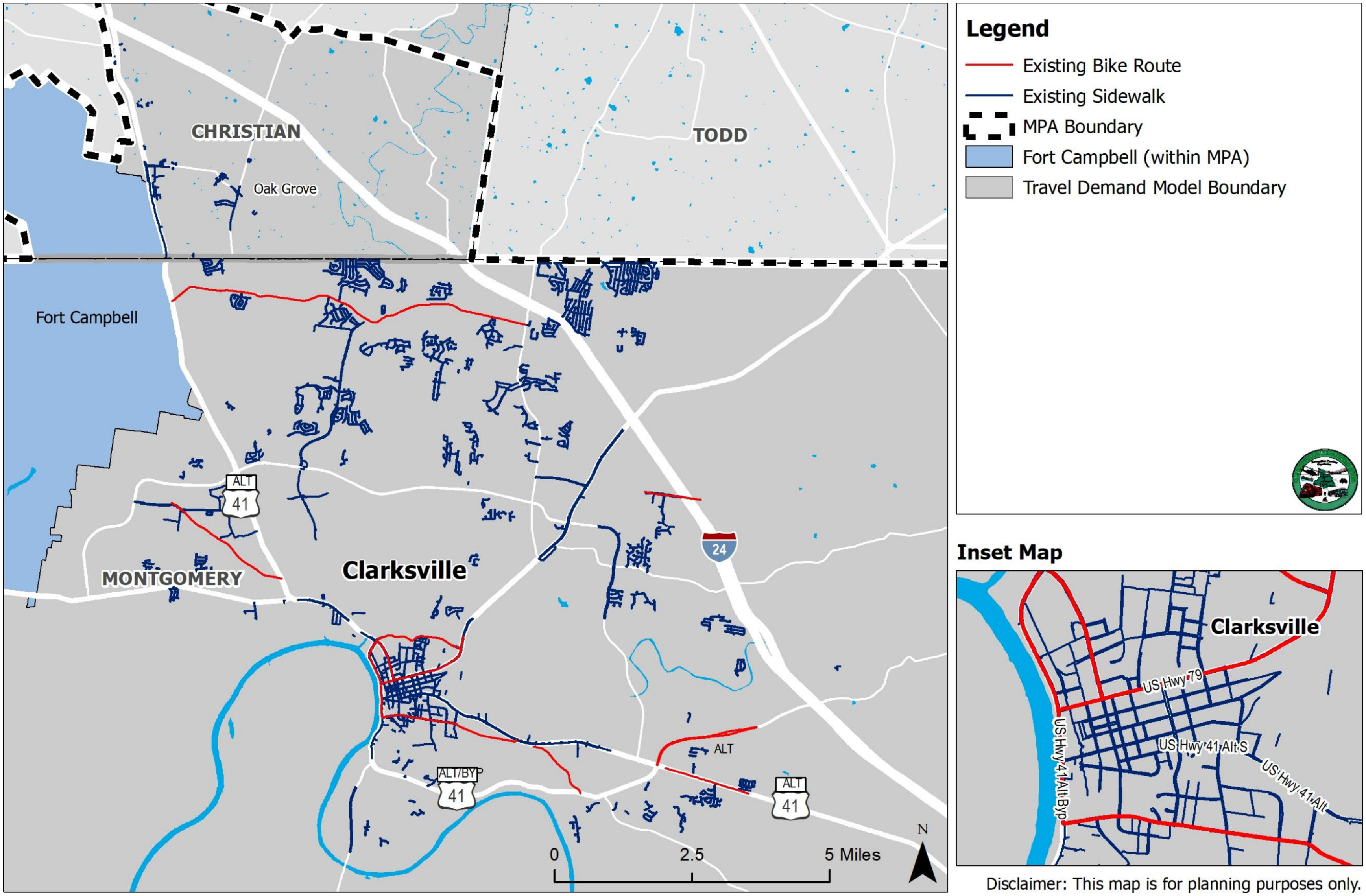
- Clarksville Transportation 2020+ Plan
- Clarksville-Montgomery County Greenway and Blueway Master Plan (2014)
- TDOT's 25-Year Long-Range Transportation Policy Plan
- Tennessee's State Bicycle Route Plan
- Clarksville Strategic Transit Plan (2016)
- Clarksville Comprehensive Operations Analysis (2016)
- Montgomery County, TN Zoning Code
- Clarksville, TN Zoning Code
- Clarksville Montgomery County Subdivision Regulations (2015)
- Oak Grove Zoning Ordinance

5.2 Existing Inventory

The MPO's existing bicycle and pedestrian facilities network consists of over 218.2 miles of bike routes and sidewalks and are scattered throughout the MPA on functionally classified roadways and within local neighborhoods.

An inventory of existing bicycle and pedestrian facilities can be seen in **Figure 5.2**.

Figure 5.2: Existing Bicycle and Pedestrian Facilities



Source: City of Clarksville

Bicycle Facilities

The Update of Tennessee's State Bicycle Route Plan inventories the State's bicycle routes. The state bicycle routes in Montgomery County are shown to the right and exist in addition to the bicycle routes previously discussed. The state bicycle routes within the MPA are the Kentucky to Alabama Midstate, and the Reelfoot Lake to Nashville Route and are comprised of state, county, and city streets and highways. These roadways are used by trucks and cars, with no special lanes provided for bicycles. Currently, the routes are not signed.

BCycle

In 2016, a bike sharing service (BCycle) was launched in Clarksville and expanded to include the Austin Peay State University in 2018. This service operates at five (5) strategic locations, and provides access to 44 bicycles, displayed in **Table 5.1**.

Table 5.1: BCycle Locations

Name	Address	Bikes	Docks
Pollard Trailhead (Greenway)	1011 Pollard Road	10	13
Cumberland Riverwalk	640 N. Riverside Drive	8	13
Legion and 2nd Street	12 Legion Street	10	11
Liberty Park	1188 Cumberland Drive	6	13
Austin Peay State University	Foy Recreation Center	10	13

Source: BCycle.com

In the City of Oak Grove, the Southern Lakes Bike Tour route passes through the northeastern part of the Plan area. This route uses Bradshaw Road (KY-109) and Barkers Mill Road (KY-1881).

Pedestrian Facilities

The Clarksville-Montgomery County Greenway and Blueway Master Plan contains an inventory of the existing pedestrian infrastructure in Montgomery County. The KYTC maintains a sidewalk inventory for the City of Oak Grove and the Christian County portion of the MPA. The existing pedestrian inventory within the MPA was displayed in **Figure 5.2.**

Trails and Greenways

The City of Clarksville maintains approximately 11.6 miles of paved trails. These trails are along the Little Red River and the downtown riverfront along the Cumberland River. Plans for multi-use paths for Clarksville-Montgomery County are contained within the Clarksville-Montgomery County Greenway and Blueway Master Plan. Additionally, the City of Clarksville has almost 10 miles of paths that connect to parks, schools, and the downtown riverfront.

Existing Plans

<u>Bicycle Plans and Policies</u>

The *Clarksville-Montgomery County Greenway and Blueway Plan* provides an in-depth evaluation of existing bicycle and pedestrian facilities within Montgomery County.

KYTC has a policy that requires consideration of incorporating pedestrian and bicycling facilities on any new, or reconstructed, state-maintained roadways. This policy applies to all existing and planned urban or suburban areas. *TDOT's Multimodal Access Policy* requires the same consideration on Tennessee roadways.

<u>Pedestrian Plans and Policies</u>

In Montgomery County and the City of Clarksville, roadway projects are required to incorporate sidewalks (except for routine resurfacing). Each municipality assumes responsibility for sidewalk maintenance and repair in their respective jurisdictions. Per the *Clarksville-Montgomery County Subdivision Regulations*, sidewalks are required on both sides of the dedicated public right-of-way or dedicated road easement.

Sidewalks must also meet ADA standards. Sidewalks outside the City limits are required to be maintained by homeowner associations, not the County Highway Department. Future site plans are required to include pedestrian circulation plans.

The State of Tennessee recently adopted an access management policy[13] for new developments along state highways. The policy requires increased use of shared driveways and internal access for developments.

This will create fewer points of conflict between vehicles and pedestrians, increasing safety.

In Oak Grove, sidewalk requirements are limited to the following zoning categories:

- Enhanced commercial district
- Central business district
- Planned unit developments (PUD)

The projected growth in the MPA over the next 25 years will require substantial residential development. It is notable that There are currently no requirements for sidewalks as part of residential development.

5.3 Maintenance

Maintenance is a major concern as it relates to the bicycle and pedestrian network in the MPA. With each new facility added to the overall bicycle and pedestrian facility network, comes an additional demand for increased funding for maintenance of those facilities. While additional facilities are needed to improve connectivity of the network throughout the MPA to improve mobility, there is a present need to maintain and improve the existing infrastructure. Failure of jurisdictions to budget for maintenance of existing infrastructure can result in degradation of facilities to the point of rendering them unusable and thus useless to the traveling public who depend on them as a means of accessing everyday needs.

