metroplan orlando
A REGIONAL TRANSPORTATION PARTNERSHIP

2045

Metropolitan Transportation Plan

Managing Mobility:
A Congestion Management Process

Adopted: 12/09/2020

Proposed Revisions: May / June 2021

What is in this document?

This document describes MetroPlan Orlando's Congestion Management Process (CMP). The purpose of the CMP is to provide the information needed to make informed decisions regarding the allocation of financial resources to manage current and future congestion in the MetroPlan Orlando area. It addresses recurring and nonrecurring congestion. The CMP identifies existing congestion-related impacts and improvement strategies for both people and goods. The CMP performance measures used to evaluate the strategies' effectiveness directly align with the 2045 MTP goals and objectives related to: Safety and Security, Reliability and Performance, Access and Connectivity, Health and Environment, and Investment and Economy. Lastly, the CMP also includes a monitoring program that will periodically assess the effectiveness of the strategies overtime.

Chapter 23 of the Code of Federal Regulations, Section 450.320 states "The transportation planning process in a TMA shall address congestion management through a process that provides for safe and effective integrated management and operation of the multimodal transportation system, based on a cooperatively developed and implemented metropolitan-wide strategy, of new and existing transportation facilities through the use of travel demand reduction and operational management strategies. The development of a congestion management process should result in multimodal system performance measures and strategies that can be reflected in the metropolitan transportation plan (MTP) and TIP."

HOW TO GET INVOLVED IN THE 2045 PLAN

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List of Acronyms and Abbreviations

ACS	American Community Survey
AMBER	America's Missing: Broadcast Emergency Response
AQI	Air Quality Index
ATCS	Adaptive Traffic Control System
BEBR	Bureau of Economic and Business Research
BPSAP	Bicycle Pedestrian Safety Action Plan
BRT	Bus Rapid Transit
CAP	Computer Assistance Service Program
CAV	Connected and Automated Vehicles
CCTV	Closed-Circuit Television
CFRPM	Central Florida Regional Planning Model
CFX	Central Florida Expressway Authority
CIP	Capital Improvement Program
CMP	Congestion Management Process
CO	Carbon Monoxide
CO2	Carbon Dioxide
CPED	Crash Prediction for Expedited Detection
DMS	Dynamic Message Sign
ECFRPC	East Central Florida Regional Planning Council
EMS	Emergency Medical Services
EV	Electric Vehicle
EVP	Emergency Vehicle Priority
F&I	Fatality plus Incapacitating Injury
FAST	Fixing America's Surface Transportation Act
FDOT	Florida Department of Transportation
FHWA	Federal Highway Administration
FOC	Fiber-Optic Cable
FTA	Federal Transit Administration
FTE	Florida's Turnpike Enterprise
GDP	Gross Domestic Product
GTFS	General Transit Feed Specification
HEV	Hybrid Electric Vehicle
HOT	High Occupancy Toll
HOV	High Occupancy Vehicle
ICE	Internal Combustion Engine
ICM	Integrated Corridor Management
IDE	Integrated Data Exchange
ITS	Intelligent Transportation System
LEHD	Longitudinal Employer-Household Dynamics
LOS	Level of Service
LOTIS	Land Overlaid on Transportation Information System
LOTTR	Level of Travel Time Reliability
LRT	Light Rail Transit
LYNX	Central Florida Regional Transportation Authority
MaaS	Mobility as a Service
MCO	Orlando International Airport
MOE	Measure of Effectiveness
MPO	Metropolitan Planning Organization
MPM	Mobility Performance Measures
MTP	Metropolitan Transportation Plan
NEPA	National Environmental Policy Act
NHS	National Highway System
Non-SOV	Non-Single Occupancy Vehicle
NPMRDS	National Performance Management Research Data Set
03	Ozone
OUATS	Orlando Urban Area Transportation Study model
PD&E	Project Development and Environment
PM	Particulate Matter
PMTD	Person Miles Traveled Daily
PPL	Prioritized Project List
RCI	Roadway Characteristics Inventory
RTMC	Regional Transportation Management Center
SAFETEA-LU	Safe Accountable Flexible Efficient Transportation Equity Act: A Legacy for Users
SHS	State Highway System
SOV	Single Occupancy Vehicle
TDM	Travel Demand Management
TIP	Transportation Improvement Program
TMA	Transportation Management Area
TNC	Transportation Network Company
TSM&O	Transportation System Management and Operations
TSP	Transit Signal Priority
TTTR	Truck Travel Time Reliability
UCF	University of Central Florida
V/C	Volume to Capacity
VMT	Vehicle Miles Traveled
VMTD	Vehicle Miles Traveled Daily
VMTPH	Vehicle Miles Traveled Peak Hour

1.0 Background

The Federal Highway Administration (FHWA) requires metropolitan areas with populations exceeding 200,000, known as Transportation Management Areas (TMAs), to create a congestion management process (CMP). The CMP is defined in federal regulations; however, the regulations are not prescriptive regarding the methods and approaches that must be used to implement a CMP. This flexibility allows metropolitan planning organizations (MPOs), who lead the development of the CMP for their metropolitan areas, to design their own approaches and processes to fit their individual needs. For MetroPlan Orlando, this means using both traditional and non-traditional approaches to solve congestion with a focus on safety, technology, and increasing access and connections to essential services for all.

The CMP is intended to be an on-going activity, fully integrated into the metropolitan transportation planning process and the 2045 Metropolitan Transportation Plan (MTP). The CMP is a living document, continuously adjusting and improving over time as goals and objectives change, new congestion issues arise, new information sources become available, and new strategies are identified and evaluated. Ultimately, the purpose of the CMP is not to identify specific projects, but rather to supply actions and strategies that advance the MPO's overall goals for system performance and reliability. The actions identified in the CMP for how to effectively integrate Transportation System Management and Operations (TSM&O) strategies ultimately influence near-term planning efforts such as the MPO's Transportation Improvement Program (TIP) and Prioritized Project List (PPL).

MetroPlan Orlando recognizes the importance of linking goals, objectives, and investment priorities to established performance objectives, and that this link is critical to the achievement of national, statewide and regional transportation goals and performance targets. As such, the CMP reflects the goals, objectives, performance measures, and targets as they are available and described in other state and public transportation plans and processes; specifically, the Florida Strategic Highway Safety Plan (SHSP), the Florida Highway Safety Improvement Program (HSIP), and the Florida Transportation Plan (FTP).

CONGESTION MANAGEMENT

Congestion management is the ***application of strategies to improve transportation system performance and reliability*** by reducing the adverse impacts of congestion on the mobility of people and goods.

A congestion management process (CMP) is a systematic, regionally-accepted approach for managing congestion that provides accurate, up-to-date information on transportation system performance and assesses various strategies for congestion management. The CMP is intended to help move these congestion management strategies into the funding and implementation stages.

The CMP, as defined in federal regulation, is intended to serve as a systematic process that provides for safe and effective integrated management and operation of the multimodal transportation system.

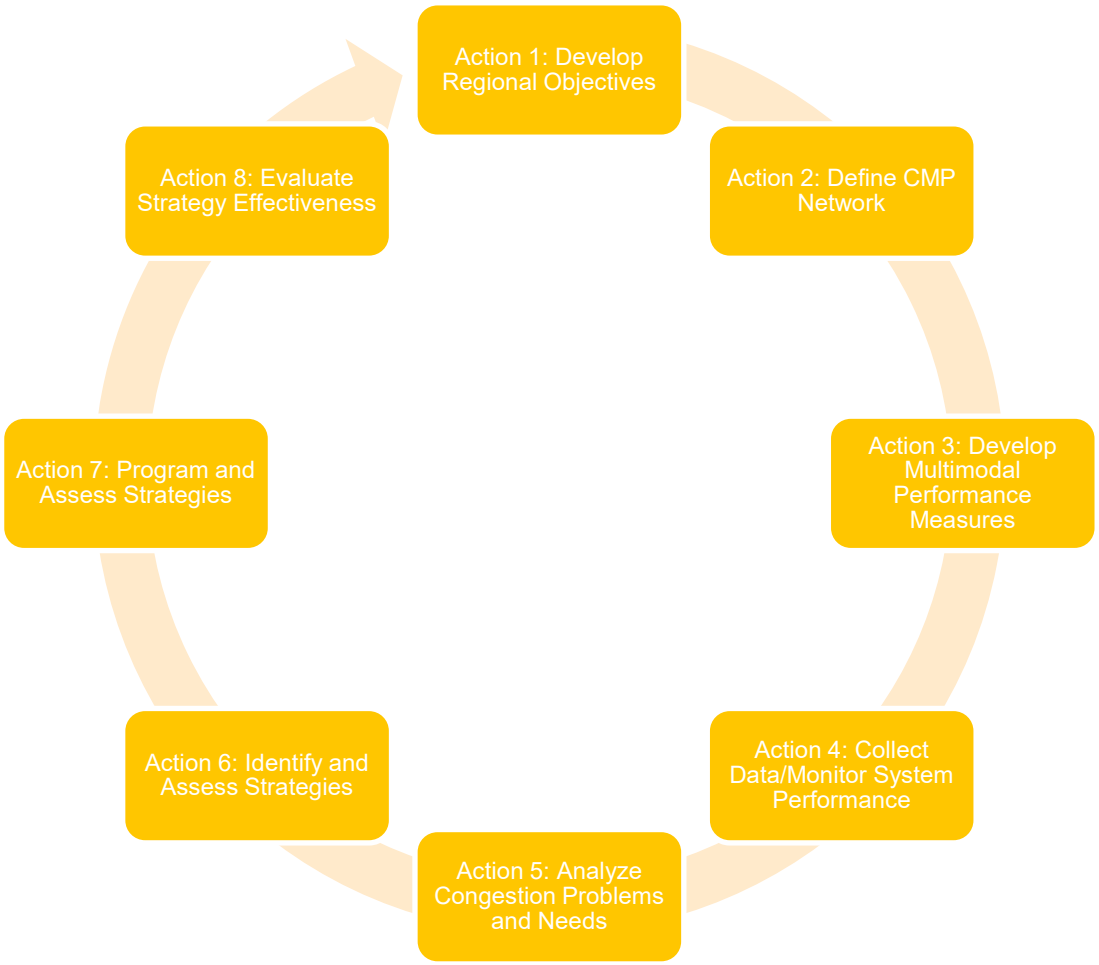
Federal regulations do not specify a prescribed update cycle for the CMP. MetroPlan Orlando updates its CMP during the development of the MTP. This allows the MTP goals and objectives to inform the CMP and for the CMP findings to inform the MTP programs and projects. In addition, MetroPlan Orlando updates the CMP annually through its monitoring process, with major updates every five years.

This document defines MetroPlan Orlando's CMP and its approach to addressing recurring and nonrecurring congestion in the region. Strategies for alleviating congestion and enhancing access and system performance, for both people and goods, are identified.

1.1 CMP "8 Actions" Process Model

FHWA guidance suggests a successful CMP follows an eight-action process model[1]. Although sometimes referred to as an eight "step" process, the term "action" acknowledges that while the CMP includes a general sequence of activities, the cyclical nature of the metropolitan planning process means that there are iterations within the sequence, and variations in approaches. These eight actions are illustrated in Figure 1 followed by a general overview of each step.

Figure 1: FHWA 8-Action Process



Action 1 – Develop Congestion Management Objectives: The CMP objectives are derived from the MTP's goals and objectives, but with a sharpened and more focused emphasis on congestion. In the first action, the key question being asked is "What is the desired outcome?". The objectives are defined in terms that enable participants in the process to focus on specific aspects of congestion, and to identify a near-term timeframe for achieving them. Objectives are multimodal, covering all modes of transportation including auto, transit, freight, walking and biking.

[1] https://www.fhwa.dot.gov/planning/congestion_management_process/cmp_guidebook/cmpguidebk.pdf

Action 2 – Define CMP Network: This action answers the question, "What components of the transportation system are the focus?" and involves defining both the geographic scope and system elements that will be analyzed in the CMP. FHWA suggests the area of application align with an MPO's physical boundary area. For MetroPlan Orlando, this includes all publicly-owned transportation facilities throughout Orange, Osceola, and Seminole Counties.

Action 3 – Develop Multimodal Performance Measures: The CMP should address, "How do we define and measure congestion?" This action is completed through the development of CMP performance measures, which are derived from the goals and objectives established during the long-range transportation planning process. Measures are used to identify where strategies have been effective and also where goals are not being achieved so that different strategies can be used. MetroPlan Orlando applies an objectives-driven, performance-based approach that includes both traditional and non-traditional CMP-related performance measures.

Action 4 – Collect Data/Monitor System Performance: The availability of data is a key factor when determining how an MPO will measure congestion. This action answers the question "How does the transportation system perform?" Data collection is on-going for MetroPlan Orlando and its transportation partners and involves a wide range of sources for monitoring the system's performance over time. MetroPlan Orlando will monitor system performance periodically and report progress via a CMP scorecard. These periodic progress reports will keep decision-makers apprised of the region's progress with congestion mitigation.

Action 5 – Analyze Congestion Problems and Needs: This action answers the questions "What congestion problems are present in the region, or are anticipated?" and "What are the sources of unacceptable congestion?" Congested locations are identified through the selection of the appropriate performance measures, analytical tools, and available data. The CMP analyzes both recurring and nonrecurring congestion. As defined by FHWA, recurring congestion, which takes place at predictable intervals at particular locations, can generally be traced to a specific cause, such as a physical bottleneck or to conditions such as sun glare. Causes of nonrecurring congestion, such as traffic incidents, may be more difficult to isolate, and solutions may require non-traditional strategies.

Action 6 – Identify and Assess Strategies: MetroPlan Orlando, working together with partners, addresses the question, "What strategies are appropriate to mitigate congestion?" in this action. It involves both identifying and assessing potential strategies for both recurring and nonrecurring congestion, and includes efforts conducted as part of the MTP or other project studies.

Action 7 – Program and Implement Strategies: This action involves the implementation and management of the defined strategies and answers the question, "How and when will solutions be implemented?". MetroPlan Orlando will work closely with the region's operating agencies throughout the implementation of congestion management strategies and activities. The CMP informs priorities in the 2045 Metropolitan Transportation Plan, thereby facilitating the implementation of the recommended actions. This creates the linkage between the CMP and funding decisions.

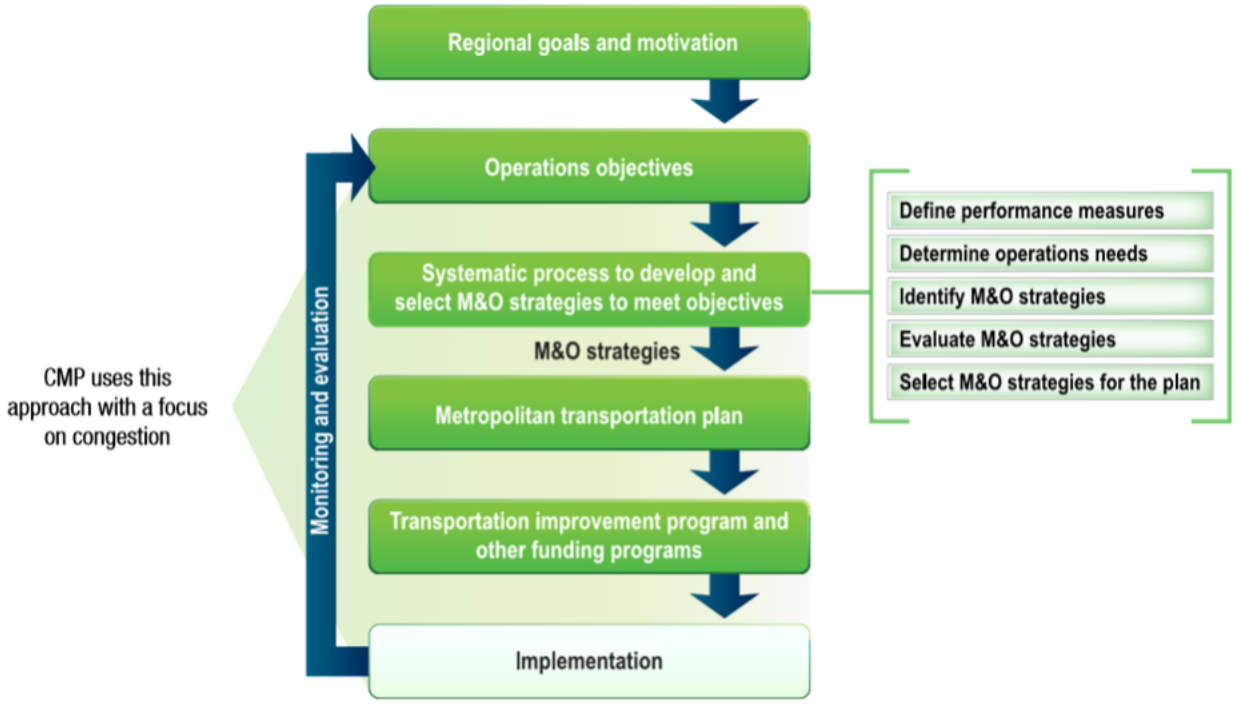
Action 8 – Evaluate Strategy Effectiveness: The last action answers the question, "What have we learned about the implemented strategies?" Using the performance measures selected in Action 3, MetroPlan Orlando periodically evaluates the effectiveness of strategies identified through the CMP. The results of this assessment are designed to inform future decision making.

1.2 Objectives-Driven, Performance-Based Approach

FHWA and the Federal Transit Administration (FTA) promote the use of an objectives-driven, performance-based approach to planning for operations as an effective way to integrate operations into the MTP. Figure 2 summarizes the overall process.

A key element of this approach is developing operations objectives that state what a region plans to achieve regarding the operational performance of the transportation system. Operations objectives are included in the MTP and guide incorporating operations into the Transportation Improvement Program (TIP). These objectives provide specific, measurable, agreed-upon statements of system performance that can be tracked on the regional level and inform investment decisions.

Figure 2: FHWA's Objectives-Driven, Performance-Based Approach[2]



[2] https://ops.fhwa.dot.gov/publications/fhwahop10027/fhwahop10027.pdf

1.3 Dimensions and Sources of Congestion

Four Major Dimensions of Congestion

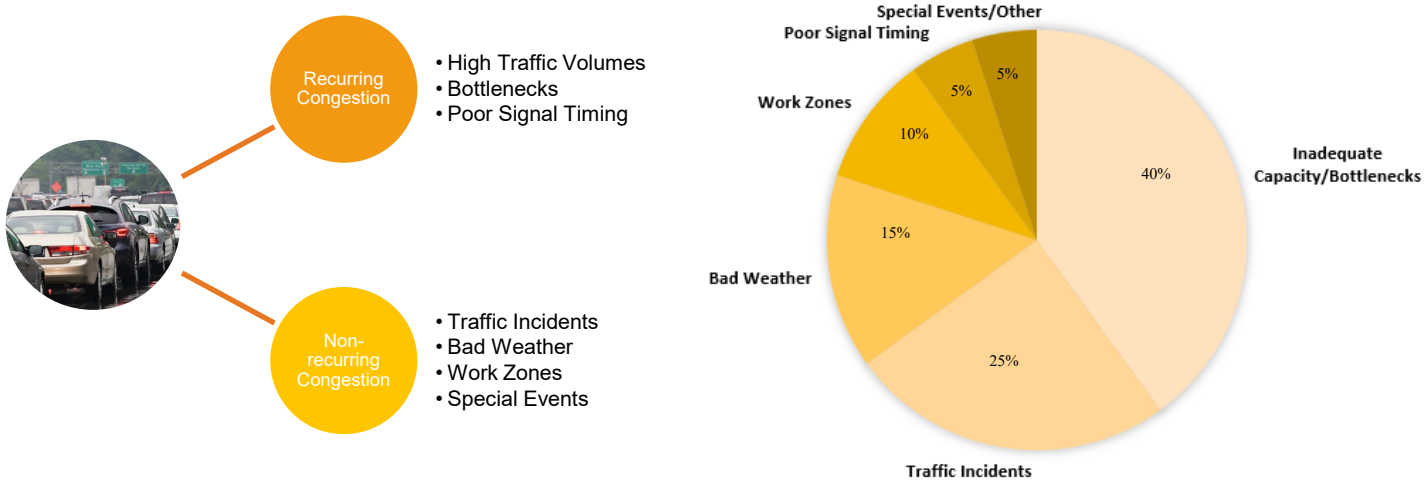
The major dimensions of congestion are described below. MetroPlan Orlando considers all dimensions in its planning activities.

Intensity 	The relative severity of congestion that affects travel. Intensity has traditionally been measured through indicators such as volume-to-capacity (V/C) ratios or level-of-service (LOS) measures that consistently relate the different levels of congestion experienced on roadways.
Duration 	The amount of time the congested conditions persist before returning to an uncongested state.
Extent 	The number of system users or components (e.g. vehicles, pedestrians, transit routes, lane miles) affected by congestion.
Variability 	The changes in congestion that occur on different days or at different times of day. When congestion is highly variable due to non-recurring conditions, such as a roadway with a high number of traffic accidents causing delays, this has an impact on the reliability of the system.

General Sources of Congestion

Congestion generally reflects a fundamental imbalance of supply and demand. There is both recurring and non-recurring congestion. Recurring congestion is an imbalance of supply and demand predictably and routinely occurring during hours when the transportation system is most desirable to travelers (i.e., morning and evening peak hours). Non-recurring congestion is an imbalance of supply and demand due to unanticipated occurrences such as crashes, disabled vehicles, work zones, adverse weather events, and planned special events. Figure 3 on the following page summarizes the sources of congestion and order of magnitude of those sources according to FHWA.

Figure 3: Sources of Congestion



Source: https://www.fhwa.dot.gov/policy/2008cpr/chap14.cfm

High traffic volumes 	Congestion can be measured in large part by the ratio of traffic volume to roadway capacity. High traffic volumes can raise this ratio and create more congestion.
Bottlenecks 	A bottleneck is a localized section of roadway where traffic experiences reduced speeds and delays due to recurring operational conditions (such as a roadway segment with narrower or fewer lanes) or non-recurring traffic incidents.
Traffic Incidents 	After a traffic incident, traffic flow is usually restricted in at least one lane, causing slower traffic flow. Drivers in the vicinity of an accident will also slow down to view the accident.
Bad Weather 	Unusual weather, such as fog or heavy rain, can reduce visibility and cause driving speeds to drop.
Work Zones 	Similar to traffic incidents, work zones usually restrict or redirect traffic flow, which often slows traffic.
Poor Signal Timing 	While raw traffic volumes certainly dictate traffic flow, poor signal timing that does not accommodate overtaxed approaches or does not coordinate with nearby signals can slow traffic flow.
Special Events 	Uncommon events such as sporting events or concerts can result in changing traffic patterns, which can cause congestion.

1.4 Congestion in the MetroPlan Orlando Region

As the population grows, so does the demand on existing infrastructure. Orange, Osceola, and Seminole Counties are expected to see continued population growth with 2019 estimates of approximately 2.241 Million[3] inhabitants in the three-county region. Central Florida's population is projected to grow more than 40% by 2045. Based on the region's current transportation and land use, a larger population will mean more vehicles on the road and more vehicle miles traveled – resulting in heavy congestion as infrastructure gets outpaced by travel demand. MetroPlan Orlando must think creatively when identifying solutions and using technology and multimodal approaches in order to keep the region moving and connected for a strong economy and quality of life. Figure 4 displays the INRIX 2018 Global Traffic Scorecard for Orlando.

Figure 4. INRIX 2018 Global Traffic Scorecard

Orlando, FL

23rd Most Congested City in the US

74 Hours Driving Time Spent in Congestion

$1,037 Annual Cost of Congestion per Driver

[3] American Community Survey 2019 1-Year Estimate

2.0 Goals and Objectives

The 2020 CMP goals and objectives are the same as those in MetroPlan Orlando's 2045 MTP. The CMP focuses on performance measures that affect or are impacted by congestion.

The CMP goals and objectives are summarized in Figure 5 and provide a mechanism for ensuring investment decisions are made with a clear focus on desired outcomes.

Figure 5. CMP Goals and Objectives

Goal #1: Safety and Security

Provide a safe and secure transportation system for all users

- Eliminate the rate and occurrence of transportation system fatalities, injuries, and crashes, with high emphasis on the most vulnerable users
- Improve emergency response and roadway clearance times

Goal #2: Reliability & Performance

Leverage innovative solutions to optimize system performance

- Improve travel time reliability on the transportation system
- Enhance and expand the region's ITS, adaptive and actively managed traffic
- Reduce travel time per capita (peak and off-peak travel times)
- Improve average transit on-time performance (bus and rail services)
- Adapt transportation infrastructure and technologies to meet changing traveler needs and desires

Goal #3: Access & Connectivity

Enhance communities and lives through improved access to opportunities

- Increase transit system frequency
- Improve housing and employment access to high-frequency transit
- Improve access to essential services across all modes of transportation
- Reduce per capita vehicle miles traveled (VMT)
- Increase ridership on public transportation
- Reduce the reliance on single-occupant vehicle travel
- Plan and develop transportation systems that reflect regional and community values

Goal #4: Health & Environment

Protect and preserve our region's public health and environmentally sensitive areas

- Reduce per capita related air quality pollutants and greenhouse gas emissions

Goal #5: Investment & Economy

Support economic prosperity through strategic transportation investment

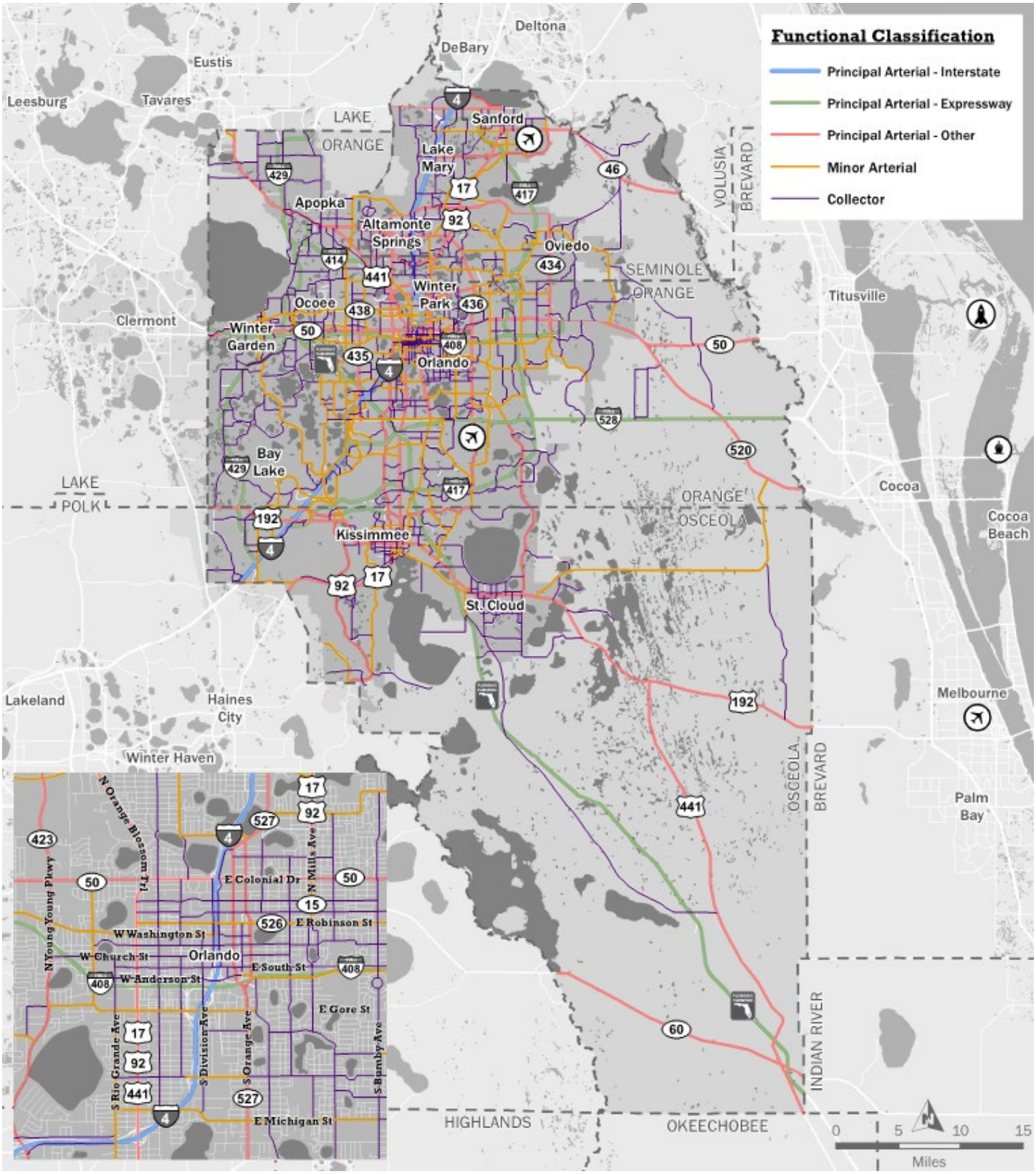
- Reduce per capita delay for residents, visitors, and businesses
- Improve transportation experience for visitors and supportive-industry workers

3.0 CMP Area of Application and Network

The traditional planning process aims to mitigate existing congestion and provide strategies to address mobility needs. Infrastructure projects are programmed in phases and typically take five to ten years from planning to implementation. MetroPlan Orlando's 2020 CMP provides a systematic approach for managing congestion in the MPO's planning area, which includes all of Orange, Osceola, and Seminole Counties as illustrated in Figure 6. The CMP's Area of Application, the area within which the recommended congestion management strategies will be applied, is the three-county region. The CMP addresses present-day congested locations that threaten the mobility of the regional transportation network. Recurring and non-recurring congestion was analyzed for all publicly-owned roadways and considers how those roadways may impact auto, transit, and freight travel. In addition, pedestrian and bicycle facilities were assessed from a safety and access perspective. All transportation facilities within the MetroPlan Orlando planning area were assessed where data was readily available.

