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Broward MPO Congestion Management Process (CMP)

Technical Report

Prepared for:
Broward MPO

Prepared by:
T. Y. Lin International
In collaboration with
Gannett Fleming, Inc.

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1. Introduction

This technical report provides a comprehensive documentation of the congested network analysis and findings as well as congestion management strategies, which is Step #5 and Step #6 of the Federal Highway Administration's (FHWA) Congestion Management Process (CMP) consistent with *Code of Federal Regulations (CFR Title 23 § 450.322)* requirements. This technical report serves as a separate document, which has been integrated into the Broward MPO's overall CMP update report.

This technical report is organized as described below:

Chapter 1: Introduction – provides a brief background and summary of the federally mandated elements required to update the Broward Metropolitan Planning Organization's (BMPO) CMP and summarizes agency coordination efforts.

Chapter 2: Congested Network Analysis – provides a detailed description of the methodology used to identify congestion problems and needs in Broward County including a discussion of different types and causes of congestions, congestion metrics and data sources. Further, this chapter explains congested network analysis, summarizes findings, and identifies congested corridors in Broward County, which serves as a key input to identify congestion management strategies.

Chapter 3: Congestion Management Strategies – discusses congestion management strategies "toolbox" and identifies corridor/area specific select strategies based on Florida Department of Transportation (FDOT) District Four's *Transportation Systems Management & Operations (TSM&O) Master Plan, September 2021* and Broward County's *Mobility Advancement Program's (MAP)* Congestion Management (CM) projects. In addition, this chapter describes congested network stratification approach and evaluation tools available to assess different congestion management strategies.

Chapter 4: Next Steps – discusses relationship between BMPO's CMP and other core products such as, Metropolitan Transportation Plan (MTP), Transportation Improvement Program (TIP) and Unified Planning Work Program (UPWP) as well as other studies.

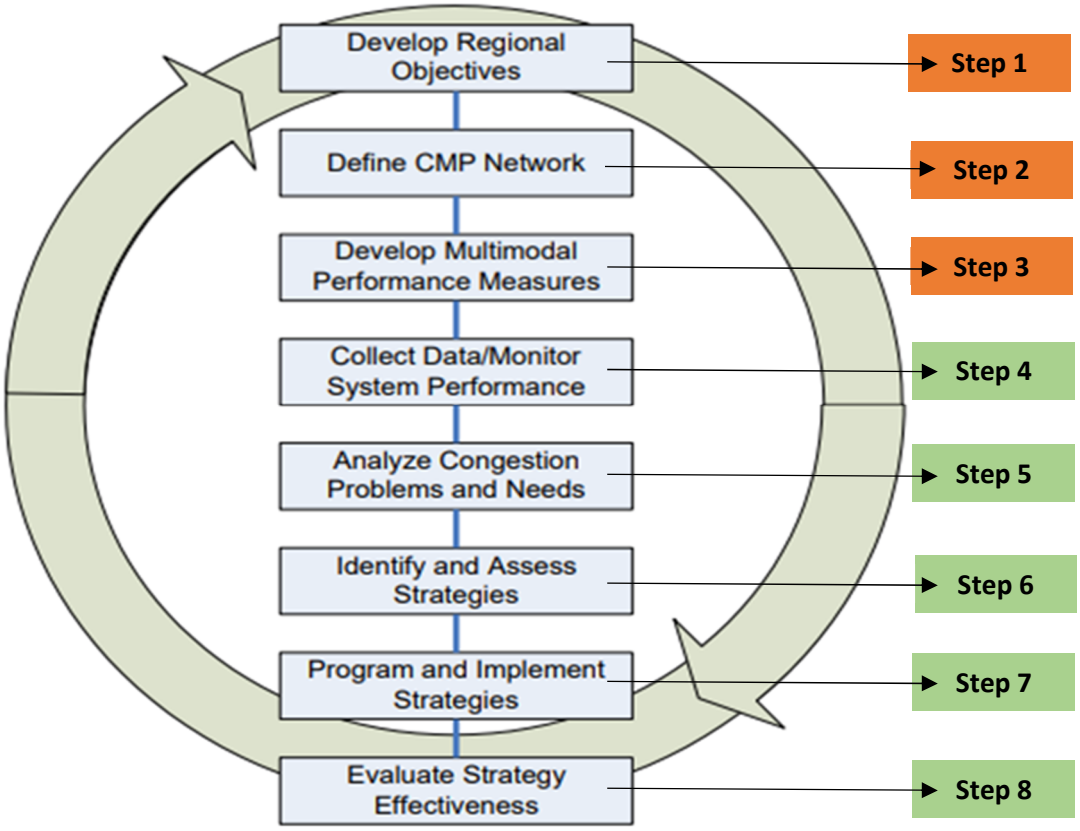
1.1 Project Background and Key Elements

The *Code of Federal Regulations* (*CFR Title 23 § 450.322 or federal regulations*) requires MPOs serving an urbanized area with a population over 200,000 persons (i.e., a Transportation Management Area or TMA) to manage congestion by developing a process that integrates all transportation modes to improve the operation of infrastructure and services that are eligible to receive federal aid. This process must be reflected in the Metropolitan Transportation Plan (MTP) and Transportation Improvement Program (TIP). When defining congestion, the federal regulations recognize that congestion is relative and unique to each community. Accordingly, the federal regulations provide MPOs

flexibility in determining what is an acceptable level of delay upon which strategies can be developed to meet this level (i.e., to mitigate "excessive delay").

Per the Federal Highway Administration (FHWA)'s *Congestion Management Process: A Guidebook* (2011), the key phases of a CMP are presented in **Figure 1-1**.

Figure 1-1: Congestion Management Process (CMP)



Source: *Congestion Management Process: A Guidebook,* FHWA, 2011

The BMPO's CMP mirrors FHWA's eight-step process (**Figure 1-1**). Typically, Steps 1 through 3 are performed as part of the Long Range Transportation Plan (LRTP) development process while Steps 3 to 8 occur during implementation phase and are updated on a regular basis, either annually or every six months.

This technical report focuses on Step #5 - *Analyze Congestion Problems and Needs* and Step #6 - *Identify and Assess Strategies*.

1.2 Agency Coordination

The BMPO's comprehensive technical analysis for CMP was complemented with a robust and inclusive agency coordination effort to guide the planning process. At the project outset, the BMPO formed an Internal Working Group (IWG) and an External Working

Group (EWG) to solicit input and feedback on the CMP. The IWG membership comprised BMPO staff from various disciplines or departments while the EWG membership included agency representatives from FDOT District Four, Broward County MAP, Broward County Transit (BCT), Broward County Traffic Engineering Department (BCTED), South Florida Regional Transportation Authority (SFRTA), municipal partners – City of Sunrise and Fort Lauderdale and one Broward County resident. As shown in **Table 1-1**, the BMPO conducted a total of six meetings, three meetings each with IWG and EWG at key project milestones. **Appendix-A** includes IWG and EWG meeting minutes for reference purposes.

Table 1-1: Agency Coordination Meeting Log

Project Milestone	Group	Timeframe	Meeting Location
Project Kickoff – Goals & Objectives; CMP Network	IWG	September 8, 2021	BMPO Office 100 W Cypress Creek Road, Suite 650 Fort Lauderdale, FL 33309
	EWG	October 25, 2021	Virtual Meeting (MS Teams)
Congested Network Analysis	IWG	February 7, 2022	
	EWG	February 24, 2022	
Congestion Management Strategies	IWG	May 11, 2022	
	EWG	May 31, 2022	

In addition, the BMPO also integrated its *Transportation Demand Management (TDM) Study* effort with the CMP to inform and align both these planning efforts. The BMPO's project teams for the CMP and *TDM Study* met on a regular basis from February 2022 through May 2022 to exchange various data, analyses, and findings.

2. Congested Network Analysis

Chapter 2 provides a detailed description of the methodology used to identify congestion problems and needs in Broward County including a discussion of different types and causes of congestions, congestion metrics and data sources. Further, this chapter explains congested network analysis, summarizes findings, and identifies congested corridors in Broward County, which serves as a key input to identify congestion management strategies.

2.1 Congested Network Analysis Methodology

For a CMP to be effective, congestion should be analyzed at the system level and along specific corridors to identify those portions of corridors/intersections (i.e., hot spots) that require more detailed analysis to understand the causes of delay, and, by extension, the strategies that need to be programmed and implemented. In analyzing congestion, the major elements of delay are intensity (how **bad** will it be), duration (how **long** will it last), extent (how **many** people/amounts of freight will be affected), and predictability (how likely is it to happen). To that end, the BMPO conducted a detailed network analysis relative to different types of congestion based on a variety of congestion metrics from authoritative data sources. The following is a detailed discussion of the BMPO's congested network analysis methodology.

2.1.1 Types of Congestion

It is also useful to classify congestion to understand how best to analyze it relative to different causes. Congestion generally results from one of the following:

- ***Capacity-Related Recurring Congestion*** – The result of a lack of throughput where volumes exceed capacity at specific times on a regular basis, such as morning and evening peak periods along work and school commuter routes and on weekends and post-evening peak periods for commercial areas with retail and dining. For transit, this form of congestion occurs when buses are at capacity and must "pass up" passengers, requiring them to wait for the next bus.
- ***Unanticipated Non-Recurring Congestion*** – Primarily created by crashes, stalled/inoperable vehicles, and debris in travel lanes that can exacerbate delay on roadways that experience (or are approaching levels of) excessive Capacity-Related Recurring delay. For transit, this happens when buses breakdown and passengers must wait for a replacement bus or take the next bus on the route, subject to available room on that bus. This type of congestion does not occur as regularly as Capacity-Related Recurring congestion, but it can still be analyzed based on the frequency of unplanned events which is predictable in the case of crashes.
- ***Planned Event-Related Congestion*** – Occurs as the result of scheduled activities at known locations such as parks, performance venues (e.g., stadiums/arenas, auditoriums/concert halls, etc.), work zones during road construction, and major weather-related events that are forecasted to result in reduced capacity for a period of time longer than isolated inclement weather. For transit, the experience during scheduled activities at known locations may not be similar for riders as

buses can be given preference in accessing and exiting event sites to incentivize more people to use the service.