Most municipal and county jurisdictions have maintenance schedules in place for other infrastructure maintenance needs, such as scheduled grass cutting/trimming of overgrown vegetation, debris removal, roadway restriping and repainting of municipal buildings and facilities. However, not all jurisdictions have similar schedules for maintenance of existing bicycle and pedestrian facilities. This differs from jurisdiction to jurisdiction as establishing maintenance schedules are deemed unnecessary in certain areas either due to a lack of significant bicycle and pedestrian infrastructure or if the type of facilities each jurisdiction is responsible for is being maintained as part of an existing roadway maintenance schedule.

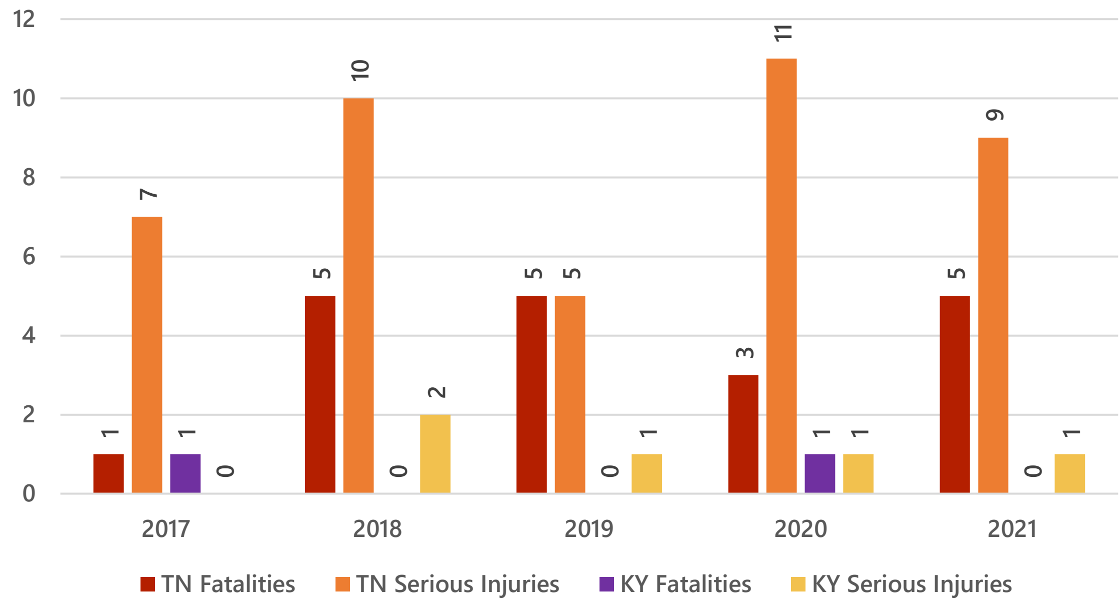
[13] Manual for Constructing Driveway Entrances on State Highways. 2015. TDOT

5.4 Safety

The IIJA requires MPOs and State DOTs to work collectively to examine performance data and establish targets for seven (7) national performance goals focused on improving the overall transportation system, the first of which is safety. This goal requires State DOTs and MPOs to set targets for five (5) safety-related performance measures and report progress toward their achievement annually. Each of the measures focus on achieving a significant reduction in traffic fatalities and serious injuries on all public roads. The fifth safety performance measure focuses on reducing fatalities and serious injuries for non-motorized users of the transportation system.

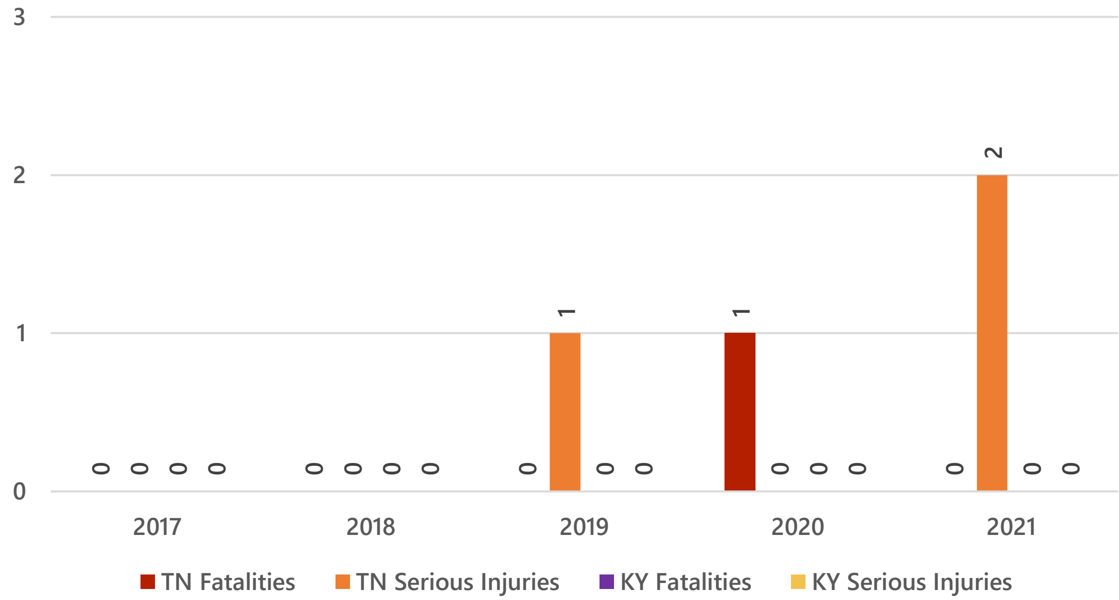
As shown in **Figures 5.3** and **5.4**, between 2017 and 2021, there were twenty-one (21) pedestrians and one (1) bicyclist killed as a result of a crash involving a motor vehicle in the MPA. During that same span, there were forty-seven (47) pedestrians and three (3) bicyclists involved in crashes that resulted in serious injuries. Of note is that serious injury crashes involving bicyclist has seen an increase in the last 3 years.

Figure 5.3: Pedestrian Fatalities and Serious Injuries



Source: TITAN (TN), 2022; CRASH (KY) 2022

Figure 5.4: Bicyclist Fatalities and Serious Injuries



Source: TITAN (TN), 2022; CRASH (KY) 2022

5.5 Carbon Reduction Program and Complete Streets

As part of the IIJA there is a new Carbon Reduction Program (CRP)[14] for the purposes of reducing transportation emissions. According to the FWHA:

> "Transportation accounts for half of urban air pollution and 70 percent of U.S. oil consumption, resulting in the United States sending over $90 billion abroad to pay for petroleum imports in 2015. Better, more efficient transportation reduces pollution and puts money back into the American economy. FHWA is working with States and metropolitan areas to:
>
> - Improve system performance, efficiency and project delivery
> - Expand transportation choices
> - Reduce emissions and other environmental impacts
> - Establish a national network of alternative fueling infrastructure"

Emphasis areas discussed in the CRP include:

- **Prioritizing Safety in All Investments and Projects** – Increasing the safety of all roadway users, in particular vulnerable non-motorized users.

[14] INFORMATION: Carbon Reduction Program (CRP) Implementation Guidance (dot.gov)

- **Complete Streets** – Encouraging the development of standards or policies as which:

  > "ensure the safe and adequate accommodation of all users of the transportation system, including pedestrians, bicyclists, public transportation users, children, older individuals, individuals with disabilities, motorists, and freight vehicles."

- **Transit Flex** – Using Federal-aid funding, "flexed" from CRP to transit funds, on transit and transit-related projects for the purpose of providing an equitable and safe transportation network for all users, including those from marginalized communities facing historic disinvestment.
- **Transferability Between FHWA Programs** - States have the flexibility to transfer funds out of CRP to other apportioned programs if necessary.
- **ADA Projects** – Projects that reduce transportation emissions may benefit from CRP funds if they improve accessibility and are used to implement recipients' ADA transition plans and upgrade their facilities to eliminate physical obstacles and provide for accessibility for individuals with disabilities. However, FHWA will provide oversight to recipients of these funds to ensure that each public agency's project planning, design, and construction programs comply with ADA and Section 504 accessibility requirements.
- **Equity** – As part of efforts to benefit all roadway users:

  > **"**FHWA will work with States to ensure consideration of using CRP funds for projects and inclusion of project elements that proactively address racial equity, workforce development, economic development, and remove barriers to opportunity, including automobile dependence in both rural and urban communities as a barrier to opportunity or to redress prior inequitiesand barriers to opportunity."