Recurring and non-recurring congestion was analyzed for all publicly owned roadways and considers how congestion may impact auto, transit, and freight travel. In addition, pedestrian and bicycle facilities were assessed from a safety and access perspective.

Figure 6: Congestion Management Process Area of Application and Roadway Network



4.0 Performance Measures

The objectives-driven, performance-based approach, promoted by FHWA and FTA, focuses on working toward desired system performance outcomes rather than just responding to problems. This approach recognizes that what is measured matters in decision making, and that setting specific, measurable performance objectives will facilitate incorporating operations strategies into the MTP.

Further discussed in the Monitoring Plan section of the CMP (Section 5.0), MetroPlan Orlando will collect and/or gather data periodically for each performance measure to track progress using a performance "scorecard" system.

Using a performance measures overview table format, the following pages introduce the CMP performance measures by objective, provide recent historic data as a baseline, and (where available) indicate if the data is trending in the right or wrong direction. To provide more background such as sources, definitions and federal guidance, metadata is also included for each measure following each performance measures overview table.

How do we define and measure congestion?

Performance measures are a critical component of the CMP. According to federal regulation, the CMP must include "appropriate performance measures to assess the extent of congestion and support the evaluation of the effectiveness of congestion reduction and mobility enhancement strategies for the movement of people and goods. Since levels of acceptable system performance may vary among local communities, performance measures should be tailored to the specific needs of the area and established cooperatively by the State(s), affected MPO(s), and local officials in consultation with the operators of major modes of transportation in the coverage area."

Example Performance Measures Overview Table:

Objectives	Performance Measures	2014	2015	2016	2017	2018	Trend
1. *Eliminate the rate and occurrence of transportation system fatalities, injuries, and crashes with high emphasis on the most vulnerable users*	**Number of fatalities, serious injuries, and total crashes by mode/user**						
	Fatal crashes	132	143	165	173	179	
	Incapacitating injury crashes	1,939	2,302	1,854	1,594	1,374	
	Total Crashes	56,163	61,323	63,049	67,641	69,960	
	Fatal crashes	13	18	11	13	15	
	Incapacitating injury crashes	653	709	658	619	576	
	Total crashes	746	828	737	720	706	
	Fatal crashes	58	62	76	84	125	
	Incapacitating injury crashes	796	795	745	772	632	
	Total crashes	966	995	857	908	824	

Here, each CMP objective is listed that MetroPlan Orlando is targeting to achieve.

Here, performance measures related to the objective are listed. These measures indicate how the MPO will assess the objective.

Here, historical data for a performance measure is noted (for years available). For measures where two or more years of data are available, a sparkline (otherwise known as a very small line chart) is shown to indicate the trend over time.

4.1 Goal #1: Safety and Security Performance Measures

Safety analyses were completed for all facilities where safety data was available, which is essentially the entire roadway network. Signal Four Analytics was the main data source for the safety performance measures. The safety performance measures were developed for the CMP in conjunction with safety goals established under the FAST Act. Safety data was collected within the MPO planning area for all modes. For pedestrian and bicycle safety data, the MPO referred to the Bicycle and Pedestrian Safety Action Plan data, analysis, and recommendations. Overall, there is much work yet to be done to reduce fatalities and serious injury crashes.

Table 1. Goal #1: Safety and Security Performance Measures Overview

Objectives	*Performance Measures*	*2014*	*2015*	*2016*	*2017*	*2018*	*Trend*
1. *Eliminate the rate and occurrence of transportation system fatalities, injuries, and crashes with high emphasis on the most vulnerable users*	**Number of fatalities, serious injuries, and total crashes by mode/user**						
	Fatal crashes	132	143	165	173	179	
	Incapacitating injury crashes	1,939	2,302	1,854	1,594	1,374	
	Total Crashes	56,163	61,323	63,049	67,641	69,960	
	Fatal crashes	13	18	11	13	15	
	Incapacitating injury crashes	653	709	658	619	576	
	Total crashes	746	828	737	720	706	
	Fatal crashes	58	62	76	84	125	
	Incapacitating injury crashes	796	795	745	772	632	
	Total crashes	966	995	857	908	824	
	Crash rate for fatalities, serious injuries, and total crashes per 100 million vehicle miles traveled						
	Fatal crash rate	0.6	0.7	0.7	0.7	0.8	
	Incapacitating injury crash rate	9.4	10.8	8.3	6.8	5.8	
	Total crash rate	271.1	288.4	280.7	289.1	293.2	

*Crash data for pedestrians and bicyclists matches years analyzed in the MetroPlan Orlando Bicycle and Pedestrian Safety Action Plans

Objectives	*Performance Measures*	*2017*	*2018*	*2019*	*Trend*
2. *Improve emergency response and roadway clearance times*	**Average emergency response time (minutes)**				
	MetroPlan Orlando Planning Area	5.6	5.7	6.1	
	Orange	6.5	6.9	7.2	
	Osceola	5.7	5.1	6.1	
	Seminole	4.5	5.0	4.9	
	Average roadway clearance time (minutes)				
	MetroPlan Orlando Planning Area	39.7	35.4	34.8	
	Orange	37.4	35.0	33.2	
	Osceola	42.4	36.8	37.7	
	Seminole	39.4	34.5	33.6	

Safety and Security Performance Measures Background Information

The following tables summarize various elements of the performance measures evaluation.

Table 2. Vehicular Fatalities/Serious Injuries Performance Measure Background Information

Definition	The total number of fatalities/serious injuries occurring on roadways within the MetroPlan Orlando planning area.
Source	Signal Four Analytics
Reporting Period	Fatalities/serious injuries are updated on a rolling basis
Appropriate level for Application	This performance measure is applied by combining DHSMV data on applicable crashes with current Signal Four Analytics data from 2014 to 2018 to predict probable outcomes for future years.
Federal Guidance	Targets established in accordance with FHWA's performance measures rules should be considered as interim condition/performance levels that lead toward the accomplishment of longer-term performance expectations in the State DOTs' and MPOs' transportation plans such as the MTP and/or the Strategic Highway Safety Plan (SHSP). States and MPOs should establish annual targets as part of the Safety Performance Management requirements that make interim progress toward a long-term goal of the Florida Department of Transportation (FDOT) "Toward Zero Deaths" target.

Table 3. Rate of Fatalities/Serious Injuries per 100M Vehicle Miles Traveled (VMT) Performance Measure Background Information

Definition	Total number of fatalities/serious injuries on roadways within the boundaries of MetroPlan Orlando per 100 million VMT.
Source	Signal Four Analytics, FDOT mileage reports
Reporting Period	Rate of fatalities/serious injuries are reported on an annual basis
Appropriate level for Application	This performance measure is applied by combining DHSMV data with Signal Four Analytics data from 2014 to 2018 to predict probable outcomes for future years.
Federal Guidance	Targets established in accordance with FHWA's performance measures rules should be considered as interim condition/performance levels that lead toward the accomplishment of longer-term performance expectations in the State DOTs' and MPOs' transportation plans such as the MTP and/or the Strategic Highway Safety Plan (SHSP). States and MPOs should establish annual targets as part of the Safety Performance Management requirements that make interim progress toward a long-term goal of FDOT's "Toward Zero Deaths" target.

Table 4. Non-motorized Fatalities and Serious Injuries Performance Measure Background Information

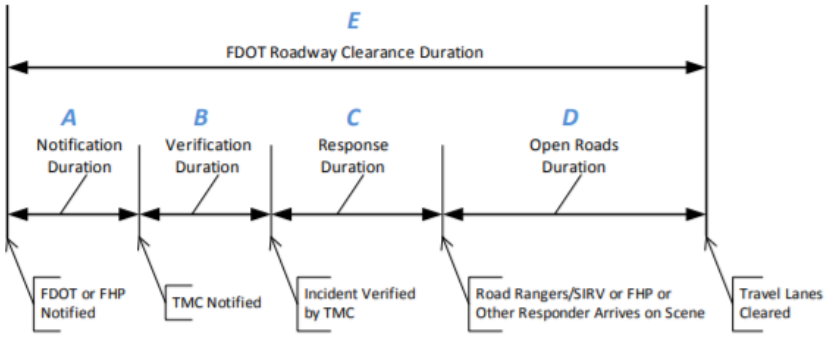
Definition	Total number of pedestrian and bicyclist fatalities and serious injuries on roadways within the boundaries of MetroPlan Orlando.
Source	MetroPlan Orlando Bicycle Pedestrian Safety Action Plans, Signal Four Analytics
Reporting Period	Pedestrian and bicyclist fatalities and serious injuries are reported on an annual basis
Appropriate level for Application	This performance measure is applied by combining Department of Highway Safety and Motor Vehicles data with current state data from 2014 to 2018 to predict probable outcomes for future years.
Federal Guidance	Targets established in accordance with FHWA's performance measures rules should be considered as interim condition/performance levels that lead toward the accomplishment of longer-term performance expectations in the State DOTs' and MPOs' transportation plans such as the MTP and/or the Strategic Highway Safety Plan (SHSP). States and MPOs should establish annual targets as part of the Safety Performance Management requirements that make interim progress toward a long-term goal of FDOT's "Toward Zero Deaths" target.

Table 5. Average Emergency Response Time by Incident Occurrence and Notification Time Performance Measure Background Information

Definition	Average emergency response time refers to the average number of minutes between dispatch and arrival to the scene. The CMP reports only SunGuide-operated facilities within the MPO boundaries, which include I-4, SR 414, SR 423, SR 520, SR 408, SR 417, SR 429, SR 436, SR 451, SR 50, SR 528, and US 441.
Source	FDOT District 5 Traffic Incident Management Program
Reporting Period	Response time is updated on a monthly basis; however, quarterly reports are prepared.
Appropriate level for Application	This performance measure is applied by obtaining emergency response data from the D5 TIM program on a quarterly or semi-annual basis to predict probable outcomes for future years.
Federal Guidance	This is not a specific area in the FHWA performance measures requirements.

Table 6. Average Roadway Clearance Time Performance Measure Background Information

Definition	Average roadway clearance time refers to the average number of minutes between FDOT or FHP Notified Time and Travel Lanes Cleared Time. The CMP reports only SunGuide-operated facilities within the MPO boundaries which include I-4, SR 414, SR 423, SR 520, SR 408, SR 417, SR 429, SR 436, SR 451, SR 50, SR 528, and US 441.
Source	FDOT District 5 Traffic Incident Management Program
Reporting Period	Roadway clearance time is updated on a monthly basis; however, quarterly reports are prepared
Appropriate level for Application	This performance measure is applied by obtaining roadway clearance time data from the D5 TIM program on a quarterly or semi-annual basis to predict probable outcomes for future years.
Federal Guidance	This is not a specific area in the FHWA performance measures requirements.



4.2 Goal #2: Reliability & Performance Measures

Various reliability and performance analyses were completed for vehicular, freight, transit and micromobility travel in the MetroPlan Orlando region. Both statewide and local sources were used when gathering data for the set of performance measures. The reliability and performance measures were developed for the CMP in conjunction with reliability goals established under the FAST Act. Overall, there continue to be opportunities to improve the system's reliability and performance across various modes.

Table 7. Goal #2: Reliability & Performance Measures Overview

Objectives	*Performance Measures*	*2014*	*2015*	*2016*	*2017*	*2018*	*2019*	*Trend*
3. *Improve travel time reliability on the transportation system*	Percent of interstate roadways providing reliable travel times	62%	63%	71%	52%	51%	55%	
	Percent of non-interstate roadways providing reliable travel times	69%	67%	67%	84%	85%	86%	
	Truck travel time reliability index	2.85	2.91	2.80	2.62	2.56	2.62	
4. *Enhance and expand the region's ITS, adaptive and actively managed traffic systems*	Percent of system miles actively monitored and managed	-	-	-	-	-	37%	N/A
5. *Reduce travel time per capita (peak and off-peak travel times)*	Annual vehicle hours of delay (per capita)	-	10.45	12.76	13.99	11.90	-	
6. *Improve average transit on-time performance (bus and rail services)*	Percent of transit system meeting on-time performance standard							
	LYNX (Fixed Route)	-	70.1%	71.5%	70.4%	72.2%	73.0%	
	SunRail	93%	96%	96%	97%	95%	95%	

Objectives	*Performance Measures*	*2014*	*2015*	*2016*	*2017*	*2018*	*2019*	*Trend*
7. *Adapt transportation infrastructure and technologies to meet changing traveler needs and desires*	Percentage of TIP funding spent on TSM&O projects	0.69	0.79	0.99	0.64	1.19	1.03	
	Annual trips using shared micromobility (scooters, e-bikes)	-	-	-	-	-	216,965	N/A
** Potential Future Performance Measures*	Annual trips using Transportation Network Companies such as Uber and Lyft (TNCs) Annual trips using automated vehicles (commercial and passenger) Annual trips using connected vehicle technology (commercial and passenger)							

Reliability & Performance Measures Background Information

The following tables summarize various elements of the performance measures evaluation.

Table 8. Level of Travel Time Reliability (LOTTR) Performance Measure Background Information

Definition	Level of Travel Time Reliability (LOTTR) performance measure compares the 80th percentile travel time to the median (50th percentile) travel time. A segment is reliable if the LOTTR ratio is less than 1.5. With a LOTTR of 1.5, if your work commute takes 30 minutes on average, you would need to plan 45 minutes to ensure an on-time arrival, 80 percent of the time. The number of person-miles traveling on reliable segments is reported as a percentage of all person-miles traveled.
Source	NPMRDS, as documented in the FDOT MPO reports
Reporting Period	Four time periods on an annual basis: AM Peak, Midday, PM Peak, and Weekend
Appropriate level for Application	The LOTTR measure is calculated for each directional road segment (for example, eastbound is one segment and westbound is another segment), and then a system-wide average is reported. This measure is applied for the National Highway System (NHS) separately for Non-Interstates and Interstates.
Federal Guidance	If the worst performing segment ratio for any of the 4 time periods has an LOTTR above 1.50, the segment is considered unreliable.

Table 9. Truck Travel Time Reliability (TTTR) Performance Measure Background Information

Definition	Truck Travel Time Reliability (TTTR) performance measure compares the 95th percentile travel time to the median (50th percentile) travel time. A segment is reliable if the TTTR ratio is less than 1.5.
Source	NPMRDS, as documented in the FDOT MPO reports
Reporting Period	Five time periods on an annual basis: AM Peak, Midday, PM Peak, Overnight, and Weekend
Appropriate level for Application	The TTTR measure is calculated for each directional road segment (for example, eastbound is one segment and westbound is another segment), and then a system-wide average is reported. This measure is applied for the National Highway System Interstates.
Federal Guidance	If the worst performing segment ratio for any of the 5 time periods has an TTTR above 1.50 then the segment is considered unreliable.

Table 10. Percent of System Miles Actively Monitored and Managed Performance Measure Background Information

Definition	This measure accounts for the percentage of miles that are actively monitored or managed, to include: those with fiber in place; those with coordinated or interconnected signals; those with closed-circuit television (CCTV), Bluetooth devices, DMS, electronic display signs, multipoint video distribution systems (MVDS), or new sensor technologies in place; and those that are included within the Integrated Corridor Management (ICM) system being managed by FDOT.
Source	Maintaining agency staff will be regularly contacted to provide updates on which corridors have been upgraded to allow for active monitoring and/or management.
Reporting Period	MetroPlan Orlando staff will coordinate with agency staff to reconfirm/update the inventory of actively managed corridors quarterly.
Appropriate level for Application	This measure could be reported for specific routes or systemwide. For this CMP, the measure will be reported systemwide.
Federal Guidance	This is not a specific area in the FHWA performance measures requirements.

Table 11. Annual Vehicle Hours of Delay per Capita Performance Measure Background Information

Definition	Vehicle delay is calculated as the product of directional hourly volume and the difference between travel time at a threshold speed and travel time at the observed speed. The resulting vehicle delay is divided by the population to determine hours of delay per capita.
Source	NPMRDS, as documented in the FDOT MPO report; US Census/ACS
Reporting Period	Vehicle hours of delay per capita can be reported for the peak period, daily or annually; however, annual vehicle hours per capita were reported.
Appropriate level for Application	This measure could be reported at points, facilities, corridors, and systemwide. For this CMP, the systemwide measure was produced to identify trends, and facilities were analyzed to identify top corridors in need of improvement.
Federal Guidance	The FHWA planning factor to increase mobility of people can be measured through person hours of delay.

Table 12. Percent of Transit System On-Time Performance (OTP) Performance Measure Background Information

Definition	On-time performance refers to the level of success of the service operating according to the published schedule.
Source	Central Florida Regional Transportation Authority (LYNX), SunRail
Reporting Period	On-time performance is reported monthly.
Appropriate level for Application	This measure could be reported for specific routes or systemwide. For purposes of this CMP, systemwide performance is reported for LYNX and SunRail, separately.
Federal Guidance	The FHWA planning factor focuses on transit asset management. Transit asset management (TAM) is a business model that prioritizes funding based on condition and performance to achieve and maintain a state of good repair (SGR) for transit assets.

Table 13. Annual Trips Using Shared Micromobility Performance Measure Background Information

Definition	Micromobility refers to modes of transportation that include very light, low-occupancy vehicles such as electric scooters (e-scooters), electric skateboards, shared bicycles, and electric pedal assisted bicycles (e-bikes).
Source	City of Orlando 2019 online ridership data for Lime and HOPR.
Reporting Period	The bikeshare/scooter program numbers are reported monthly.
Appropriate level for Application	This measure could be reported for facilities, corridors or systemwide. For this CMP it is reported at a city level for the City of Orlando.
Federal Guidance	The FHWA planning factors do not focus on micromobilty at this time; however, these alternate modes of travel overall help alleviate congestion.

Table 14. Percentage of TIP Funding Spent on TSM&O Projects Performance Measure Background Information

Definition	This measure accounts for the percentage of TIP funding that is allocated to TSM&O projects annually.
Source	MetroPlan Orlando
Reporting Period	Annually, MetroPlan staff will calculate the percentage spent on TSM&O projects.
Appropriate level for Application	Systemwide.
Federal Guidance	This is not a specific area in the FHWA performance measures requirements.

Table 15. Annual Trips Using TNCs Performance Measure Background Information

Definition	The U.S. Census Bureau reports that the number of non-employer establishments in the taxi and limousine service sector has witnessed robust growth in the last four years. This sector consists of establishments without employees supplying taxi and limousine services, including ride hailing operators (e.g., Uber and Lyft).
Source	Not yet available
Reporting Period	Annual trips using TNCs is reported yearly in some regions but has yet to be reported for the MetroPlan Orlando region.
Appropriate level for Application	This measure, once reported, could be used in analyses for the entire region or subregions.
Federal Guidance	The FHWA planning factors do not focus on TNCs at this time; however, this alternate mode of travel has emerged as a desirable transportation option for many.

4.3 Goal #3: Access & Connectivity Performance Measures

Multiple data sources were gathered and reviewed to assess multimodal access and connectivity throughout the MetroPlan Orlando region. Overall, there continue to be opportunities to improve multimodal access and connectivity across modes throughout the region.

Table 16. Goal #3: Access & Connectivity Performance Measures Overview

Objectives	*Performance Measures*			*2014*	*2015*	*2016*	*2017*	*2018*	*2019*	*Trend*
8. *Increase transit system frequency*	**Average fixed-route transit frequency (minutes)**									
		LYNX		-	-	-	-	-	30	N/A
		SunRail		-	-	-	-	-	30	N/A
	Percent of fixed-route transit ridership on: <15-minutes, 16-30 minutes, 31-59 minutes, >60 minutes routes									
		LYNX	<15 min	-	-	-	-	-	14%	N/A
			16-30 min	-	-	-	-	-	64%	N/A
			31-59 min	-	-	-	-	-	21%	N/A
			>60 min	-	-	-	-	-	1%	N/A
		SunRail	<15 min	-	-	-	-	-	58%	N/A
			16-30 min	-	-	-	-	-	24%	N/A
			31-59 min	-	-	-	-	-	18%	N/A
9. *Improve housing and employment access to high-frequency transit*	**Percent of population within ½ mile of 30-minute or 15-minute transit frequency**			-	26.4	25.4	23.2	23.2-	24.8	
	Percent of jobs within ½ mile of 30-minute or 15-minute transit frequency			-	49.8	47.3	45.8	45.9	48.9	
10. *Improve access to essential*	**Percentage of Population/Acreage with Access to Essential Services within a 10-Minute Walk/Bicycle Ride**									
		Walking				-	-	-	24%/15%	N/A

Objectives	Performance Measures	2014	2015	2016	2017	2018	2019	Trend
services across all modes of transportation	Bicycling			-	-	-	24%/15%	
11. Reduce per capita vehicle miles traveled (VMT)	**Daily VMT per capita**	28.3	28.3	29.2	30	29.8	-	
12. Increase ridership on public transportation*	**Annual Passenger Miles**							
	LYNX	178,129,640	169,531,610	152,609,500	156,256,600	153,806,000	140,099,800	
	SunRail	2,611,850	14,058,080	13,104,900	12,850,000	12,044,600	-	
	Annual Unlinked Trips							
	LYNX	30,141,250	29,377,103	27,378,800	26,031,000	25,117,900	22,821,800	
	SunRail	169,940	959,040	910,400	901,200	831,500	-	
	Average Weekday Unlinked Trips							
	LYNX	96,420	92,150	86,200	83,800	79,700	73,100	
	SunRail	4,050	3,650	3,500	3,400	3,360	-	
	Average Weekend Unlinked Trips							
	LYNX	52,685	52,614	48,100	41,700	44,600	40,800	
	SunRail	Not applicable						
13. Reduce the reliance on single-occupant vehicle travel	**Percent of commutes that are non-single occupant vehicle (SOV)**	20%	19%	20%	21%	-	-	
14. Plan and develop transportation systems that reflect regional and community values	**Percentage of TMA/SU Funds Allocated for Projects that Support the MetroPlan Orlando Board Emphasis Areas**	-	-	-	$97 million	$129 million	$151 million	

Objectives	*Performance Measures*	*2014*	*2015*	*2016*	*2017*	*2018*	*2019*	*Trend*
**Potential future performance measures*	Average pedestrian and bicycle weekday trips (in urban centers and outside urban centers) Average pedestrian and bicycle weekend trips (in urban centers and outside urban centers) Percent of environmental justice populations with access to high-frequency transit							

*Numbers have been rounded to the nearest hundred

Access & Connectivity Performance Measures Background Information

The following tables summarize various elements of the performance measures evaluation.

Table 17. Average Fixed-route Transit Frequency Performance Measure Background Information

Definition	Transit frequency refers to the number of buses scheduled to stop on a roadway segment in one direction of flow in a one-hour time period. A ridership-weighted median is presented for LYNX routes. A simple median is presented for SunRail as there is only one route.
Source	LYNX and SunRail schedule data's weekday headway(s).
Reporting Period	Average transit frequency is reported monthly and annually.
Appropriate level for Application	This measure could be reported for specific routes or systemwide. For this CMP, it is reported separately for the entire LYNX and SunRail systems.
Federal Guidance	This is not a specific area in the FHWA performance measures requirements.

Table 18. Percent of Fixed-Route Transit Ridership on <15/30/60/>60-minute Headway Routes Background Information

Definition	The number of passengers who board public transportation vehicles on the transit system's fixed routes with 15-minute, 30-minute, and 60-minute headways (i.e., how frequently a bus stops). Headway is the amount of time between transit vehicle arrivals at a stop.
Source	LYNX and SunRail schedule data's weekday headway(s).
Reporting Period	Transit ridership by fixed-route is reported monthly and annually.
Appropriate level for Application	This measure could be reported for specific routes or systemwide. For this CMP, it is reported separately for the entire LYNX and SunRail systems.
Federal Guidance	This is not a specific area in the FHWA performance measures requirements.

Table 19. Percent of Population/Jobs within a Half-mile of High Frequency Performance Measure Background Information

Definition	This measure refers to the percentage of the population and jobs within a half-mile of fixed route transit with either 30-minute or 15-minute headways.
Source	LYNX, American Community Survey (for population), InfoUSA (for employment/jobs)
Reporting Period	Average transit frequency is reported monthly and annually. The American Community Survey is updated annually. Employment location data is updated periodically.
Appropriate level for Application	The measure is reported along the transit routes running at 30 and 15-minute headways.
Federal Guidance	This is not a specific area in the FHWA performance measures requirements.

Table 20. Percentage of Population/Acreage with Access to Essential Services Performance Measure Background Information

Definition	This measure serves as an indicator of the access to essential services including grocery stores, markets/convenience stores, small markets, restaurants, public parks, government, schools and health care. The measures reflect the percentages of (1) population and (2) acreage within the MetroPlan Orlando planning area that have a proximity score of 8 or higher, indicating that percentage of population/acreage has access to essential services within a 10-minute walk.
Source	Proximity scores were calculated using the Land Overlaid on Transportation Information System (LOTIS) tool developed and managed by the East Central Florida Regional Planning Council.
Reporting Period	Proximity scores will be recalculated quarterly.
Appropriate level for Application	Systemwide.
Federal Guidance	This is not a specific area in the FHWA performance measures requirements.

Table 21. Daily Vehicle Miles Traveled per Capita Performance Measure Background Information

Definition	This measure is determined using vehicle traffic volume and segment length (in miles) divided by the population
Source	FDOT mileage reports, US Census/ACS
Reporting Period	VMT is reported yearly.
Appropriate level for Application	This measure will be reported systemwide.
Federal Guidance	This is not a specific area in the FHWA performance measures requirements.

Table 22. Number of Annual Passenger Miles Performance Measure Background Information

Definition	This measure is the number of annual unlinked passenger trips (or the number of boardings on public transportation vehicles) multiplied by the system's average trip length (in miles).
Source	National Transit Database (NTD)
Reporting Period	Annual passenger miles are reported yearly.
Appropriate level for Application	This measure will be reported systemwide.
Federal Guidance	This is not a specific area in the FHWA performance measures requirements.

Table 23. Number of Annual, Average Weekday and Average Weekend Unlinked Trips Performance Measure Background Information

Definition	The number of passengers who board public transportation vehicles. Passengers are counted each time they board vehicles no matter how many vehicles they use to travel from their origin to their destination.
Source	National Transit Database (NTD)
Reporting Period	This is reported annually.
Appropriate level for Application	This measure will be reported systemwide.
Federal Guidance	This is not a specific area in the FHWA performance measures requirements.

Table 24. Percent of Non-Auto Mode Share/Split Performance Measure Background Information

Definition	The percentage of commute trips made in the region using a mode of transportation other than a single-occupant automobile (includes teleworking).
Source	Census, ACS
Reporting Period	This is reported annually.
Appropriate level for Application	This measure will be reported systemwide.
Federal Guidance	This is not a specific area in the FHWA performance measures requirements.

Table 25. Percentage of TMA/SU Funds Allocated for Projects that Support the MetroPlan Orlando Board Emphasis Areas Performance Measure Background Information

Definition	This measure accounts for the percentage of TMA/SU funds that are spent annually in support of the MetroPlan Orlando Board Emphasis Areas, including: Trail Connectivity, Engaging Younger Populations, Complete Streets, Safety, and SunRail Connectivity. STP Urban (SU) funds are allocated specifically to Transportation Management Area (TMA) urbanized areas.
Source	MetroPlan Orlando
Reporting Period	Annually, MetroPlan Orlando staff will calculate the percentage spent in support of Board emphasis areas.
Appropriate level for Application	Systemwide.
Federal Guidance	This is not a specific area in the FHWA performance measures requirements.

4.4 Goal #4: Health & Environment Performance Measures

Several pollutant and greenhouse gas emissions data were assessed for this goal. Although the MetroPlan Orlando region is in an attainment area, meaning the air quality is good, reducing transportation-related emissions will always remain a priority.

Table 26. Goal #4: Health & Environment Performance Measures Overview

Objectives	*Performance Measures*	*2015*	*2016*	*2017*	*2018*	*2019*	*Trend*
15. Reduce per capita related air quality pollutants and greenhouse gas emissions	Average annual Air Quality Index	44	50	52	50	49	
**Potential Future Performance Measures*	Access to electric vehicle charging stations						

Health & Environment Performance Measures Background Information

The following table summarizes various elements of the performance measures evaluation.

Table 27. Average Annual Air Quality Index (AQI) Performance Measure Background Information

Definition	The AQI is an index for reporting daily air quality, and it is calculated based on monitored concentrations of ground-level ozone, particulate matter, carbon monoxide, sulfur dioxide and nitrogen dioxide. The highest AQI for the pollutants measured at each site over the past 24 hours is displayed. There are four air quality monitoring stations in Central Florida, two in Orange County and one each in Osceola and Seminole Counties.
Source	Florida Department of Environmental Protection
Reporting Period	AQI is reported daily. For the purposes of the CMP, the fourth highest AQI for each month is identified and an annual average is computed.
Appropriate level for Application	This measure will be reported areawide.
Federal Guidance	An AQI value of 100 generally corresponds to the national air quality standard for the pollutant, which is the level the U.S. Environmental Protection Agency (EPA) has set to protect public health. The MetroPlan Orlando region is within an attainment area. Attainment areas are considered to contain air quality as good as or better than the National Ambient Air Quality standards, as defined in the Clean Air Act (CAA). For nonattainment areas, the set of federally required performance measures for highway systems include a set of measures to be used to assess progress toward achieving the goals of the Congestion Mitigation and Air Quality Improvement (CMAQ) Program. This federal funding program provides states and MPOs with funds for transportation investments that contribute to air quality improvements and provide congestion relief. Examples of CMAQ-funded projects include roadway and intersection improvements that address congestion chokepoints and help reduce vehicle idling, and bicycle and pedestrian paths that enhance travel for non-motorized modes. The National Performance Management Measures rule — 23 Code of Federal Regulations (CFR) Part 490 — identifies traffic congestion and emissions reduction performance measures that pertain to the CMAQ Program.

4.5 Goal #5: Investment & Economy Performance Measures

Two *Investment and Economy* objectives and related performance measures were identified for evaluation in the CMP. The Investment and Economy performance measures assist with tracking the cost of congestion and the reliability of the region's corridors carrying the most visitors/tourists.