Regardless of the type of delay, each one results in frustration for travelers, increased fuel consumption and emissions, and lost productivity. The difference is that Capacity-Related Recurring and Planned Event-Related delay is predictable and can be incorporated into trip planning. The BMPO identified seven root causes of congestion. These root causes have been assigned to the types of congestion they result in and are presented in **Table 2-1**.

Table 2-1: Types of Congestion by Root Causes

Capacity-Related Recurring Congestion	Unanticipated Non-Recurring Congestion	Planned Event-Related Congestion
Physical Bottlenecks	Traffic Incidents	Special Events
Traffic Control Devices	Weather	Work Zones
	Fluctuations in Normal Traffic	
47% predictable	*30% predictable*	*2% predictable*

Based on Regional Integrated Transportation Information System (RITIS) data, in year 2019 Broward accounted for approximately 11% of total congestion in the Florida with approximately 11.69 million vehicle hours of delay. The economic impact resulting from this congestion was approximately $305.91 million in lost time and excess fuel consumption. Further investigation into causes of congestion available from RITIS data indicated that signals and recurring congestion accounted for approximately 47% of total congestion. Incidents, weather, signals, and work zones or some combination of these were causes for approximately 30% of total congestion. In addition, holidays and work zones accounted for merely 2% of total congestion while 21% resulted for multiple and unclassified causes.

In essence, approximately 47% of the total congestion is predictable and while 30% is unpredictable its causes can be detected. Therefore, the BMPO along with its partner agencies can identify and implement mitigation strategies to manage a vast majority congestion. In addition, the BMPO can assist its municipal partners with providing technical assistance to manage planned event-related congestion.

2.1.2 Congestion Analysis: Network & Modes

The CMP network identified in Step #2 included:

- **On-System State Highways and Roadways** – interstates, Florida's Turnpike, major arterials
- **Off-System Roadways** – county and local major arterials and collectors
- **Truck Routes** – highways and roadways utilized for goods movement
- **Transit Routes** – rail and bus
- **Bicycle Network** – buffered bicycle lanes, paved trails/shared use paths
- **Pedestrian Facilities** – sidewalks, paved trails/shared use paths

In addition, the Fort Lauderdale/Hollywood International Airport, Port Everglades, and freight railroads operated by Florida East Coast Railway (FEC) and CSX Transportation (CSX), as well as the FDOT Strategic Intermodal System (SIS) were also part of the CMP network.

In Step #5 of the CMP, the BMPO identified a subset of the Step #2 CMP network based on readily available data, institutional knowledge, and experience in conjunction with input received from its partner agencies, such as FDOT District Four, SFRTA (Tri-Rail), BCT to conduct a more detailed data driven analysis. Consequently, the BMPO focused its analysis efforts on comprehensive vehicular congestion throughout Broward County as indicated in **Table 2-2**.

Table 2-2: Networks & Modes

Mode	Congestion Analysis	Network
Automobiles/Vehicles	✓	On-System State Highways and Roadways: Interstates, Florida's Turnpike, major arterials Off-System Roadways: County and local major arterials and collectors
Transit (Bus and Rail)	Not congested	Will consider high ridership routes
Bicycle Network	Not congested	Identify gaps, first and last mile connections
Pedestrian Facilities	Not congested	Identify gaps, first and last mile connections
Freight	✓	Strategic Intermodal System (SIS) and Freight Supportive Network developed by FDOT
Rail, Port, and Airport	✓	Landside infrastructure

Both transit operators, BCT and SFRTA (Tri-Rail) confirmed that there were on-time performance issues in some corridors as well as delays due to breakdowns, the buses and trains typically do not pass up passengers due to crush loads and heavy demand. In addition, it should be noted that most of the on-time performance issues on bus routes resulted from vehicular congestion. Therefore, transit routes were not included as part of detailed congested network analysis.

Identifying congestion on pedestrian and bicycle facilities is subject to the availability of usage data by time of day at granular level, which is typically not available. Quantitative measures of congestion for non-motorized modes include physical space per user (e.g., square footage per pedestrian, volume/capacity ratio, etc.) and flow rate (pedestrians/minute/foot, bicycle mean speed in mph, etc.). However, pedestrian and bicycle congestion in Broward County is not known to be capacity-related, but rather delays that result from waiting for traffic signals to allow for safe, legal crossings of streets. Consequently, pedestrian and bicycle networks are not considered for detailed data driven congestion analysis. Instead, the BMPO considered pedestrian and bicycle modes

along with other active transportation modes to improve first and last mile connections, address connectivity and safety issues as well as provide alternative to single occupant vehicle travel in congested corridors especially in transportation equity areas. Further, subsequent CMP updates could incorporate qualitative and anecdotal information to identify congested locations for pedestrians and bicyclists and the development of related strategies if desired.

Freight supportive network and SIS facilities were included in the CMP network by reference to FDOT's TSM&O Master Plan, September 2021. For rail, port, and airport the CMP focused on congestion from landside infrastructure standpoint.

2.1.3 Congestion Metrics

Each type of congestion needs to be defined to identify linear and nodal hot spots where delay is deemed to result in negative effects to economic opportunities and quality of life based on the multimodal performance measures developed by the BMPO in CMP Step #3. It is important to note this distinction between the multimodal performance measures and the metrics for defining congestion. The former is used to monitor system performance and evaluate strategy effectiveness, which is conducted in CMP Step #4 and CMP Step #8, respectively. The metrics for defining congestion are used to detect locations where strategies need to be identified, programmed, and implemented to reduce existing and projected delay through CMP Steps #5, #6 and #7, respectively. The BMPO's approach for identifying congested corridors and intersections for each type of congestion is discussed below.

- ***Capacity-Related Recurring*** – There are multiple metrics proposed for identifying areas of this type of congestion. Metrics associated with Capacity-Related Recurring congestion are based on the identification of bottlenecks resulting primarily from lack of physical capacity and, to a lesser degree, system management and operations activities that could be better coordinated and optimized. These metrics are calculated by the differential between off-peak and peak period travel times. A threshold is then applied to all links and nodes with those at or exceeding the threshold being considered congested. Metrics for identifying Capacity-Related Recurring congestion in the BMPO's CMP include:
    - *Total Daily Hours of Delay (Vehicle Hours):* Represents the total hours of additional travel time due to congestion each day for all motor vehicle operators; will be calculated systemwide based on a comparison between free flow and congested travel times. Individual segments were assessed using the Southeast Florida Regional Planning Model (SERPM) for the base year and the MTP horizon year (2045).
    - *Volume/Capacity Ratio:* Represents the ratio of the number of vehicles relative to the design capacity of a road segment; calculated systemwide and for individual segments using the SERPM for the base year and 2045.
    - *Travel Time Index (TTI):* Represents the ratio of peak period travel times to travel times during free-flow conditions with a TTI of 1.5 representing a trip that takes 50 percent longer in a peak period compared to the non-peak period; was calculated for individual segments included in the RITIS, which

is primary State Highway System (SHS) with current data and up to one year of historical data available.

- *Regional Integrated Transportation Information System (RITIS) Bottleneck Ranking:* Represents bottlenecks based on 12 factors, such as queue length, impact, and accumulated delay, etc.; calculated for individual segments included in the RITIS for specific time periods within in a day and/or calendar year.
- *Planning Time Index (PTI):* Represents the extra time that is necessary to arrive at a destination on-time 95 percent of the time (i.e., a PTI of 1.3, for example, means that a traveler should plan for one-third more time for their trip in the peak period compared to free-flow conditions); can be calculated systemwide and for individual segments included in the RITIS with current data and up to one year of historical data available.

Using the metrics above, a consolidated list of existing and projected Capacity-Related Recurring congestion locations in Broward County was produced. These metrics were applied to the entire CMP network comprising commuting and freight roadway corridors. The thresholds for determining existing and future Capacity-Related Recurring congestion are included in **Table 2-3**.

Table 2-3: Capacity-Related Congestion Thresholds

Metric	Threshold
Vehicle Hours of Delay (VHD)	Top 25% percentile
Volume/Capacity Ratio	>0.9
Travel Time Index (TTI)	>=1.5
RITIS Bottleneck Ranking (difference in speed and travel time compared to free flow for minimum duration of five minutes)	Speed <60% (Travel time >=40%)
Planning Time Index (PTI)	>=1.3

- ***Unanticipated Non-Recurring*** – As discussed previously, the exact location and time of a specific incident cannot be predicted but the propensity for crashes to occur at certain locations compared to others can be calculated. The University of Florida Signal Four Analytics was used to identify crash density and hotspots using *ArcGIS Spatial Analyst Extension* tool. These locations were ranked by frequency and severity of crashes and compared to Capacity-Related Recurring congestion levels. If Volume/Capacity Ratio (i.e., 0.9 or higher) was applied to high-crash locations to identify links of Unanticipated Non-Recurring congestion.

Table 2-4: Unanticipated Non-Recurring Congestion Thresholds

Metric	Threshold
Fatal and Serious Injury Crashes (All modes)	Crash hotspots
Volume/Capacity Ratio	0.9

- ***Planned Event-Related*** –While the following locations where regional events are hosted were identified for evaluation purposes, a more granular analysis of type of special events, duration, and day of the event as well as data availability in RITIS resulted in selection of four major special event location for data-driven analysis.
    - Fort Lauderdale International Boat Show, 801 Seabreeze Blvd, Fort Lauderdale, FL 33316
    - Tortuga Music Festival, Fort Lauderdale Beach Park, 1100 Seabreeze Blvd, Fort Lauderdale, 33316
    - BB&T Center, 1 Panther Pkwy, Sunrise, 33323 (NHL Florida Panthers games and other sporting contests; large, national music acts; regional events)
    - Seminole Hard Rock Hotel & Casino, 1 Seminole Way, Davie, 33314
    - Los Olas Art Fair, 620 E Las Olas Blvd, Fort Lauderdale, 33301
    - Broward Center for the Performing Arts, 201 SW Fifth Ave, Fort Lauderdale, 33312
    - Brazilian Festival, 1005 Seabreeze Blvd, Fort Lauderdale 33316
    - Drive Pink Stadium (formerly known as Inter Miami CF Stadium), 1350 NW 55th St, Fort Lauderdale, 33309

Congestion occurring before and after the event was identified based on RITIS bottleneck ranking function.