- **Climate Change and Sustainability** - Encouraging recipients to consider climate change and sustainability throughout the planning and project development process.
- **Labor and Workforce** – Encouraging recipients to work with FHWA to:

  > "identify opportunities for Federal-aid highway investments to advance high-quality job creation through the use of local or other geographic or economic hire provisions authorized under section 25019 in the BIL, and Indian employment preference for projects that are located on or near Tribal reservations authorized under 23 U.S.C. 140(d), or other workforce strategies targeted at expanding workforce training opportunities for people to get the skills they need to compete for these jobs, especially underrepresented populations: women, people

of color, and groups with other systemic barriers to employment (people with disabilities, formerly incarcerated, etc.)."

- **Truck Parking** – Increasing truck parking would increase the efficiency of U.S. supply chains and safety for truck drivers and other roadway users and reduce emissions.

Complete Streets

Complete streets is a design philosophy that provides transportation users with multiple, safe travel options along a roadway, including both motorized and non-motorized users. Often, complete streets designed facilities may physically share routes, while in other cases a parallel facility is used. This design process allows those who prefer to walk and bicycle to have a safer and more comfortable experience, while still having access to mobility and the ability to conduct their business. Examples of complete streets include:

- The addition of greenways and trails parallel to roadways
- The addition of pedestrian sidewalks
- The creation of a combined bike and pedestrian path
- Installation of median crossing islands
- Traffic calming measures
- The addition of bike lanes
- Road diets with the addition of bicycle/pedestrian lanes with streetscape beautification

The use of complete streets would enhance travel throughout the region by providing users with multiple options of travel, reducing roadway congestion, and increasing safety. A Complete Streets implementation strategy combines innovations from multiple disciplines to achieve the creation of safe, connected, and equitable street networks.

Currently, none of the jurisdictions or agencies within the MPA have a Complete Streets Policy. However, according to NACTO, with the signing of the IIJA:

> "MPOs must use 2.5 percent of their overall funding to develop and adopt complete streets policies, active transportation plans, transit access plans, transit-oriented development plans, or regional intercity rail plans. Similarly, states must reserve 2.5 percent of State Planning and Research funds for the same purposes. However, these policies do not have to be included in state or MPO spending plans."

As a result, CUAMPO is planning to work with local departments/officials on a Complete Street Plan and the MPO has applied for and received an SS4A grant that will be beneficial to the upcoming Complete Street Plan.

6.0 Public Transit

6.1 Public Transit

Public transportation services in the MPA play a key role in providing the community with access to the places they need to go, particularly for transit-dependent populations. Transit is a link to jobs and opportunities, connecting people to schools, health care, and their communities. Additionally, public transit has significant benefits for the entire community as it can increase local business access to skilled workers, reduce congestion and emissions, and foster walkable communities.

There are three (3) primary transit usage patterns, which are:

- Occasional riders who take transit once in a while.
- Commuters who take transit regulary but only for work.
- All-purpose riders who take transit regulary for multiple reasons.

The goal is to engineer a transit system that encourages the creation of "all-purpose riders" by improving transit services. To do this, an emphasis is placed on increasing the core system's strength and reliability to make the system more attractive to everyone. This can be achieved by:

- Fostering reliable, frequent service
- Increasing walkability
- Increasing frequency
- Travel time improvements

Without a good, reliable transit system, even those riders who often use transit out of necessity will find alternative transportation at the first opportunity. It is important to note that riders in all three categories will supplement their use of the transit system with other modes of transportation, including using ride-sharing services, walking, cycling, or using an automobile.

Special Concerns within the MPA

Age 18-34

The presence of Fort Campbell has resulted in a higher-than-average number of people aged 18-34 within the MPA, a group which favors reduced vehicle dependence and is more inclined to walk, bicycle, or use transit.

Fort Campbell

Within the MPA, a large contingent of soldiers, their spouses and families, and civilian support staff at Fort Campbell provide an additional source of ridership that do not follow traditional ridership patterns. Fort Campbell operates as its own city within the MPA and follows separate planning regulations; however, it is given consideration in transportation planning efforts in the region due to its significant impact on travel patterns.

The demographic makeup of Fort Campbell's population is supportive of increases in ridership, as mentioned in the previous section since many soldiers fall within that younger age group. These challenges and opportunities require a close, working relationship with the leadership of Fort Campbell to implement proposed improvements to transit service that are affected by the base's presence.

6.2 Local Public Transit Providers

The public transportation network in the MPA is comprised of fixed route and demand-responsive services. As of Spring 2023, fixed route services are offered within the City of Clarksville and a few key destinations by the Clarksville Transit System[15] (CTS). CTS also operates a route to Fort Campbell.

CTS and the Regional Transit Authority (RTA) operate a regional commuter bus route between Clarksville and Nashville. Currently there is no fixed route public transportation serving the Christian County portion of the MPA, although some CTS routes do operate nearby.

The surrounding areas are served by demand responsive public transit services operated by:

- CTS's Lift service within the City of Clarksville.
- Mid-Cumberland Human Resource Agency (MCHRA) in Tennessee.
- Pennyrile Allied Community Services (PACS) in Kentucky.

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[15] CTS-SystemMap 8-18-prf4 (cityofclarksville.com)

The region is also served by a Greyhound bus station in downtown Clarksville, which provides access outside the region.

Clarksville Transit System Fixed Routes

The most recent CTS Strategic Transporation Plan and Comprehensive Operational Analysis (COA) were both completed in 2016; however, an update of the COA is expected to be completed in early 2024. The COA was designed "to assess the public transportation services for the City of Clarksville, TN, Fort Campbell Military Installation and the City of Oak Grove, KY." The existing Strategic Transit Plan and the COA incorporate public and stakeholder input, and provide data, analysis, and recommendations for CTS.

The stated mission of CTS is to "plan, implement, maintain and manage a public transportation system that allows for maximum mobility for the community with emphasis on safety, quality and efficiency." It operates in a "hub and spoke" pattern, as shown on the CTS website (CTS-SystemMap_8-18-prf4 (cityofclarksville.com)), with all buses leaving and returning to the Transit Center, located at 200 Legion Street. The buses circulate throughout the community and return to the centralized Transit Center enabling passengers to transfer from one route to another route to reach their final destination. There are additional transfer points along each route for quicker transport.

CTS operates eight (8) routes, with most operating:

- Monday through Friday from 4:40 a.m. to 9:00 p.m.
- Saturday from 6:40 am to 9:00 pm.

The Transit Center is open:

- Monday through Friday from 5:30 a.m. to 8:00 p.m.
- Saturday from 6:30 a.m. to 8:00 p.m.

APSU routes run Monday through Friday 7:00 a.m. to 7 p.m. Two (2) Peay Pickup vans operate on continuous loops during the fall and spring semesters when school is in session.

As of Spring 2023, the base bus fare for CTS is $1.50. However, reduced fares are available for specific members of the community, as shown below.

Fares (Correct Change Only)

- Children (Age 4 and Under): Free
- City Employee (With City of Clarksville Identification): $0.75
- Full Fare: $1.50
- Senior Age 65 and Over (With Clarksville Transit System (CTS) Photo Identification): Free
- Student (With Identification Card): $1.00
- Transfers: $0.25
- Disabled (With CTS Photo Identification Card or Medicare Card): $0.75

Passes

- 1-Day Pass: $4.00
- 7-Day Pass: $20
- 31-Day Liberty Pass: $50
- 31-Day Liberty Disabled Pass (CTS Photo Identification, Medicare Card or Veterans Service Connected Identification Card): $25

Passes can be purchased on buses or the Transit Center.

Clarksville Transit System Lift Service

The Lift is a demand response service for the disabled and elderly and serves as the ADA required complementary paratransit service for passengers who are:

• unable to navigate the public bus system,

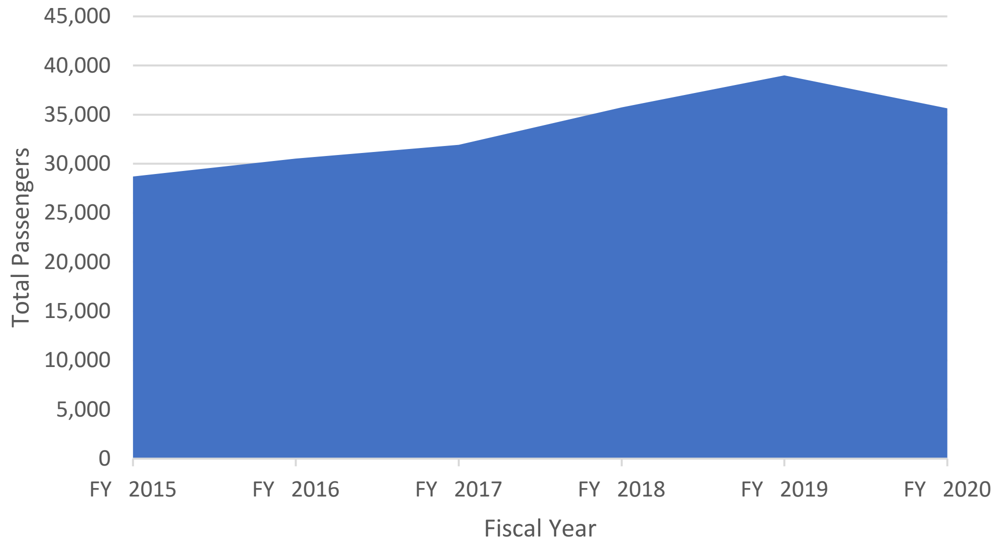
• unable to get to a point where they could access the public bus system, or

• have a temporary need for these services because of injury or some type of limited duration cause of disability (49 CFR 37.123).