Table 28. Goal #5: Investment & Economy Performance Measures Overview

Objectives	*Performance Measures*	*2015*	*2016*	*2017*	*2018*	*2019*	*Trend*
16. Reduce per capita delay for residents, visitors, and businesses	**Annual vehicle hours of delay and associated cost per capita (for personal travel)**	10.45/ $186.07	12.76/ $227.20	13.99/ $249.16	-	-	
17. Improve transportation experience for visitors and supportive-industry workers	**Percent of regional visitor emphasis corridors providing reliable travel times**	-	-	-	-	44.4%	N/A

Investment & Economy Performance Measures Background Information

The following tables summarize various elements of the performance measures evaluation.

Table 29. Vehicle hours of delay and associated cost (annual) Performance Measure Background Information

Definition	Cost of delay comes from multiplying the value of time by the number of hours of delay for passenger vehicles in the MetroPlan Orlando planning area. According to Texas A&M Transportation Institute research, the cost of delay is $18.12 for personal travel and $52.14 for commercial (truck) travel in 2019. For years 2015 through 2017 calculation, 2016 values were applied at $17.81 for personal travel.
Source	NPMRDS, as documented in the FDOT MPO reports; Texas A&M Transportation Institute https://static.tti.tamu.edu/tti.tamu.edu/documents/mobility-report-2019-appx-c.pdf https://tti.tamu.edu/tti-publication/value-of-delay-time-for-use-in-mobility-monitoring-efforts/
Reporting Period	Vehicle hours of delay and cost of delay is reported annually.
Appropriate level for Application	This measure could be reported on a facility/corridor or systemwide. For this CMP it is reported systemwide.
Federal Guidance	The FHWA planning factor to increase mobility of people can be measured through vehicle hours of delay. Associated cost is not a specific area in the FHWA performance measures requirements.

Table 30. Percent of Regional Visitor Emphasis Corridors Providing Reliable Travel Times Performance Measure Background Information

Definition	Visitor emphasis corridors were considered as facilities carrying 60% or greater visitor traffic per FDOT's Central Florida Visitor Study completed in 2019. For this particular measure, a corridor was considered unreliable if at least one segment of the corridor had one segment or more with an LOTTR of 1.5 or higher.
Source	StreetLight Data
Reporting Period	Annually
Appropriate level for Application	This measure could be reported on a facility/corridor or systemwide. For this CMP it is reported systemwide and by corridor.
Federal Guidance	This is not a specific area in the FHWA performance measures requirements.

5.0 Data Collection & Monitoring System Performance

Gathering data to monitor system performance is the element of the CMP that requires the largest amount of resources and staff time for MetroPlan Orlando and its planning partners. Nearly all of the CMP performance measures have available data that is reported routinely. MetroPlan Orlando staff will periodically monitor when new data becomes available for each of the performance measures described in Section 4.0. As new data becomes available, MetroPlan Orlando staff will update "Performance Scorecards" that will be used to provide a visual snapshot of the region's congestion levels and its impact across the various goal areas overtime.

It is essential to devise a mechanism for collecting the data needed to quantify the performance measures listed in the CMP and to track congestion and system performance over time. A data collection monitoring plan that identifies specific elements such as type, frequency of data collection, responsibilities, analysis techniques, and performance reporting is essential for a CMP. The key to effective transportation decision making is accurate and reliable transportation data. The following discussion describes the data collection techniques, the monitoring plan, and how findings from the periodic CMP assessments will be integrated into MetroPlan Orlando's planning processes.

How does the transportation system perform?

Data collection and system monitoring are needed to provide information to make effective decisions and are typically an ongoing activity. According to federal regulation, the CMP must include:

"Establishment of a coordinated program for data collection and system performance monitoring to define the extent and duration of congestion, to contribute in determining the causes of congestion, and evaluate the efficiency and effectiveness of implemented actions. To the extent possible, this data collection program should be coordinated with existing data sources (including archived operational/ITS data) and coordinated with operations managers in the metropolitan area."

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5.1 Types of Data and Collection Techniques

The performance measures background information reported in the previous section identifies the specific data sources, areas of application, and reporting periods for the MetroPlan Orlando CMP. In general, the data types include:

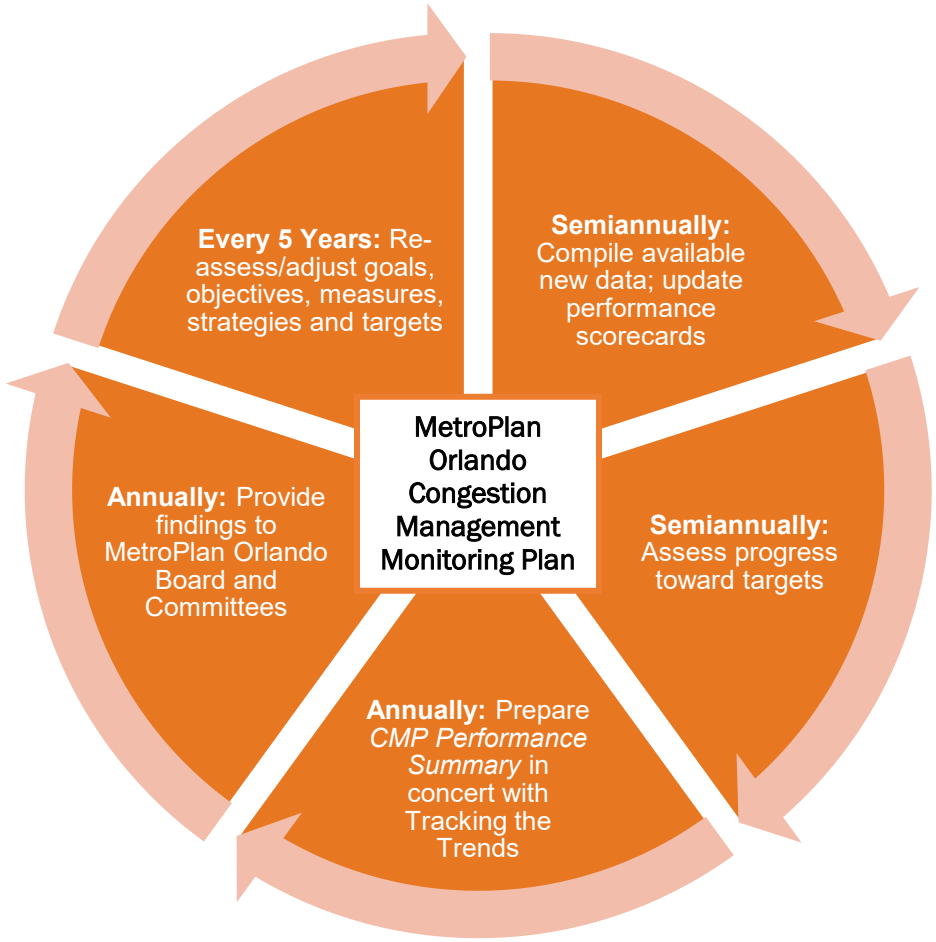
- Roadway characteristics data
- Traffic volume counts
- Speed and travel time data
- ITS and operations data
- Private sector cellular data
- Transit data
- Bicycle/pedestrian data
- Crash data
- Travel survey data
- Environmental data
- Cost of congestion data
- Micromobility data
- Land use data
- Funding data

The collection techniques vary by data source. MetroPlan Orlando staff coordinate and compile the data from various sources and transportation partners. The majority of data is reported annually, while some of the measures are reported monthly. MetroPlan Orlando coordinates with these transportation partners that collect their own data: FDOT, SunRail, LYNX, East Central Florida Regional Planning Council (ECFRPC), University of Florida, and local governments.

5.2 Monitoring Plan

MetroPlan Orlando has staff whose role is to manage the collection of data to allow for monitoring changes in the various performance measures, determine the impacts on congestion levels throughout the region, and report on the effectiveness of implemented strategies over time. Below is the monitoring process MetroPlan Orlando staff will follow:

Figure 7: FHWA's Objectives-Driven, Performance-Based Approach



On a semiannual basis, MetroPlan Orlando will compile and analyze all available new data and use the findings of this analysis to update the Performance Scorecards (see example scorecard, Section 9.0) for each goal area and note progress towards the targets for each measure. For those measures where data is available less frequently, the data from the previous reporting period will stand until new data is available. Table 31 provides a summary of the anticipated availability of data updates for each performance measure. Staff will provide (and/or present) the findings from the monitoring exercise to the MetroPlan Orlando Board and standing committees semiannually.

Staff will prepare an Annual CMP Performance Summary that summarizes the findings and progress over the prior year; the summaries may provide updates on congestion impacts in specific areas of the region and/or interim findings from strategy implementation. The Annual CMP Performance Summary will be developed in a timeframe that will allow for combined data collection with MetroPlan Orlando's Tracking the Trends and System Performance updates.

Every five years, the entire CMP will be reevaluated to determine appropriate adjustments to the various components including the goals and objectives, performance measures, data availability, targets and recommended strategies.

Table 31. Data Availability, by Performance Measure

Goal	Objectives	Performance Measures	Reporting Period
Safety & Security	Eliminate fatal/ severe crashes	# Crashes (fatal, serious, total)	Annually
		Crash Rates	Annually
	Improve emergency response times	Average Response Times	Semiannually
		Average Clearance Times	Semiannually
Reliability & Performance	Improve reliability	% Reliable, Interstate	Annually
		% Reliable, Non-Interstate	Annually
		Truck Reliability Index	Annually
	Expand ITS/Active Management	% System Actively Managed	Semiannually
	Reduce travel time	Annual Delay per capita	Annually
	Improve transit on-time performance	% System meeting OTP standards	Annually
	Meet changing traveler needs	Annual Micromobility Trips	Monthly
Access & Connectivity	Increase transit frequency	Average Transit Frequency	Annually
		% Ridership, by Headway	Annually
	Improve access to high frequency transit	% Population within ½-mile	Annually
		% Jobs within ½-mile	Annually
	Improve access to essential services	% Population/Acreage within a 10-minute walk/bike ride	Annually
	Reduce per capita VMT	Daily VMT, per capita	Annually
	Increase transit ridership	Annual Passenger Miles	Annually
		Annual Unlinked Trips	Annually
		Average Weekday Unlinked Trips	Annually
		Average Weekend Unlinked Trips	Annually
	Reduce reliance on SOVs	% of Commutes using non SOVs	Annually
	Reflect community values in transportation systems/planning	% TMA/SU Funds Allocated for Projects Supporting Board Emphasis Areas	Annually
Health & Environment	Reduce air pollutants and GHGs	Air Quality Index	Semiannually
Investment & Economy	Reduce per capita delay	Annual Delay and Associated Cost, per capita	Annually
	Improve transportation for visitors & tourist industry workers	% Reliable, Visitor Emphasis Corridors	Annually

6.0 Evaluation of Congestion Problems and Needs

The data collected as part of the CMP was used to identify specific problem areas and needs throughout the MetroPlan Orlando metropolitan area. The complexity of translating the data into meaningful information varies across the different performance measures and data sources. Sources of congestion were identified at a high level for the CMP; however, more refined assessments may be required in specific areas for project identification purposes.

The following factors were taken into consideration when evaluating the data to identify locations of congestion:

- Locations of major trip generators
- Time-of-day traffic variations
- Work trips versus non-work trips

Table 32 summarizes the evaluations used to assess the levels of congestion, locations of that congestion, and related needs throughout the MetroPlan Orlando planning area.

What are the congestion problems in the region?

Before congestion management strategies can be identified, it is necessary to identify what the problems are, where they are located, and what is causing them. This action serves as a critical link between data collection and strategy identification. Federal regulations require that the CMP include "methods to monitor and evaluate the performance of the multimodal transportation system [and] identify the causes of recurring and nonrecurring congestion."

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Table 32. Data Availability, by Performance Measure

Goal Area	Evaluation	Sources and Tools Used
Safety	Evaluations Performed: • Identified top 25 segments for fatalities • Identified top 25 segments for fatalities and incapacitating injuries • Identified top 25 segments with the most crashes per 100 million VMT • Identified top 25 segments with the most fatal and serious injury crashes per 100 million VMT • Identified top corridors for pedestrian and bicyclist needs directly from the MetroPlan Orlando Bicycle and Pedestrian Safety Action Plan Findings: Safety continues to play a role in congestion levels throughout the region. High-level analyses were conducted as part of the CMP, revealing various segments throughout the region experiencing the most fatal, incapacitating, and overall crashes. From the **top 25 fatality-related segments** the *Principal Arterial-Other Rural*[4] facility type had the highest total number of	Source: Signal Four Analytics crash data covering 2014-2019, 2019 MetroPlan Orlando Pedestrian/Bicyclist Safety Action Plans reporting 2011-2017 data Tool: GIS

[4] See FDOT Urban Boundary and Functional Classification Handbook (2013) for facility type definitions.

Goal Area	Evaluation	Sources and Tools Used
	fatalities at 27% followed by *Principal Arterial-Interstate Urban* at 25%. In terms of county-by-county, 45% of total fatality crash related segments occurred in Orange County, 33% in Osceola, and 23% in Seminole. From the **top 25 fatality plus incapacitating injury-related segments** (F&I), the *Minor Arterial Urban* and *Principal Arterial-Other Urban* facility types had the highest amount of F&I crashes at *48*% followed by 46%, respectively, with the remaining amount occurring on *Principal Arterial-Interstate Urban* facility types. From an F&I crash rate perspective, *Local Urban* made up 40% and *Major Collector Urban* made up 29%. In terms of county-by-county F&I related segments, 68% of the total number of F&I crashes occurred in Orange County, 28% in Osceola, and 4% in Seminole. From the **top 25 all crash segments,** *Principal Arterial-Interstate Urban* and *Major Collector Urban* experienced the highest amount of total crashes with 46% and 32%, respectively. From a total crash rate perspective, the *Local Urban and Major Collector Urban* facility types experienced the highest rate of crashes at 47% and 43%, respectively. In terms of county-by-county total crash related segments, 86% of the total number of crashes occurred in Orange County with the remaining 14% occurring in Osceola County. Seminole County did not make the top 25 segments within the MetroPlan Orlando region for total crashes. Additional analysis is required to better understand the causes of crashes and to identify specific countermeasures to mitigate those causes. FDOT Central Office is conducting systemic analysis and mitigation plans throughout the state as part of its "Vital Few" efforts. MetroPlan Orlando is committed to improving safety and will continue to partner with the state and other agencies throughout the region to better define the causes of crashes on the region's transportation system.	
Reliability	Evaluation Performed: • Identified unreliable travel time areas within the region • Reviewed the MetroPlan Orlando Connected and Automated Vehicle Readiness Study to identify infrastructure needs and system capabilities • Reviewed the MetroPlan Orlando Intelligent Transportation Systems (ITS) Master Plan to identify system needs Findings: StreetLight data shows a scattering of 11 of the most unreliable travel time areas within the region. The most unreliable travel	Source: 2019 StreetLight Data's location-based services (LBS) dataset, MetroPlan Orlando Connected and Automated Vehicle Readiness Study, 2017 MetroPlan ITS Master Plan, 2020 Osceola County TSM&O Strategic Plan Tool: GIS

Goal Area	Evaluation	Sources and Tools Used
	time areas consist of destinations related to downtowns, entertainment districts and employment areas in general. The region is preparing to support connected and autonomous vehicles (CAVs) and MetroPlan Orlando has identified a list of needed actions to enhance readiness for CAVs, including infrastructure, network capacity, and training. The region has a well-established vision and set of goals and objectives for ITS throughout the three counties. Findings and recommendations from the 2017 ITS Master Plan led by MetroPlan Orlando were reviewed to inform the CMP update.	
Access & Connectivity	Evaluations Performed: • Identified segments not within a 20-minute travel shed from key destinations by auto and/or transit • Identified segments not within a 30-minute travel shed from activity centers by auto and/or transit • Identified areas with the least accessibility to essential services by walking and bicycling Findings: Proximity to key destinations and activity centers relates to land use and where the population elects to live. It is evident that access to these areas by transit is significantly poorer than by automobile. The analysis also indicated that 24% of the region's population can currently access essential services on foot or bicycle, with access primarily available in the downtown Orlando core and in other areas with focused development.	Source: 2019 StreetLight Data, LYNX's 2019 route map, Activity Centers previously defined by MPO, Land Overlaid on Transportation Information System (LOTIS) Tool: GIS, LOTIS
Health & Environment	Evaluation Performed: • Identified systemwide Air Quality Index (AQI). The AQI is an index for reporting daily air quality, and it is calculated based on monitored concentrations of ground-level ozone, particulate matter, carbon monoxide, sulfur dioxide and nitrogen dioxide. Findings: Air quality within the region is good.	Source: Florida Department of Environmental Protection Tool: N/A – directly received from FDEP
Investment & Economy	Evaluation Performed: • Identified the reliability of the regional visitor emphasis corridors (i.e., corridors carrying 60% or more visitor traffic) Findings: Of the visitor emphasis corridors, there are scatterings of unreliable segments. The exact causes of the congestion are not known; however, contributing factors are most likely	Source: 2019 StreetLight Data, FDOT Sourcebook Tool: GIS

Goal Area	Evaluation	Sources and Tools Used
	oversaturated conditions and points of conflict (intersection and driveway densities).	

6.1 Goal #1: Safety System Performance

All Crashes

The top 25 crash segments were identified by absolute number of fatal only, fatal and severe (incapacitating) injuries, and all crashes. Additionally, the top 25 segments were identified based on fatal only, fatal and severe (incapacitating) injury crash rates, and total/all crash rates. Figures 8 and 9 are maps of the top 25 segments for the various metrics followed by supporting tables and graphs visually summarizing the crash information by facility type and by county.

Bicycle and Pedestrian Only

To stay consistent with other ongoing MetroPlan Orlando activities, the 2019 Bicycle and Pedestrian Safety Action Plans (BPSAPs) were reviewed and integrated into the safety evaluation. As part of those Safety Action Plans, bicyclist and pedestrian crash data was analyzed for 2011 through 2017 for each of the three counties in the metropolitan area. Crash data was reviewed with respect to bicyclist and motorist actions, movement, and locations at the time of each crash to determine crash types and cause profiles. Figure 10 represents the resulting top corridors (three in each county) identified for bicycle and pedestrian needs, followed by a table summarizing the corridors and limits. Safety field reviews were performed on the top 9 corridors and the following common issues were observed:

- Majority of fatal crashes along safety field review corridors occurred at mid-block locations with pedestrians/bicyclists crossing the main roadway outside of a marked crosswalk.
- Little to no street lighting along corridors, with nighttime pedestrian/bicyclist related crashes accounting for 25 to 45 percent of crashes along the safety field review corridors.
- Truncated domes worn down or missing at curb ramps for signalized intersections.
- Pedestrian crosswalk markings were faded at signalized intersections.
- No marked crosswalks across public street approaches at unsignalized intersections.

A range of potential bicyclist and pedestrian crash countermeasures that include both infrastructure changes and behavioral changes from either the bicyclist or the driver were defined and then ranked according to the relative impact each would have on the Critical Safety Success Factors (CSSFs) identified in the BPSAPs. The top ranked countermeasures are included in the recommended strategies in Section 7.0.

Figure 8: Top 25 Segments for Fatalities and Severe (Incapacitating) Injuries

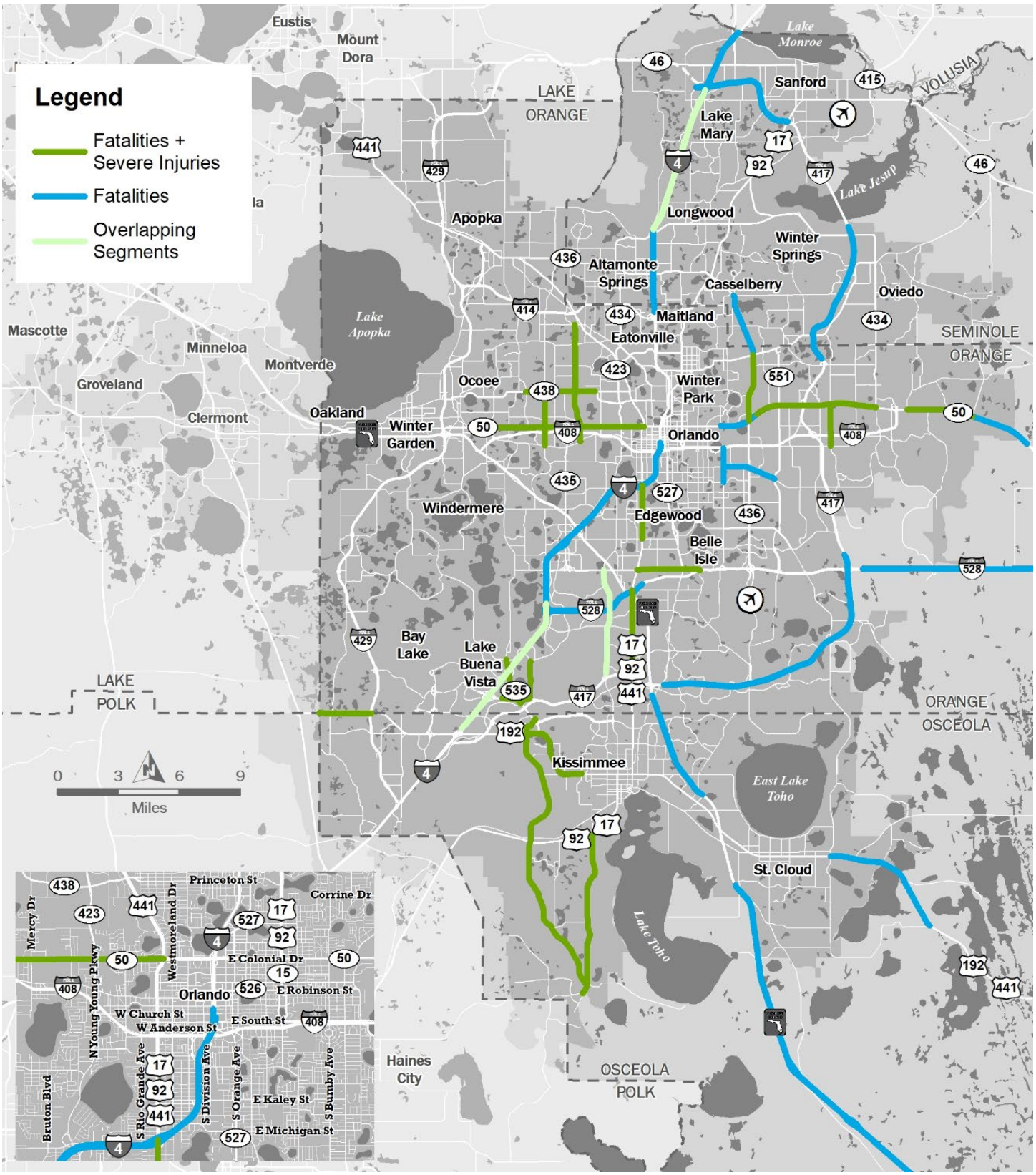


Table 33: Top 25 Segments for Fatalities (2013-2017)

Road Name	City	County	Fatalities	Functional Classification	Surrounding Area Types (from CFRPM)	LOTTR Max	AADT	Daily VMT	Length (Miles)
1. I-4	LAKE MARY	Seminole	12	Principal Arterial-Interstate Urban	Undeveloped Portions of Urbanized Areas/Other Outlying Business District/High Density Outlying Business District	1.30	75,450	539,532	14.30
2. SR 528	UNINCORP.	Orange	12	Principal Arterial-Expressway Rural	Transitioning Areas/Urban Areas over 5,000 population/Undeveloped Rural Areas/Developed Rural Areas/Small Cities under 5,000 Population	1.10	51,210	725,185	28.32
3. I-4	ORLANDO	Orange	12	Principal Arterial-Interstate Urban	Other Outlying Business District/Urbanized Area (over 500,000) Primary City CBD/All CBD Fringe Areas/High Density Outlying Business District/Residential Area of Urbanized Areas	1.54	9,450	59,600	12.61
4. Florida's Turnpike	UNINCORP.	Osceola	12	Principal Arterial-Expressway Rural	Undeveloped Rural Areas/Transitioning Areas/Urban Areas over 5,000 population	1.10	46,800	2,304,133	98.47
5. SR 60	UNINCORP.	Osceola	11	Principal Arterial-Other Rural	Undeveloped Rural Areas	1.09	7,600	83,020	21.85
6. US 192	ST. CLOUD	Osceola	11	Principal Arterial-Other Rural	Developed Rural Areas/Small Cities under 5,000 Population/Transitioning Areas/Urban Areas over 5,000 population	1.15	24,360	159,732	6.56
7. SR 50	UNINCORP.	Orange	11	Principal Arterial-Other Rural	Undeveloped Rural Areas	1.15	11,400	64,633	5.67
8. Colonial Dr	UNINCORP.	Orange	9	Principal Arterial-Other Rural	Undeveloped Portions of Urbanized Areas	1.24	28,204	86,250	3.06

Road Name	City	County	Fatalities	Functional Classification	Surrounding Area Types (from CFRPM)	LOTTR Max	AADT	Daily VMT	Length (Miles)
9. I-4	UNINCORP.	Seminole	8	Principal Arterial-Interstate Urban	Other Outlying Business District/Residential Area of Urbanized Areas	1.20	113,700	396,038	6.97
10. I-4	ORLANDO	Orange	8	Principal Arterial-Interstate Urban	Other Outlying Business District	1.65	93,000	422,484	9.09
11. US 441	UNINCORP.	Osceola	8	Principal Arterial-Other Rural	Undeveloped Rural Areas	1.11	2,600	51,217	19.70
12. SR 520	UNINCORP.	Orange	8	Principal Arterial-Other Rural	Undeveloped Rural Areas	1.10	20,500	214,145	10.45
13. Colonial Dr	ORLANDO	Orange	8	Principal Arterial-Other Urban	Residential Area of Urbanized Areas/Other Outlying Business District	1.47	68,000	132,762	1.95
14. SR 417	ORLANDO	Orange	7	Principal Arterial-Freeway and Expressway Urban	Residential Area of Urbanized Areas/Undeveloped Portions of Urbanized Areas/Transitioning Areas/Urban Areas over 5,000 population	1.28	58,800	797,257	27.12
15. SR 417	OVIEDO, WINTER SPRINGS	Seminole	7	Principal Arterial-Freeway and Expressway Urban	Residential Area of Urbanized Areas/Other Outlying Business District/Transitioning Areas/Urban Areas over 5,000 population	1.29	55,300	400,237	14.48
16. SR 417	SANFORD	Seminole	7	Principal Arterial-Freeway and Expressway Urban	Other Outlying Business District/High Density Outlying Business District/Residential Area of Urbanized Areas	1.16	44,600	288,277	12.93
17. I-4	UNINCORP.	Osceola	7	Principal Arterial-Interstate Urban	Other Outlying Business District/High Density Outlying Business District/Residential Area of Urbanized Areas	1.43	106,000	788,725	14.88

Road Name	City	County	Fatalities	Functional Classification	Surrounding Area Types (from CFRPM)	LOTTR Max	AADT	Daily VMT	Length (Miles)
18. Florida's Turnpike	KISSIMMEE	Osceola	7	Principal Arterial-Freeway and Expressway Urban	Residential Area of Urbanized Areas/High Density Outlying Business District	1.33	57,750	314,792	10.90
19. I-4	ALTAMONTE SPRINGS, MAITLAND	Seminole, Orange	7	Principal Arterial-Interstate Urban	Other Outlying Business District/Residential Area of Urbanized Areas	1.54	82,250	324,050	7.88
20. Curry Ford Rd	ORLANDO	Orange	7	Minor Arterial Urban	Residential Area of Urbanized Areas/Other Outlying Business District	1.33	33,000	86,950	2.63
21. John Young Pkwy	UNINCORP.	Orange	7	Principal Arterial-Other Urban	Residential Area of Urbanized Areas	1.32	76,000	394,882	5.20
22. Semoran Blvd	CASSELBERRY	Seminole	7	Principal Arterial-Other Urban	Other Outlying Business District/Residential Area of Urbanized Areas	1.48	55,500	172,005	3.10
23. Conway Rd	ORLANDO	Orange	7	Minor Arterial Urban	Residential Area of Urbanized Areas	1.32	30,000	49,491	1.67
24. SR 528	UNINCORP.	Orange	6	Principal Arterial-Expressway Rural	Undeveloped Rural Areas	1.08	47,000	252,569	10.75
25. SR 528	UNINCORP.	Osceola	6	Principal Arterial-Freeway and Expressway Urban	Other Outlying Business District/Residential Area of Urbanized Areas/High Density Outlying Business District	1.58	46,150	285,431	12.37

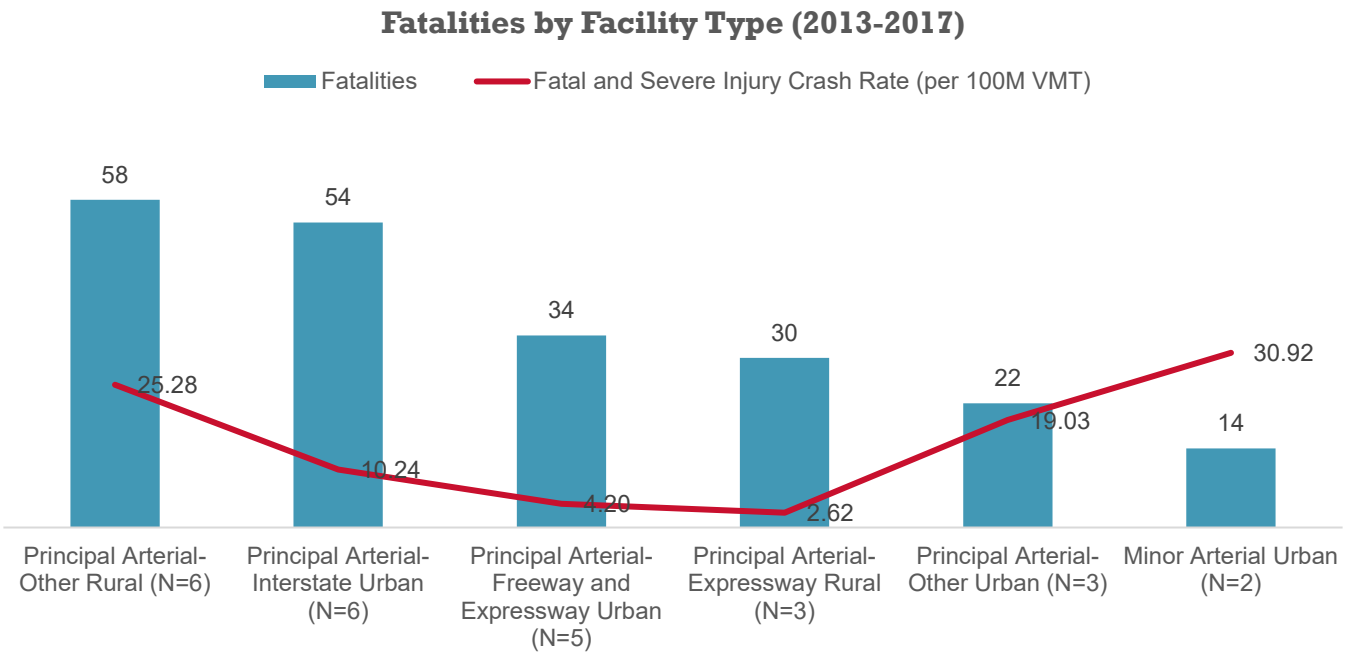
Table 34: Top 25 Segments for Fatalities and Severe (Incapacitating) Injuries (2013-2017)