The following eight roadway segments included in the BMPO's 2045 MTP for resiliency related transportation improvements were mapped with the intent of identifying their spatial relationship with congested corridors in Broward County.

- SR-A1A from S of Arizona St to SR-858/Hallandale Beach Blvd
- SR-820/Hollywood Blvd from US-1/SR-5 to SR-A1A
- US-1/SR-5 from E Las Olas Blvd to SR-736/Davie Blvd
- E Las Olas Blvd from US-1/SR-5 to SR-A1A
- Johnson St from US-1/SR-5 to N 14th Ave
- US-1/SR-5 from SR-842/Broward Blvd to E Las Olas Blvd
- US-1/SR-5 from SR-824/Pembroke Rd to SR-858/Hallandale Beach Blvd
- SR-858/Hallandale Beach Blvd from US-1/SR-5 to SR-A1A

If any of these the resiliency projects overlapped with congested corridors, there was potential for identifying strategies and solutions that can be in implemented within five years or so to address congestion resulting from extreme weather events, such as flooding due to heavy precipitation and "king tides" until the corridor in question would be retrofitted, appropriately

2.1.4 Data Sources

A variety of authoritative data sources shown in **Table 2-5** were used to analyze congestion problems and needs in Broward County. Using multiple datasets and metrics helped BMPO to triangulate information from various data sources and have a higher confidence level in the analysis results. Key data sources used include RITIS, Signal Four

Analytics, regional travel demand model - Southeast Regional Planning Model (SERPM v8.5.12) and BMPO's Level of Service (LOS) reports for Year 2020 and Year 2045.

Table 2-5: Congestion Analysis Data Sources

Tools/Datasets		Capacity-Related Recurring Congestion	Unanticipated Non-Recurring Congestion	Planned Event-Related Congestion	Timeframe
RITIS (HERE)	Bottleneck Ranking Function	✓	-	✓	March and April 2019
	Planning Time Index (PTI)	✓	-		March and April 2019
	Congestion Scan (TTI, Speed profile)	-	-	✓	Varies (Year 2019)
Signal Four Analytics		-	✓	-	2015 and 2019 Historical Crash Data, During Congested Period
Southeast Regional Planning Model (SERPM), v 8.5.12		✓	✓	-	2015 and 2045 Volume to Capacity Ratio
Broward MPO Level of Service (LOS) Reports		✓	✓	-	Year 2020 and 2045

In addition, while the timeframe for the various data varies, the BMPO largely used Year 2019 pre pandemic data to inform existing conditions analyses. The future year data was for primarily Year 2045 obtained from SERPM. **Section 2.2** provides a detailed discussion on various analyses and findings for each type of congestion.

2.2 Congested Network Analysis Findings

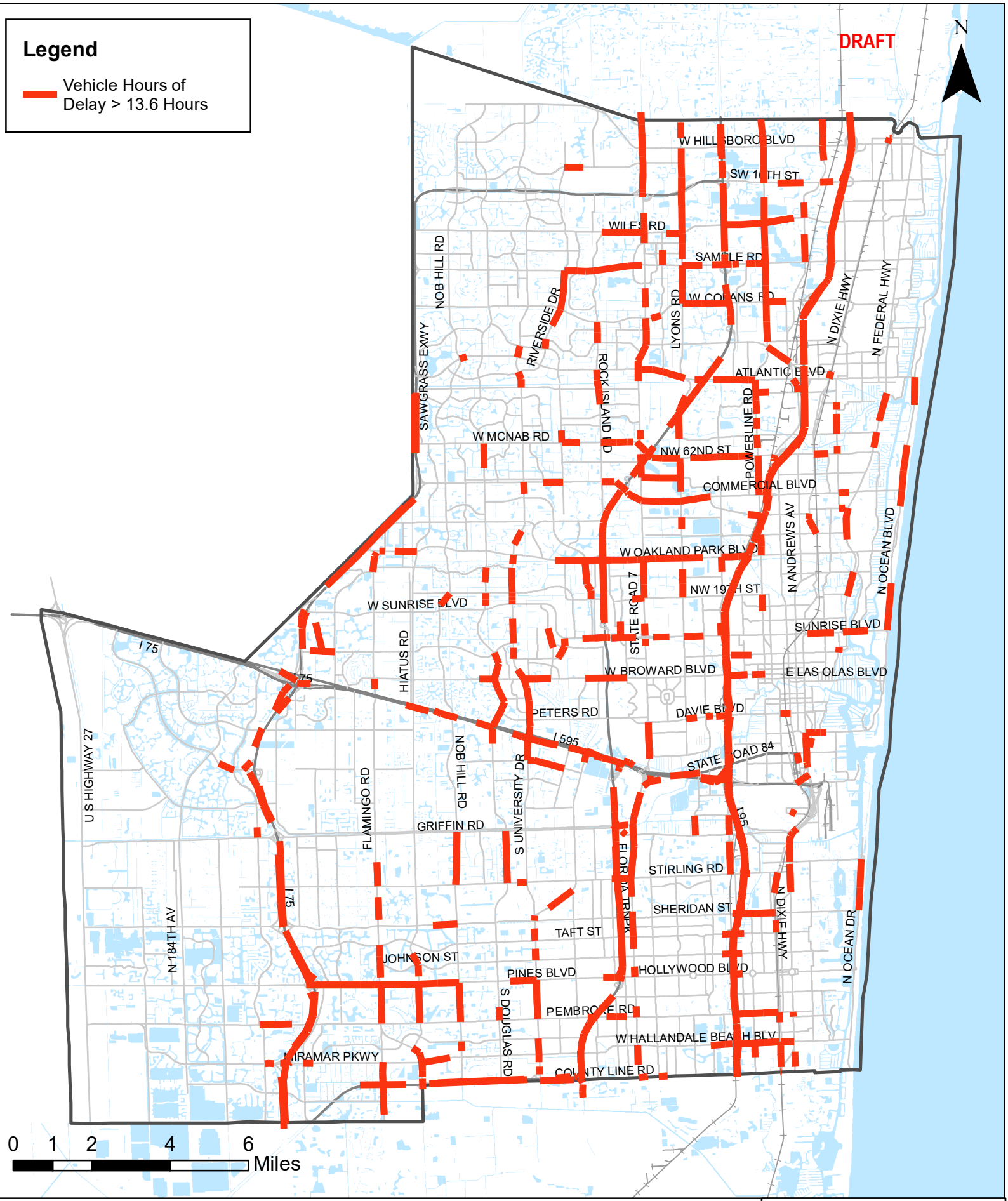
2.2.1 Capacity-Related Recurring Congestion

Vehicle Hours of Delay

Vehicle hours of delay (VHD) was estimated using the Southeast Regional Planning Model (SERPM) v8.512. The SERPM estimated the congested time to travel through each of the roadway links in the PM peak period. The difference between the congested time and the free-flow time for a given roadway link was multiplied by the link volume to estimate the link VHD. For Broward County, all the roadway links from the SERPM were ordered by the VHD and the 4th quartile of links, representing the top 25% links with the most VHD. The links are shown in **Figures 2-1 and 2-2,** for Years 2015 and 2045, respectively.

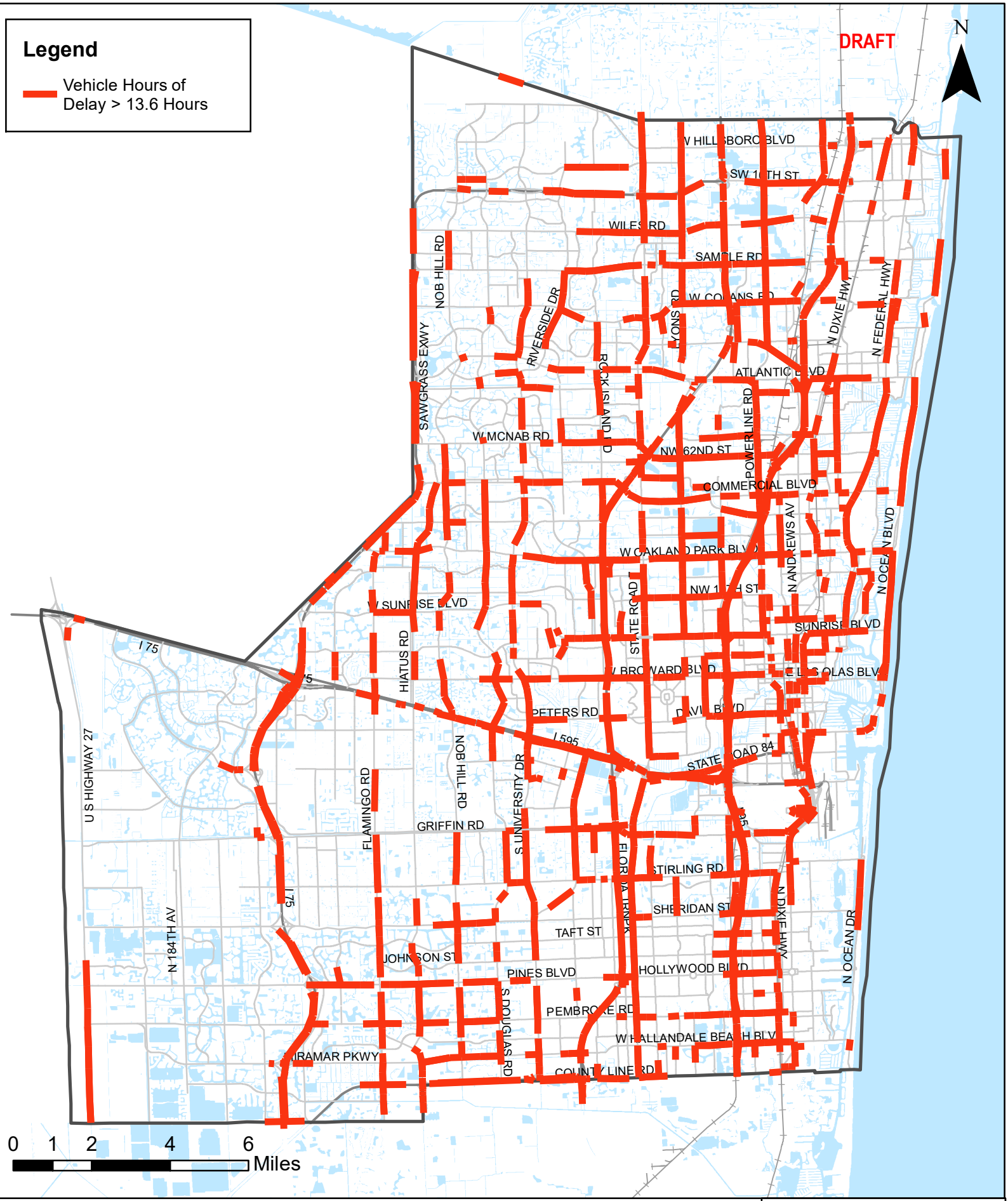
Based on the 2015 VHD analysis from the SERPM, 13.6 hours of VHD was estimated as the cut-off value for the 4th quartile. The corridors with the highest VHD include interstates I-75, I-95, and I-595, the Florida Turnpike, and several State Roads, such as SR 7/US 441, SR 845/Powerline Rd, SR A1A/Ocean Blvd, SR 834/Sample Rd, SR 870/ Commercial Blvd, SR 816/Oakland Park Blvd, and SR 820/Pines Blvd. Based on the