The Federal Transit Administration (FTA) requires that paratransit service area comprises a three-quarter mile buffer around existing fixed route services. The service is by appointment only. The cost for this service is $2.50 per ride.

Recent ridership numbers indicate a steady increase from 2015 to 2019 with a decrease in 2020 due to COVID-19. However, the COA noted that ridership is expected to increase as the elderly population eligible for the service increases over the next 50 years. Figure 6.1 displays the Lift ridership on the CTS from 2015 through 2020.

Figure 6.1: CTS Annual Lift Ridership, 2015-2020



Transit Dependent Populations

The *Clarksville Transit Strategic Plan 2021 Update* provides in-depth information of the "transit reliant populations" and the Transit Reliance Index. It is important that CTS serves all members of the community. These populations include:

- unemployed
- minorities
- zero-vehicle households
- persons in poverty
- youth
- older adult
- persons with disabilities

[Clarksville Transit Strategic Plan 2021 Update (cityofclarksville.com)](https://www.cityofclarksville.com/DocumentCenter/View/7510/Clarksville-Transit-System-2022-Strategic-Plan)

https://www.cityofclarksville.com/DocumentCenter/View/7510/Clarksville-Transit-System-2022-Strategic-Plan

Mid-Cumberland Human Resource Agency (MCHRA) Public Transit

The MCHRA's service area covers over 5,400 square miles and over 1.14 million persons. The appointment-only service operates 108 vehicles and provides nearly 123,900 vehicle trips annually. In 2021, MCHRA vehicles drove approximately 1.8 million miles. Within Montgomery County, the MCHRA operates 10 vehicles and employs 12 drivers. The service operates:

- Monday through Friday from 6 a.m. to 6 p.m.
- A one-way ticket within the county is $3.00.
- A one-way ticket within the city is $2.00.

Pennyrile Allied Community Services (PACS)

The Pennyrile Allied Community Services (PACS) provides rural public transportation for a nine-county area in Kentucky which includes Christian County. The demand response service is available Monday through Friday from 8 a.m. to 4:30 p.m. and Saturday by appointment. Pricing for the service is:

Individual Rates

- In-region trips are $1.25 per mile per person.
- Out-of-region trips are $1.50 per mile per person.
- One (1) minor (0-17 yrs.) may ride with guardian free of charge.
- Three (3) mile minimum/$3.75 minimum one-way trip.

ADA accessible vehicles available upon request.

Veteran Transportation

- Veterans have a reduced fare of $1.00 per mile per person.
- One (1) escort may accompany the veteran for a charge of $1.00 per mile.
- Any additional riders are required to pay the current rates for private transportation.
- Rides must be scheduled a minimum of 24 hours in advance.
- 3 mile/$3.00 minimum charge per one-way trip.

Group Trips

- Flat rate round trip $20 per vehicle and $1.25 per mile.

Intercity Trips

PACS make daily trips to the following locations in Nashville, TN

- VA Medical Center
- Vanderbilt
- Airport
- MTA Bus Station

Departure time is at 6:00 a.m. with a return time of 3:00 p.m., Monday through Friday. Fares are $12.50 per trip, or $25.00 round trip. However, rides must be scheduled 24 hours in advance.

Transportation Network Companies

A Transportation Network Company (TNC) is a private company that matches passengers with vehicles, via websites and mobile apps. These are also referred to as ride-hailing services, with Uber and Lyft being the largest of these service providers. Currently, both Uber and Lyft serve the Clarksville MPA.

While these transportation services are not public transit, TNCs are increasingly partnering with the public sector to test new ways to provide public, or subsidized, transportation. These pilot programs are still evolving, but many focus on providing trips in low-demand areas or times of day or for people with disabilities.

6.3 Transit Capital Assets

An inventory of capital assets for CTS, shown in **Table 6.1**, was provided in the COA.

Table 6.1: CTS Revenue and Maintenance Fleet

CTS Fleet	Buses	Cutaways	Vans	Service Vehicles
Vehicles	24	7	10	21
Passenger Capacity	26	3-12	9	0
Average Age (Years)	5.5	4.5	3.5	5
Average Mileage	270,961	115,706	104,823	44,631
TAM Condition	Good (4 out of 5)	Adequate (3 out of 5)	Good (4 out of 5)	Adequate (3 out of 5)
Type of Transit Service	Fixed-Route	Fixed-Route Paratransit	Paratransit	N/A

Source: CTS 2021

6.4 Fixed Route Regional Peer Comparison

A peer comparison analysis is a benchmarking tool that allows an area to compare itself to areas with similar conditions. Ideally, the peer group has elements in common with the transit system studied, such as population of area served, geographical location (state or region), and type of services offered.

Because this is a regional long-range transportation plan, the criteria to select peer systems is somewhat different from the typical criteria used by transit agencies in short-range transit development plans. The focus is on the MPA versus the service area of a particular agency.

Peer Selection Methodology

The Urban Integrated National Transit Database (iNTD), provided by the Florida Department of Transportation (FDOT), uses data from the National Transit Database (NTD) and the 2019 American Community Survey, to identify urban transit systems across the United States which are most like one another. Criteria used to identify peer systems are:

- The presence of rail or heavy rail
- Service area population
- Total revenue miles
- Total operating budget
- Population density
- State capital
- Percent college students
- Population growth rate
- Percent low income
- Annual delay (hours) per traveler, freeway lane miles per capita
- Percent of service that is demand response

Peer Selection Methodology

Based upon the above criteria, **Table 6.2** shows the three (3) U.S. urban transit systems most like CTS. The peer selection module mostly matches with NTD data; however, it has been noted that the Service Area Population in the database is currently behind. As a result, the 2020 NTD population data was used to update the iNTD data, displayed in **Table 6.3**.

Table 6.2: Selected Peer Regions

Region	Urban Fixed Route System
Huntington, West Virginia	Tri-State Transit Authority
Montgomery, Alabama	Montgomery Area Transit System
Waco, Texas	Waco Transit System

Source: CTS 2020

Table 6.3: Peer Fixed Route Systems Trends, 2020

Indicator	Huntington	Montgomery	Waco	Peer Average	Clarksville
Service Area Population	202,637	263,907	172,378	212,974	158,655
Service Area Square Miles	92	135	99	109	105
Service Area Population Density	2,203	1,955	1,741	1,960	1,511
Vehicles operated in Maximum	23	19	17	20	18
Vehicle Revenue Miles	885,229	1,250.144	727,454	954,276	1,186,262
Vehicle Revenue Hours	57,875	76,360	48,362	60,866	71,442
Boardings	815,913	457,082	761,134	678,043	587,661
Fare Revenue	$984,357	$396,138	$1,059,474	$813,323	$502,675
Annual Operating Expense	$6,260,207	$5,461,308	$4,616,574	$5,446,030	$4,953,922
Vehicle Revenue Miles per Capita	4.4	4.7	4.2	4.4	7.5
Vehicle Revenue hours per capita	0.3	0.3	0.3	0.3	0.5
Boardings per Revenue Mile	.92	.37	1.05	.78	0.50
Boardings per Revenue Hour	14.10	5.99	16.09	12.06	8.23
Boarding per Capita	4.03	1.73	4.42	3.39	3.70
Operating Expense per Vehicle Revenue Mile	$7.07	$4.37	$6.35	$5.93	$4.18
Operating Expense per Vehicle Revenue Hour	$108.17	$71.52	$97.62	$92.44	$69.34
Operating Expense per Boarding	$7.67	$11.95	$6.07	$8.56	$8.43
Average Fare	$1.21	$0.87	$1.39	$1.16	$0.86
Farebox Recovery Rate	15.72%	7.25%	22.95%	15.31%	10.15%

Source: Urban iNTD, NTD

Fixed Route Regional Peer Comparison

The findings in **Table 6.3** provide relevant transit operations information for all fixed route, urban transit services operating in the selected peer regions. The following trends can be gleaned from this information:

Level of Service

CTS provides significantly more transit service than most of its peers. This is true for both vehicle revenue hours and miles provided per capita.