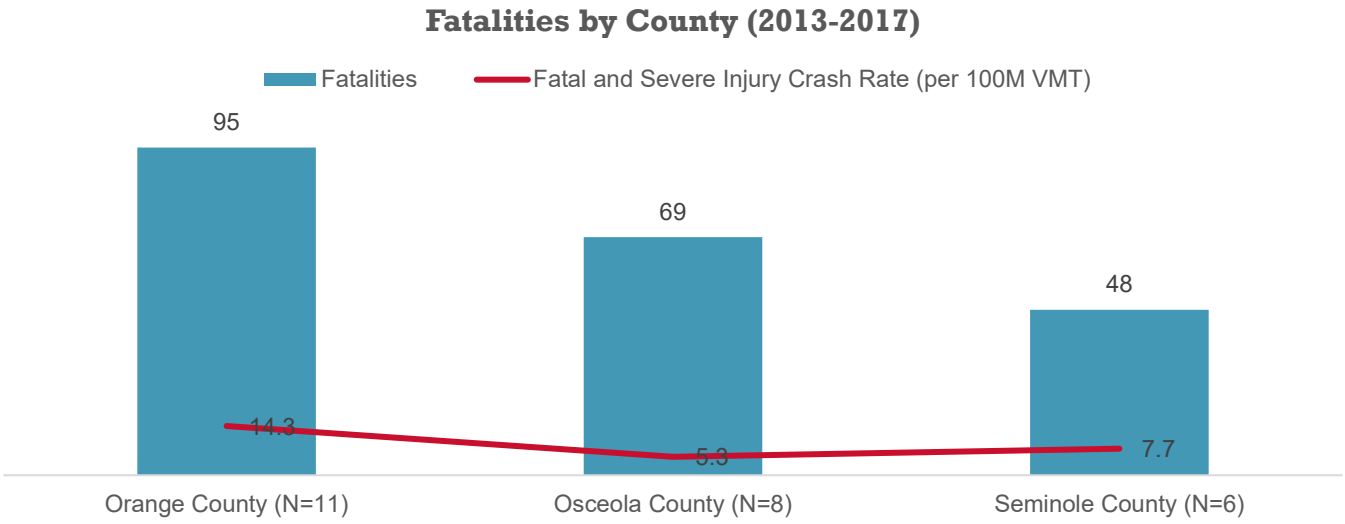
Road Name	City	County	Fatalities + Severe Injuries	Functional Classification	Surrounding Area Types (from CFRPM)	LOTTR Max	AADT	Daily VMT	Length (Miles)
1. Silver Star Rd	ORLANDO	Orange	210	Minor Arterial Urban	Residential Area of Urbanized Areas/High Density Outlying Business District	1.28	35,833	122,000	3.38
2. Colonial Dr	UNINCORP.	Orange	168	Principal Arterial-Other Urban	Other Outlying Business District/Residential Area of Urbanized Areas	1.34	50,500	190,751	3.78
3. John Young Pkwy	UNINCORP.	Orange	167	Principal Arterial-Other Urban	Residential Area of Urbanized Areas	1.32	76,000	394,882	5.20
4. Poinciana Blvd	UNINCORP.	Osceola	165	Minor Arterial Urban	Other Outlying Business District/Undeveloped Portions of Urbanized Areas/Residential Area of Urbanized Areas	1.32	20,833	226,726	7.00
5. Pleasant Hill Rd	UNINCORP.	Osceola	160	Minor Arterial Urban	Residential Area of Urbanized Areas	1.36	40,000	124,494	3.62
6. Pine Hills Rd	UNINCORP.	Orange	147	Minor Arterial Urban	Residential Area of Urbanized Areas/Other Outlying Business District	1.36	25,450	72,252	2.54
7. Orange Blossom Tr	UNINCORP.	Orange	146	Principal Arterial-Other Urban	High Density Outlying Business District/Other Outlying Business District/Residential Area of Urbanized Areas	1.48	41,833	165,030	3.94
8. SR 535	UNINCORP.	Orange	143	Minor Arterial Urban	High Density Outlying Business District/Other Outlying Business District	1.74	59,000	129,795	2.32
9. Hiawassee Rd	UNINCORP.	Orange	139	Minor Arterial Urban	Other Outlying Business District	1.46	34,075	59,118	2.65

Road Name	City	County	Fatalities + Severe Injuries	Functional Classification	Surrounding Area Types (from CFRPM)	LOTTR Max	AADT	Daily VMT	Length (Miles)
10. Pine Hills Rd	UNINCORP.	Orange	130	Minor Arterial Urban	Residential Area of Urbanized Areas	1.33	39,500	129,540	3.28
11. Pleasant Hill Rd	UNINCORP.	Osceola	128	Minor Arterial Urban	Residential Area of Urbanized Areas	1.26	41,000	179,868	4.39
12. Orange Blossom Tr	UNINCORP.	Orange	124	Principal Arterial-Other Urban	Other Outlying Business District	1.23	60,000	158,158	2.64
13. Poinciana Blvd	UNINCORP.	Osceola	122	Principal Arterial-Other Urban	Residential Area of Urbanized Areas/Other Outlying Business District/Undeveloped Portions of Urbanized Areas	1.33	18,900	150,627	7.97
14. Semoran Blvd	UNINCORP.	Orange	120	Principal Arterial-Other Urban	Other Outlying Business District/High Density Outlying Business District/Residential Area of Urbanized Areas	1.38	44,500	147,284	3.31
15. I-4	LAKE MARY	Seminole	117	Principal Arterial-Interstate Urban	Undeveloped Portions of Urbanized Areas/Other Outlying Business District/High Density Outlying Business District	1.30	75,450	539,532	14.30
16. US 192	KISSIMMEE	Osceola	116	Principal Arterial-Other Urban	Residential Area of Urbanized Areas/Other Outlying Business District	1.30	33,501	135,247	4.04
17. SR 536	UNINCORP.	Orange	105	Minor Arterial Urban	Residential Area of Urbanized Areas/Other Outlying Business District	1.46	27,150	78,066	3.21
18. US 192	UNINCORP.	Osceola	105	Principal Arterial-Other Urban	Residential Area of Urbanized Areas/Undeveloped Portions of Urbanized Areas/Transitioning Areas/Urban Areas over 5,000 population	1.29	51,500	132,222	2.57

Road Name	City	County	Fatalities + Severe Injuries	Functional Classification	Surrounding Area Types (from CFRPM)	LOTTR Max	AADT	Daily VMT	Length (Miles)
19. Colonial Dr	UNINCORP.	Orange	104	Principal Arterial-Other Urban	Residential Area of Urbanized Areas/Other Outlying Business District	1.56	59,500	131,557	2.21
20. I-4	UNINCORP.	Osceola	104	Principal Arterial-Interstate Urban	Other Outlying Business District/High Density Outlying Business District/Residential Area of Urbanized Areas	1.43	106,000	788,725	14.88
21. Colonial Dr	OCOEE	Orange	98	Principal Arterial-Other Urban	Other Outlying Business District/Residential Area of Urbanized Areas	1.28	41,500	161,341	3.89
22. Sand Lake Rd	BELLE ISLE	Orange	97	Minor Arterial Urban	Other Outlying Business District/Residential Area of Urbanized Areas	1.43	47,750	150,075	3.12
23. Colonial Dr	UNINCORP.	Orange	91	Principal Arterial-Other Urban	Undeveloped Portions of Urbanized Areas/Residential Area of Urbanized Areas	1.75	42,000	136,663	3.25
24. Dean Rd	UNINCORP.	Orange	89	Minor Arterial Urban	Residential Area of Urbanized Areas	1.35	25,000	51,364	2.05
25. Colonial Dr	ORLANDO	Orange	88	Principal Arterial-Other Urban	Other Outlying Business District/High Density Outlying Business District/Residential Area of Urbanized Areas	1.32	40,500	150,038	3.70

The following graphs visually portray the breakdown of fatality only crashes by facility type and by county for the top 25 segments. From the **top 25 fatality-related segments,** the *Principal Arterial-Other Rural* facility type had the highest total number of fatalities at 27%, followed by *Principal Arterial-Interstate Urban* at 25%. In terms of county-by-county, 45% of total fatality crash related segments occurred in Orange County, 33% in Osceola, and 23% in Seminole.

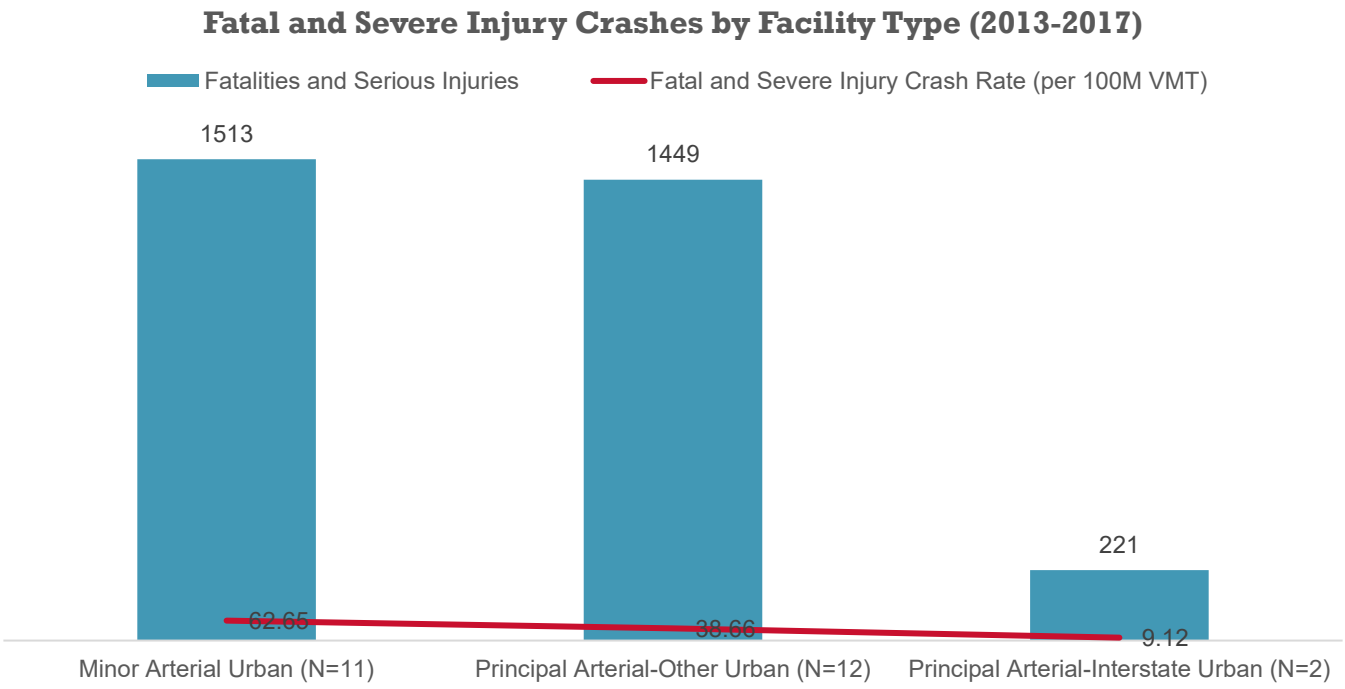


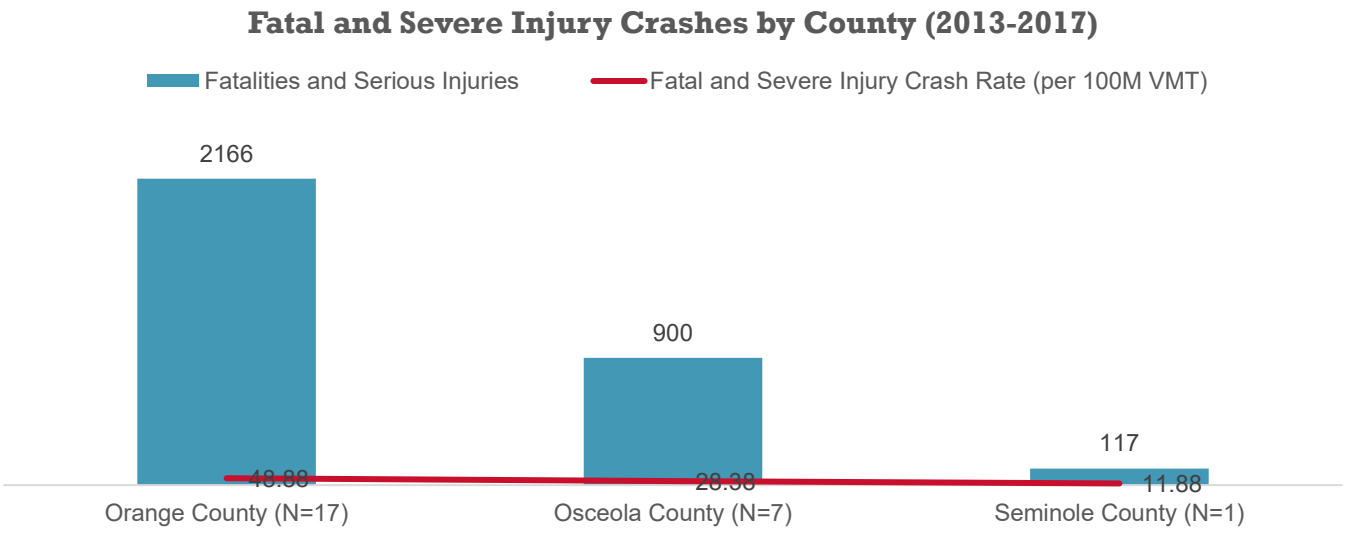


N = Number of segments out of top 25

The following graphs visually portray the breakdown of fatality and severe (Incapacitating) injuries only by facility type and by county for the top 25 segments. From the **top 25 fatal and severe (incapacitating) injury (FSI)-related segments**, the *Minor Arterial Urban* and *Principal Arterial-Other Urban* facility types had the highest amount of FSI crashes at *48*% followed by 46%, respectively, with the remaining amount occurring on *Principal Arterial-Interstate Urban* facility types. From an FSI crash rate perspective, *Local Urban* made up 40% and *Major Collector Urban* made up 29%. In

terms of county-by-county FSI related segments, 68% of the total number of FSI crashes occurred in Orange County, 28% in Osceola, and 4% in Seminole.





N = Number of segments out of top 25

Figure 9: Top 25 Segments with the Most Crashes per 100M Vehicle Miles Traveled

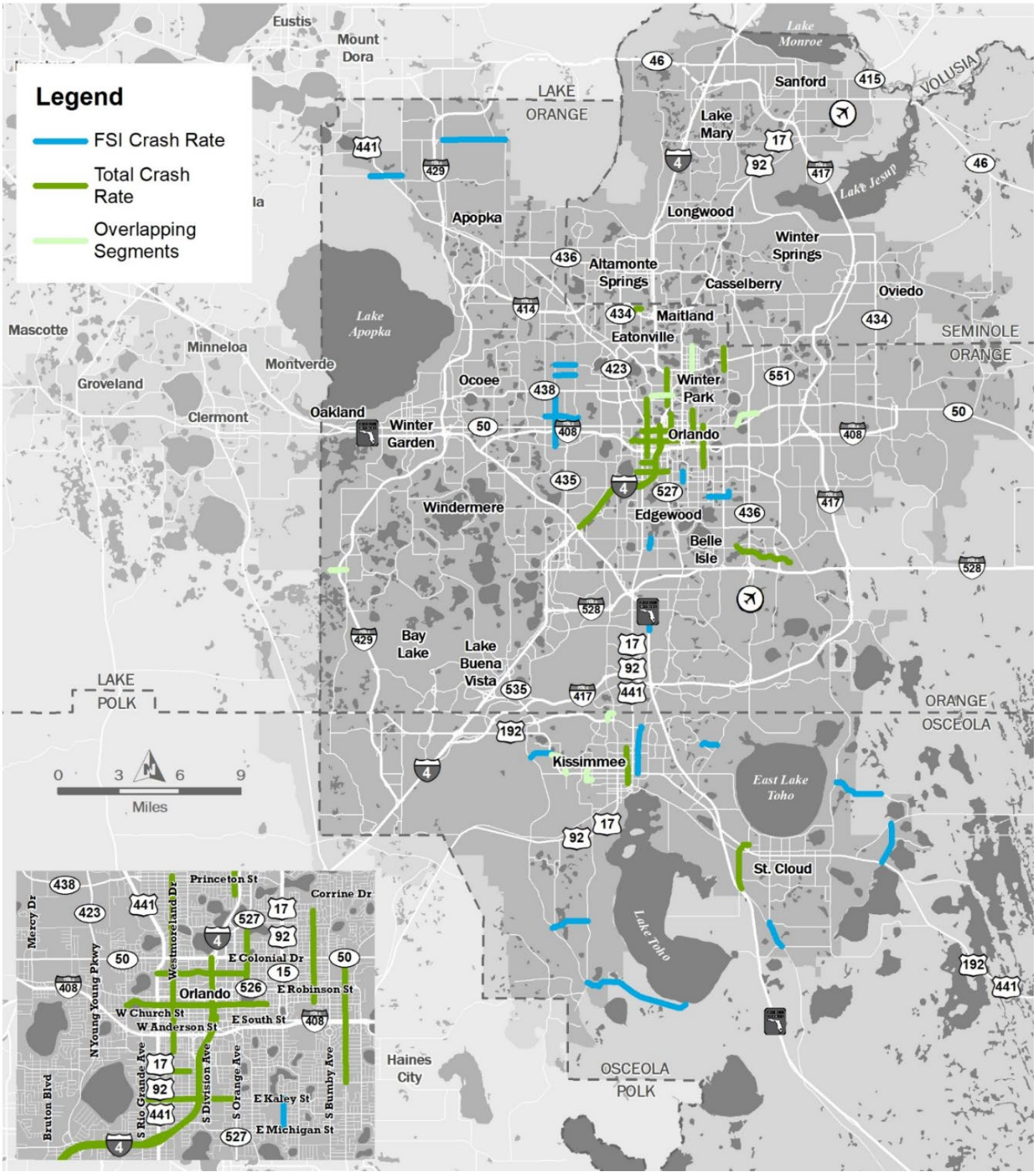


Table 35: Top 25 Segments with the Most Crashes per 100M Vehicle Miles Traveled (VMT) (2013-2017)

Segment	City	County	All Crashes Rate (per 100M VMT)	Total Crashes	Functional Classification	Area Type	AADT	LOTTR	Daily VMT	Length (Miles)
1. Pennsylvania Ave	WINTER PARK	Orange	24,056	126	Local Urban	All CBD Fringe Areas	3,147	0.00	287	1.19
2. Armstrong Blvd	KISSIMMEE	Osceola	14,004	195	Major Collector Urban	Other Outlying Business District	800	8.46	763	0.95
3. Grand St	ORLANDO	Orange	9,089	35	Local Urban	Other Outlying Business District	420	1.34	211	0.50
4. Central Blvd	ORLANDO	Orange	6,947	204	Major Collector Urban	Urbanized Area (over 500,000) Primary City CBD/All CBD Fringe Areas	1,600	1.71	1,609	1.01
5. Hampton Ave	ORLANDO	Orange	4,218	187	Local Urban	Residential Area of Urbanized Areas	1,657	1.43	2,429	1.47
6. Old Cheney Hwy	UNICORP.	Orange	4,210	278	Minor Collector (Fed Aid) Urban	Other Outlying Business District	2,700	4.23	3,618	1.34
7. Hughey Ave	ORLANDO	Orange	3,708	394	Major Collector Urban	Urbanized Area (over 500,000) Primary City CBD	5,600	1.83	5,822	1.01
8. Central Ave	KISSIMMEE	Osceola	3,677	242	Major Collector Urban	Other Outlying Business District	2,413	2.13	3,606	1.76
9. I-4	ORLANDO	Orange	3,518	3827	Principal Arterial-Interstate Urban	Other Outlying Business District/Urbanized Area (over 500,000) Primary City CBD/All CBD Fringe Areas/High Density Outlying Business District/Residential Area of Urbanized Areas	9,450	1.54	59,600	12.61

Segment	City	County	All Crashes Rate (per 100M VMT)	Total Crashes	Functional Classification	Area Type	AADT	LOTTR	Daily VMT	Length (Miles)
10. Primrose Dr	ORLANDO	Orange	3,390	360	Major Collector Urban	Residential Area of Urbanized Areas	3,200	1.61	5,819	2.01
11. Winter Park St	ORLANDO	Orange	3,189	49	Local Urban	Residential Area of Urbanized Areas	810	1.64	842	1.04
12. Central Blvd	ORLANDO	Orange	2,976	112	Major Collector Urban	All CBD Fringe Areas/Other Outlying Business District/Urbanized Area (over 500,000) Primary City CBD	1,600	1.32	2,062	1.29
13. Schofield Rd	UNICORP.	Orange	2,757	8	Local Urban	Transitioning Areas/Urban Areas over 5,000 population	239	1.33	159	0.79
14. Hazeltine National Dr	ORLANDO	Orange	2,669	161	Local Urban	Other Outlying Business District	933	0.00	3,305	2.98
15. Thacker Ave	UNICORP.	Osceola	2,625	342	Local Urban	Other Outlying Business District	12,228	2.79	7,138	0.58
16. Old Canoe Creek Rd	ST. CLOUD	Osceola	2,558	319	Local Urban	Residential Area of Urbanized Areas/Other Outlying Business District	3,133	2.24	6,832	2.51
17. Westmoreland Dr	ORLANDO	Orange	2,505	268	Major Collector Urban	Other Outlying Business District	3,900	1.46	5,862	1.50
18. Maitland Summit	MAITLAND	Orange	2,450	214	Minor Collector (Fed Aid) Urban	High Density Outlying Business District	8,600	2.09	4,787	0.56
19. Old Vineland Rd	KISSIMMEE	Osceola	2,439	96	Major Collector Urban	Residential Area of Urbanized Areas	1,600	1.97	2,157	1.35

Segment	City	County	All Crashes Rate (per 100M VMT)	Total Crashes	Functional Classification	Area Type	AADT	LOTTR	Daily VMT	Length (Miles)
20. Westmoreland Ave	ORLANDO	Orange	2,414	70	Major Collector Urban	Residential Area of Urbanized Areas	1,200	1.50	1,589	1.32
21. Phelps Ave	WINTER PARK	Orange	2,301	76	Minor Collector (Fed Aid) Urban	Residential Area of Urbanized Areas	1,650	1.58	1,810	1.10
22. Highland Ave	ORLANDO	Orange	2,239	153	Major Collector Urban	All CBD Fringe Areas	3,900	2.91	3,745	0.96
23. Amelia St	ORLANDO	Orange	2,236	225	Major Collector Urban	Other Outlying Business District/All CBD Fringe Areas	3,825	2.14	5,513	1.44
24. Formosa Ave	ORLANDO	Orange	2,229	106	Local Urban	Residential Area of Urbanized Areas	1,560	1.54	2,606	1.76
25. Kaley Ave	ORLANDO	Orange	2,219	341	Major Collector Urban	Other Outlying Business District/Residential Area of Urbanized Areas	5,850	1.50	8,419	1.51

Table 36: Top 25 Segments with the Most Fatal and Severe (Incapacitating) Injury Crashes per 100M VMT

Segment	City	County	Fatal & Serious Injury Crash Rate (per 100M VMT)	Total Fatalities + Incapacitating Injuries	LOTTR	Functional Classification	Area Type	AADT	Daily VMT	Length (Miles)
1. Main St	UNINCORP.	Osceola	214	22	1.60	Minor Collector Rural	Transitioning Areas/Urban Areas over 5,000 population/Residential Area of Urbanized Areas	1,000	5,365	5.36

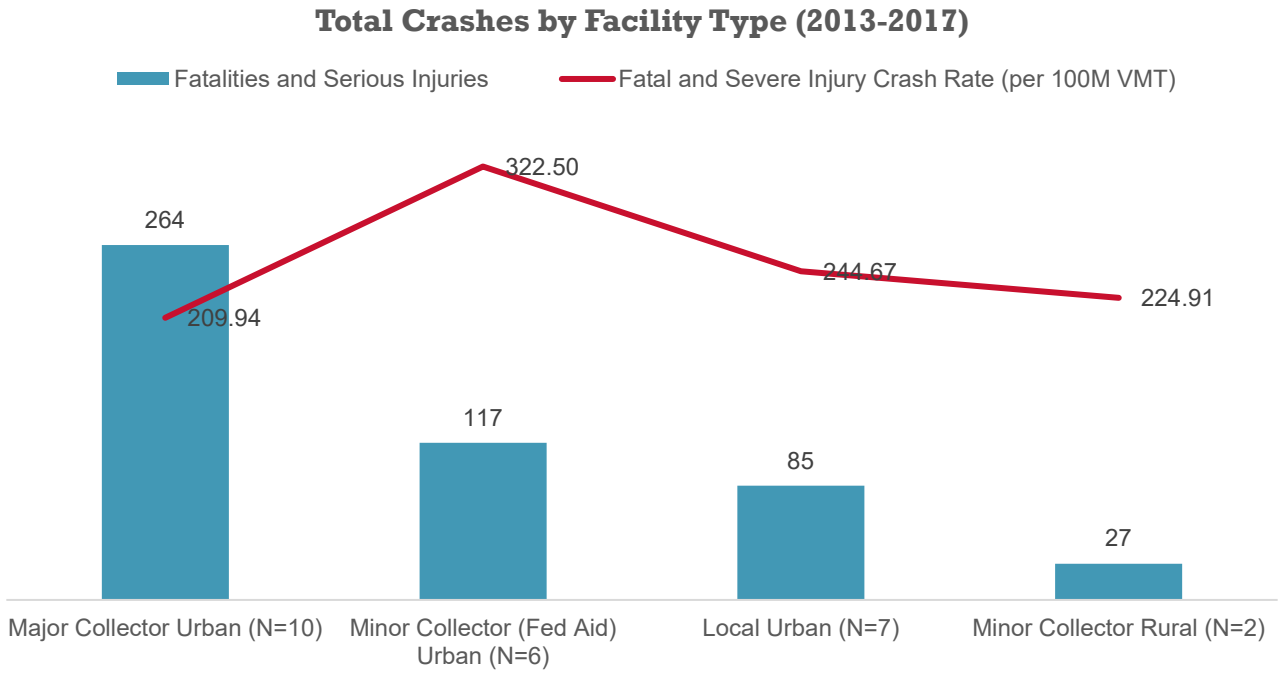
Segment	City	County	Fatal & Serious Injury Crash Rate (per 100M VMT)	Total Fatalities + Incapacitating Injuries	LOTTR	Functional Classification	Area Type	AADT	Daily VMT	Length (Miles)
2. Vick Rd	UNINCORP.	Osceola	275	36	1.10	Minor Collector (Fed Aid) Urban	Residential Area of Urbanized Areas	3,700	6,765	1.83
3. Spring St	ST. CLOUD	Osceola	233	11	0.00	Major Collector Urban	Residential Area of Urbanized Areas	1,750	2,354	1.35
4. Osceola Pkwy	UNINCORP.	Osceola	842	24	1.60	Minor Collector (Fed Aid) Urban	Transitioning Areas/Urban Areas over 5,000 population/Developed Rural Areas/Small Cities under 5,000 Population	650	1,301	2.00
5. Aloma Ave	UNINCORP.	Orange	271	7	0.00	Minor Collector Rural	Transitioning Areas/Urban Areas over 5,000 population/Undeveloped Portions of Urbanized Areas	500	1,213	2.43
6. Osceola Pkwy	KISSIMMEE	Osceola	406	16	1.60	Major Collector Urban	Residential Area of Urbanized Areas	1,600	2,157	1.35
7. Main St	UNINCORP.	Osceola	226	20	1.60	Major Collector Urban	Residential Area of Urbanized Areas	4,500	4,857	1.08