Year 2045 SERPM results, additional roadway links had more than 13.6 hours of VHD as compared to Year 2015. More arterials experience delay in different various local jurisdictions, such as Sunrise, Plantation, Oakland Park, and Fort Lauderdale. Increase in population and jobs growth between Years 2015 and 2045 contributes to this increased congestion throughout Broward County.



Vehicle Hours of Delay, PM Peak Hour, Year 2015

Figure 2-1



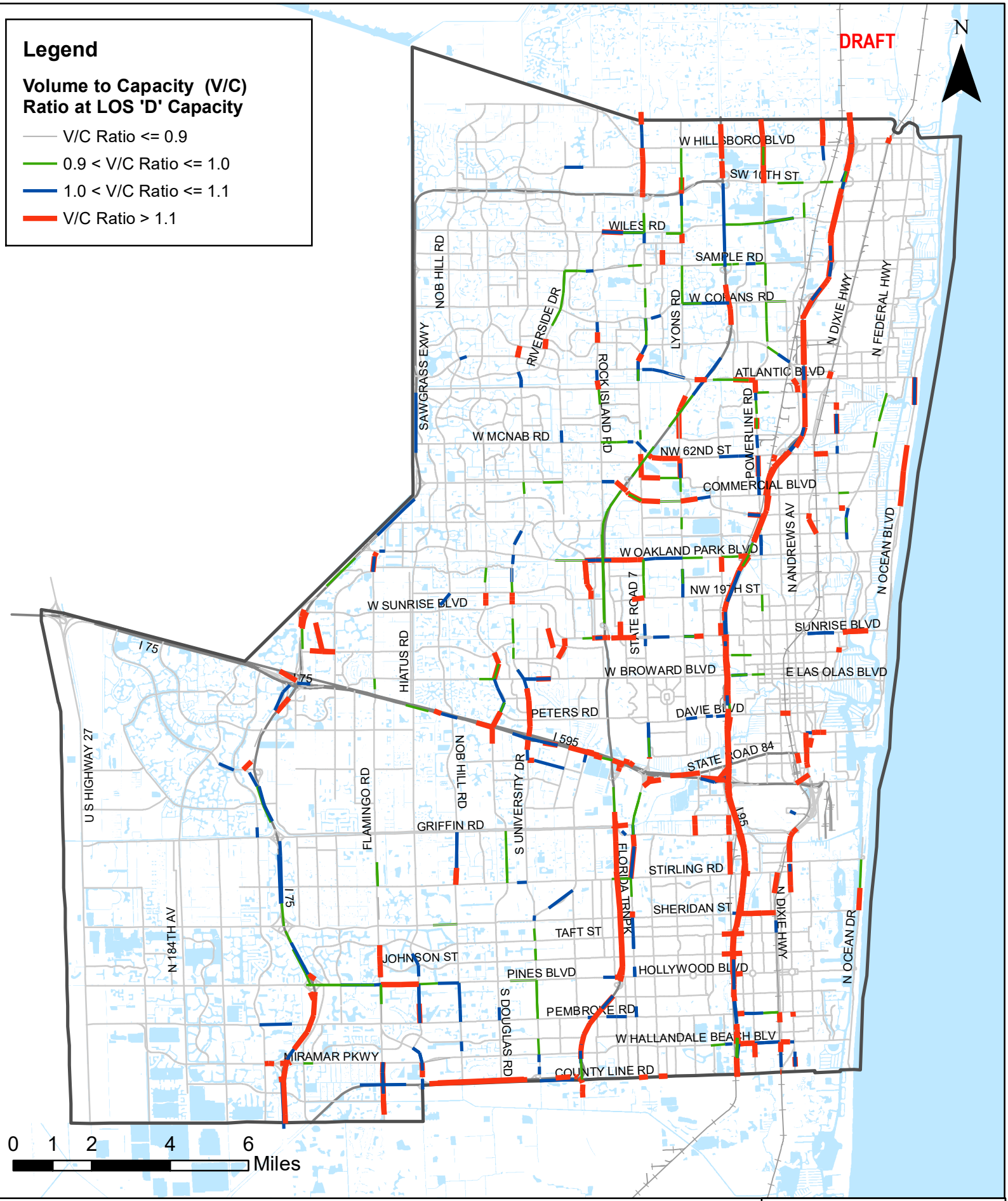
Vehicle Hours of Delay, PM Peak Hour, Year 2045

Figure 2-2

Volume to Capacity (V/C) Ratio

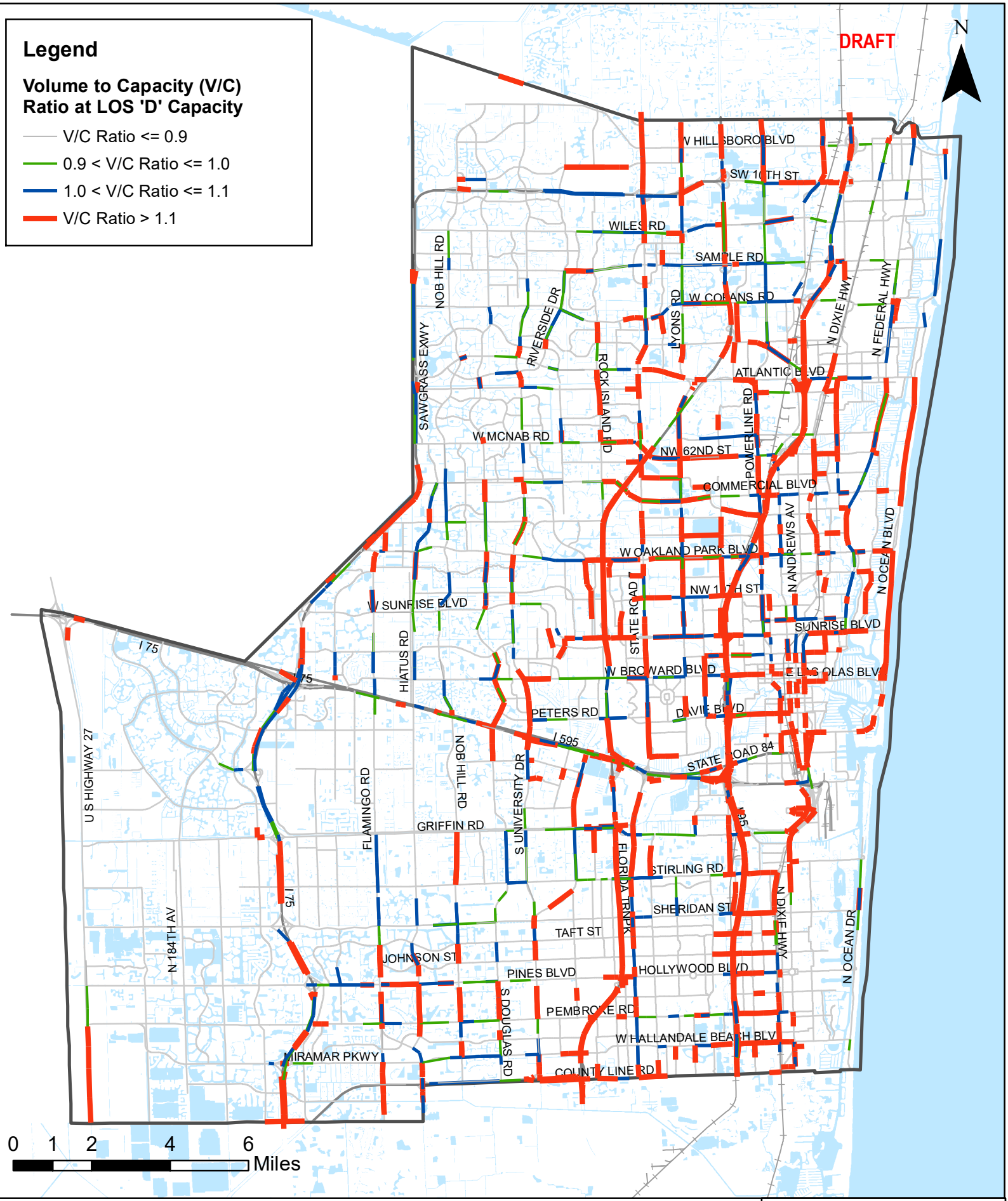
Based on the SERPM 8.512 results, the traffic volumes on each of the roadway links were estimated and compared to the capacity at level of service (LOS) 'D'. The FDOT's target LOS is 'D' for state roads. **Figures 2-3** and **2-4** show the volume to capacity (V/C) ratios at LOS 'D' capacity for Years 2015 and 2045, respectively.