Productivity

CTS is less productive in Boardings per Revenue Mile and Boardings per Hour; however, CTS ranks high according to its peers is in Boardings per Capita.

Cost Efficiency

CTS is the most cost efficient in Operating Expenses per Vehicle Revenue Mile and Operating Expenses per Vehicle Revenue Hour with its peers and is closest to the peer average for Operating Expense per Boarding.

Farebox recovery

CTS reports a significantly lower average fare compared to its peers.   CTS farebox recovery rate, or the share of operating costs covered by fares, is in the lower half of its peers.

Summary

Overall, when compared to the selected peer regions, CTS provides much more extensive transit service and cost efficiency. However, CTS is less productive in attracting riders. when compared to its peers and is on the lower half in terms of its farebox recovery rate and average fare.

7.0 Travel Demand Management

Travel Demand Management (TDM) involves a set of strategies designed to change travel behavior and reduce Single Occupancy Vehicle (SOV) trips. When these strategies are implemented on an area-wide basis with support from government organizations, businesses, state and private universities, and residents, TDM strategies may be able to reduce delay during peak periods on local roadway networks.

7.1 Existing TDM Strategies

Within any area TDM strategies include, but are not limited to:

Carpooling

This strategy involves a group of people who live and work near each other commuting together in a single vehicle.

Vanpooling

This strategy involves allowing a group a people to share the ride, similar to a carpool but on a larger scale.

Transit

This strategy involves using transit to reach workplaces and other tasks. Generally, under this program, employers provide employees transit passes at discounted prices to encourage the use of transit to work.

Bike

This strategy involves using bike to reach nearby destinations instead.

Telecommuting

This strategy involves allowing employees to work from home or another off-site location part time or full-time. This strategy has gained additional acceptance due to the ongoing COVID-19 pandemic.

Walking

This strategy involves encouraging students and employees to walk to their school or workplace.

7.2 Short-Term Recommendations

While some organizations and partners exist within the MPA that already promote or use TDM within the region there are additional step that the MPO, local jurisdictions, and employers/residents can take to improve TDM within the Clarksville region. Short-term actions for improving TDM include:

- Conduct a survey to identify the strengths and weaknesses of existing TDM programs.
- Improve exiting CTS services based on input from passenger surveys, feasibility studies to add any new routes, and the Comprehensive Operational Analysis.
  - Good transit services have the potential to encourage a mode shift in travel behavior and reduce the use of SOVs.
- Use Emerging Technologies (discussed in Chapter 8).
  - With the latest technologies, "big data" about travel behavior and congestion can be collected in regards to the Clarksville MPA and used to develop policies and infrastructure improvements that helps in reducing SOVs and congestion.
- Promote an increased use of ridesharing services.
  - Use of shared trip options like UberPool and Lyft Shared can replace SOV travel thereby reduce congestion during peak periods.
  - Use of bike and scooter share systems for short trips and to provide last mile connections for transit passengers.
- Provide on-street and off-street bicyclist and pedestrian facilities near APSU, Fort Campbell, libraries, schools, and community centers.
  - This can encourage the use of alternative forms of transportation and reduce SOVs along major corridors and intersections within the influence area of these institutions.
- Work with local employers to develop programs and incentives that encourage employees to use transit to commute to work, such as creating programs that provide discounted transit passes.
- Encourage future developments with a large footprint to have a bicycle and pedestrian circulation plan.
- Encourage major traffic generators within the Clarksville MPA, like government agencies, APSU, Fort Campbell, and major private businesses to adopt TDM strategies for employees and visitors.
- Manage transportation system impacts of freight and deliveries
  - Reduce the number of delivery locations and truck idling time by having an agreement with retail chains to install secure storage lockers, which guard packages until claimed by the consumer.

- Create partnerships with logistics companies to use e-bikes as a delivery method over trucks where applicable in urban areas. These e-bikes can use bike lanes in restricted areas and do not need to wait on congested corridors.

8.0 ITS and Emerging Technologies

Within Tennessee, VMT is expected to outpace the current rate of infrastructure development (such as highway expansions or new roadways), as VMT for the state was up to nearly 76.4 billion in 2020 from about 70.4 billion in 2010[16]. This indicates that congestion will worsen without additional mitigation strategies. Transportation Systems Management and Operations (TSMO) is a transportation network management approach that prioritizes technologies and other practices to alleviate congestion as capacity expansions are often cost-prohibitive and disruptive to surrounding communities. Intelligent transportation system (ITS) programs are an integral component of TSMO as they integrate advanced communication technologies into the transportation infrastructure and within vehicles[17].

The purpose of this chapter is to document existing ITS inventory information, including field assets, communication network, and software packages. In doing so, this will allow CUAMPO to assess its ability to support various ITS applications and readiness to support the next wave of transformative technology of Connected and Autonomous Vehicles (CAVs).

8.1 ITS Operating Environment

The MPA's Regional ITS Architecture, which was updated in 2020, is developed and maintained by the CUAMPO. This document, the Clarksville Regional Intelligent Transportation System Architecture and Deployment Plan[18], identifies the types of ITS services that are planned for implementation in the region. This document provides all involved agencies, such as emergency responders, law enforcement, transit agencies, and pertinent transportation agencies, the ability to share resources and information necessary to ensure the operation of the transportation system. As part of the process, MPO staff and TCC members review potential TIP projects to help ensure coordination with the Architecture.

Central Management and Data Exchange Systems

Various software systems may be used to operate the various elements of the region's ITS program. These include those software systems used for real-time traffic management and

[16] FHWA, Highway Statistics, 2020.
[17] https://safety.fhwa.dot.gov/its/
[18] http://www.cuampo.com/wp-content/uploads/2021/03/Final-CRITS-Architecture-2020-with-Appendices.pdf

those used for long-term traffic operations, such as published road construction. This section of the report discusses these types of systems and their respective roles in managing traffic operations around the region.

Data Exchange Systems

This section focuses on the data exchange systems that are managed by TDOT and KYTC and that report data to the public for the Clarksville MPO region.

- TDOT SmartWay Information System
    - TDOT uses a traveler information system called TDOT SmartWay to convey useful travel information to roadway users. The traveler information system is populated by the TMC operators via an application called SWIFT (Statewide Information for Travelers) and feeds information such as traffic congestion, lane closures, road closures, traffic incidents, construction activity, road conditions, and rest area locations to the traveling public through the TDOT SmartWay website (https://smartway.tn.gov/traffic). Additionally, users of the website can view the TDOT closed-circuit television (CCTV) cameras and active dynamic message sign (DMS) messages to observe road conditions first-hand prior to starting their journey.
- KYTC GoKY Website
    - GoKY.ky.gov is a statewide traffic, construction and weather condition information system.

Inventory of ITS Equipment

This section focuses on the ITS assets that comprise the Clarksville region's ITS program. These assets are managed by TDOT's and KYTC's TMCs and include the ITS device types summarized in **Table 8.1**.

Table 8.1: ITS Device Types

Device	Description
Closed-Circuit Television (CCTV) Camera	CCTV cameras provide coverage on high-traffic corridors. They feed back to the traffic management centers, allowing for quick response times to incidents on the road network.
Dynamic Message Signs (DMS)	Dynamic message signs display important messages to drivers on key corridors.

Close Circuit Television

Close circuit television (CCTV) cameras provide visual coverage of locations along traveled roadways. For highway applications, CCTV cameras are often strategically placed on high-volume corridors and near locations with high concentrations of crashes that require incident management and response. Video feeds are transmitted back to the TMC for real-time viewing and operators may keep these video feeds on in the background for passive monitoring and early detection of non-routine congestion. During incidents, CCTV cameras provide a high degree of visual clarity of how the incident is progressing, which allows for better management of the event and accurate dissemination of information to the public.

Dynamic Message Signs

Dynamic message signs (DMS) are electronic signs that have the capability of changing part or all a sign’s message. Most DMS are the large electronic signs that appear over Kentucky highways, but smaller versions can be found on other routes. DMS can be used for many applications regarding traffic management, public safety, and evacuation. Together with CCTV cameras, DMS are important for mitigating disruptions on the system due to incidents and other unpredictable events as they timely conveyance of information on travel conditions to the traveling public.

Traveler Information Dissemination Methods

511 System

The goal of 511, established by the Federal Communications Commission (FCC) in 2000, has been to establish a single national phone number as the source for all things related to traveler information. Many states, including Tennessee, have adopted 511 as part of their ITS programs. Tennessee 511 and uses an automated voice response system where callers are guided through the menu through a series of requests. Callers can ask for specific roadways or regions, and the system will provide information. The information provided in Tennessee’s 511 system is also available in other dissemination tools, namely the TDOT Smartway website. Traveler information for Kentucky is provided by KYTC’s GoKY website.