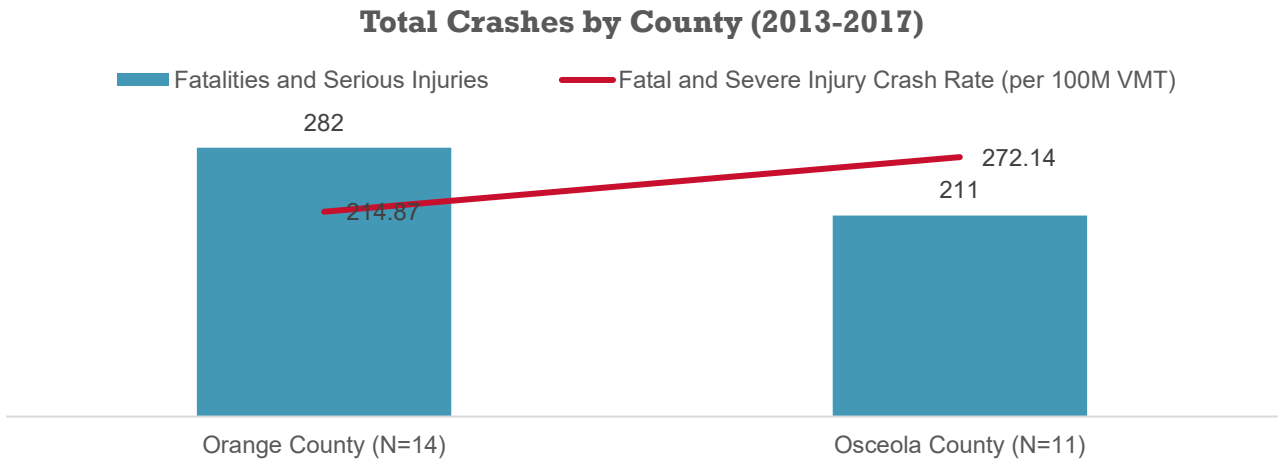
Segment	City	County	Fatal & Serious Injury Crash Rate (per 100M VMT)	Total Fatalities + Incapacitating Injuries	LOTTR	Functional Classification	Area Type	AADT	Daily VMT	Length (Miles)
8. Fern Creek Ave	UNINCORP.	Orange	292	19	2.18	Major Collector Urban	Residential Area of Urbanized Areas	4,194	3,377	0.81
9. Apopka Vineland Rd	ORLANDO	Orange	173	6	0.00	Minor Collector (Fed Aid) Urban	Residential Area of Urbanized Areas	3,800	1,901	0.50
10. Rio Grande Ave	UNINCORP.	Orange	218	45	1.60	Major Collector Urban	Residential Area of Urbanized Areas	6,000	10,284	1.71
11. Oakland Ave	UNINCORP.	Orange	246	27	0.00	Minor Collector (Fed Aid) Urban	Residential Area of Urbanized Areas	5,600	5,563	0.99
12. Fern Creek Ave	UNINCORP.	Orange	194	17	2.18	Major Collector Urban	Residential Area of Urbanized Areas	4,800	4,807	1.00
13. 5th St	ORLANDO	Orange	195	3	0.00	Local Urban	Residential Area of Urbanized Areas	810	842	1.04
14. Tampa Ave	APOPKA	Orange	172	29	1.60	Major Collector Urban	Residential Area of Urbanized Areas/Transitioning Areas/Urban Areas over 5,000 population	2,800	8,617	3.08

Segment	City	County	Fatal & Serious Injury Crash Rate (per 100M VMT)	Total Fatalities + Incapacitating Injuries	LOTTR	Functional Classification	Area Type	AADT	Daily VMT	Length (Miles)
15. 5th St	UNINCORP.	Orange	300	5	0.00	Minor Collector (Fed Aid) Urban	Residential Area of Urbanized Areas	1,350	731	0.54
16. Schofield Rd	UNINCORP.	Orange	241	15	1.33	Local Urban	Residential Area of Urbanized Areas	2,267	3,407	1.25
17. Narcoossee Rd	KISSIMMEE	Osceola	503	7	1.50	Major Collector Urban	Other Outlying Business District	800	763	0.95
18. Aloma Ave	UNINCORP.	Orange	180	18	1.60	Local Urban	Undeveloped Portions of Urbanized Areas	3,650	5,472	1.55
19. Dakin Ave	UNINCORP.	Orange	424	28	0.00	Minor Collector (Fed Aid) Urban	Other Outlying Business District	2,700	3,618	1.34
20. Rocket Blvd	KISSIMMEE	Osceola	198	26	0.00	Major Collector Urban	Other Outlying Business District/Residential Area of Urbanized Areas	3,675	7,194	2.34
21. Adventure Way	UNINCORP.	Orange	183	84	0.00	Major Collector Urban	Residential Area of Urbanized Areas/Other Outlying Business District	9,000	24,494	2.72
22. Northern Way	UNINCORP.	Orange	2,068	8	0.00	Local Urban	Transitioning Areas/Urban Areas over 5,000 population	239	159	0.79

Segment	City	County	Fatal & Serious Injury Crash Rate (per 100M VMT)	Total Fatalities + Incapacitating Injuries	LOTTR	Functional Classification	Area Type	AADT	Daily VMT	Length (Miles)
23. Sinclair Rd	UNINCORP.	Osceola	253	33	1.46	Local Urban	Other Outlying Business District	12,228	7,138	0.58
24. Kaley Ave	WINTER PARK	Orange	382	2	0.00	Local Urban	All CBD Fringe Areas	3,147	287	1.19
25. Heintzelman Blvd	UNINCORP.	Orange	253	8	1.15	Local Urban	High Density Outlying Business District	2,246	1,731	1.19

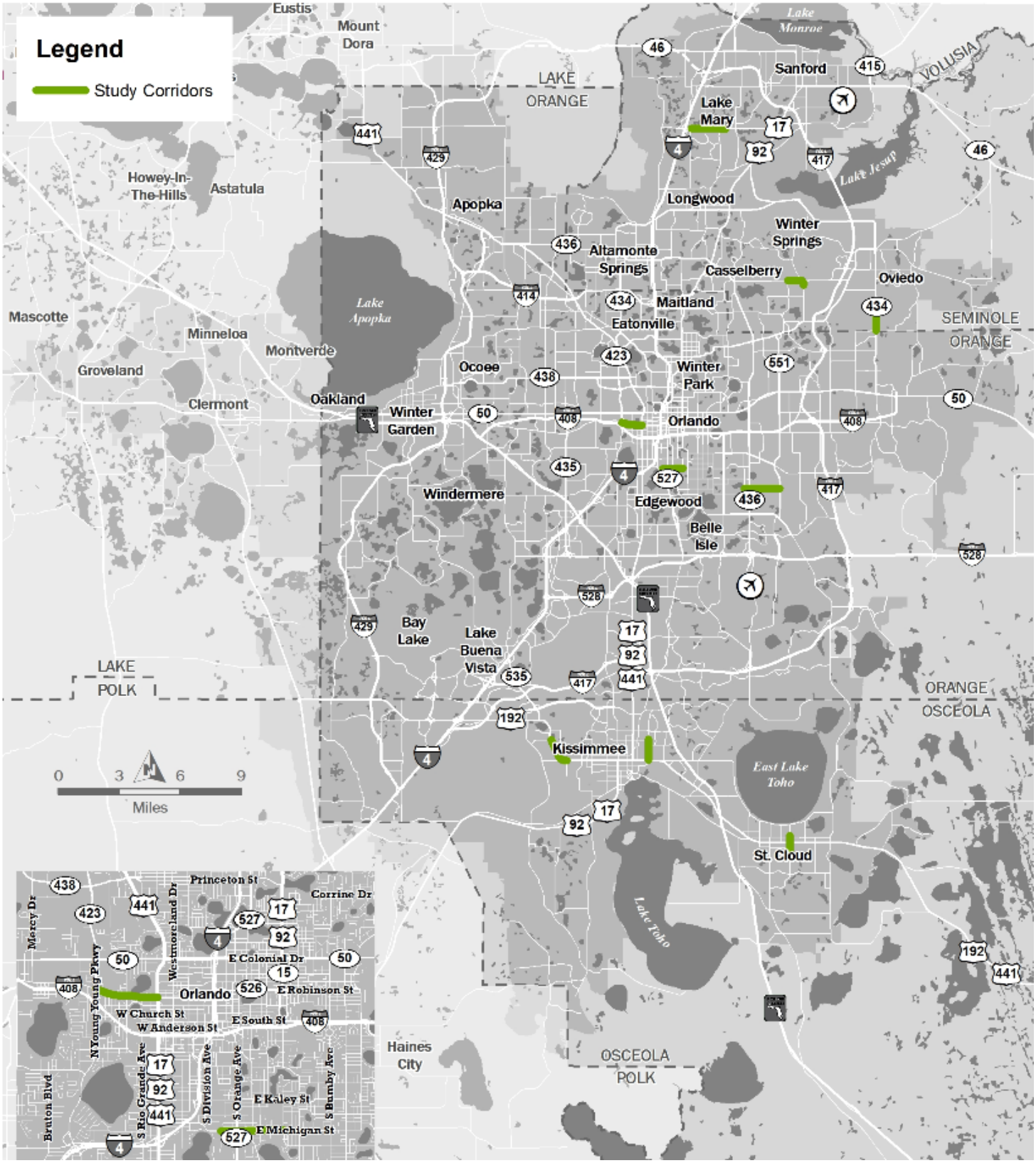
The following graphs visually portray the breakdown of total crashes by facility type and by county for the top 25 segments. From the **top 25 all crash segments,** *Principal Arterial-Interstate Urban* and *Major Collector Urban* experienced the highest amount of total crashes with 46% and 32%, respectively. From a total crash rate perspective, the *Local Urban and Major Collector Urban* facility types experienced the highest rate of crashes at 47% and 43%, respectively. In terms of county-by-county total crash related segments, 86% of the total number of crashes occurred in Orange County with the remaining 14% occurring in Osceola County. Seminole County did not make the top 25 segments within the MetroPlan Orlando region for total crashes.





N = Number of segments out of top 25

Figure 10: Top Corridors for Bicycle and Pedestrian Safety Issues



Source: MetroPlan Bicycle and Pedestrian Safety Action Plans, 2019

Table 37: Top Corridors for Bicycle and Pedestrian Safety Issues

County	Highest Priority Corridors and Segments for Bicyclists and Pedestrians
Osceola County	• Michigan Avenue from US 192 to Donegan Avenue in Kissimmee • US 192 from Siesta Lago Drive to Old Vineland Road in Kissimmee • Michigan Avenue from Michigan Avenue Elementary School to 8th Street in St. Cloud
Seminole County	• Red Bug Lake Road from Dodd Road to Tuskawilla Road and Tuskawilla Road from Willa Springs Drive to Red Bug Lake Road in Winter Springs • Lake Mary Boulevard from Rinehart Road to North 7th Street in Lake Mary • SR 434 from McCulloch Road to Remington Drive in Oviedo
Orange County	• Pershing Avenue from Dixie Bell Drive to Goldenrod Road in Orlando • Michigan Street from the Railroad Crossing to Mills Avenue in Orlando • Washington Street from John Young Parkway to Orange Blossom Trail in Orlando

Source: MetroPlan Bicycle and Pedestrian Safety Action Plans, 2019

6.2 Goal #2: Reliability System Performance

The travel time reliability performance measure is defined by the FAST Act for purposes of reporting performance for the National Highway System (NHS) — a road network of interstates, expressways, and major regional arterials. Through this analysis, MetroPlan Orlando expands on the reporting of the FAST Act travel time reliability performance measures by applying them to all roads in the primary network.

The FAST Act Level of Travel Time Reliability (LOTTR) performance measure compares the 80th percentile travel time to the average (50th percentile) travel time. If the ratio of these two figures is 1.5 or higher, the segment's travel time is considered unreliable. Another way to think about this measure is that if the LOTTR is 1.5 and your work commute takes 30 minutes on average, you would need to plan 45 minutes to ensure an on-time arrival, 80 percent of the time. LOTTR is computed for four time periods: Weekday AM Peak (6-10 AM), Weekday PM Peak (4-8 PM), Weekday Midday (10 AM-4 PM), and Weekends (6 AM-8 PM). A segment is reliable if the LOTTR ratio is less than 1.5 for all four time periods. This effort reports the maximum LOTTR—across both directions and four time periods—for each segment in the priority network.

The data source recommended by FAST Act to compute LOTTR is the National Performance Management Research Data Set (NPMRDS), which reports average travel speeds for each five-minute period in a year. For this analysis, however, StreetLight Data products were used in order to more closely match the MetroPlan Orlando primary network that was also used in the 2045 MTP update. The StreetLight Data reports the percentage of travelers traveling at each speed bin (e.g., 10 to 12 mph) across the year —reportable at various day and time parts.

Because NPMRDS averages all probes (drivers) before outputting an average travel speed, it eliminates most variability due to driver behavior (e.g., how fast an individual driver is comfortable driving). On the other hand, StreetLight Data's distribution of travel speeds is reflective both of variability in conditions—including congestion, incidents, etc.—and variability in driver behavior.

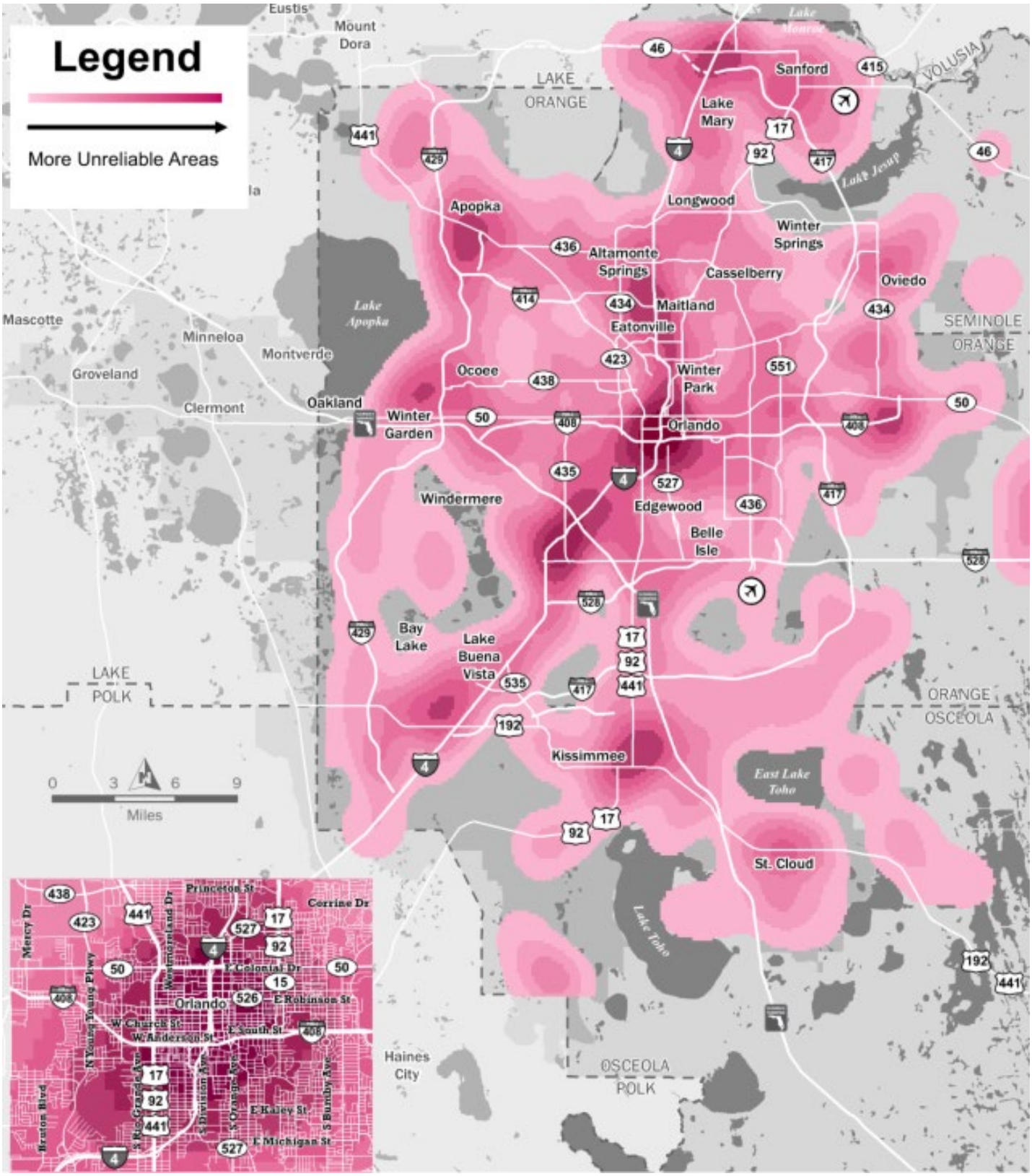
The MetroPlan Orlando "primary network", developed for the 2040 long-range transportation plan addendum, was used as part of this effort. The primary network covers all roads in the NHS, as well as minor arterials and collectors. To overcome limitations in the StreetLight Data platform, short segments under one mile were combined with adjacent segments to develop a StreetLight Data-friendly copy of the primary network.

Table 38 and Figure 11 describe and show, respectively, the areas within the MetroPlan Orlando region with the highest LOTTRs across the four analysis time periods (i.e., least reliable segments).

Table 38: MetroPlan Orlando Region Least Reliable Areas

Area	Description
Alafaya/UCF	Contains the region's largest university (UCF), the Central Florida Research Park, Waterford Lakes, and supporting housing and businesses.
Sanford/Lake Mary	Most unreliable segments in this area are concentrated near the I-4 interchanges and the neighboring suburban office parks.
Apopka	There is a cluster of unreliable segments in downtown Apopka.
Oviedo	A small number of unreliable segments are present in and near downtown Oviedo.
Maitland/Eatonville	A combination of residential traffic and suburban office parks drive up travel times near the I-4 interchange.
Winter Garden/Ocoee	A small number of unreliable segments are present in and near downtown Winter Garden.
Downtown Orlando	As the region's economic and cultural center, downtown Orlando attracts a large number of employees and eventgoers that can overwhelm its roadway network.
Millenia/International Drive	One of the largest shopping and residential concentrations in the region, in close proximity to other major attractors such as Universal Studios, International Drive Premium Outlets, and the Convention Center.
Disney	The world-famous theme parks at Disney attract large numbers of cast and visitors, many of whom also visit supporting hospitality and leisure destinations on US 192 and SR 535.
Kissimmee	A cluster of unreliable segments is found along John Young Parkway and US 441/Orange Blossom Trail, and US 192 north of downtown Kissimmee.
St. Cloud	A small number of unreliable segments are present in and near downtown St. Cloud.

Figure 11: Least Reliable Areas in the MetroPlan Region



MetroPlan Orlando Connected and Automated Vehicle Readiness Study

Within this action of the CMP, MetroPlan Orlando recognizes that understanding the current state of the system when it comes to connected and automated vehicles (CAVs) is important as both are innovative technologies that can impact both recurring and non-recurring congestion. In August 2019, the MetroPlan Orlando Board approved a technical memorandum that documents an evaluation of the current preparedness of the region for the emergence of CAVs and recommends next steps to proactively enhance preparation efforts. The final report contains:

- An industry review of nationwide CAV deployments, standards, and best practices.
- An assessment of the preparedness within MetroPlan Orlando's planning area for CAV technologies.
- An overview of the stakeholder engagement that was conducted for this project.
- A summary of findings, conclusions, and recommended next steps for MetroPlan Orlando and the region.

The baseline conditions are shared below to help set the foundation of existing conditions and local capabilities and emerging/future needs with respect to preparedness for CAVs.

Roadway Infrastructure

There is a wide variety of development across the region in terms of roadway infrastructure to accommodate CAVs. By far, the majority of agencies in the region are taking a measured approach to CAV supportive infrastructure, due to the rapid (and sometimes unpredictable) evolution of devices and technologies. Most are focusing on infrastructure improvements that serve dual purposes - not just readiness for CAV, but for immediate needs such as roadway safety deployments (wrong way detection, curve warning systems, etc.) and improvements in operational capacity and monitoring (CCTV, Bluetooth readers, etc.).

Pavement markings and adequate signal systems are critical infrastructure components to CAV operations. In general, the larger agencies in the MetroPlan Orlando planning area (FDOT D5, the Central Florida Expressway Authority (CFX), Florida's Turnpike Enterprise (FTE), Orange, Seminole, and Osceola Counties, and the City of Orlando) have more advanced and robust levels of investment in roadway infrastructure with respect to deployed ITS and CAV-ready devices, and many continue to maintain signals on behalf of their local jurisdictions. The majority of agencies indicated their pavement markings should be more than suitable for AV deployments in terms of lane control and automated steering, due to FDOT design guidelines being comprehensive and state-of-the-practice. However, several agencies indicated the need for improved maintenance programs to keep pavement markings in a well-maintained state.

System and Network Capabilities

In terms of developing an existing conditions baseline, overall, the study found that a majority of jurisdictions in the MetroPlan Orlando region have fully implemented or are moving towards the use of fiber-optic cable (FOC) networks within their jurisdiction. The use of FOC networks has the potential to enable consistent communication and testing grounds for region-wide CAV deployment. While the implementation of communications is often straight-forward, anticipating data storage and server needs for agencies is a bit trickier, as many Central Florida jurisdictions have partnered with vendors to store data on cloud servers instead of in-house.

Staffing Proficiency and Training Needs

The majority of local agencies in the MetroPlan Orlando area indicated their staff (or contractors) have established proficiency in signal or TSP device installation, maintenance, and repair; however, they lack specific training in CAV applications, since much of the next generation software, equipment, and technologies are new and evolving rapidly.

Since there is no CAV-specific training being currently offered at the regional or state level, many agencies are training their existing operations and signal maintenance staff to different training levels, leading to a lack of consistency among jurisdictions.

Several stakeholders requested that a region-wide training program on CAV be developed, to promote consistency between counties and city jurisdictions on CAV testing, equipment, software, and deployment. In addition to serving as a common training, the collaboration of the region's operations and signal staff could provide an open forum for discussion and collaboration between jurisdictions on CAV-related issues that will arise as testing and deployment continue.

Equity Challenges

In terms of equity, several agencies indicated they anticipate equity challenges as they implement CAV applications. Going forward, ensuring equity for each jurisdiction's residents and visitors will be critical to the success of CAV implementation and deployment across the MetroPlan Orlando planning area. Agencies must collaborate and work together to ensure that all members of Central Florida's communities have equal access to the benefits of CAV technology or demonstrations, and that all sectors of their community have equal access to CAV implementations, going above and beyond Title VI and ADA requirements. FDOT D5 anticipates CAV implementation could lead to further stratification of existing trip types and sees potential in balancing trip chaining and directing subsidies to balance out the benefits of CAV. Agency-specific initiatives are summarized below in the final report.

The CAV Readiness Study Final Report, available on the MetroPlan Orlando website here: https://metroplanorlando.org/wp-content/uploads/MetroPlan-CAV-Readiness-7.1.20-Final.pdf, documents a set of recommendations for regional leaders to evaluate in terms of developing short-term to mid-term concepts and plans for CAV preparedness. A summary of the recommendations in each of five categories – Planning and Policy; Infrastructure; Data Collection and Management; Pilot Projects and Staffing and Training – is included in Table 39.

Table 39: Summary of Recommendations from the Connected and Automated Vehicle Readiness Study

Category	Recommendation
Planning & Policy	
Executive Guidance	• Ensure that leadership is on board with promoting CAV at the highest level. • Incorporate CAV deployment into transportation processes & stakeholder involvement. • Delineate state, local, and agency-specific regulatory, deployment and legislative roles. • Engage in national initiatives and industry groups to facilitate knowledge exchange.
Long Range Transportation Planning	• Emphasize planning and readiness for CAV technology in the 2045 MTP. • Note in the 2045 MTP the need to identify and prioritize CAV demonstration projects. • Reflect CAV development in adjacent and local jurisdictions transportation plans. • Educate key stakeholders/partners on CAV-related trends, opportunities & challenges. • Align CAV activities with existing committees or partnerships.
Site Development	• Identify districts/corridors that can be transitioned to multi-modal, CAV-friendly areas. • Develop guidelines/best practices for landscaping maintenance to accommodate CAVs. • Develop drop-off zone and CAV holding zone strategies for key urban districts/corridors. • Develop design guidelines for drop-off zones for a variety of land use types. • Identify strategic opportunities for creating drop-off zones. • Monitor parking trends to assess the impact of CAVs on parking demand. • Update recommendations for parking best practices as CAVs grow in market share. • Be prepared for circumstances that compel temporary or medium-term adjustments. • Assess and update signage standards and regulations as CAVs grow in market share.
Equity	• Support CAV application development in all geographic areas of the region. • Engage all types of communities to better understand needs, gaps, and opportunities. • Lead or support initiatives for workforce retraining and workforce readiness for CAV. • Ensure CAV pilot projects are accessible to users with varying abilities.

Infrastructure Guidelines	
Roadway Technology	• Develop guidelines to be applied at signalized intersections to allow for ease of CAV deployment and interoperability. • Develop minimum acceptable CAV signing and pavement marking guidelines. • Develop recommended maintenance standards, schedules and service life guidelines. • Assess whether current pavement marking standards are compatible with CAVs. • Determine if national CAV infrastructure guidelines are sufficient for everyday needs as well as for special cases. • Assess deployment and infrastructure requirements for EV charging stations.
TSM&O/ITS Guidelines	• Create communication guidelines with private industries (Google/Bing/Apple Maps, etc.) • Prioritize provision of a fast, reliable, secure, private, and interoperable wireless network. • Standardize IP assignments and ensure sufficient IP addresses are available. • Promote the sharing of fiber optic cable where feasible. • Use cyber locks and password protection at field locations to protect hardware. • Develop data sharing requirements between agencies and vendors/manufacturers. • Use a security credential management system (SCMS) to validate authorized users and verify the authenticity of transmitted messages. • Develop state and regional ITS architecture related to connected vehicles. • Develop guidelines for RSU equipment deployed in the region to ensure interoperability. • Create guidelines for a basic set of applications that RSU's in the region should operate.
Maintenance	• Define maintenance responsibilities between locals, the state, and private partners. • Ensure procurement of replacement equipment as equipment is deployed. • Identify funding sources for maintenance of CAV technologies on local roadways. • Establish acceptable roadside equipment downtimes. • Review the need for redundant systems to provide a backup if CAV technology fails. • Develop guidelines for CAV equipment monitoring. • Develop standardized maintenance procedures for roadside equipment. • Develop guidelines for changes to the MAP messaging (broadcast by RSUs).

Data Collection & Management	
Data Governance	• Establish data sharing regulations that protect proprietary/personally identifiable info. • Update data retention policies for CAV to reflect the value of new types of data. • Complete a cost-benefit analysis on storage needs for saving vast amounts of raw data. • Establish consistent and efficient methods to filter large data sets for usability. • Explore how CAV data could be used as a strategy to fund the transportation system. • Develop a CAV Data Governance Plan that identifies roles, responsibilities, and policies. • Learn from CAV pilot project experience what types of vendor data is most useful. • Use lessons learned to inform better data sharing agreements for future projects.
Data Collection/Storage	• Anticipate CAV data storage requirements, including data types and longevity needs. • Establish data sharing agreements with vehicle vendors and other private entities. • Ensure servers are capable of storing higher volumes of data; plan for future data needs. • Develop back-end systems capable of accepting and managing collected CAV data.
Data Sharing	• Develop open-source platforms to promote cross-collaboration and data sharing. • Implement policies to anonymize available CAV data prior to sharing. • Establish memorandums of understanding (MOUs) on how to share CAV data/resources. • Partner on data sharing with jurisdictions to promote Smart City connections.
Data Security	• Study/implement best practices related to security protocols for CAV data. • Protect personally identifiable information using separation and other techniques. • Ensure security at field locations and for messages transmitted between vehicles and roadside equipment.

Pilot Projects	
CV Pilot Projects	• Promote CV pilot projects and partner with local agencies to support pilots in the region. • Build an interoperable CV system between pilot projects within the region and beyond.
AV Pilot Projects	• Establish use cases for AV pilot projects that further the state of the practice. • Promote an equitable distribution of AV pilot projects within the region. • Partner with local interest groups to gain insight into user input on AV testing. • Partner with private automakers to learn about AV technology and advance pilot activity.
CAV Testing	• Expose the public to emerging technologies and demonstrate benefits via CAV testing. • Incorporate feedback/evaluation into CAV tests that engage the general public. • Evaluate pilot projects on if they met local needs and/or had unintended consequences. • Analyze CAV testing activities to better understand maintenance and staffing needs. • Establish guidance that requires pilots/deployments to proceed under safe conditions. • Maintain awareness of federal grant/other funding opportunities for pilots and projects. • Support federal and state lobbying efforts and statutes that promote CAV innovation. • Educate internal and external stakeholders to increase awareness of CAV technology.
Staffing & Training	
Recruitment/Retention	• Look for opportunities to hire from technology fields and local technical schools. • Offer existing staff new opportunities to work on CAV projects or testing. • Facilitate educational programs that will help meet recruitment needs to support CAVs. • Address recruitment challenges for attracting and retaining qualified data scientists and other technology positions; explore the possibility for joint hires between jurisdictions.
Training	• Identify training efforts with lessons learned from/site visits to early deployments. • Identify training that covers device setup, best practices for maintenance, standard operating procedures (SOPs) for troubleshooting, and device software interfaces. • Seek out available CAV certification programs & communications/networking training. • Seek out external training opportunities, such as webinars led by other states.

MetroPlan Orlando ITS Master Plan (2017)

The Intelligent Transportation System (ITS) Master Plan evaluated existing systems in the MetroPlan Orlando area, determined future needs, and outlined future ITS projects to improve traffic flow. The purpose of the Master Plan was to propose a system that improves efficiency, reliability and safety of the region's multi-modal transportation system.

A series of tasks were completed that provided a deep understanding of the regions' goals, objectives, needs, and strategies. The analysis showed that ITS investments not only help move transportation into the future, but also make financial sense. An inventory of existing ITS infrastructure for the City of Orlando, each of the three counties, LYNX, and FDOT identified a set of needs bundled into the following general groups: Travel and Traffic Management, Parking Management, Public Transit Management, Emergency Management, Information Management, Maintenance and Construction, and Other.

The ITS Master Plan recommended a set of future deployments that will be coordinated, integrated and interoperable. The Plan identifies and prioritizes a set of recommended projects that will prepare the region to support and benefit from emerging traffic technologies including integrated corridor management, active traffic management, automated vehicle location and connected and automated vehicles in a system that is scalable and agile. One of the key changes recommended in the Plan is the expansion of the communications infrastructure throughout the region that would allow for an increase of system reliability, interoperability and information sharing.

The proposed system envisioned in the Master Plan is designed to be state-of-the-practice with virtual traffic signal control, traffic monitoring, and roadway surveillance for incident management and traveler information using multiple subsystems. The subsystems include CCTV camera monitoring, DMS, MVDS, Bluetooth devices, and transit management all connected by a robust fiber optic system and an Ethernet network. A brief summary of each of the systems included in the Master Plan is below.