For the Year 2015, major interstate highways, I-75 and I-95, show significant congestion levels, as the V/C ratios results are greater than 1.0 for most segments. There are a few more roadways approaching or exceeding the capacity. These roadways show V/C ratios greater than 0.9. For Year 2045, the congestion becomes more severe, reflected in more roadway links approaching or exceeding the capacity. These growing congestion levels are primarily located in growing cities, such as Fort Lauderdale, Pembroke Pines, and Hollywood. It should be noted that the pattern of VHB and V/C ratio is somewhat similar. Further, in Year 2015 congestion is limited to north-south corridors with smaller east-west roadway segments experiencing capacity constraints. As population and jobs grow between Year 2015 and Year 2045, travel demand increases and most of the arterials and some major collectors experience degradation in V/C ratios throughout the County.



Volume to Capacity (V/C) Ratio at LOS 'D'
PM Peak Hour, Year 2015

Figure 2-3



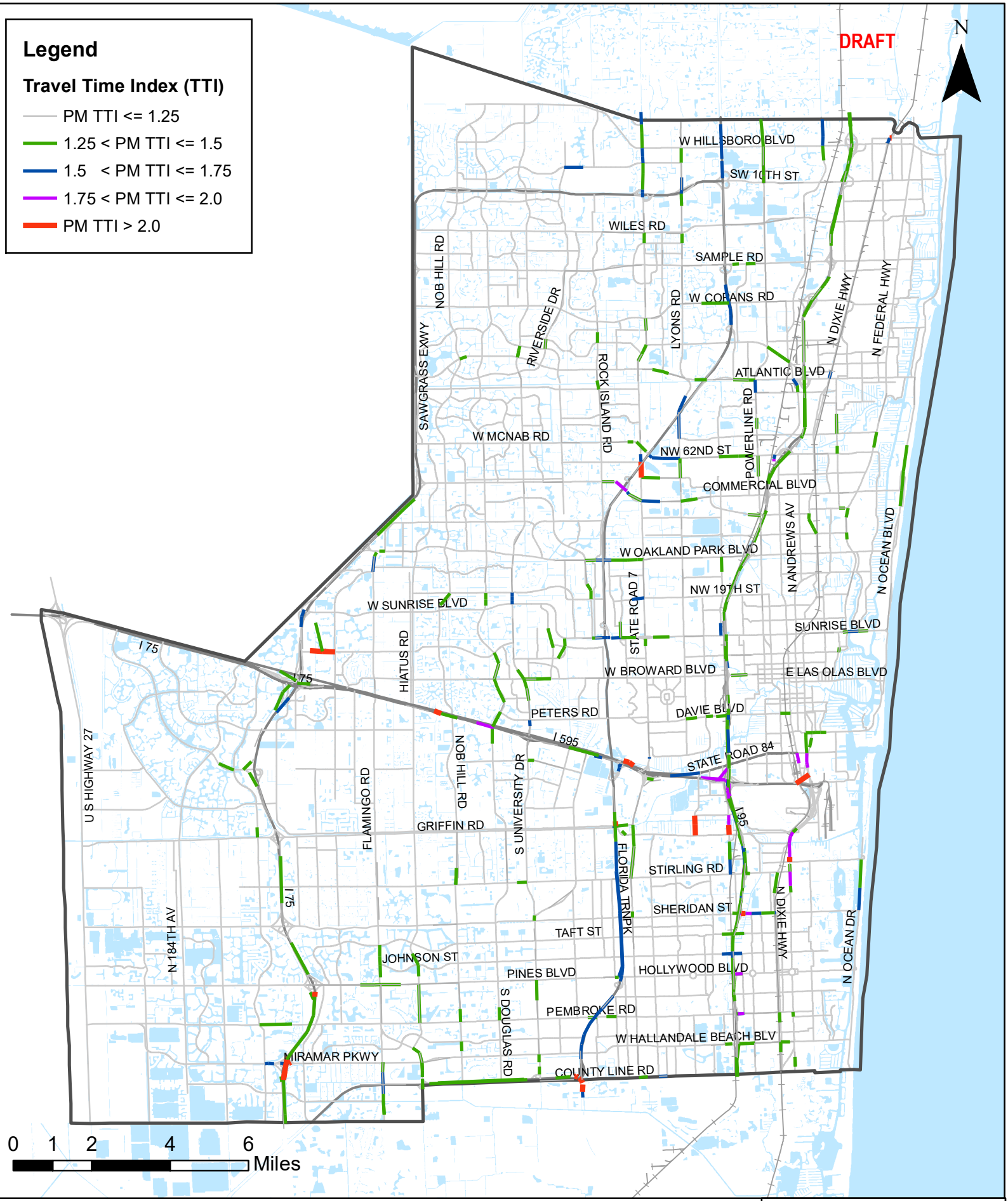
Volume to Capacity (V/C) Ratio at LOS 'D'
PM Peak Hour, Year 2045

Figure 2-4

Travel Time Index (TTI): The Travel Time Index (TTI) is a performance metric that infers the roadway congestion conditions. The TTI is the travel time represented as a percentage of the ideal travel time. In this case, the TTI was estimated as the ratio of the PM peak period congested travel time over the off-peak period congested travel time. Higher value of TTI indicates longer travel time and more congestion.

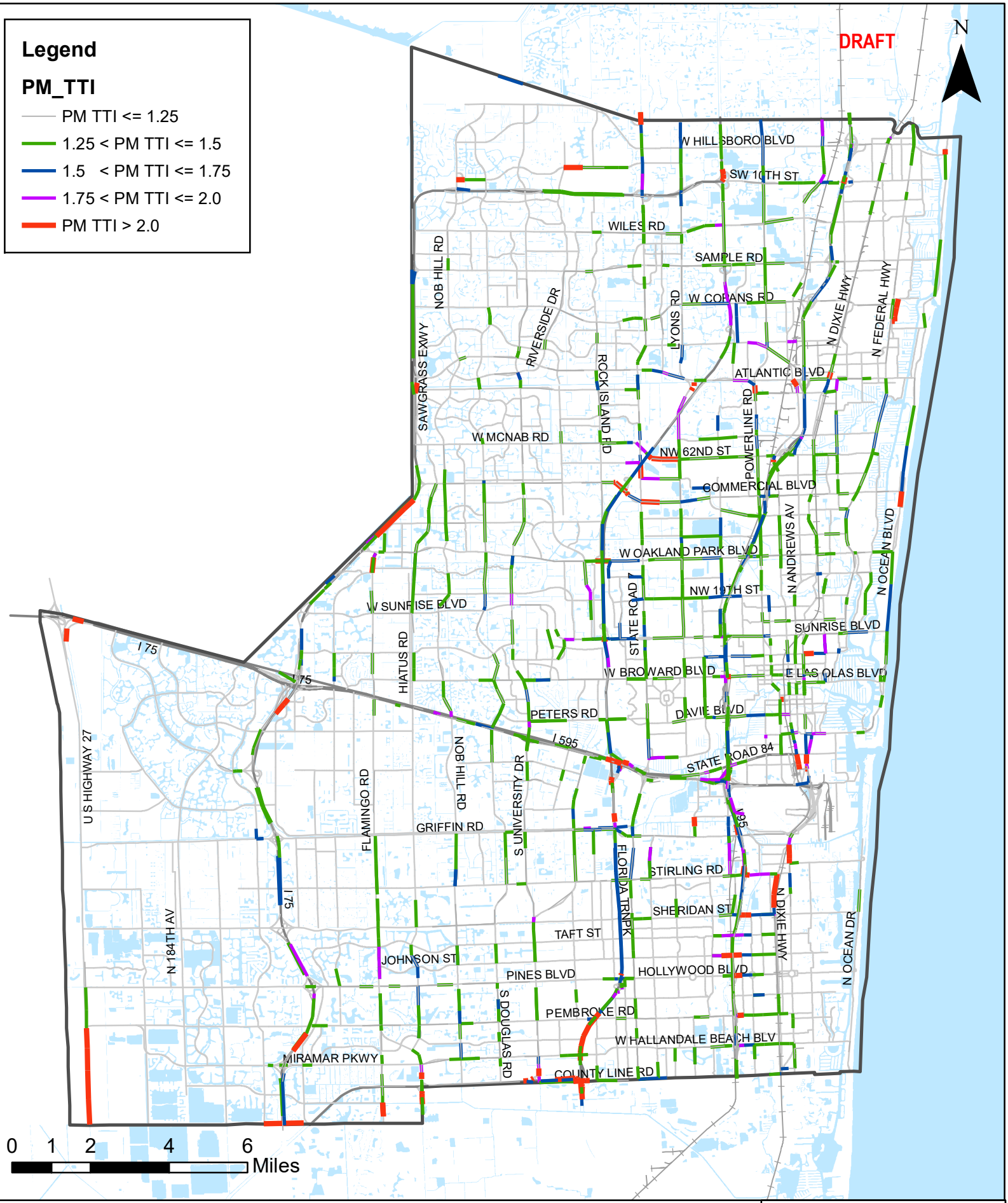
Figures 2-5 and **2-6** show the TTI for Broward County based on the Year 2015 and the Year 2045 SERPM, respectively. In Year 2015, most segments of the interstate highways and the Florida Turnpike show TTI values of 1.25 or more, indicating some degree of congestion. In Year 2045, the congestion appears to increase, as more arterials show slight congestion with a TTI between 1.25 and 1.5 while highways experience an increased TTI of 1.5 or more.