8.2 Emerging Technologies

This section discusses the emerging transportation and ITS technologies that currently impact, or could potentially impact, transportation and land use patterns in the Clarksville MPA. While the impacts of technology advancements to passenger travel have historically been a focus area within planning, this discussion also investigates potential impacts to freight transportation. Trends that increase or alter how goods move could result in a larger volume of freight moving through the Clarksville MPA, create new challenges, and/or exacerbate existing challenges. Understanding transportation technology trends is important for identifying potential operational solutions to the region's mobility challenges.

Connected and Autonomous Vehicles

The Society of Automation Engineers' automation levels classification scheme is the industry standard in terms of measuring the degree of automation in a vehicle, as shown in **Table 8.2**. Levels one (1) through three (3) include Advanced Driver Assistance Systems (ADAS), which consist of features such as blind spot monitoring, lane centering, and adaptive cruise control. Levels four (4) and five (5) are more commonly referred to as autonomous vehicles, with systems referred to as Automated Driving Systems (ADS). These vehicles are driverless under certain conditions, with higher levels referring to the degree in which the driver must assume control of the vehicle. For instance, level three may require driver intervention under certain weather conditions or roadway configurations, but level five vehicles are designed without any need for driver intervention.

Table 8.2: Society of Automotive Engineers (SAE) Automation Levels

Level	Title	Description
0	No Automation	Zero autonomy; the driver performs all driving tasks.
1	Driver Assistance	Vehicle is controlled by the driver, but some driving assist features may be included in the vehicle design.
2	Partial Automation	Vehicle has combined automated functions, like acceleration and steering, but the driver must be ready to take control of the vehicle at all times with notice.
3	Conditional Automation	Driver is a necessity but is not required to monitor the environment. The driver must be ready to take control of the vehicle at all times with notice.
4	High Automation	The vehicle is capable of performing all driving functions under certain conditions. The driver may have the option to control the vehicle.
5	Full Automation	The vehicle is capable of performing all driving functions under all conditions. The driver may have the option to control the vehicle.

Source: Society of Automotive Engineers

Investments in CAV technology have been made at the federal, state, and regional level. At the federal level, USDOT has funded the Ann Arbor Connected Vehicle Environment, Connected Vehicle Pilots Program, and the Advanced Transportation and Congestion Management Technologies Deployment Program to advance vehicle communications technologies.[19] USDOT also released its *Federal Automated Vehicle Policy in 2016, the Automated Driving Systems 2.0: Vision for Safety* in 2017, and *Preparing for the Future of Transportation: Automated Vehicle 3.0* in 2018, which provides more detailed guidance and best practices in terms of testing and deployment of automated technologies.

CAVs for Passenger Transport

A major application of autonomous vehicles has been that of personal vehicles. These vehicles utilize LiDAR or RADAR, as well as various cameras, to navigate the environment around them. Several vehicle manufacturers have developed Level 2 systems that are available to consumers, such as Tesla "Autopilot" and Cruise "Super Cruise". These systems control steering and acceleration; however, drivers must be prepared to take control of driving. True fully autonomous vehicles are being tested in controlled testbed facilities and on public roadways across the country. One prominent example within the U.S. is the University of Michigan's Mcity, which features more than 25 partners across both the private and public sector leading in AV testing. Some companies, such as Ford via the Fusion hybrid autonomous test vehicle, are testing on roadways across Washington State, California, and New Jersey. In Tennessee, a six-mile portion of I-24 will also feature AVs, as part of the I-24 Motion study, a partnership between TDOT and Vanderbilt University. The Test Tracking Tool, put together by the National Highway Traffic Safety Administration (NHTSA), has become a helpful resource for tracking deployments.

Many AV testing efforts are also centered around ridehail or ridesharing applications. These vehicles utilize the same technology as personal AVs but are focused on moving many passengers to ridesharing models of operation. Ridesharing has the potential to improve mobility for many user groups, similar to personal AVs, but also result in lower user costs due to their shared nature. One such deployment has been the Google-owned company Waymo, which conducted extensive testing across Phoenix and San Francisco. Since 2017, the company has driven over 20 million self-driven miles.

[19] https://www.transportation.gov/sites/dot.gov/files/docs/policy-initiatives/automated-vehicles/320711/preparing-future-transportation-automated-vehicle-30.pdf

Source: Waymo

Ridesharing AVs would also be used in Shared Fleet Applications, which refer to fleets of AVs available to groups of roadways users through specific programs. These could include public programs, private company programs, or subscription services. One of the few examples of such a deployment occurred when Waymo initially rolled out its Waymo One AV testing program exclusively for its employees before offering rides to all San Francisco riders.

Also shared in nature and focused on the movement of various passengers, autonomous shuttles are AVs designed for lower-speed, specific routes. These types of vehicles, also referred to as specialized transit, are different in that they are built without a traditional driver's seat and operate at lower speeds, usually under 25 mph. As such, they can be ideal for servicing urban corridors or providing first or last mile connections to larger transportation systems. There have been many AV shuttle deployments across the U.S., beginning with the AAA Free Self-Driving Shuttle, which operated in Las Vegas for one year and served over 32,000 riders. As of 2021, Knox County, TN is also testing autonomous shuttles. The mobility company, Olli, owned by Local Motors, has started testing in mixed traffic along Valley Vista Road.

Shared AV applications tend to focus on providing mobility solutions through ridesharing vehicles or autonomous shuttles. However, it is important to note that AV technology has the potential to improve traditional public transportation vehicles as well. For instance, some companies have explored autonomous transit buses. One such company is the Canadian electric bus manufacturer, New Flyer, which has released an electric, Level 4 autonomous bus. The Connecticut Department of Transportation (CTDOT) purchased three (3) of these buses through federal funding and will be launching a test program in early 2023.

Source: New Flyer Xcelsior

CAVs for Freight Transport

While much attention on CAV technology has focused on passenger cars and the movement of people, an increasing number of trucks are utilizing these technologies including sensor, communications, and/or processing software technologies for both steering and braking assistance. Due to ongoing industry challenges to attract new drivers and the continued need to improve safety, the benefits of greater vehicle automation to the trucking industry are substantial. There are multiple companies actively engaged in the development of autonomous trucks.

On a per-mile basis, labor and fuel are the two (2) highest operational costs for the trucking industry. Autonomous trucks would significantly reduce both costs. Other potential benefits include reduced driver stress, fewer accidents, reduced congestion, and lower carbon emissions.

An example of a company pushing the trend towards autonomous trucks is Embark, which is currently testing a system that automates the freeway portion of a truck's journey and allows the driver to take over to navigate the more complex local roads. The approach is designed to enable truck drivers to complete more journeys per day while spending less time actually driving. Another example company is TuSimple, which has been performing depot-to-depot test runs in Phoenix, Tucson, Dallas, El Paso, Houston, and San Antonio.[20]

[20] Ackerman, E. "This Year, Autonomous Trucks Will Take to the Road With No One on Board," IEEE Spectrum, January 4, 2021.

Other companies with promising pilot programs include Waymo, Aurora, Locomation, and Plus.ai.

Another motivating factor behind the emerging trend of autonomous trucks is that it provides the ability for fleet operators to deploy trucks in platoons. Truck platoons use vehicle-to-vehicle (V2V) communications and autonomous vehicle control technology to electronically "tether" tractor-trailers together in a convoy formation. One of the primary benefits of platooning is greater fuel efficiency (and the associated cost savings), which stems from reduced aerodynamic drag on the following vehicle(s). Other visions of connected vehicle technology also incorporate vehicle-to-infrastructure (V2I), or vehicles equipped with transceivers that communicate with roadside infrastructure. This concept seeks to improve vehicle operation, safety and mobility, and impacts to the environment. For instance, some applications notify trucks of abrupt stops ahead, curves, or wrong-way drivers. Some states have deployed connected technology focused on freight, one major example being the Texas Connected Freight Corridors project by TxDOT. The connected vehicle technology in this project will include work zone warning systems, queue warning systems, wrong-way driver notification systems, advanced traveler information systems, and freight signal priority.

Aside from autonomous heavy-duty trucks, two other applications have applied automated driving systems to the delivery of goods – personal delivery devices (PDD) and drones, also known as unmanned aircraft systems (UAS). PDD are smaller, lower-speed vehicles focused on the last-mile delivery of vehicles. Due to their size, they can navigate complex environments and operate on the road, bike lanes, or sidewalks. In Franklin, Tennessee; Amazon's last-mile delivery robot, Scout, began testing in 2021. FedEx has also developed a last-mile delivery robot called Roxo. Since its development in 2019, it has been tested in various cities, including Memphis, Tennessee. Drones, while by some definitions also considered a personal delivery device, utilize airspace for faster last-mile delivery. Large companies have invested in drone programs, such as Amazon Prime Air initiative and the IPS Flight Forward Drone Delivery Program. However, drone testing continues to largely occur in public sector testing grounds, such as the Ohio Unmanned Aircraft Systems Center and the Lone Star UAS Center of Excellence and Innovation in Texas.