Traffic Signals System

Traffic signal hardware will continue to be connected to the existing ATMS and will be upgraded to be compatible with the signal management software, as applicable. All traffic signal upgrades will consist of the replacement of the traffic signal controller. Any traffic signals which are not already connected to the network will be interconnected using fiber optic communications along the corridor.

Adaptive Traffic Control System (ATCS)

Adaptive systems are becoming a versatile tool for a traffic engineer to employ in order to provide improved traffic operations based on real-time traffic conditions on the roadway. In an effort to improve traffic flow and reduce delay throughout the MetroPlan Orlando area, additional segments in the region would benefit from an adaptive traffic system.

Closed-Circuit Television Cameras System

Video plays an important role in the operation of the network by providing the capability to monitor traffic, verify incidents, and verify operation of field components. CCTV cameras can provide the ability to see traffic situations from the computer monitor of the designated employee(s) on a real-time basis, providing invaluable assistance in verifying the existence of traffic crashes and/or incidents prior to dispatching response crews (i.e., law enforcement, EMS and Fire and Rescue). CCTV cameras can monitor traffic flows along a corridor, enabling the designated operator(s) to select timing plans or adjust signal timings based upon the observed traffic flow patterns. Additional CCTV cameras will be deployed throughout the network to provide enhanced video traffic surveillance.

Travel Time Detection System

Travel Time Detection Systems involve collecting traffic information using various ITS technologies and posting traffic reports onto the 511 Traveler Information System and DMS system to help drivers learn about upcoming traffic delays, alternate route information and travel times. This information helps the motorists to divert away from the congested roadway and use alternative routes. A variety of travel time measurement systems have emerged as ideal mechanisms for constantly monitoring arterial performance, incident detection, and identification of irregular traffic patterns. Expansion projects should consider installing traffic sensors on primary arterials in the long term, depending on technology advances over time and general industry standards.

Transit Signal Priority (TSP)

TSP strategies adjust signal timing at intersections to better accommodate transit vehicles. Connected vehicle technologies provide opportunities to significantly enhance current TSP system by:

- Providing more accurate estimates of prevailing traffic conditions at signalized intersections;
- Allowing earlier detection and continuous monitoring of transit vehicles as they approach and progress through intersections; and
- Supporting more intelligent priority strategies that implement trade-offs between traffic and transit delay at intersections in a network

Traveler Information System

Dynamic Message Signs (DMS) and Advanced Dynamic Message Signs are typically used to provide motorists with real-time traffic information, travel times, incident information, vehicle alerts (such as America's Missing: Broadcast Emergency Response (AMBER) Alerts), safety related messages, and detour advisories in advance of key decision points along arterial roadways. Deployment of DMS systems will primarily be on limited access roadways, major arterials and evacuation routes. These signs will provide information on the status of the interstates and corridors so travelers can make informed decisions before committing to entering the roadway.

Full details of the ITS Master Plan are available on the MetroPlan Orlando website here: https://metroplanorlando.org/wp-content/uploads/MetroPlan_ITS-Master-Plan_Final.pdf. Several elements from the proposed system laid out in the ITS Master Plan are included in the recommended strategies in Section 7.0.

6.3 Goal #3: Access & Connectivity System Performance

Accessibility to Key Destinations by Vehicle

This evaluation considers access to a set of key regional destinations —which include major attractions, airports, and the convention center. MetroPlan Orlando has previously calculated this performance measure as the percent of the population within a 20-minute travel time to a key destination. A segment is categorized as being accessible, by car or transit, to key destinations if a significant portion of the segment is within a 20-minute travel shed from the centroid of any of the destinations listed below.

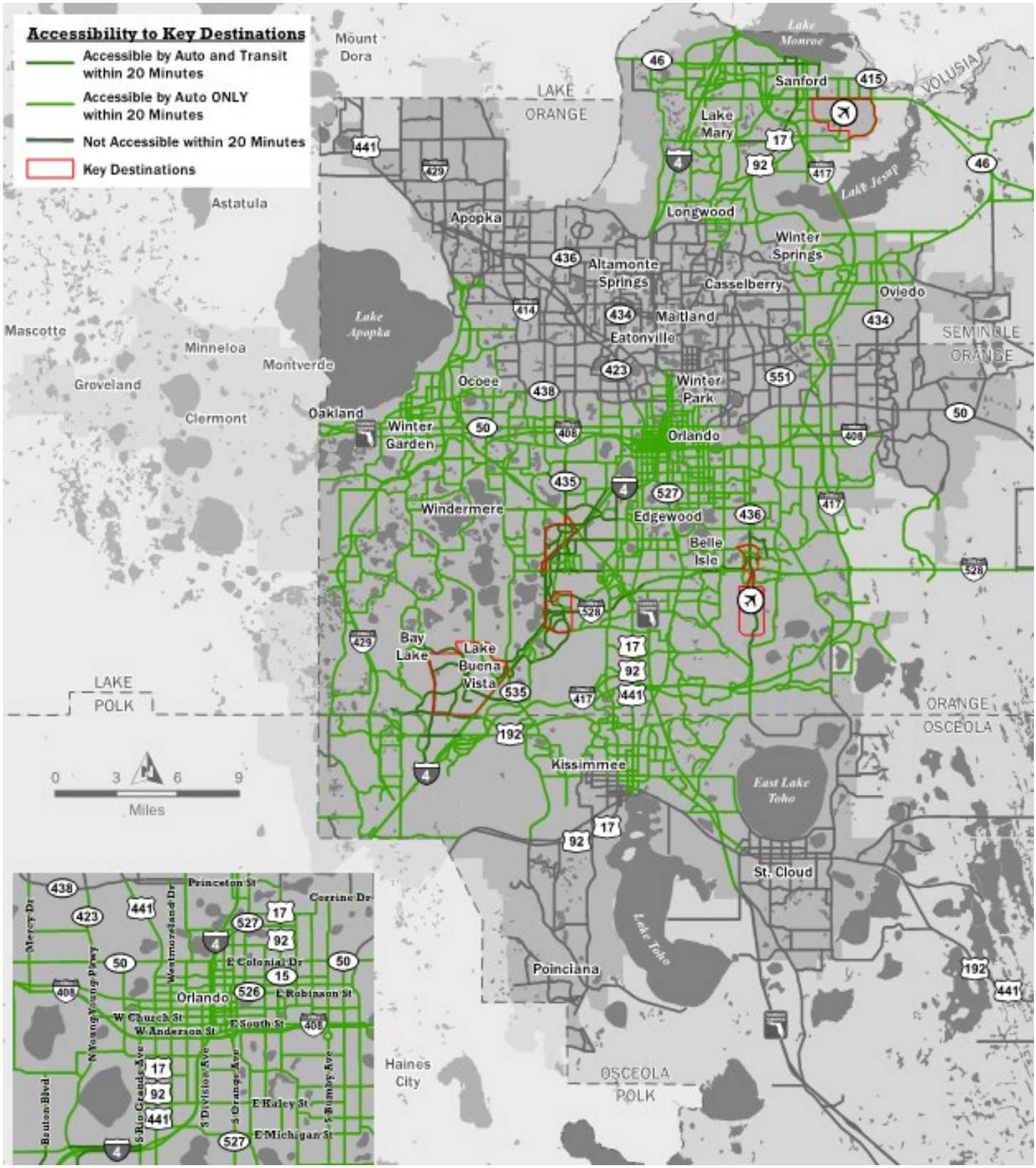
Category	Key Destination
Attractions	Disney World Universal Studios
Airports	Orlando International Airport (MCO) Sanford International Airport (SFB)
Convention Center	Orange County Convention Center

For the auto mode, average travel speeds for weekdays between 4 PM and 8 PM are used for determining proximity using ArcGIS' network analyst. For the transit mode, a conversion factor is applied to the auto speeds on segments with existing fixed-route transit service. Figure 12 presents a map of segments accessible to key destinations.

Accessibility to Activity Centers by Vehicle

The evaluation also considers access to regional activity centers, as defined by a 2015-2016 MetroPlan Orlando study using AirSage data and the socioeconomic data from the Orlando Urban Area Transportation Study (OUATS) model. Figure 13 displays the twenty (20) activity center locations. Unlike the Key Destinations evaluation, the one for activity centers uses a 30-minute travel time threshold. Based on a visual desktop analysis/assessment, a segment is categorized as accessible to activity centers if a significant portion of the segment is within a 30-minute travel shed from the centroid of any of the activity centers. The auto and transit speeds for this measure are the same as those used for the key destinations evaluation. Figure 14 presents a map of the segment-level accessibility to activity centers.

Figure 12: Accessibility to Key Destinations

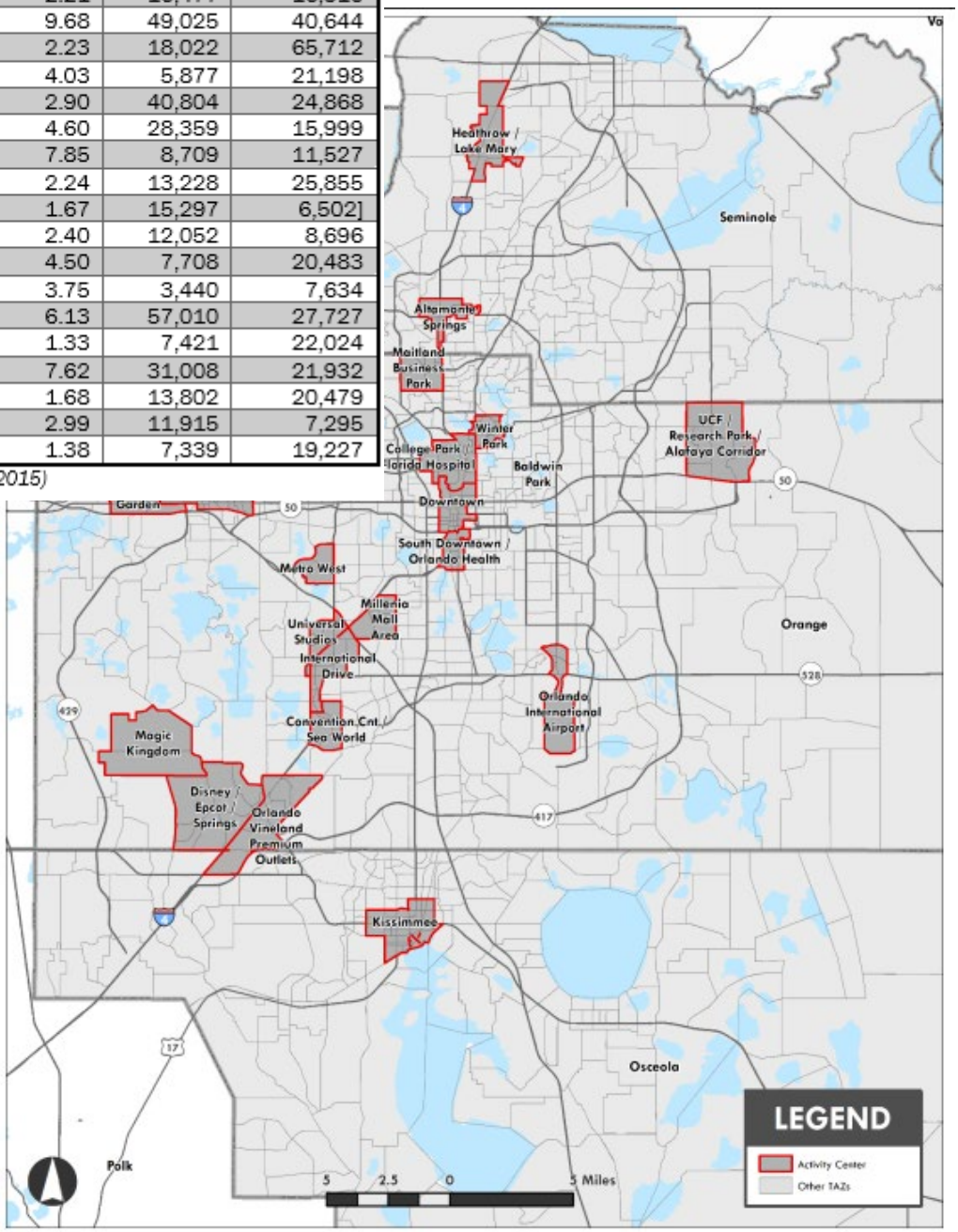


Source: Streetlight Data Location-Based Services (2019 Weekday 4-8pm)

Figure 13: Activity Centers within the MetroPlan Orlando Metropolitan Area

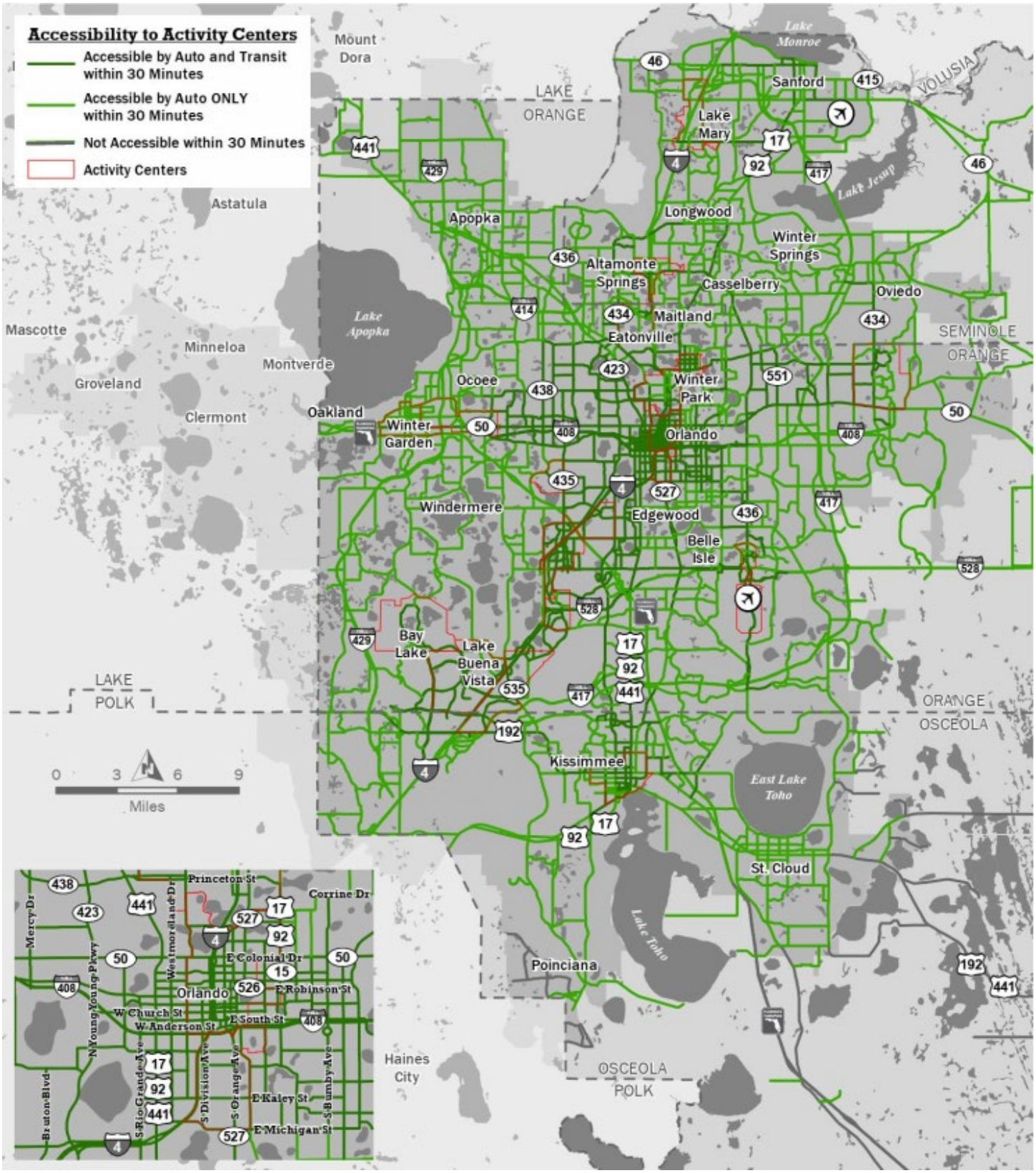
Name	Land Area (sq. mi.)	Population (2015)	Employment (2015)
Altamonte	1.88	11,179	17,422
College Park/Florida Hospital	3.39	14,948	16,629
Convention Ctr/Sea World	2.21	16,477	16,510
Disney/Epcot/Disney Springs	9.68	49,025	40,644
Downtown	2.23	18,022	65,712
Heathrow/Lake Mary	4.03	5,877	21,198
International Drive	2.90	40,804	24,868
Kissimmee	4.60	28,359	15,999
Magic Kingdom	7.85	8,709	11,527
Maitland Business Park	2.24	13,228	25,855
Metro West	1.67	15,297	6,502]
Millenia Mall Area	2.40	12,052	8,696
Ocoee	4.50	7,708	20,483
Orlando International Airport	3.75	3,440	7,634
Orlando Vineland Premium Outlets	6.13	57,010	27,727
South Downtown/Orlando Health	1.33	7,421	22,024
UCF/Research Park/Alafaya Corridor	7.62	31,008	21,932
Universal Studios	1.68	13,802	20,479
Winter Garden	2.99	11,915	7,295
Winter Park	1.38	7,339	19,227

Source: MetroPlan Orlando AirSage Data (April 2015)



Source: MetroPlan Orlando AirSage Data (April 2015)

Figure 14: Accessibility to Activity Centers by Vehicle

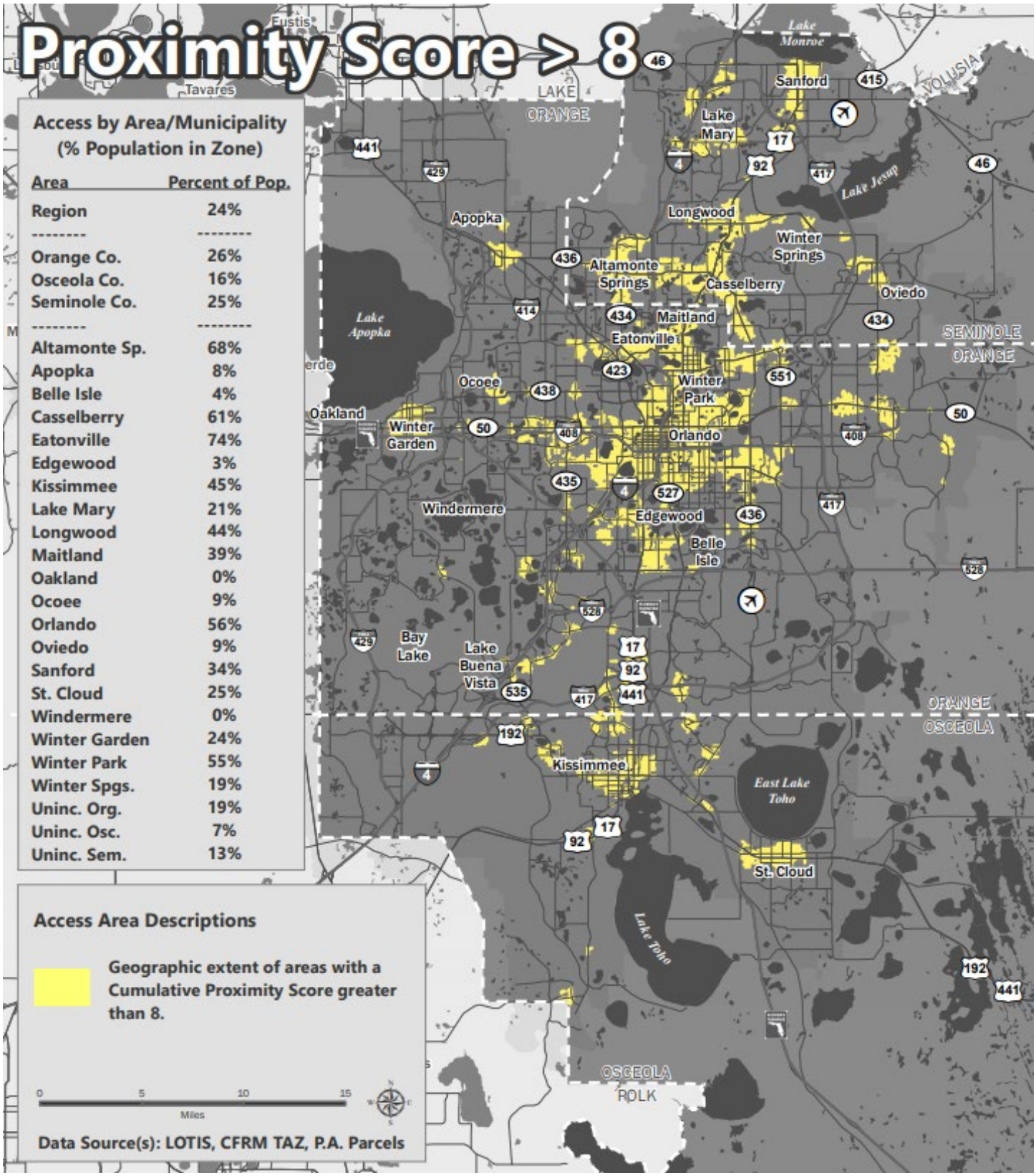


Source: Streetlight Data Location-Based Services (2019 Weekday 4-8pm)

Accessibility to Essential Services by Walking or Bicycle

MetroPlan Orlando worked with the East Central Florida Regional Planning Council (ECFRPC) to determine accessibility to essential services on foot and by bike throughout the three-county area. LOTIS (Land Overlaid on Transportation Information System) software was used to conduct the analysis. LOTIS is a unified planning database that overlays transportation and land use data over the MetroPlan Orlando region. This evaluation served as an indicator of the access to essential services including grocery stores, markets/convenience stores, small markets, restaurants, public parks, government, schools and health care. The results reflect the percentages of (1) population and (2) acreage within the MetroPlan Orlando planning area that have a proximity score higher than 8, indicating that percentage of population/acreage has access to essential services within a 10-minute walk. Figure 15 displays the areas within the region that received a proximity score higher than 8. In summary, the analysis indicated that 24% of the region's population can currently access essential services on foot or bicycle, with access primarily available in the downtown Orlando core and within other areas with focused development.

Figure 15: Locations with Access to Essential Services within a 10-minute Walk/Bicycle Ride



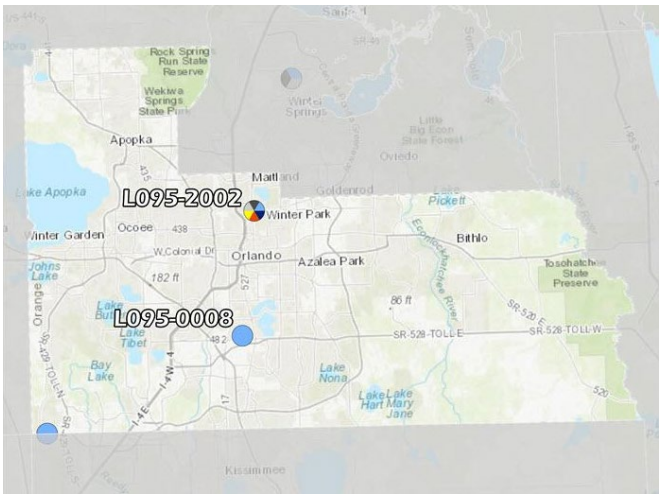
6.4 Goal #4: Health & Environment System Performance

MetroPlan Orlando utilized the state's air quality data found on the Florida Department of Environmental Protection website (https://floridadep.gov/air/air-monitoring/content/single-site-data) to evaluate the region's air quality.

Air Monitoring Sites

There are currently three air monitoring sites in operation with the MetroPlan Orlando planning area.

Orange County Air Monitor Sites



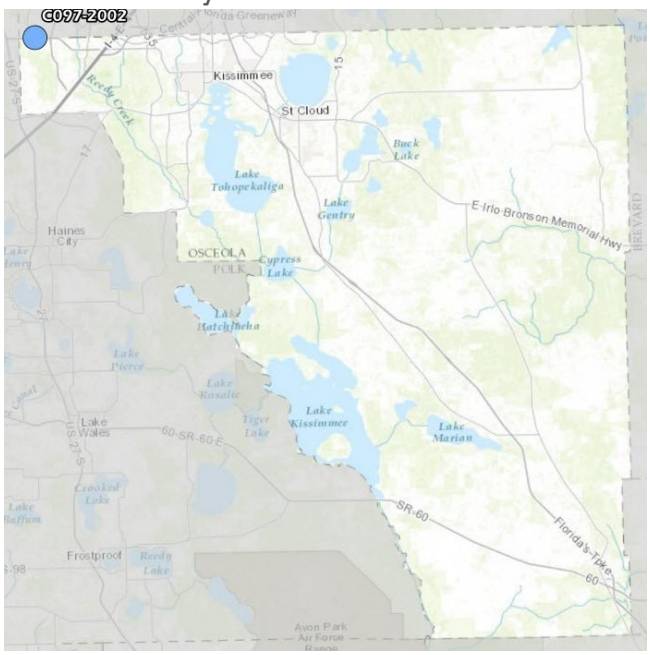
1. AQS # L095-2002 – Lake Isles Estates
   213 S. Denning Ave
   Winter Park, FL 32789

   Pollution Monitoring Data
   - Began monitoring Ozone on: 1/1/1976
   - Began monitoring Particle Pollution 2.5 on: 9/26/2016
   - Began monitoring SO2 on: 1/1/1976
   - Began monitoring NO2 on: 1/1/1981
   - Began monitoring CO on: 3/23/1978

2. AQS # 095-0010 – Skyview Drive
   7697 S. Orange Blossom Trail
   Orlando, FL 32809

   Pollution Monitoring Data
   - Began monitoring Ozone on: 3/5/2020

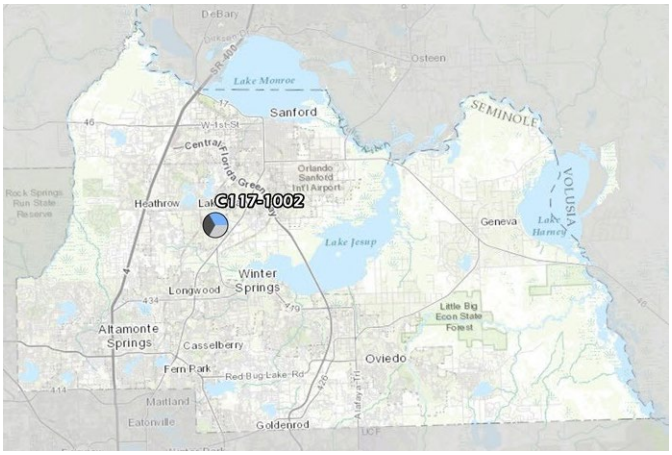
Osceola County Air Monitor Site



3. AQS # C097-2002 – Osceola Co. Fire Station
   8706 W Irlo Bronson Memorial Hwy (SR 192)
   Kissimmee, FL 34747

   Pollution Monitoring Data
   - Began monitoring Ozone on: 9/1/1993

Seminole County Air Monitor Site



4. AQS # C117-1002 – Seminole Community College
   284-300 Broadmoor Rd.
   Sanford, FL 32773-6199

Pollution Monitoring Data

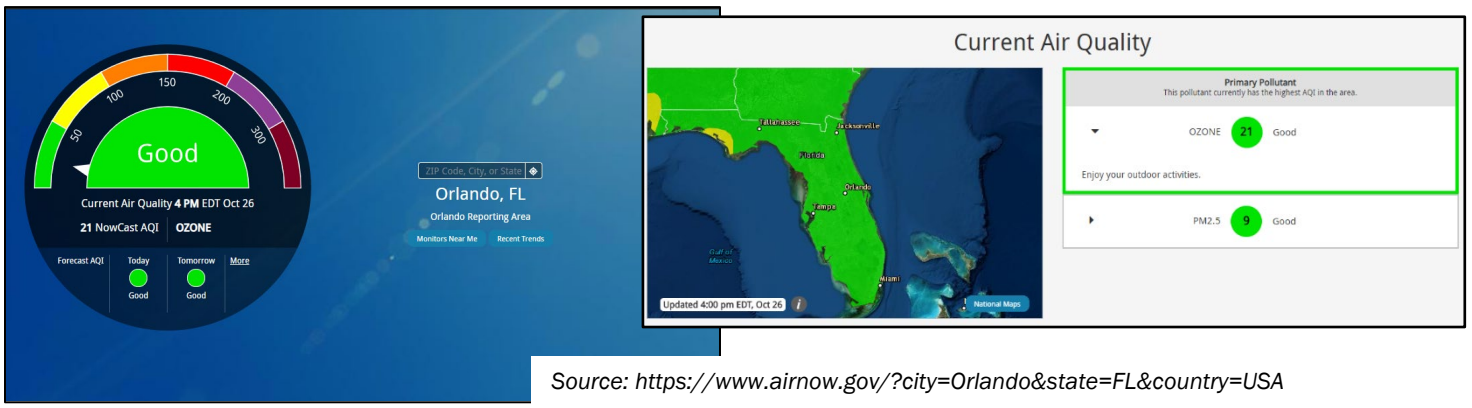
- Began monitoring Ozone on: 1/1/1980
- Began monitoring Particle Pollution 2.5 on: 9/20/2017
- Began monitoring Particle Pollution 10 on: 12/22/2000

Air Quality Index (AQI)

According to the Florida Department of Environmental Protection, the Air Quality Index (AQI) "is an index for reporting daily air quality. It tells you how clean or polluted your air is, and what associated health effects might be a concern for you. The AQI focuses on health effects one may experience within a few hours or days after breathing polluted air. It takes all the monitored pollutants and relates them to a single scale value to communicate air quality. The AQI uses a scale that runs from 0 to 500. The higher the AQI value the greater the level of air pollution, and the greater the health concern. For example, an AQI value of 50 represents good air quality with little potential to affect public health, while an AQI value over 300 represents hazardous air quality. Florida rarely has AQI values greater than 100 and has never officially had a value greater than 200. An AQI value of 100 generally corresponds to the national air quality standard for the pollutant, which is the level the U.S. Environmental Protection Agency (EPA) has set to protect public health. AQI values below 100 are generally thought of as satisfactory. AQI values near or just above 100 indicate air quality is considered to be unhealthy for certain sensitive groups of people. Higher AQI values indicate the air quality is unhealthy for everyone."