The BMPO focused on roadway segments with a TTI of 1.5 or more. A value of 1.5, for example, indicates a 20-minute off-peak trip requires 30 minutes during the peak period. In other words, it would take 50% longer to go from point A to point B during peak period compared to off-peak period. As stated above, north-south oriented roadway segments with 1.5 TTI or more include I-95, I-75, Sawgrass Expressway and Florida's Turnpike in Year 2015 while in Year 2045 several east-west roadway segments feeding into these limited access facilities experience congestion.



Travel Time Index (TTI), PM Peak Hour, Year 2015

Figure 2-5



Travel Time Index (TTI), PM Peak Hour, Year 2045

Figure 2-6

RITIS Bottleneck Ranking

The Regional Integrated Transportation Information System (RITIS) is a situational awareness data archiving and analytics platform, which integrates existing data from the transportation systems and provides a broad portfolio of analytical tools and features. Bottleneck Ranking is a function provided by RITIS that allows users to identify, rank, and explore bottleneck locations on the roadway. It provides this information for a given geographical area and time period and provides a list of bottleneck locations which were analyzed and ranked by total delay. Event occurrences, such as accidents, are also measured and evaluated.

Figure 2-7 illustrates the recurring bottleneck locations, within the top 50 bottleneck locations for Broward County's State Roads, excluding Interstate Highways and Florida Turnpike, during the time period of March through April 2019. These bottleneck records represent the bottlenecks that are most likely to be caused by traffic delays. The top recurring bottlenecks located at SR A1A/Ocean Blvd, SR 842/Las Olas Blvd, SR 820/ Hollywood Blvd, and SR 858/Hallandale Beach Blvd.

Figure 2-8 illustrates the top 10 bottleneck locations for Broward County, from March through April 2019. The top bottlenecks were located on I-95, I-595, and SR A1A / Ocean Blvd.

While **Figures 2-7** and **2-8** illustrate top 50 bottlenecks in Broward County based on March-April 2019 data, **Appendix-B** provides detailed back up data regarding each of these bottlenecks.

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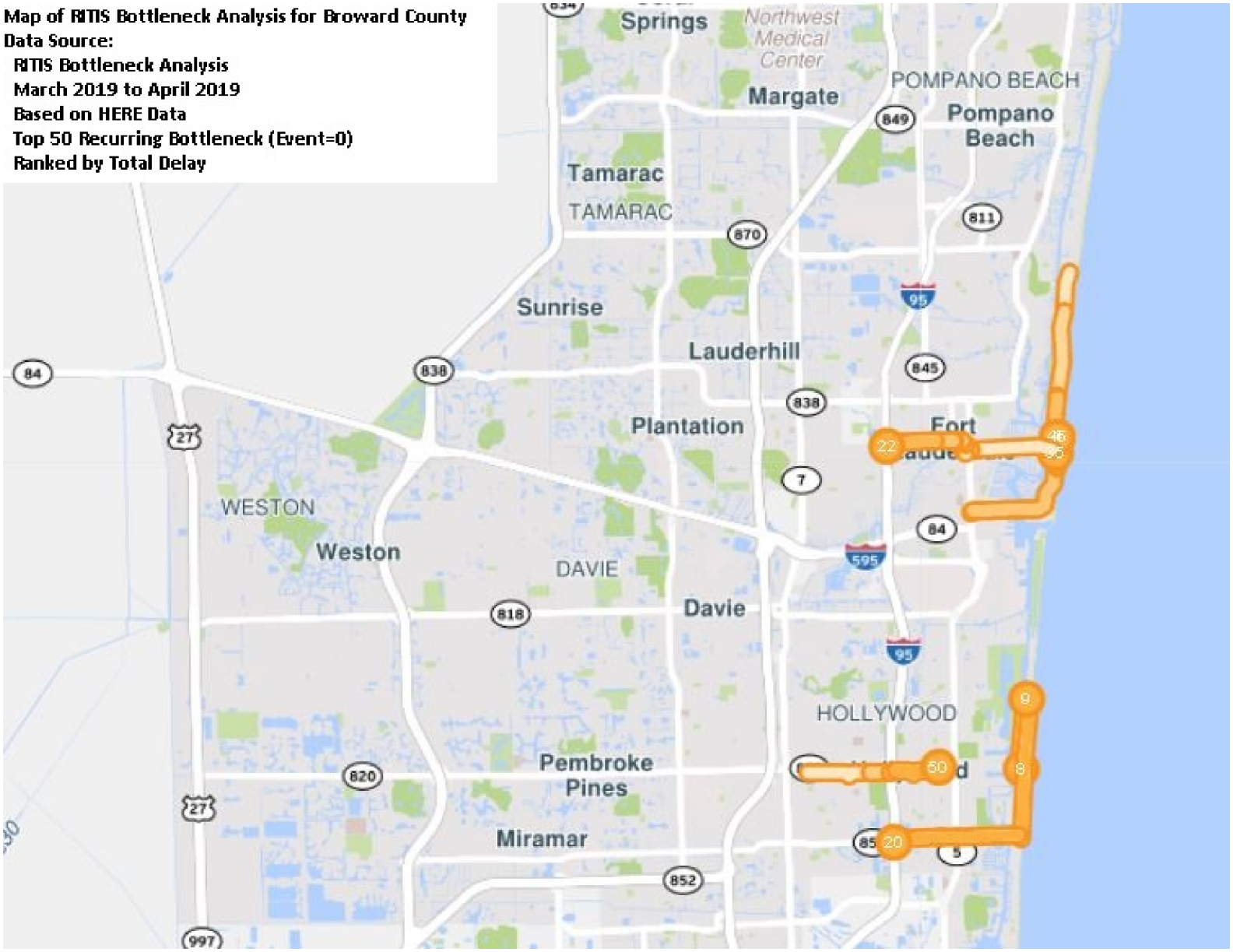
Map of RITIS Bottleneck Analysis for Broward County
Data Source:
RITIS Bottleneck Analysis
March 2019 to April 2019
Based on HERE Data
Top 50 Recurring Bottleneck (Event=0)
Ranked by Total Delay



0 1 2 4 6
Miles

RITIS Recurring Bottleneck Ranking
(State Roads Only) March-April 2019

Figure 2-7

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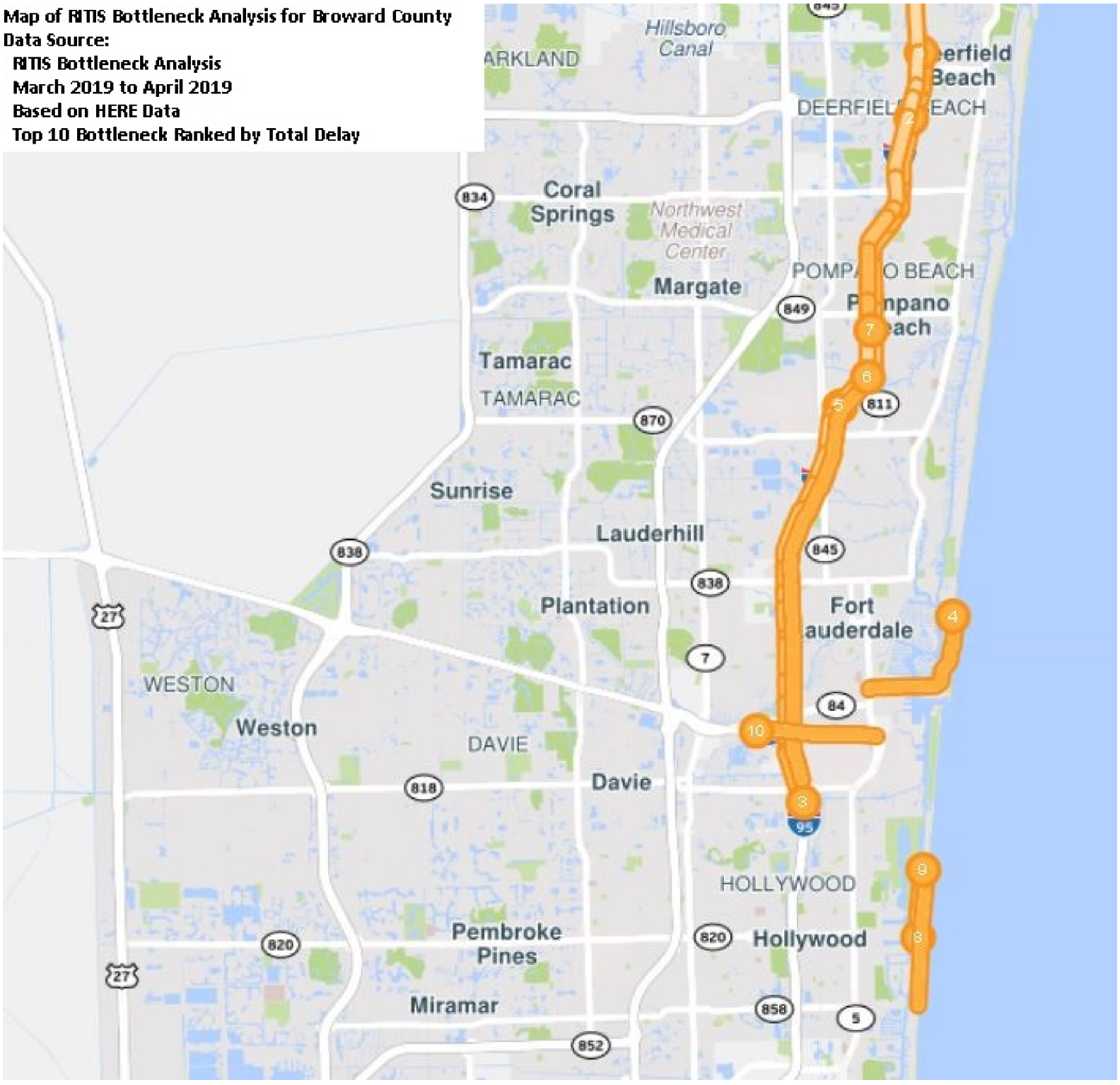
Map of RITIS Bottleneck Analysis for Broward County
Data Source:
RITIS Bottleneck Analysis
March 2019 to April 2019
Based on HERE Data
Top 10 Bottleneck Ranked by Total Delay



0 1 2 4 6
Miles

RITIS Top 10 Bottleneck Ranking, March-April 2019	Figure 2-8

Planning Time Index (PTI)

The Planning Time Index (PTI) is a performance metric provided by the RITIS that infers the roadway congestion conditions. The PTI is the total time that should be planned to arrive on time and therefore includes an adequate buffer time. The PTI compares near-worst case travel time to a travel time in light or free-flow traffic. Higher value of PTI indicates longer planned travel time and more congestion.