Vehicle Electrification

Advances in battery and fuel cell technology have allowed for the development electric vehicles for both passenger and freight use. These vehicles generally have lower operating and fuel costs. Numerous vehicle manufacturers have launched electric vehicles into the U.S. market, including Nissan, General Motors, Volkswagen, and Ford. However, electric vehicles require charging and need a widely available charging infrastructure, such as charging stations, to be effective. This has prompted the federal government, and many state DOTs, to prioritize electric vehicle infrastructure investments.

Source: Energy Northwest

The passing of the IIJA in 2021 allocated over $30.7 billion towards EV and charging infrastructure. These funds are delivered directly to state and local governments and also directs two (2) key agencies – the Department of Energy and the Department of Transportation – to create a new joint office to support the allocation of funds and infrastructure development.

At the state level, departments of transportation have launched programs to prepare for and fund electric vehicles. In 2018, Tennessee initiated the Drive Electric Tennessee program as a strategic planning effort to guide EV adoption within the state. Various stakeholders throughout the state informed the first Electric Vehicle Roadmap, published in 2019, which identifies crucial steps and projects to advance electric vehicle adoption within the state. Other states have formed strategic partnerships to advance regional EV goals. For example, one of the largest and most recent partnerships has been the Regional Electric Vehicle for the Midwest Memorandum of Understanding (REV Midwest MOU). REV Midwest MOU includes five states – Illinois, Indiana, Michigan, Minnesota, and Wisconsin – and seeks to accelerate electrification of both personal and freight vehicles in the region by investing in the necessary infrastructure and removing any policy barriers.

While passenger cars have generated the majority of electric vehicle shares, electric trucks are seen as vital to reducing emissions and the environmental impact of the transportation sector. Electrification provides an opportunity to address multiple challenges attributed to the freight transportation sector. For example, while medium- and heavy-duty vehicles represented only about five (5) percent of registered vehicles in 2018, they were responsible for over twenty-six (26) percent of the U.S. transportation sector's fuel consumption[21] and twenty-three (23) percent of the sector's greenhouse gas (GHG) emissions[22]. Electrification would also help to address an important transportation equity challenge: public health. Respiratory diseases attributed to tailpipe emissions disproportionately affect disadvantaged communities due to their proximity to major highways, rail yards, trucking terminals, and other freight-intensive land uses.[23]

Beyond the ability of freight vehicle electrification to mitigate the negative externalities attributed to goods movement, potential fuel cost savings is a motivating factor behind this trend. Fuel typically represents the second highest cost to motor carriers (about 24 percent of total cost), behind driver wages, on a per mile basis.[24] Historically, electricity prices have been lower and more stable than gasoline and diesel prices and thus offers the opportunity for an industry characterized by tight profit margins to achieve considerable cost savings. As a result of the multiple potential benefits to electrification, several operators of private (e.g., Walmart and Amazon) and for-profit fleets (e.g., Knight-Swift and Dependable Highway Express) have made investments in achieving electric and zero-emission fleets.[25]

[21] FHWA, Table VM-1 - Highway Statistics 2018 – Policy: Federal Highway Administration, https://www.fhwa.dot.gov/policyinformation/statistics/2018/pdf/vm1.pdf.
[22] Environmental Protection Agency – Office of Transportation and Air Quality, Fast Facts: U.S. Transportation Sector Greenhouse Gas Emissions 1990-2018, https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P100ZK4P.pdf.
[23] American Lung Association, American Lung Association Energy Policy Development: Transportation Background Document, 2015, www.lung.org/getmedia/10333ba7-8f6f-472e-8392-1388cd5fd754/transportation-backgrounder.pdf.pdf.
[24] American Transportation Research Institute, Operational Costs of Trucking, 2019.
[25] Ronan, D., "Trucking Industry Making Strides Toward Electrification," Transport Topics, March 11, 2021, https://www.ttnews.com/articles/trucking-industry-making-strides-toward-electrification.

Despite the potential for electrification to generate industry cost savings and positive environmental and transportation equity impacts, it is not without its challenges. This is evidenced by the low market penetration of electric freight vehicles as only about 600 electric trucks are estimated to have been sold in the U.S. and Canada 2019.[26] Some of the key barriers to heavy-duty vehicle electrification include[27]:

- **Higher Upfront Vehicle Costs.** High vehicle purchase price is perceived as one of the largest barriers to freight electrification. Besides batteries, which are the most expensive component of an electric vehicle, other parts and components such as electric motors are also costly compared to their diesel and gasoline equivalents. High upfront costs particularly impact smaller carriers and owner-operators as they are not likely to have the capital or confirmed client demand to invest in electric vehicles.
- **Costly and Complex Charging Infrastructure Processes.** Planning and installing electric vehicle infrastructure is another of the largest barriers to deploying an electric truck fleet. Charging stations vary in the speed (and subsequently cost) with which they can fully charge a vehicle. The selection of the type of charging station must depend on the size of the vehicle, dwell time, and other factors. Aside from selecting and purchasing the stations, motor carriers must deal with the complexity and cost associated with siting, planning, commercial utility interconnection requirements, construction permitting, and final installation. To address this barrier, some automotive, utility, and infrastructure companies are testing technology that allows electric vehicles to charge while in-motion via under-road pads that wirelessly transmit electricity to receivers mounted underneath vehicles or using overhead wires.[28] The process, known as dynamic charging, could reduce the cost of charging infrastructure for motor carriers if they could rely on a publicly available source of energy to supplement their own investments.

[26] Environmental Defense Fund, Race to Zero, October 2020, https://www.edf.org/sites/default/files/documents/Race%20to%20Zero-ICCT_EDF_PQ-FINAL.pdf
[27] Electrification Coalition, Electrifying Freight: Pathways to Accelerating the Transition, https://www.electrificationcoalition.org/wp-content/uploads/2020/11/Electrifying-Freight-Pathways-to-Accelerating-the-Transition.pdf.
[28] Hodari, D., "These Companies Want to Charge Your Electric Vehicle as You Drive," Wall Street Journal, January 18, 2021.

- **Commercial and Industrial Electricity Rate Structures.** Electricity charging costs in the U.S. are, on average, comparatively lower than diesel fueling costs.[29] However, the substantial electricity demand requirements combined with limited down time to charge larger class vehicles and the rate structures of many utility markets can greatly reduce the financial savings of electricity over diesel. Heavy-duty vehicles must be able to charge at reasonably priced rates that meet their operational needs. Without greater flexibility in rate structures, it may be financially challenging for fleet operators to consider electrifying their fleets.
- **Limited Availability of Certified Service Centers and Technicians.** Without certified facilities and technicians, many fleet operators may be resistant to electrify their fleets until they can be assured that timely repairs can be made to their vehicles in order to protect against extended periods of downtime. Commercial vehicle fleets have very demanding operational requirements that require close monitoring to ensure optimal operational efficiency and minimal disruptions to fleet operations. While diesel trucks have a large network of highly capable and knowledgeable service centers and technicians to support their operation, this is not the case for heavy-duty electric vehicles. While some of the required maintenance and repairs for electric trucks will not require any special equipment or technical knowledge beyond what is already required for diesel-based vehicle platforms, in some cases specialized technical equipment and technicians will be needed. Currently, these assets are only available on a limited basis.
- **Concerns with Grid Resiliency.** As electric truck fleets become more common, there is concern that without significant investments in utility upgrades to current grid infrastructure, local grid networks may be pushed beyond their current distribution capacity. This can create disruptions to services or a slowdown of fleet electrification efforts. Electric trucks have very high electrical demand requirements, and their widespread deployment would create large new demand for electricity. Evaluating the need for increasing grid distribution capacity is therefore essential to providing sufficient reliability to support a fully electrified freight transportation system.

[29] "Fuel Prices." Alternative Fuels Data Center: Fuel Prices, U.S. Department of Energy's Office of Energy Efficiency and Renewable Energy's Vehicle Technologies Office, afdc.energy.gov/fuels/prices.html.

9.0 Existing Plans Review

Existing local and regional plans and processes can influence the MTP and its strategies; the MTP 2050 builds on that base. This chapter is not a comprehensive list of every plan or study conducted within the CUAMPO region, but of those that are likely to have the greatest impact on the MTP update.

9.1 2045 MTP - CUAMPO, 2019

The 2045 Clarksville MTP is the multimodal, long-range transportation plan for the Clarksville MPA, which is used to guide the expenditure of federal and state transportation funds within the region. The MTP is federally required to be updated every five (5) years and looks at a minimum 20-year horizon. The 2045 MTP set a regional vision and course of action for addressing the transportation needs of the Clarksville MPA over the next twenty-seven years. It is the document from which the TIP is currently drawn and contains a list of potential transportation projects within the region.