AQI is available through the Spatial Air Quality System for all sites in Florida with ozone or continuous fine particle monitors, the two pollutants most commonly driving the AQI concentration. Figure 16 is a snapshot in time during October 2020 showing the Orlando area's air quality where ozone is the primary pollutant (highest AQI) in the area.

Figure 16: City of Orlando's Air Quality Index and State of Florida Air Quality Index (on July 2, 2020)



Source: https://www.airnow.gov/?city=Orlando&state=FL&country=USA

Emissions

Florida's air quality has historically been good due to the location and proximity our state (and region) has to the ocean. However, traffic congestion produces emissions on a daily basis. Additional idling or vehicle miles traveled due to any of the causes of congestion previous mentioned will only exacerbate the issue.

According to a 2018 article from JP Morgan[5], the car industry is undergoing a radical transformation, with most carmakers agreeing the next 10 years will bring more change than the two previous decades. The next target date cited by automakers as a tipping point is 2025, when everything from materials and fuel to cost and the companies that build cars are set to look dramatically different. Automakers are preparing to phase out cars powered solely by internal combustion engines (ICEs) as governments look to tackle fuel emissions. The growth in electric vehicles (EVs) and hybrid electric vehicles (HEVs) is climbing and by 2025, EVs and HEVs will account for an estimated 30-40% of all vehicle sales.

6.5 Goal #5: Investment & Economy System Performance

To evaluate the economic impact of congestion on the MetroPlan Orlando region, reliability was assessed at the segment level for regional visitor emphasis corridors (i.e., corridors carrying 60% or more visitor traffic, as defined in the 2019 visitor study) using 2019 StreetLight data. Figure 17 displays the reliability of the visitor emphasis corridors followed by supporting Tables 40-41 summarizing the individual segments' reliability.

[5] https://www.jpmorgan.com/global/research/electric-vehicles

Figure 17: Level of Reliability for Regional Visitor Emphasis Corridors

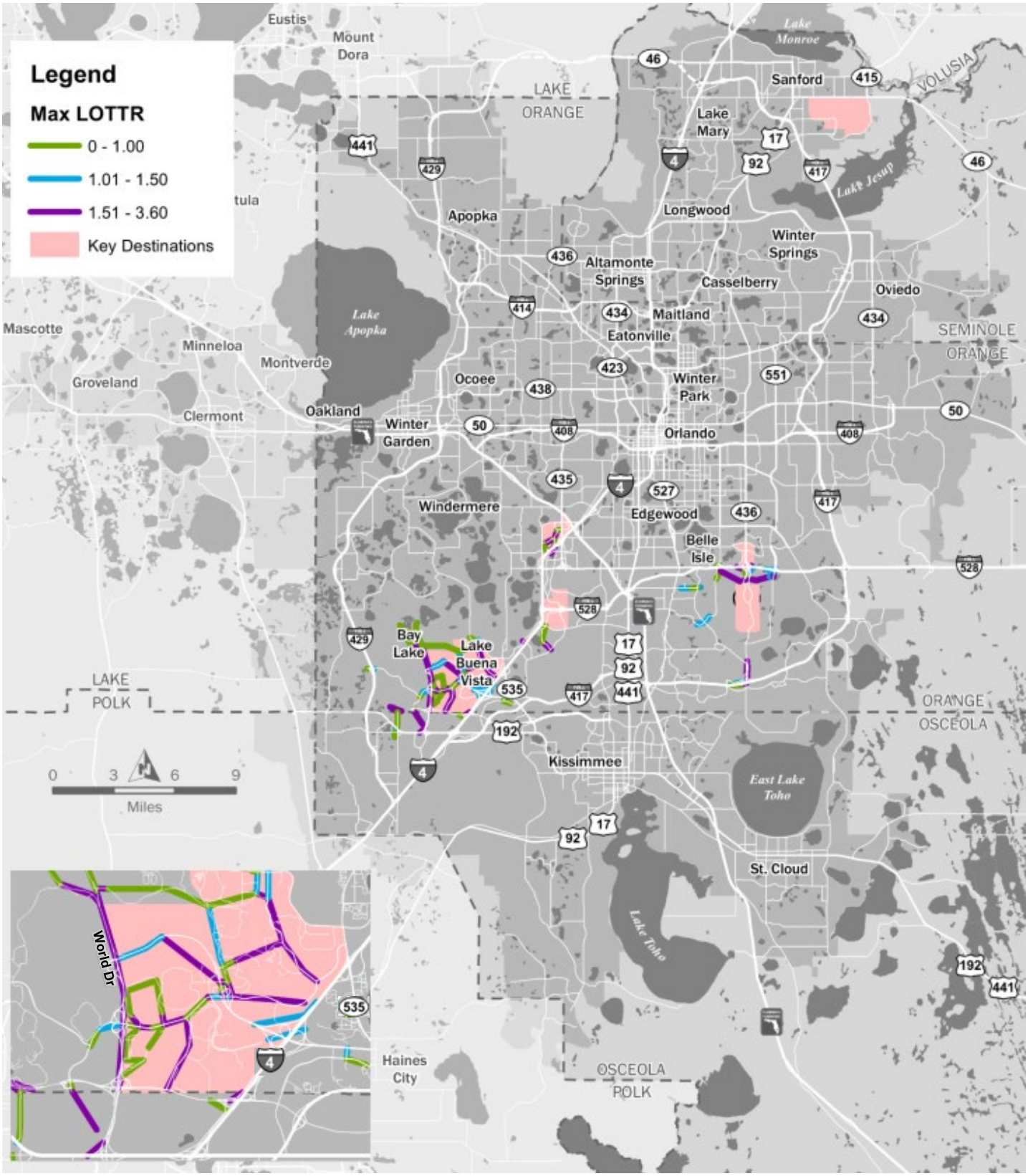


Table 40: Visitor Corridor Reliability

Road Name	Minimum Visitor Percent	Maximum Visitor Percent	Min Dir. No. of Lanes	Max Dir. No. of Lanes	Length (Miles)	Min Posted Speed	Max Posted Speed	Min LOTTR Max	Max LOTTR Max
1. 7 Seas Dr	64.05	71.75	1	1	1.22	25	25	0.00	0.00
2. Adventure Way	63.46	63.46	2	2	0.16	35	35	0.00	0.00
3. Bear Creek Rd	**63.73**	**63.73**	**2**	**2**	**0.53**	**25**	**25**	**3.60**	**3.60**
4. Bear Rd	**66.29**	**68.85**	**1**	**1**	**3.58**	**30**	**30**	**2.39**	**2.39**
5. Black Lake Rd	61.92	64.54	2	2	0.11	35	35	1.41	1.41
6. Bonnet Creek Rd	61.58	71.08	2	2	3.08	40	40	0.00	1.26
7. Buena Vista Dr	60.45	78.81	2	3	10.65	30	45	0.00	2.30
8. Cargo Rd	**60.78**	**67.27**	**2**	**2**	**2.77**	**25**	**35**	**1.27**	**2.39**
9. Community Dr	62.46	66.59	1	1	2.20	30	30	0.00	0.00
10. CR 527A	61.61	68.99	1	1	1.01	45	45	0.00	1.33
11. Disney/MGM Studio Access	**67.91**	**71.29**	**1**	**2**	**1.67**	**25**	**35**	**0.00**	**1.60**
12. Entry Point Blvd	60.38	60.51	1	1	0.51	20	20	0.00	0.00
13. Epcot Center Dr	**62.52**	**70.17**	**2**	**3**	**4.82**	**50**	**50**	**0.00**	**2.21**
14. Floridian Way	**69.84**	**74.87**	**1**	**2**	**3.66**	**35**	**45**	**0.00**	**1.77**
15. Hollywood Way	**70.22**	**70.48**	**2**	**2**	**0.52**	**35**	**35**	**0.00**	**1.55**
16. Hotel Loop Rd	**64.57**	**67.91**	**1**	**2**	**5.88**	**25**	**35**	**0.00**	**1.89**
17. International Ave	60.14	60.14	2	2	0.18	25	25	1.44	1.44
18. International Dr	62.08	63.88	3	3	0.66	45	45	0.00	0.00
19. Live Oak Ln	**62.31**	**62.31**	**1**	**1**	**0.22**	**30**	**30**	**1.58**	**1.58**
20. Major Blvd	62.18	62.18	3	3	0.13	30	30	0.00	0.00
21. Osceola Pkwy	**63.73**	**63.73**	**2**	**2**	**0.61**	**30**	**30**	**1.60**	**1.60**
22. Overpass Rd	**66.45**	**70.05**	**1**	**1**	**0.25**	**25**	**25**	**2.21**	**1.24**
23. I-4 SB Off-Ramp to SR 417	**60.28**	**88.58**	**1**	**2**	**10.60**	**35**	**40**	**0.00**	**2.39**
24. Secure Rd	66.29	68.85	1	1	1.29	30	30	0.00	0.00
25. Sherberth Rd	63.73	63.73	2	2	0.77	35	35	0.00	0.00

Road Name	Minimum Visitor Percent	Maximum Visitor Percent	Min Dir. No. of Lanes	Max Dir. No. of Lanes	Length (Miles)	Min Posted Speed	Max Posted Speed	Min LOTTR Max	Max LOTTR Max
26. SR 535	61.32	64.88	2	2	0.63	40	40	0.00	0.00
27. SR 536	**61.00**	**65.58**	**2**	**2**	**0.25**	**30**	**45**	**1.63**	**1.63**
28. SR 551	**62.98**	**62.98**	**3**	**3**	**0.28**	**45**	**45**	**2.39**	**2.39**
29. Tradeport Dr	60.67	62.10	2	2	0.80	45	45	1.21	1.31
30. Universal Blvd	**61.23**	**67.79**	**3**	**3**	**1.05**	**30**	**30**	**0.00**	**1.65**
31. Victory Way	**61.98**	**62.62**	**2**	**2**	**1.25**	**45**	**45**	**1.71**	**1.71**
32. Vista Blvd	**62.15**	**73.08**	**1**	**1**	**5.15**	**30**	**45**	**0.00**	**1.77**
33. W Buena Vista Dr	**75.84**	**78.81**	**2**	**2**	**1.50**	**30**	**30**	**2.53**	**2.53**
34. Western Way	74.93	81.29	2	2	0.44	40	40	0.00	1.09
35. Westwood Blvd	60.49	65.24	2	2	2.85	40	40	0.00	1.47
36. World Dr	**60.43**	**68.98**	**1**	**3**	**8.46**	**55**	**55**	**0.00**	**1.89**

Note: Bold indicates unreliable facilities with a Max LOTTR greater than 1.50

Table 41: Least Reliable Visitor Corridors (Max LOTTR greater than 1.50)

Road Name	Minimum Visitor Percent	Maximum Visitor Percent	Min Dir. No. of Lanes	Max Dir. No. of Lanes	Length (Miles)	Min Posted Speed	Max Posted Speed	Min LOTTR Max	Max LOTTR Max
1. Bear Creek Rd	63.73	63.73	2	2	0.53	25	25	3.60	3.60
2. Bear Rd	66.29	68.85	1	1	3.58	30	30	2.39	2.39
3. Cargo Rd	60.78	67.27	2	2	2.77	25	35	1.27	2.39
4. Dis/MGM Studio Acc.	67.91	71.29	1	2	1.67	25	35	0.00	1.60
5. Epcot Center Dr	62.52	70.17	2	3	4.82	50	50	0.00	2.21
6. Floridian Way	69.84	74.87	1	2	3.66	35	45	0.00	1.77
7. Hollywood Way	70.22	70.48	2	2	0.52	35	35	0.00	1.55
8. Hotel Loop Rd	64.57	67.91	1	2	5.88	25	35	0.00	1.89
9. Live Oak Ln	62.31	62.31	1	1	0.22	30	30	1.58	1.58
10. Osceola Pkwy	63.73	63.73	2	2	0.61	30	30	1.60	1.60

Road Name	Minimum Visitor Percent	Maximum Visitor Percent	Min Dir. No. of Lanes	Max Dir. No. of Lanes	Length (Miles)	Min Posted Speed	Max Posted Speed	Min LOTTR Max	Max LOTTR Max
11. Overpass Rd	66.45	70.05	1	1	0.25	25	25	2.21	1.24
12. SR 536	61.00	65.58	2	2	0.25	30	45	1.63	1.63
13. SR 551	62.98	62.98	3	3	0.28	45	45	2.39	2.39
14. Victory Way	61.98	62.62	2	2	1.25	45	45	1.71	1.71
15. W Buena Vista Dr	75.84	78.81	2	2	1.50	30	30	2.53	2.53
16. World Dr	60.43	68.98	1	3	8.46	55	55	0.00	1.89

7.0 Identification and Assessment of Strategies

The identification and assessment of appropriate congestion mitigation strategies is a key component of the CMP. Having identified where the region is experiencing congestion-related issues, the next action within the CMP process is to develop a set of recommended strategies to effectively manage congestion and achieve the congestion management objectives developed under Action 1. The identification of strategies involves several important considerations:

- Potential for meeting Congestion Management objectives
- Local context
- Contribution to other regional planning objectives

> ***What strategies could aid in congestion management?***
>
> 23 CFR 450.320 (c) 4 states that the CMP shall include: "Identification and evaluation of the anticipated performance and expected benefits of appropriate congestion management strategies that will contribute to the more effective use and improved safety of existing and future transportation systems based on the established performance measures. The following categories of strategies, or combinations of strategies, are some examples of what should be appropriately considered for each area:
>
> i. Demand management measures, including growth management and congestion pricing;
> ii. Traffic operational improvements;
> iii. Public transportation improvements;
> iv. ITS technologies as related to the regional ITS architecture; and
> v. Where necessary, additional system capacity."

7.1 Congestion Management Strategy Toolbox

MetroPlan Orlando staff utilized FHWA's Planning for Operations research to identify the congestion management "toolbox" of strategies. Below is a summary of the wide-ranging set of congestion management strategies that were considered as part of Action 6.

Transportation System Management & Operations (TSM&O) Strategies

The existing transportation system can be utilized most effectively and efficiently through TSM&O strategies. TSM&O is a program based on actively managing the multimodal transportation network and optimizing performance of the existing system to preserve capacity and improve the safety and reliability of the transportation system. Several categories of TSM&O strategies are described below.

Transit Operations and Management. These strategies pertain to the operation and management of the transit system in a safe and efficient manner.

- Strategies include: transit signal preemption, designated lanes for transit, express bus service, high-capacity and high-frequency transit service, optimized route structure, queue jumps, pedestrian and bicycle infrastructure including at signals, active monitoring technology, electronic fare collection, hard shoulder running, expanded hours or frequency, consolidated account systems among transit providers/modes, and improved user interfaces to facilitate trip planning.

Travel Demand Management. Travel demand management is defined as providing users with effective travel choices to shift or reduce the demand for travel in congested conditions. Travel demand management oversees two types of travel: commute travel and travel associated with tourism, emergencies, special events, shopping, etc.

- Strategies include: parking pricing strategies and management, congestion pricing, flexible work hours or telecommuting/work from home benefits and policies, trip chaining, carpool and vanpool programs, park-n-ride lots, mixed use development, first/last mile options.

Arterial Management. Arterial management is the management of arterial facilities in a manner that provides users with a safe, efficient, and reliable trip.

- Strategies include: Integrated corridor management, traffic signal coordination, advance traffic management systems (ATMS), special use lanes, active monitoring technology, reducing access points, reducing full access density, alternative intersection geometry and signal phasing, reversible lane systems, variable speed limits.

Freeway Management. Freeway management is the implementation of policies, strategies, and technologies to improve freeway performance. The over-riding objectives of freeway management programs include minimizing congestion (and its side effects), improving safety, and enhancing overall mobility.

- Strategies include: Ramp metering, congestion pricing, managed lanes, special use lanes, active monitoring technology.

Freight Management. Freight management is the effective management of the system for freight transportation. The goal of freight is to move goods safely, efficiently, and reliably throughout the region. This may range from satisfying the customer (e.g., freight shippers, receivers, and carriers) to reducing travel time on the system.

- Strategies include: Freight priority corridors/signals, congestion pricing, curb management, commercial truck parking areas.

Emergency / Incident Management. Emergency management is designed to provide users with a safe and efficient transportation system during an emergency situation. Incident management is defined as verifying, responding to, and clearing traffic incidents in a manner that provides transportation system users with the least disruption.

- Strategies include: Expanding the use of roving patrols (e.g., Road Ranger programs), enhancing inter-agency voice and data communications systems, active monitoring technology (i.e., CCTV cameras), emergency equipment technology and vehicle upgrades, responder training, dynamic detours, queue warning systems and other traveler information messaging, hard shoulder running, reversible lanes.

Work Zone Management. Work zone management involves organizing and operating areas impacted by road or rail construction or maintenance activities to minimize traffic delays, maintain safety for workers as well as travelers, and accomplish the work efficiently.

- Strategies include: Deploying and managing DMS and websites, advanced warning signs, integration into traveler information systems, dynamic detours.

Special Event Management. Special event management provides users with a safe and efficiently managed transportation system during a planned special event.

- Strategies include: Deploying and managing DMS and websites, advanced warning signs, integration into traveler information systems, integrated corridor management, recurring and routine interagency coordination and planning, dynamic detours.

Travel Weather Management. Travel weather management focuses on providing users with a safe and efficient transportation system during and after weather events.

- Strategies include: Deploying and managing DMS and websites, traveler information messaging (via mobile access or integration into vehicles), dynamic detours, hard shoulder running.

Traveler Information. Traveler information is designed to provide transportation system users with the information they need to choose the safest and most efficient mode and route of travel.

- Strategies include: Deploying and managing DMS and websites, mobile access to information, integration into vehicles.

Non-Motorized Transportation Strategies. Non-motorized transportation strategies include improvements that directly impact bicycle and pedestrian facilities and may encourage a shift from automobile trips to these other modes.

- Strategies include: New sidewalk connections, designated bicycle facilities, improved safety of existing bicycle and pedestrian facilities, exclusive non-motorized right of way, complete streets.

Strategies to Add Capacity

Strategies to add capacity are generally much costlier than TSM&O strategies and should be considered a last resort for reducing congestion. These strategies tend to fall outside the near-term time period a CMP focuses on and are more suited for the long-term time period addressed in the MTP. Strategies to add capacity can either address long-term needs via corridor-wide or alternative route expansion or can contribute to moving more traffic through a short bottleneck location in less time. These improvements are costly and will require high construction dollars to accomplish the needed goals.

- Strategies include: Adding traffic lanes, constructing new roadways, managed lanes, auxiliary lanes, intersection improvements

7.2 Congestion Management Strategies Identified for the MetroPlan Orlando Planning Area

Based on the results of the congestion management evaluations documented under Action 6, the following TSM&O programs and projects are recommended as priority opportunities for MetroPlan Orlando to invest in to manage congestion. These priorities focus around creating more system options, system efficiency, and system reliability. The recommended strategies are focused in three key areas that are anticipated to reduce both recurring and non-recurring congestion:

1. Improving safety for all users
2. Optimizing capacity on the regional transportation system
3. Shifting single-occupant vehicle (SOV) trips to other modes

The recommended strategies are primarily pulled from the TSM&O toolbox detailed above, in an effort to prioritize projects that will improve congestion within the five-year cycle before the next CMP update. Capacity improvements (including intersection and interchange reconfigurations) are recommended for consideration as tools to optimize capacity and resolve bottlenecks in targeted areas. Table 42 summarizes the recommended strategies for congestion management over the next five years. In keeping with FHWA guidance, this CMP does not identify specific projects but rather supplies recommended actions and strategies that can advance MetroPlan Orlando's overall goals for system performance and reliability.

Table 42: Recommended Congestion Management Strategies

Strategies that improve safety for all users

Implementing strategies that improve safety will support the Safety and Security goal developed for both the Congestion Management Process and for MetroPlan Orlando's long-term planning as documented in the 2045 Metropolitan Transportation Plan. These strategies also target non-recurring congestion by seeking to reduce traffic incidents and crashes. Recommended strategies include:

- **Support the FDOT Toward Zero Deaths Initiative and Vital Few focus areas.**
  - Develop a Vision Zero Action Plan for the region
  - Prioritize initiatives and projects in the MetroPlan Orlando region that focus on improving safety for all system users in support of a Vision Zero approach. Advance projects that follow the tenets of the Safe Systems approach with a focus on Evaluation, Engineering (using the Crash Modification Factors Clearinghouse), Enforcement, Education, and Encouragement techniques.
- **Advance the role of predictive analytics in informing and assisting with incident management.**

  MetroPlan Orlando is partnering with the University of Central Florida and FDOT District 5 to pilot a predictive safety analytic tool – the *Crash Prediction for Expedited Detection* (CPED) application – under an FHWA grant. The tool aims to enable faster crash identification and responses by using predictive information and visualization of current traffic conditions enabled through access to CCTV camera access. The CPED application is expected to improve road safety and reduce congestion by reducing the duration and impact of crashes and reducing the number and impact of secondary crashes.
- **Implement the recommendations from the MetroPlan Orlando Bicycle and Pedestrian Safety Action Plans (BPSAPs).**

  The BPSAPs evaluated and ranked a series of pedestrian and bicyclist crash countermeasures based on potential to reduce the observed frequency and severity of various crash types. The range of potential crash countermeasures include infrastructure-related modifications to the roadway and surrounding environment, control countermeasures that prescribe road user behaviors, and behavioral changes targeted at the traveling public.

  The following countermeasures were ranked highest and specific actions are recommended for further analysis and implementation to improve bicycle and pedestrian safety on the corridors studied as part of the BPSAPs and throughout the region:

  - ***Behavioral countermeasures***: Better bicyclist lane control and yielding; better pedestrian yielding; better driver scanning and yielding

    Recommended action: Identify key messaging and distribution campaign to educate the traveling public and encourage the behaviors most likely to reduce crashes.
  - ***Design countermeasures***: Improved lighting; additional bike lanes, where appropriate

    Recommended action: Identify locations for design changes most likely to reduce crashes. Focus initially on the corridors studied as part of the BPSAPs, and then on other locations where crash history, typology and environmental factors indicate the likelihood of effectiveness.

- ***Control Counter Measures***: Nighttime speed reductions, reduced posted speeds.

  Recommended action: Evaluate current operating speeds and identify practicable speed-related countermeasures on high severity corridors where speeds and darkness contribute most to pedestrian and bicyclist fatalities and serious injuries.

- **Expand Emergency / Incident Management Programs.**

  FDOT District 5 provides a variety of services to support traffic incident management (TIM) efforts. TIM support services include management of the Regional Transportation Management Center (RTMC), which provides real-time traveler information to the public via an extensive Intelligent Transportation Systems (ITS) network. The TIM program also oversees deployment of the Road Rangers and Asset Management teams, who both work to ensure the safety of emergency responders and the traveling public by providing emergency maintenance of traffic during incidents, assisting with emergency repairs, and offering roadside assistance to stranded motorists. These efforts protect the travelers and responders involved in initial traffic incidents, help to return roadways to normal operations as quickly as possible, and decrease the risk of secondary crashes.

  The following strategies are recommended to manage congestion-related traffic incidents and other emergencies on area roadways:

  - Continue to support the Road Rangers service patrol program to encourage expeditious management of traffic incidents on limited access roadways in the region.
  - Continue to utilize Integrated Corridor Management (ICM) to redirect traffic for major incidents. ICM uses data collected on the freeway and arterial system to actively manage the multimodal system and make operational decisions for the benefit of system mobility as a whole. It provides the ability to treat transportation as a single system and increases the operational efficiency of the whole transportation network.
  - Expand notification systems so that information about traffic incidents and related detours are pushed through dynamic message signage (DMS), on mobile platforms (Waze, Florida 511) and to connected vehicles enabled with appropriate technology. More informed drivers can result in more efficiently utilized roadway capacity.

Strategies that optimize system capacity

Implementing strategies that optimize system capacity supports the following goal areas: Reliability and Performance, Health and Environment, and Investment and Economy. The strategies identified below deliver improved reliability of the transportation network by minimizing recurring congestion. Providing a less congested, reliable network will, in turn, help to reduce the amount of congestion-produced air pollutants and support economic success by increasing freight efficiency and improving the travel experience for visitor and workers.

<u>Freeway Management Strategies</u>

- **Introduce ramp metering, as appropriate.**

  Ramp metering is a potential tool to address recurring congestion and safety issues. Ramp meters are traffic

signals installed on freeway on-ramps to reduce overall freeway congestion by managing the amount of traffic entering the freeway and by breaking up platoons that make merging onto the freeway difficult. The signal timing at ramp metered locations can be adjusted based on traffic volume and speed at any given time.

Potential benefits of ramp metering include reducing crashes, breaking up platoons, and increasing vehicle throughput in a cost-effective manner. Ramp metering is currently planned for implementation on the I-4 managed lanes.

- **Evaluate and implement managed lanes where appropriate**.

  Managed lanes are a TSM&O approach, defined as highway facilities or set of lanes within an existing highway facility where operational strategies are proactively implemented and managed in response to changing conditions using a combination of tools. These tools may include access, vehicle eligibility, pricing, or some combination. Some examples of managed lanes are high-occupancy vehicle (HOV) lanes, high-occupancy toll (HOT) lanes, truck only lanes, bus rapid transit lanes, reversible lanes and express lanes.

  Tolling is not a requirement for a managed lane, but can be used to provide individuals with a choice of paying a toll to move through congested areas and experience a more reliable trip. The I-4 Ultimate managed lanes project (currently underway) consists of three primary elements used in coordination to manage congestion and improve travel time reliability: electronic toll collection, pricing, and ITS.

  Additional managed lanes concepts should be evaluated on other limited access facilities within the region to determine the potential for improved travel time reliability, greater travel options and choices, and more efficient use of system capacity.

- **Consider interchange improvements / auxiliary lanes where appropriate**.

  Interchange improvements and/or auxiliary lanes are options that should be evaluated where traffic demand overwhelms available capacity at an interchange or along a freeway corridor, particularly where recurring localized bottlenecks are predictable in cause, location, time of day, and approximate duration. Common locations of bottlenecks include places where the number of lanes decreases, at ramp junctions and interchanges, and where there are roadway alignment changes.

<u>Arterial Management Strategies</u>

- **Expand the "actively monitored" system.**

  Active management of the transportation system is already a priority in the region, with 37% of system miles that are actively monitored or managed. This includes: those with fiber in place; those with coordinated or interconnected signals; those with CCTVs, Bluetooth devices, DMS, electronic display signs, or MVDS in place; and those that are included within the Integrated Corridor Management (ICM) system being managed by FDOT. Expanding the actively monitored system will support various other recommended strategies and continue to integrate technology to improve the flow of vehicle traffic and improve safety.

  Several local jurisdictions have developed plans to expand their advanced traffic management systems (ATMS), lay additional fiber, install traffic cameras, and other elements that add to the actively managed system. During the next monitoring period it is recommended that funding of these activities be prioritized.

- **Continue the Signal Retiming program.**

Signal retiming along corridors is a relatively low-cost TSM&O strategy that typically results in measurable benefits. Regular signal retiming helps improve traffic flow and account for changes in traffic patterns. Since 2007, MetroPlan Orlando has ranked retiming and coordinating traffic signals as a top priority to mitigate traffic congestion, enhance intersection capacity, make roadways more efficient, and improve air quality and safety. It is recommended that this program remains a funding priority for MetroPlan Orlando given the year over year benefits the program has had in improving travel times and intersection delay on arterial roadways throughout the region.

- **Expand ICM program**.

  As noted above, ICM uses data collected on the freeway and arterial system to actively manage the multimodal system and make operational decisions for the benefit of system mobility as a whole. It is recommended that the program continue to be a priority with expansions as appropriate – to include additional arterial corridors and to manage traffic during a variety of incident and event types – to increase the operational efficiency of the whole transportation network and maximize the impact of transportation investments.

- **Intersection improvements.**

  Geometric improvements can improve the traffic flow through an intersection and should be evaluated for potential implementation along arterials to improve travel time reliability and/or safety. These types of upgrades include additional turning lanes, protected turns, turn restrictions, lane widening, implementing alternative intersection geometry configurations, and other methods of improving the intersection's capacity.

Freight Management Strategies

- **Increase reliability of key truck routes and improve connectivity to major freight terminals**.

  As Florida's population continues to grow and freight movement responds to commercial and consumer demands it is critical that freight vehicles move through the region on schedule, and that they are able to access local drop-off points safely and easily in support of the complex, dispersed, and resilient supply chain. Many of the freeway and arterial strategies aimed at improving reliability can positively impact freight travel through the region and it is recommended that projects that will support improved reliability and connectivity for freight deliveries be prioritized. Relatedly, truck parking needs must be addressed to ensure the trucking industry has the necessary infrastructure to serve global trade while complying with trucking regulations and the quality of life of nearby communities.

- **Develop consistent curb management throughout the region**.

  Curb space is a highly sought-after commodity. Drivers parking cars, bicyclists and pedestrians moving from point A to B, street vendors, transportation network companies (TNCs) like Uber or Lyft picking up or dropping off passengers and, of course, vehicles making deliveries are among the contenders for this thin ribbon of limited real-estate. It is recommended that the region prioritize planning for curb management so that the region can update methods to think about curb use on a minute-by-minute scale. Particularly in downtowns and urbanized areas, having a robust curb management strategy will have a significant impact on congestion at the local street level. Several local jurisdictions are already working to evaluate or develop curb management strategies, and it is recommended that MetroPlan Orlando support these efforts through

funding, provision of training/access to thought leadership and promoting consistency so that travelers can quickly gain an understanding of how to utilize these spaces across the region.