Figure 2-9 shows the PTI for Broward County for the time period of March through April 2019. Roadways with PTI of 1.3 or more indicates that 30 percent more time should be planned when traveling along these roadways. For instance, a PTI of 1.3 indicates that for a 30-minute trip, 39 minutes should be planned to arrive on-time 95 percent of the time. In Year 2019, most north-south and east-west major roadways were congested with a PTI of 1.3 or more during PM peak period.

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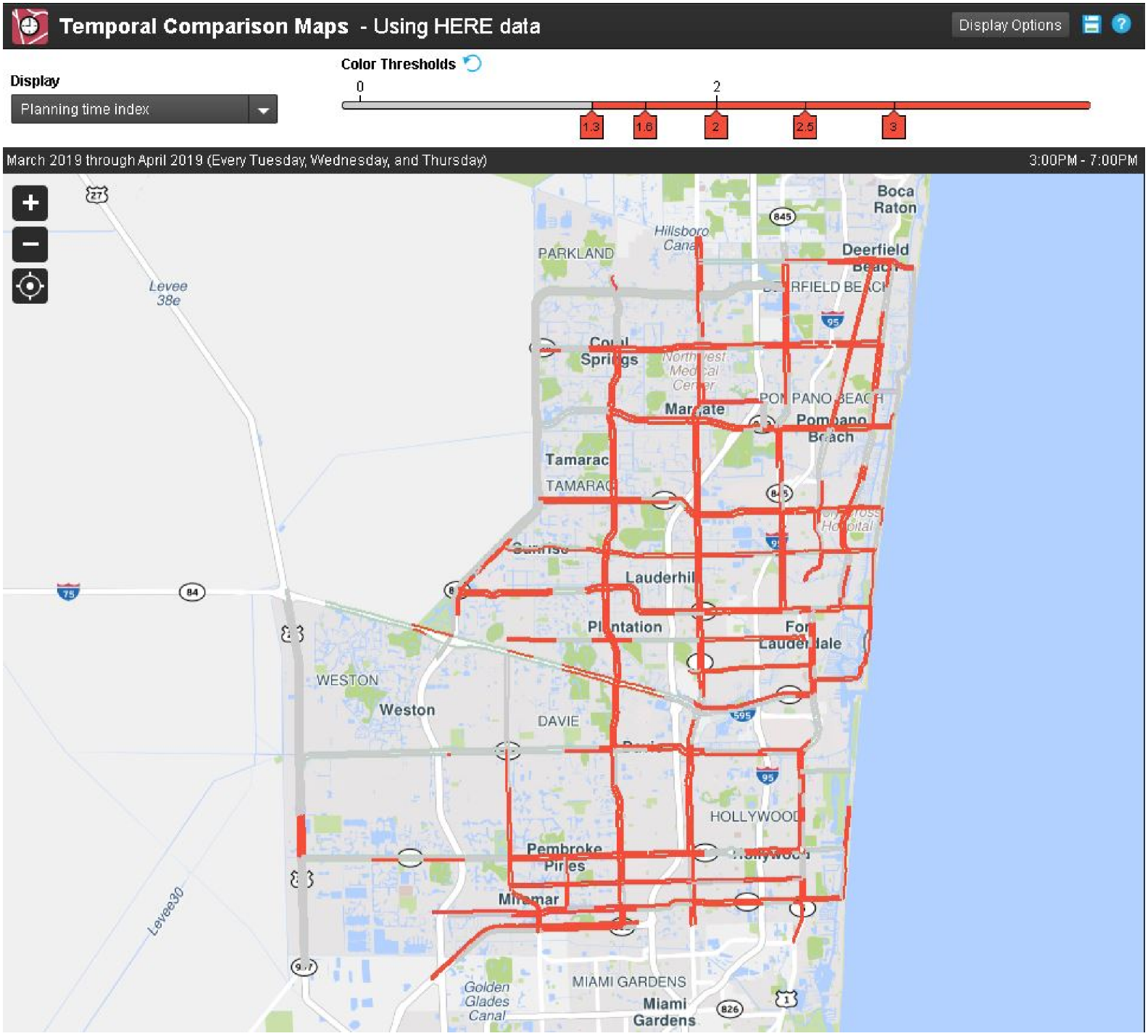


0 1 2 4 6 Miles

Planning Time Index (PTI), PM Peak Hour
March-April 2019

Figure 2-9

Level of Service (LOS) Report, BMPO

The BMPO's LOS report for Year 2020 and Year 2045 were reviewed. The 2020 LOS was based on latest available traffic count data collected by BMPO for the evening (PM) peak hour while Year 2045 PM peak hour traffic volume was derived from SERPM. It should be noted that the capacity used to develop V/C ratios to derive level for service (LOS) is based on FDOT's Quality/Level of Service Handbook. **Table 2-6** shows various north-south and east-west oriented corridors in Broward County based on BMPO LOS Report.

Table 2-6: Level of Service (LOS) Report, BMPO, PM Peak Hour, Year 2020 and Year 2045

Roadway	Year 2020		Year 2045	
	North-South	East-West	North-South	East-West
Small Roadway Segments	Weston Rd, SW 145th Ave, Hiatus Rd, SW 100th Ave, NE 3rd Ave	Atlantic Blvd, Sample Rd, SR 84, Pembroke Rd, Pines Blvd, Sheridan St, Miramar Pkwy	-	-
Large Roadway Segments	I-75, Sawgrass Expwy, University Dr, Florida's Turnpike, SR-7, US-1, SR-A1A	Oakland Park Blvd, Commercial Blvd, Atlantic Blvd, Pines Blvd, Hollywood Blvd, SE 17th St	In addition to Year 2020 roadway segments	
			Flamingo Rd, Hiatus Rd, Palm Ave, Nob Hill Rd, Coral Ridge Dr, Pine Island Rd, Davie Rd, SR-7, Lyons Rd, Powerline Rd, Rock Island Rd, Andrews Ave, Dixie Hwy	Miramar Pkwy, Hallandale Beach Blvd, Pembroke Rd, Johnson St, Taft St, Sheridan St, Stirling Rd, SR-84, Broward Blvd, Sunrise Blvd, Prospect Rd, Cypress Creek Rd, Riverside Dr, Copans Rd, Sample Rd, Hillsboro Blvd

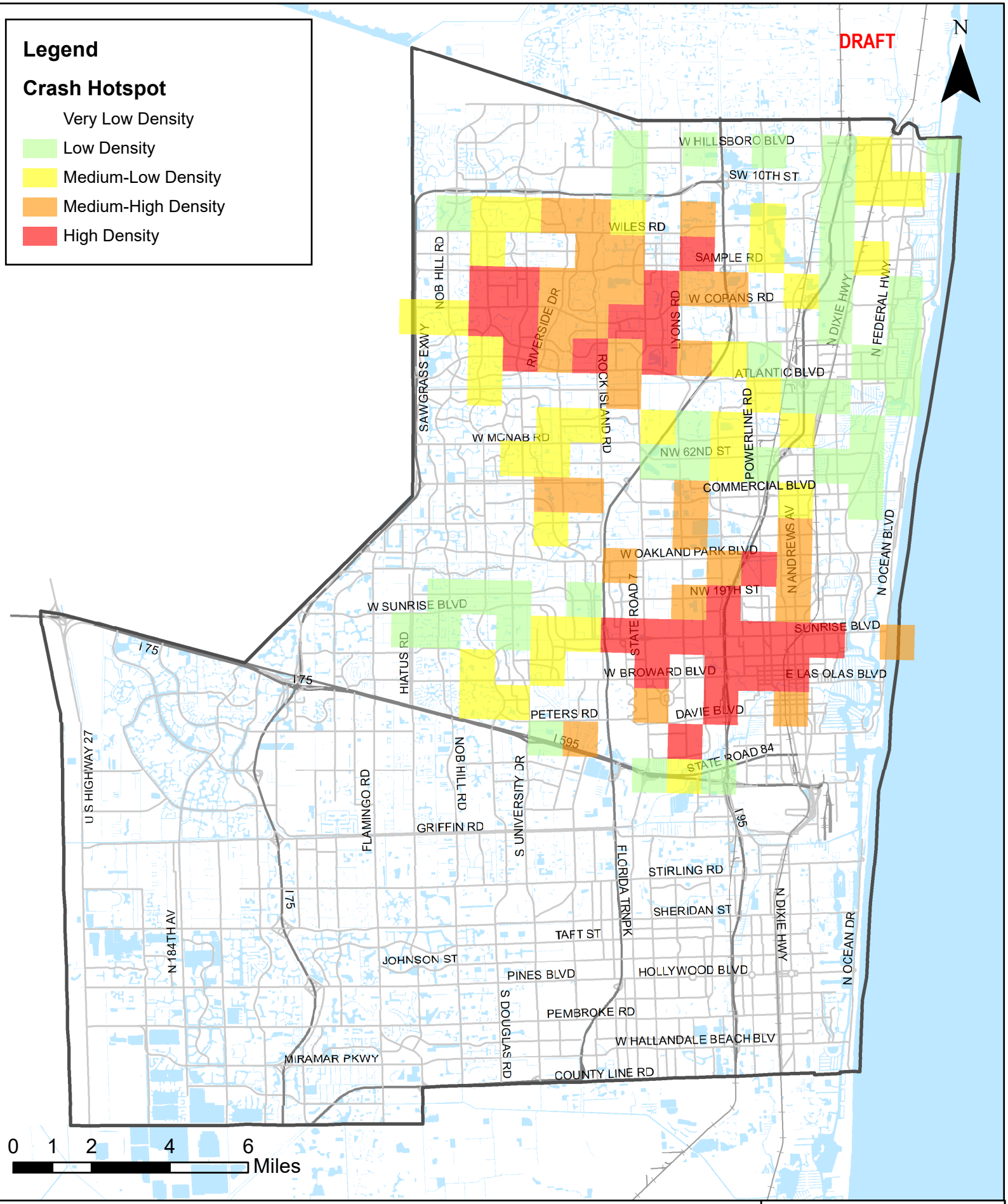
While BMPO did not develop maps showing these corridors given the nature of traffic count data, which is driven by the location of the counter that does not precisely indicate the limits of a roadway segment. However, BMPO's review indicated that the congested corridors in Broward County exhibit the same patterns as discussed in **Section 2.2.1** under Year 2015, Year 2019 as well as Year 2045 for other metrics.