9.2 City of Clarksville Transportation 2020+ Strategy - City of Clarksville, 2021

The Transportation 2020+ Strategy is a document designed to guide transportation decisions within the City of Clarksville based on available local funds. The plan also estimates the costs associated with prior improvements and outlines options to fund the plan's goals. The plan prioritizes transportation projects into three (3) tiers with a combined estimated cost of $462 million. These projects are tiered based on:

- need,
- their ability to solve the City's most pressing traffic and mobility problems, and
- the best allocation of City resources to equitably implement transportation priorities throughout the city.

Tier one is generally larger projects which are ranked as urgently needed to address traffic congestion, promote motorist and pedestrian safety, connect the community, and expand transit service. Tier 2 and Tier 3 projects focus on the community's identifiable and expected future mobility needs.

9.3 TDOT 25-Year Long Range Transportation Policy Plan - TDOT, 2015

TDOT is responsible for developing, maintaining, and operating the state's system of transportation facilities and services for the State of Tennessee. The TDOT 25-Year Long Range Transportation Policy Plan provides a foundation for prioritizing transportation investments across the state with an emphasis on:

- multimodal transportation in direct response to changes in public opinion,
- demographics,
- industry needs,
- funding, and
- travel patterns.

The plan explores the demographic shifts and funding trends that affect the state and communicates recommendations through guiding principles, policy papers, and emphasis areas. It also describes a fiscal outlook for Tennessee and establishes a direction for investing in the State's transportation system to promote Efficiency, Effectiveness, and Economic Competitiveness.

9.4 Kentucky 2022-2045 Long-Range Statewide Transportation Plan – KYTC, 2022

Like TDOT, KYTC is responsible for developing, maintaining, and operating the state's system within Kentucky. The plan is a 23-year long-range plan that establishes broad goals, guiding principles, and strategic actions to work toward the vision for the Commonwealth's multimodal transportation system.

The five interconnected LRSTP Goals which support the delivery of the LRSTP Vision for the Commonwealth of Kentucky are:

- Enhance safety
- Deliver a high level of maintenance and resiliency
- Establish a reliable flow of people and freight
- Provide local, regional, and global connectivity for communities
- Deliver and operate a system that protects or enhances the natural and human environment

The five LRSTP Guiding Principles were also derived from stakeholder and public input. These Guiding Principles provide the process framework for the delivery of improvements or policies supporting the achievement of all five LRSTP Goals and are outlined as follows:

Quality of Life
Create a clean and efficient system that promotes healthy and fully engaged lifestyles while protecting the natural and human environment

Equity
Seek fairness in mobility and accessibility to meet the needs of all community members

Adaptability/Sustainability
Develop and operate a system that can adjust to the potentially disruptive forces of advances in technology, funding challenges, or human-made and natural disasters

Seamlessness
Integrate connectivity across all modes to provide reliable trip choices for people and freight

Economic Vitality
Deliver and operate a system that improves the ability of the state to provide employment and market opportunities

9.5 State Transportation Improvement Program (STIP) - TDOT, 2023

The STIP implements the policies and programs of the Statewide Long Range Transportation Plan. Per the 2023-2026 STIP, the seven (7) Guiding Principles" are:

1. Preserve and Manage the Existing System - Protect existing assets and maintain efficiency of the system through cost-effective management and new technologies.
2. Support the State's Economy - Make transportation investments that support economic growth, competitiveness and tourism; build partnerships with communities and regions to link employment, commercial/retail areas and other key activity centers.
3. Maximize Safety and Security - Reduce injuries and fatalities in all modes of transportation; minimize construction-related safety incidents; improve disaster preparedness and incident response.
4. Provide for the Efficient Movement of People and Freight - Optimize the movement of people and goods by providing greater access to transportation services for all people and by building better connections among different modes of transportation.
5. Build Partnerships for Sustainable and Livable Communities - Provide early and ongoing opportunities for broad public input on plans and programs; work closely with local public and private planning efforts; coordinate land use and transportation planning.
6. Protect Natural, Cultural, and Environmental Resources - Maintain the integrity of communities and historical sites; minimize impacts on natural resources and conserve energy.
7. Emphasize Financial Responsibility - Provide accountability; maximize Tennessee's share of federal transportation funding; develop alternative funding strategies; select projects based on identified regional needs; allow flexibility in local management of projects where feasible.

This plan proposes projects for all modes of transportation within the state and includes analysis of forecast funding changes anticipated to occur due to the IIJA.

9.6 State Transportation Improvement Program (STIP) - KYTC, 2021

The Kentucky Transportation Cabinet's (KYTC) Fiscal Years 2021-2024 STIP was developed in accordance with federal regulations and the implementation of the 2021 STIP is in accordance with the FAST Act program and guidelines. The STIP contains listings of highway and transit projects within the 120 Kentucky counties and was conducted through the collaborative efforts of FHWA, FTA, and KYTC to ensure that all federal-aid funding is utilized in accordance with federal regulations and guidelines. Federal funding for projects included in the STIP are finalized when a request for project authorization is approved by FHWA or upon approval of a grant by FTA.

9.7 Tennessee Statewide Multimodal Freight Plan – TDOT, Amended 2022

In 2014 TDOT took the initiative to complete the Tennessee Statewide Multimodal Freight Plan for the purposes of MAP-21 requirements. The purpose of the freight plan was:

1) Define strategic goals for the Tennessee freight system
2) Establish a strategy to achieve freight-related goals that align with TDOT's guiding principles
3) Fulfill the requirements of MAP-21.

Building on input from public and private freight stakeholders the plan listed the existing assets of the freight transportation system, evaluated the economic benefits of the system, anticipated future trends and economic growth, and determined implementable strategies for Tennessee to improve freight movement across all modes of transportation, as well as the equally important connections between modes. This plan developed a list of short- and long-term projects that address future needs of the Tennessee freight system.

<u>Goals</u>

The plan is guided by seven (7) principles of TDOT's Long-Range Planning which are closely aligned with FHWA's national goals for freight movement. These goals are intended to guide future needs of Tennessee roads, rail lines, waterways, and air freight movements. These principles are:

- Support the State's Economy through efficient movement of goods.

- Preserve and Manage the Existing System through strategic investments designed to reduce congestion/ bottlenecks, enhance efficiency of intermodal movements.
- Maximize Safety and Security by providing adequate, safe facilities to meet industry guidelines.
- Maintain the freight system so that roadway bridges, rail bridges, locks for barges, and airport runways can support the industry.
- Consider land use when evaluating the transportation system in the state to Provide for the Efficient Movement of People and Freight.
- Enhance the current system using Intelligent Transportation Systems (ITS) technology and other innovative technologies.
- Improve the freight system such that the environmental and community impacts are limited.

Work with industries and communities to create a freight system that Builds Partnerships for Sustainable and Livable Communities.

9.8 Tennessee Strategic Highway Safety Plan – TDOT, 2020

In 2019, Tennessee updated its SHSP to build on the foundation created by the original developed in 2004. The SHSP follows guidance provided by the FHWA in March of 2016 for meeting requirements of MAP-21 to obligate funds under the Highway Safety Improvement Program.

The SHSP has maintained its commitment to the Toward Zero Deaths (TZD) vision. TZD is the result of a national collaboration of safety professionals from various agencies and organizations using a data-driven approach to develop standard strategies focused on providing safer roadways that are regularly refined, implemented, and evaluated. The mission of this plan was to ensure that improvements in safety continue to result in a reduction of serious injury and fatal crashes by implementing achievable, time-bound, and measurable goals to reduce the occurrence of serious injuries and fatalities.

Goals

- Adopt and implement new safety performance measures in accordance with MAP-21.
- Reduce the average number & rate of fatalities per year by not exceeding the 2022 five (5) year projected rolling average.
- Reduce the average number & rate of serious injuries per year by not exceeding the 2022 five (5) year projected rolling average.

To that end, the SHSP contains sub-plans to address:

- Data Collection and Analysis
- Driver Behavior & Public Awareness
- Infrastructure Improvements
- Vulnerable Road User Protection (bicyclists, motorcyclists, pedestrians, and seniors)
- Operational Improvements (work zones & emergency response)
- Motor Carrier Safety

Recommendations

The SHSP sets overall safety standards for Tennessee state roads, which the MPOs plan support. Specific safety standards and performance measures are project-specific, but the MTP and other MPO plans should support the overall SHSP safety goals. Measures to ensure coordination between the SHSP and Memphis MPO include:

- Each MPO in Tennessee will be included as Safety Partners for the SHSP.
- Any MPO wishing to serve on the Steering Committee will be included upon request.

Updates to all transportation plans by each planning organization will explicitly address safety, and allow participation by SHSP Steering Committee members to align projects with goals of the plan.