Automated, Connected, Electric and Shared (ACES) Vehicle Strategies

- **Integrate findings from the Connected and Automated Vehicle Readiness Study into planning efforts.**

  Automated vehicles, when immersed in bulk traffic, have the potential to improve traffic flow and fuel consumption and help to prevent traffic jams or dissipate them once formed. Pilot testing of connected and automated vehicle technologies is already underway in Central Florida, and many more use cases need to be piloted throughout the region in order to assess what infrastructure improvements are needed to support these technologies. A summary of the recommended actions to prepare the region to support CAVs is included in Section 6.0. For the monitoring period associated with this CMP update, the following items are recommended to take priority:

  - Fund CAV demonstration projects across modes and geographies, including testing of automated public transportation options, shared vehicles and truck platooning.
  - Work with FDOT and local partners develop guidelines for roadway technology, TSM&O/ITS support infrastructure, site development, and maintenance.
  - Make a plan for data collection and management associated with CAVs.
  - Develop an outreach campaign aimed at educating stakeholders, including the traveling public, and increasing awareness of CAV technology.
  - Prioritize workforce development to prepare the industry to be supportive of CAVs through recruitment of qualified new staff and training opportunities for existing staff.

- **Plan for electric vehicle (EV) charging station integration.**

  The Florida Department of Agriculture and Consumer Services' Office of Energy is working on an Electric Vehicle Roadmap for the state of Florida. The goals of this roadmap are to identify best practices for siting charging stations, impacts on the electric grid, and barriers to expansion of charging infrastructure. Prioritizing sustainable modes of transportation is critical in order to reduce emissions and congestion, and as EVs become more common on area roadways, it will be important that Central Florida has a regional plan for providing supportive infrastructure to accommodate these vehicles. It is recommended that an EV Roadmap that builds on the state efforts be developed for Central Florida.

Data Collection and Monitoring Strategies

Big data plays an important role in a "smart" city or region. Data measuring traffic congestion can be used by transportation planners and public agencies to identify problems, propose countermeasures, assess improvements and develop policies. Transportation professionals can process data from IoT ("Internet of Things") devices and sensors to recognize patterns and needs. The analysis capabilities afforded by the presence of meaningful data stores can reduce the number of road crashes and congestion, help mitigate for incidents that do occur, and help drivers find a parking spot, among other use cases. It is recommended that the region leverage data collection and monitoring in order to advance "smart" technology and find innovative solutions to some of the region's most pressing challenges. Specific strategies recommended for consideration include:

- **Develop a congestion management dashboard.**

  The purpose of the dashboard would be to house and illustrate key, real-time and historical metrics pertaining to daily travel options and operations. It is envisioned that such a dashboard would provide information to help inform the choices of travelers in the region on a day-to-day basis with respect to mode choice and route, and also inform transportation professionals trying to assess conditions and make policy or project recommendations.

- **Data purchasing.**

  Set aside funding to purchase data such as StreetLight, WeJo, etc. on a recurring basis

Strategies that shift SOV trips to other forms of travel

Strategies that shift single-occupant vehicle (SOV) trips to other modes can have a real impact on congestion levels on area roadways if the shift is significant enough. The strategies recommended within this category focus on how programs and projects can increase the likelihood that residents and visitors in the region will take full advantage of the region's multimodal system (or technology) to gain access to jobs, recreation and essential services. Many of the strategies will support the Access and Connectivity goal area.

- **Magnify Travel Demand Management [6] (TDM) strategies**

  Transportation demand management (TDM), or simply demand management, is defined a set of strategies aimed at maximizing traveler choices. Per FHWA:

  Managing demand is about providing travelers, regardless of whether they drive alone, with travel choices, such as work location, route, time of travel and mode. In the broadest sense, demand management is defined as providing travelers with effective choices to improve travel reliability[7].

  MetroPlan Orlando has an opportunity to play an important role in planning for TDM at the regional level. By encompassing a wide variety of local jurisdictions, MPOs can take a more "holistic" view of TDM and are able to steer valuable resources to TDM initiatives in the form of federal funding for support, implementation, and operation of a variety of TDM programs. Since MetroPlan Orlando is designated as a TMA, the agency must consider TDM strategies as part of the federally mandated Congestion Management Process. FDOT's reThink Your Commute Program leads TDM planning and associated activities in Central Florida. It is recommended that MetroPlan Orlando collaborate with local partners to pursue the following three levels of advancement in the TDM space, advancing from Level 1 to 3 in TDM planning as an MPO over time:

  - ***Level 1***: Develop TDM-specific strategic plans to help guide long-term and short-range initiatives. Planning should be coordinated at the local, regional and state levels and address first/last-mile options, vanpool, carpool, and telecommuting
  - ***Level 2***: TDM-focused Task Forces/Working Groups – To further refine TDM-related initiatives, the standing TAC and TSM&O committees should be engaged to help guide the overall planning process

[6] https://ops.fhwa.dot.gov/plan4ops/trans_demand.htm

[7] FHWA, Mitigating Traffic Congestion-The Role of Demand-Side Strategies, prepared by ACT, Report No. FHWA-HOP-05-001, October 2004

related to TDM and build awareness and motivation among member jurisdictions that have not pursued TDM

- ***Level 3***: Articulate regional TDM goals by (1) recommending TDM activities to meet these goals, (2) developing metrics to evaluate project-specific and systemwide performance (3) setting aside funding for TDM initiatives / guiding investments in TDM activities, and (4) establishing evaluation measures.

- **Adapt roads to accommodate all users.**

  Visitors and residents are more likely to pursue a variety of mode options if they feel they will be accommodated in a safe, convenient and comfortable manner when pursuing non-SOV modes. It is incumbent on transportation professionals to plan, design, operate and maintain streets that will provide a high-quality and safe trip on a variety of modes. It is recommended that planning efforts prioritize implementation of improvements that are in support of the MetroPlan Orlando Complete Streets policy and that will provide a high level of access, comfort, and safety for all users of all ages and abilities regardless of their mode of transportation.

- **Improve local street connectivity/accessibility to essential services.**

  Improving local street connectivity, and in turn accessibility, to essential services will increase the probability of travelers to consider using active transportation or transit to complete their trips. Better access increases convenience, and potentially safety and comfort. Strategies may include adding to the roadway network, adding sidewalks or bicycle lanes, or various transit enhancements to improve accessibility.

- **Optimize public transportation operations and connectivity**

  Strategies recommended here are intended to encourage mode shift toward public transportation options by improving the user experience with respect to access, efficiency and/or convenience.

  - Support LYNX and SunRail planned projects that optimize route structure, service hours and/or frequency.
  - Utilize technology to enhance the transit experience. It is recommended that technology deployments be evaluated and/or implemented to enhance operations and to broaden the appeal for transit. Specific strategies recommended for further analysis include:
    1. Incorporating transit signal priority (TSP) along visitor emphasis corridors.
    2. Provision of trip planning tools that are user-friendly across a broad spectrum of potential riders, including residents or visitors who may not speak English or who have disabilities.
    3. Developing a system that will allow users to pay for trips on various modes (LYNX, SunRail, TNCs, toll roads, etc.) with a single account, eventually building towards providing a Mobility as a Service (MaaS) platform for the region.

8.0 Programming and Implementation of Strategies

The Congestion Management Process is implemented through the identification and development of improvement projects. These projects are targeted to alleviate existing operational issues, separate from the MPO's planning process that addresses future mobility needs. The planning process is carried out in phases where the time elapsed from the planning phase through the construction phase could take 10 years. Most projects identified through the CMP are intended to be implemented in less than half that time.

> ***How will congestion management strategies be implemented?***
>
> This Action is critical for turning the strategy recommendations of the CMP into on-the-ground implemented projects. Federal regulations require that the CMP include: "Identification of an implementation schedule, implementation responsibilities, and possible funding sources for each strategy (or combination of strategies) proposed for implementation."
>
> 23 CFR 450.320 (c) 5

8.1 Ongoing Projects

A number of projects that support the strategies defined under Action 7 are already under way and will continue through all or a part of the monitoring period for this CMP update.

Signal Retiming Program

Signal retiming along corridors is a relatively low-cost TSMO strategy that typically results in measurable benefits including reduced vehicle delay, fuel savings, and reduced vehicle emissions. MetroPlan Orlando is currently entering its 14th year of involvement with the Signal Retiming Program and received retiming requests on more than 30 corridors for FY 2020-2021.

In FY 2018-2019 (the last year for which a before and after assessment study was completed), MetroPlan Orlando retimed 24 corridors throughout Orange, Osceola, and Seminole Counties. Assuming a monetary value of time of $17.67/hour, the benefit-cost ratio of the 2018 corridor retiming program was 8.8.

FDOT District Five ATCMTD Grant

FDOT D5, in partnership with MetroPlan Orlando, received an $11.9 million grant from FHWA aimed at advancing TSMO technologies, improving safety, and easing congestion under its "Connecting the East Orlando Communities" (CEOC) project. Elements of the project include:

- **PedSafe** is an innovative pedestrian and bicycle collision avoidance system that alerts drivers when a pedestrian or bicyclist is in the area. Also, traffic signals are being designed to become aware of pedestrians crossing the road.
- **GreenWay** is designed to better utilize the multimodal transportation system by actively managing over 1,000 traffic signals within the region.
- **SmartCommunity** is an integrated program that provides travel time information for driving, riding the bus, taking the train, or using rideshare/carshare.

- **SunStore** is FDOT's central data storage for all the transportation system management and operations information. SunStore will allow for seamless data sharing which will advance CAV readiness goals and give private firms access to data for potential use in congestion management dashboards, corridor management software, and similar efforts.

MetroPlan Orlando, UCF & FDOT Traffic Safety Federal Grant

The Federal Highway Administration (FHWA) awarded MetroPlan Orlando a $295,000 grant to support a safety strategy, as Central Florida works toward a goal of zero fatalities on Central Florida roads. The grant is one of only eight such awards nationwide for the coming fiscal year.

In partnership with the University of Central Florida (UCF) and the Florida Department of Transportation, MetroPlan Orlando will apply the Crash Prediction for Expedited Detection grant toward developing a tool for real-time crash prediction and operations. MetroPlan Orlando will engage partners including researchers, the advanced vehicle technology industry, and first responders to learn news ways to share data and information to improve transportation safety. As the region's long-range transportation planning organization, MetroPlan Orlando will lead the collaboration with UCF and FDOT to make these safety tools and information more useful, by refining them through cases that address specific safety problems in the Orlando metro area.

A primary focus will be on predicting and responding to crashes on Central Florida highways, using camera screening techniques, data-sharing, and other tools that will help reduce response time to crashes. This assists in clearing roadways and preventing secondary crashes– which often occur when drivers come upon the original crash scenes or get involved in traffic tie-ups caused by them. The tools and insights can also benefit emergency services and freight companies.

8.2 New Project Identification and Implementation

The congestion mitigation strategies identified under Action 7 as having the greatest potential benefit are to be evaluated in detail based on committee or technical recommendations. During this phase, additional analysis of potential projects will occur to identify specific improvements, implementation issues, and costs. Programs or policy changes will be evaluated by the MetroPlan Orlando TSM&O Advisory Committee, or some subset thereof, to identify recommended action items. Recommendations will then be made for the projects or programs to be implemented based on their forecasted ability to help the region meet congestion management goals. This may result in refocusing resources, such as existing rideshare programs or local maintenance crews (where possible), programming improvements in the local agency capital improvement programs (CIPs), or using boxed funds controlled by the MPO. These finally may be identified as projects for implementation in future MTPs. In summary, projects can be funded by any of the following means:

1. Funded with Recurring Resources (Done In-House) Funding for Project Implementation
2. Dedicated TSM&O Funding
3. Other Funding Programs (Safety, Etc.)
4. High Priority Candidate Future Projects (MTP)
5. Other Future Grants

9.0 Strategy Effectiveness Evaluation

The FHWA guidelines call for CMPs to include provisions to monitor the performance of strategies implemented to address congestion. Regulations require “a process for periodic assessment of the efficiency and effectiveness of implemented strategies, in terms of the area’s established performance measures.” This step helps determine whether operational or policy adjustments are needed to make the current strategies work better and provides information about how various strategies work to implement future approaches within the CMP study area.

Action 8 of the CMP cycle calls for the monitoring of strategy effectiveness in alleviating congestion on the system. After appropriate strategies have been implemented, performance measures will be studied to identify the effectiveness of implemented strategies on alleviating congestion and supporting the congestion management goals and objectives. Table 43 provides a matrix of different mitigation strategies and the performance measures each strategy may have an impact on. This table may be used to easily identify potential strategies to implement when underperforming trends are identified. As more data is collected over time, it will become easier to identify trends, and compare congestion data across different geographic regions within the region. Monitoring the various performance measures identified within the CMP over time will allow a “before-and-after” analysis to determine the effectiveness of an adopted strategy.

9.1 Annual Congestion Management Process Report

The MPO will lead the programmatic evaluation of strategy effectiveness. An assessment of the efficiency and effectiveness of implemented strategies will take place on a rolling basis – annually at a minimum. As a key tool in MetroPlan Orlando’s process, an Annual Congestion Management Process Report will be developed in the interim years until the next CMP update. This report will track the progress toward the performance measure targets illustrated in Table 44 and will discuss the role that the implemented strategies have in moving the needle on various measures – to the extent possible with the available project level data and conditions of the multimodal transportation system as a whole. The ongoing monitoring of congestion management objectives and their correlation to specific strategies will enable decision-makers and agencies the opportunity to select the most effective strategies for continued or future implementation. The results of the evaluation will provide information that will allow MetroPlan Orlando to make necessary changes in project priorities and will inform modifications to the CMP at the next update cycle. The Annual Report will be developed with MetroPlan Orlando’s Tracking the Trends and System Performance data collection and reporting efforts.

9.2 Target Setting

23 CFR 490.101 defines a target as "a quantifiable level of performance or condition, expressed as a value for the measure, to be achieved within a time period required by the Federal Highway Administration." A target for a measure is a single numerical value that has the same unit and precision level as its measure. Under 23 CFR 490.105 MPOs are required to establish targets for applicable national performance measures. Within the context of the CMP that has been established herein, there are several safety and reliability measures that are also national performance measures – the remainder are specific to MetroPlan Orlando’s CMP process. Table 44 shows the 2025 targets for each performance measure defined in the CMP; those that are also national performance measures are denoted in italics.

Table 43: Congestion Management Strategies vs Performance Measures

Goal	Objectives	Performance Measures	Strategies to Improve Safety				Strategies to Optimize Capacity												Strategies to Encourage Mode Shift					
			Toward Zero Deaths /Vital Few	Predictive Crash Analytics	Bike/Ped Safety Recommendations	Emergency/Incident Management Programs	Ramp Metering	Managed Lanes	Interchange Improvements/Auxiliary Lanes	Actively Monitored Roadways	Signal Retiming Program	Integrated Corridor Management	Intersection Improvements	Truck Routes/ Freight Terminal Connectivity	Curb Management Standards	CAV Readiness Planning & Demonstrations	EV Charging Station Integration	Congestion Management Dashboard	Data Purchasing/Monitoring	Develop TDM-specific Strategic Plans	Build Awareness/Motivation around TDM	Adapt Roads for All Users/Complete Streets	Local Street Connections to Essential Svcs	Public Transportation: Optimize Service	Public Transportation: Technology
Safety & Security	Eliminate fatal/ severe crashes	# Crashes (fatal, serious, total)	x	x	x	x	x	x	x	x	x	x	x		x	x							x			
		Crash Rates	x	x	x	x	x	x	x	x	x	x	x		x	x							x			
	Improve emergency response times	Average Response Times				x				x		x							x							
		Average Clearance Times				x				x		x							x							
Reliability & Performance	Improve reliability	% Reliable, Interstate	x	x		x	x	x	x	x		x				x			x							
		% Reliable, Non-Interstate	x		x					x	x	x	x		x	x			x							
		Truck Reliability Index	x	x		x	x	x	x	x		x		x		x			x							
	Expand ITS/Active Mgmt	% System Actively Managed								x		x				x										
	Reduce travel time	Annual Delay per capita	x	x		x	x	x	x	x	x	x	x	x	x	x				x	x					
	Improve transit OTP	% System OTP	x	x	x	x	x	x	x	x	x	x	x		x	x						x		x		
	Meet changing traveler needs	Annual Micromobility Trips													x			x		x	x	x	x	x	x	x
Access & Connectivity	Increase transit frequency	Average Transit Frequency																						x		
		% Ridership, by Headway																		x	x	x		x	x	x
	Improve access to high frequency transit	% Population within ½-mile																						x		
		% Jobs within ½-mile																						x		
	Improve access to essential services	% Population/Acreage within a 10-minute walk/bike ride			x																	x	x	x		
	Reduce per capita VMT	Daily VMT, per capita			x													x		x	x	x	x	x	x	x
	Increase transit ridership	Annual Passenger Miles			x													x		x	x	x		x	x	x
		Annual Unlinked Trips			x													x		x	x	x		x	x	x
		Avg Weekday Unlinked Trips			x													x		x	x	x		x	x	x
		Avg Weekend Unlinked Trips			x													x		x	x	x		x	x	x
	Reduce reliance on SOVs	% of Commutes using non SOV Modes			x										x			x		x	x	x	x	x	x	x
	Reflect community values system/planning	% TMA/SU Funds Allocated for Board Emphasis Areas	x	x	x	x				x		x			x	x		x		x	x	x	x	x	x	x
Health & Envt	Reduce air pollutants and GHGs	Air Quality Index	x	x		x	x	x	x	x	x	x	x	x			x			x	x	x	x	x	x	x
Investment & Economy	Reduce per capita delay	Annual Delay and Associated Cost, per capita	x	x		x	x	x	x	x	x	x	x	x	x	x				x	x					
	Improve travel for visitors & tourist industry workers	% Reliable, Visitor Emphasis Corridors	x	x		x				x	x	x				x		x	x							

The assumed target horizon is for the 5-year monitoring period associated with this CMP update. The following methodology was used to set the targets:

- For national performance measures, the targets are set in keeping with FDOT's statewide targets.
- For performance measures for which this is the first time that the metric is being tracked for the region, no target is set.
- For all other targets, an average of recent reported levels (as documented in Section 4.0) was used.

Table 44: Performance Measure Targets for 2025

Goal	Objectives	Performance Measures	Target
Safety & Security	Eliminate fatal/ severe crashes	***# Crashes (fatal/serious/total)***	***0/0/0***
		Crash Rates (fatal/serious/total	***0/0/0***
	Improve emergency response times	Average Response Times	30 min (60 min after hours)
		Average Clearance Times	60 min
Reliability & Performance	Improve reliability	***% Reliable, Interstate***	***<70%***
		% Reliable, Non-Interstate	***≥50%***
		Truck Reliability Index	***≤2.00***
	Expand ITS/Active Management	% System Actively Managed	N/A
	Reduce travel time	Annual Delay per capita	12.3 hours
	Improve transit OTP	% System OTP	73%
	Meet changing traveler needs	Annual Micromobility Trips	N/A
Access & Connectivity	Increase transit frequency	Average Transit Frequency	N/A
		% Ridership, by Headway	N/A
	Improve access to high frequency transit	% Population within ½-mile	N/A
		% Jobs within ½-mile	N/A
	Improve access to essential services	% Population/Acreage within a 10-minute walk/bike ride	N/A
	Reduce per capita VMT	Daily VMT, per capita	29.2
	Increase transit ridership	Annual Passenger Miles	158,405,530 LYNX / 10,944,886 SunRail
		Annual Unlinked Trips	26,811,310 LYNX / 754,416 SunRail
		Avg Weekday Unlinked Trips	85,222 LYNX / 3,600 SunRail
		Avg Weekend Unlinked Trips	46,743 LYNX
	Reduce reliance on SOVs	% of Commutes using non SOV Modes	20%
	Reflect community values system/planning	% TMA/SU Funds Allocated for Board Emphasis Areas	N/A
Health & Envt	Reduce air pollutants and GHGs	Air Quality Index	<50
Investment & Economy	Reduce per capita delay	Annual Delay and Associated Cost, per capita	12.4hours / $220.81
	Improve travel for visitors & tourist industry workers	% Reliable, Visitor Emphasis Corridors	N/A

Required national performance measures. FDOT statewide 4-year targets used.

9.3 CMP Performance Scorecard

MetroPlan Orlando will develop a CMP Performance Scorecard to monitor and manage the Congestion Management Process. Performance scorecards will be updated semiannually to provide an illustration of the progress the region has made toward achieving the targets noted in Table 44. Several agencies throughout the country have advanced to

using an online, easily accessible and trackable approach, and some have advanced to monitoring congestion on a real-time basis. MetroPlan Orlando staff will make the latest performance scorecards available on the agency website and will pursue development of a congestion management dashboard to make real-time congestion-related and other system data available to the public. Figure 18 shows a sample Performance Scorecard for the Safety and Security goal area.

Figure 18: Sample Performance Scorecard for Safety and Security Goal Area

Performance Measure		Previous	Current	Target	Goal Met?	Trend
Number of Fatality, Serious Injury, and Total Crashes by mode						
	Fatal crashes	173	179	0	✖	☒
	Serious crashes	1,594	1,374	0	✖	☑
	Total crashes	67,641	69,960	0	✖	☒
	Fatal crashes	13	15	0	✖	☒
	Serious crashes	619	576	0	✖	☑
	Total crashes	720	706	0	✖	☑
	Fatal crashes	84	125	0	✖	☒
	Serious crashes	772	632	0	✖	☑
	Total crashes	908	824	0	✖	☑
Crash Rate for Fatality, Serious Injury, and Total Crashes per 100 million vehicle miles traveled						
	Fatal crashes	0.7	0.8	0	✖	☒
	Serious crashes	6.8	5.8	0	✖	☑
	Total crashes	289.1	293.2	0	✖	☒
Emergency Response Time (min)		8.9	7.5	30(60)	✖	☑
Clearance Time (min)		69.7	63.8	60	✖	☑

☑ towards goal ☒ away from goal ⟷ unchanged since last report

9.4 Project-Specific Assessments

Evaluation of CMP-associated projects after their initial implementation will generally be completed by or in coordination with the sponsoring agencies. As with most management systems and processes, the CMP is data intensive. It is anticipated that the sponsoring agencies will be responsible for compiling the necessary data to conduct performance evaluations and produce a user-friendly performance-based report easily understood by the public. The effectiveness of various strategies or projects will be monitored and provided to the standing MetroPlan Orlando committees and the Board periodically, at a minimum in coordination with the Annual Congestion Management Report.

Appendix A:
Glossary

Glossary

Arterial Management. Arterial management is the management of arterial facilities in a manner that provides users with a safe, efficient, and reliable trip.

Emergency / Incident Management. Emergency management is designed to provide users with a safe and efficient transportation system during an emergency situation. Incident management is defined as verifying, responding to, and clearing traffic incidents in a manner that provides transportation system users with the least disruption.

Freeway Management. Freeway management is the implementation of policies, strategies, and technologies to improve freeway performance. The over-riding objectives of freeway management programs include minimizing congestion (and its side effects), improving safety, and enhancing overall mobility.

Freight Management. Freight management is the effective management of the system for freight transportation. The goal of freight transportation is to move goods safely, efficiently, and reliably throughout the region. This may range from satisfying the customer (e.g., freight shippers, receivers, and carriers) to actual travel time on the system.

Level of Travel Time Reliability. LOTTR is a metric for measuring the travel time reliability of the system. LOTTR is a ratio of the 80th percentile travel time to the 50th percentile travel time for all vehicles. This measure is applied for the National Highway System (NHS) separately for Non-Interstates and Interstates.

Non-Recurring Congestion. Non-recurring congestion occurs due to construction, inclement weather, accidents, and special events.

Recurring Congestion. Known to many as “rush-hour traffic”. Recurring congestion is often seen as a capacity problem and is logically combated with raising roadway capacity. Recurring congestion typically occurs during peak-hour conditions when the demand on the roadway is often at its highest and the capacity of the roadway does not meet the demand.

System Efficiency. Efficiency is defined as maximizing the benefits of the transportation system to the user while minimizing user costs. Costs to consider include additional travel time, monetary costs, travel distance, and fuel consumption. Operations objectives in the category of efficiency focus on minimizing costs and managing several aspects to congestion: extent, duration, and intensity.

Special Event Management. Special event management provides users with a safe and efficiently managed transportation system during a planned special event.

System Options. System options refers to the user’s ability to select a mode of travel from among many that are available to make a trip within a given timeframe, for a specific purpose, and/or via a certain route. Availability and utilization of multimodal options, such as transit, ridesharing, bicycling, and walking can be important components of a regional strategy to reduce traffic congestion and improve the operation of the transportation system.

System Reliability. A reliable transportation system can be defined as one that provides the users with a consistent and predictable travel time. While reliability could be expanded beyond travel time to cost, comfort, route, and mode availability, those aspects are more appropriately handled in other sections of the menu.

Transit Operations and Management. Transit operations and management is the operation and management of the transit system in a safe and efficient manner.

Travel Demand Management. Travel demand management is defined as providing users with effective travel choices to shift or reduce the demand for travel in congested conditions. Travel demand management oversees two types of travel: commute travel and travel associated with tourism, emergencies, special events, shopping, etc.

Travel Weather Management. Travel weather management focuses on providing users with a safe and efficient transportation system during and after weather events.

Traveler Information. Traveler information is designed to provide transportation system users with the information they need to choose the safest and most efficient mode and route of travel.

Truck Travel Time Reliability. TTTR is a metric for measuring truck travel time reliability on the Interstate system. It is a ratio of the 95th percentile travel time to the 50th percentile travel time – this measure is applied for the NHS Interstates.

Work Zone Management. Work zone management involves organizing and operating areas impacted by road or rail construction to minimize traffic delays, maintain safety for workers as well as travelers, and accomplish the work efficiently.

Appendix B:
Review of Available Data

Review of Available Data

Availability of data is critical to ensure the CMP is not overly burdensome from a resources perspective. As described in the previous sections, the following data sources were identified for the CMP performance measures:

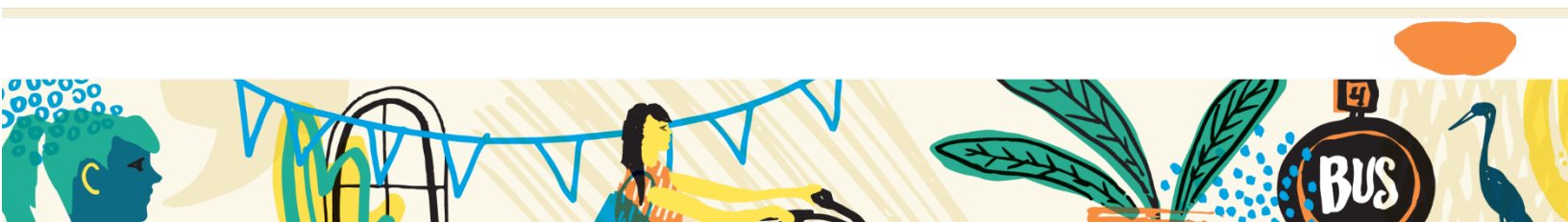
- StreetLight data (origins-destinations, volume, travel time)
- 2017 HERE speed data (travel time)
- 2017 NPMRDS speed data (travel time)
- FDOT Roadway Characteristic Inventory (posted speed, # of lanes, Area type, functional classification, bike lanes, sidewalks, roadway geometry)
- FDOT Traffic Characteristics Inventory (vehicle volumes, vehicle classifications, truck volumes, pea hour factors, directional factors)
- LOTIS network/ECFRPC's route condition tool (ped/bike infrastructure, proximity to land uses)
- FDOT/University of Minnesota Center for Transportation Studies (accessibility)
- US Census and American Community Survey (demographics)
- Signal4Analytics (safety/crash)
- StreetLight (travel patterns and travel characteristics)
- D5 TIM program (emergency response and roadway clearance times)
- SunRail and LYNX (transit)

Appendix C:
Summary of Performance Measure Calculations

Summary of Performance Measure Calculations

Measure	Calculation
Goal #1: Safety and Security	
Serious injuries	$\sum Serious\ Injuries$
Rate of Fatalities	$\frac{\sum Fatalities}{100\ million\ VMT}$
Rate of Serious Injuries	$\frac{\sum Serious\ Injuries}{100\ million\ VMT}$
Non-motorized Fatalities and Serious Injuries	$\sum Pedestrian\ Fatalities + \sum Pedestrian\ Serious\ Injuries + \sum Bicyclist\ Fatalities + \sum Bicyclist\ Serious\ Injuries$
Average Emergency Response Time	$\frac{\sum Response\ time}{\sum Incidents} \times 100$
Average Roadway Clearance Time	$\frac{\sum Clearance\ time}{\sum Incidents} \times 100$
Goal #2: Reliability & Performance	
Level of Travel Time Reliability	$\frac{Travel\ Time_{80th\ percentile}}{Travel\ Time_{50th\ percentile}}$
Truck Travel Time Reliability	$\frac{95th\ Percentile\ Travel\ Time}{50th\ Percentile\ Travel\ Time}$
Vehicle Hours of Delay per Capita	$(\sum Vehicle\ Volume\ \times (Daily\ or\ Peak\ Travel\ Time - Travel\ Time\ at\ LOS\ B)) \div$ population
Percent of Transit System On-Time Performance	$\frac{\sum On-time\ Routes}{\sum Routes} \times 100$
Annual Trips using Shared Micromobility	$\sum Micromobility\ Trips$
Annual Trips using TNCs	$\sum TNC\ Trips$

Measure	Calculation
Goal #3: Access & Connectivity	
Average Fixed-route Transit Frequency	$\frac{\sum Headways}{\sum Routes}$
Percent of Population within a Half-mile of transit	$\frac{\sum Population\ within\ a\ half\ mile\ of\ Transit}{\sum Total\ Population}$
Annual Passenger Miles	$\sum Passengers \times \frac{\sum Trip\ Length}{\sum Routes}$
Goal #5: Investment & Economy	
Cost of Delay	$\sum Vehicle\ Hours\ of\ Delay \times Value\ of\ Time$



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250 South Orange Avenue • Suite 200 • Orlando, Florida 32801

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