2.2.2 Unanticipated Non-Recurring Congestion

To analyze unanticipated non-recurring congestion, the BMPO identified high density crash locations or crash hotspots for fatal and serious injury crashes that occurred during evening or PM peak period in Year 2015 and Year 2019. Crash hotspot analysis was based on data from Signal Four Analytics. The BMPO identified crash hotspots using *ArcGIS Spatial Analyst Extension*

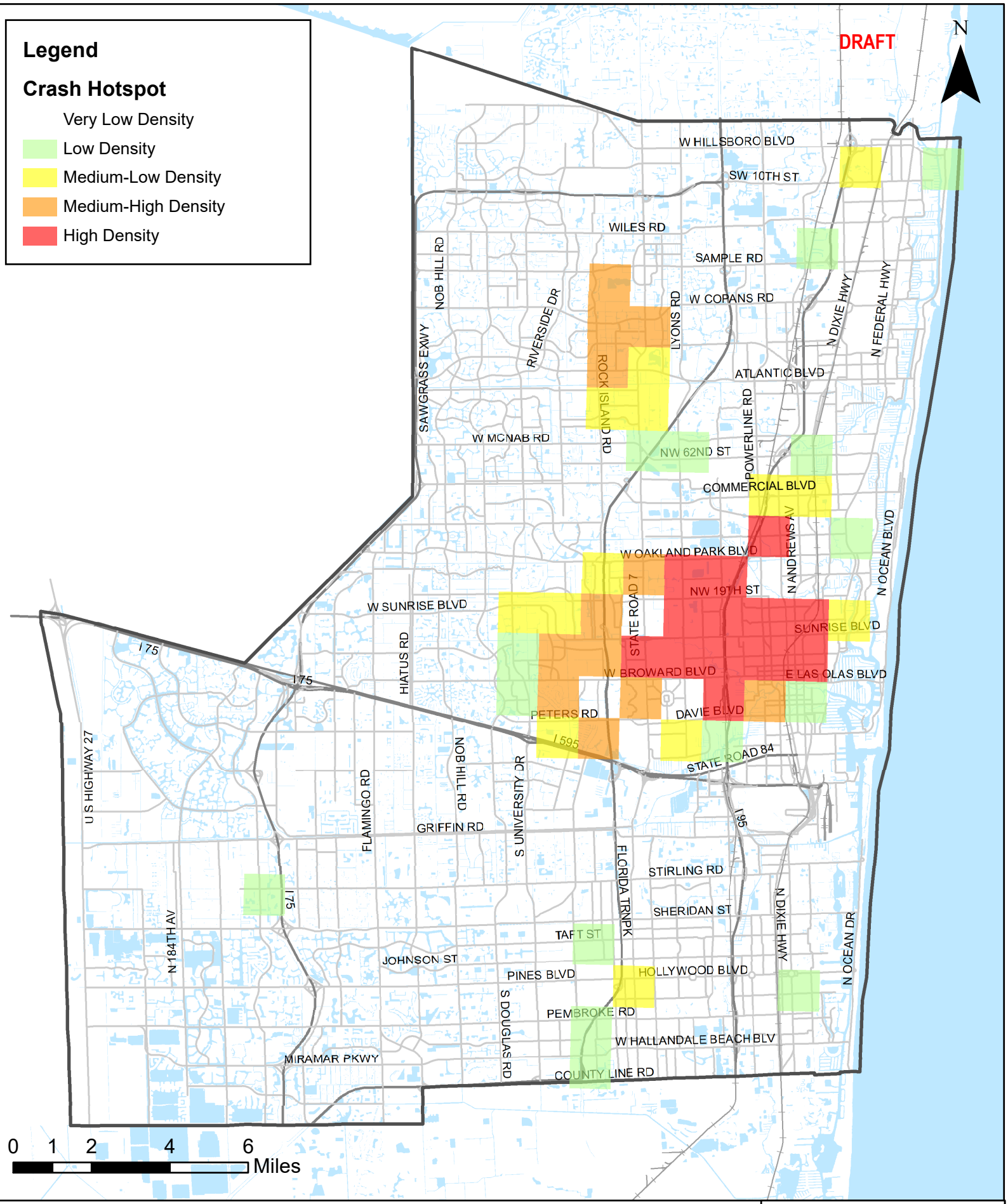
While detailed safety studies are required to identify crash patterns and recommend improvements, the BMPO's intent was to identify hotspots or high density crash locations relative to congested corridors in Broward County. These crash hotspots would be prime candidates where safety improvements would be integral to any congestion management strategy or strategies evaluation process. Addressing safety would help reduce crashes and resulting congestion.

Figures 2-10 and **2-11** shows crash hotspots for all modes (bicycles, pedestrians, and automobiles) during PM peak period for Year 2015 and Year 2019, respectively. In the Year 2015 high density crash locations are concentrated in the central and eastern portion of Broward County in and around downtown Fort Lauderdale as well as northwestern part of the County in Coral Springs and Coconut Creek. In Year 2019, the crash hotspots tend to be limited to Fort Lauderdale, as well as in some areas of the Cities of Oakland Park and Wilton Manors.



Crash Hotspots (All Modes), PM Peak Hour, Year 2015

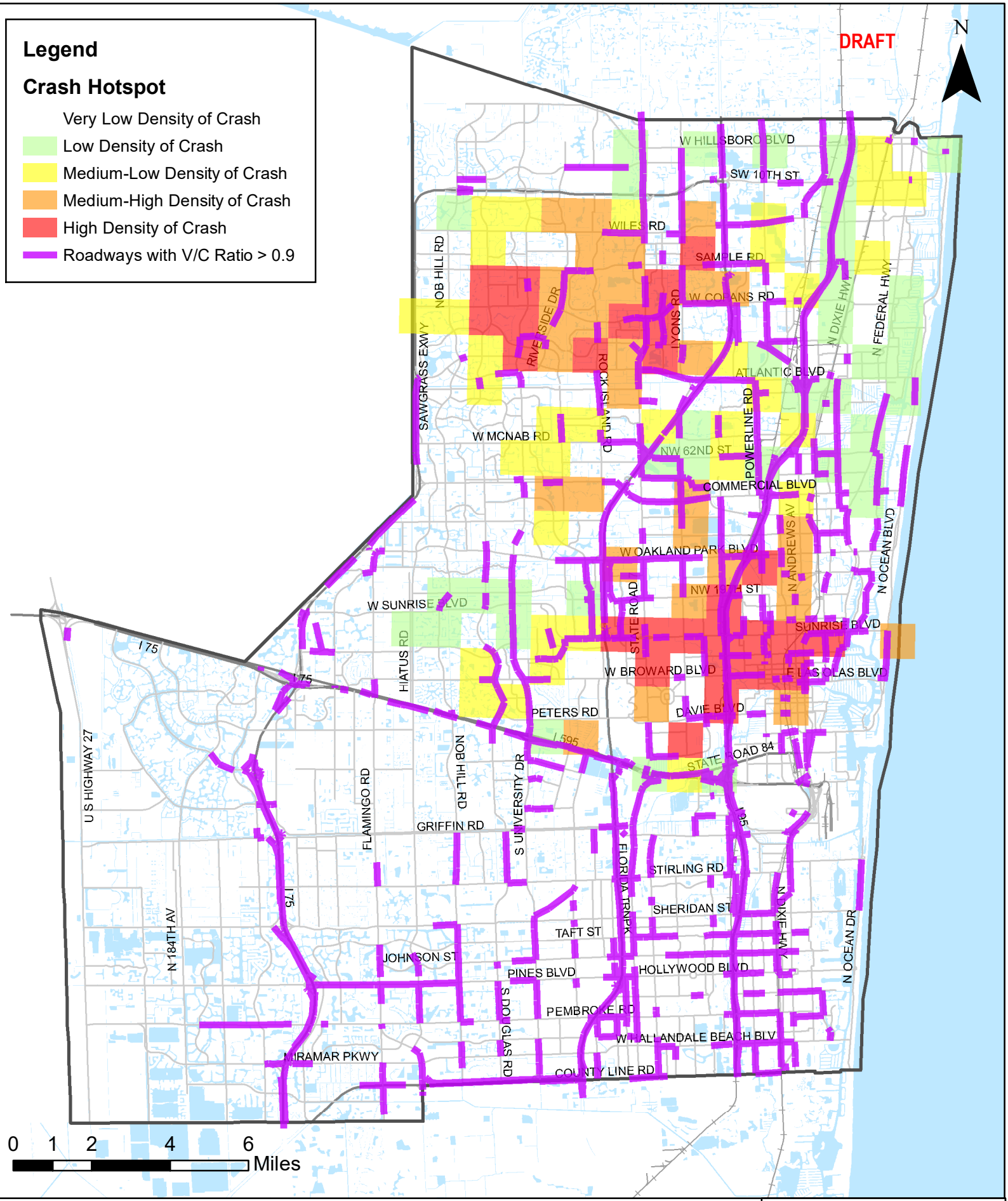
Figure 2-10



Crash Hotspots (All Modes), PM Peak Hour, Year 2019

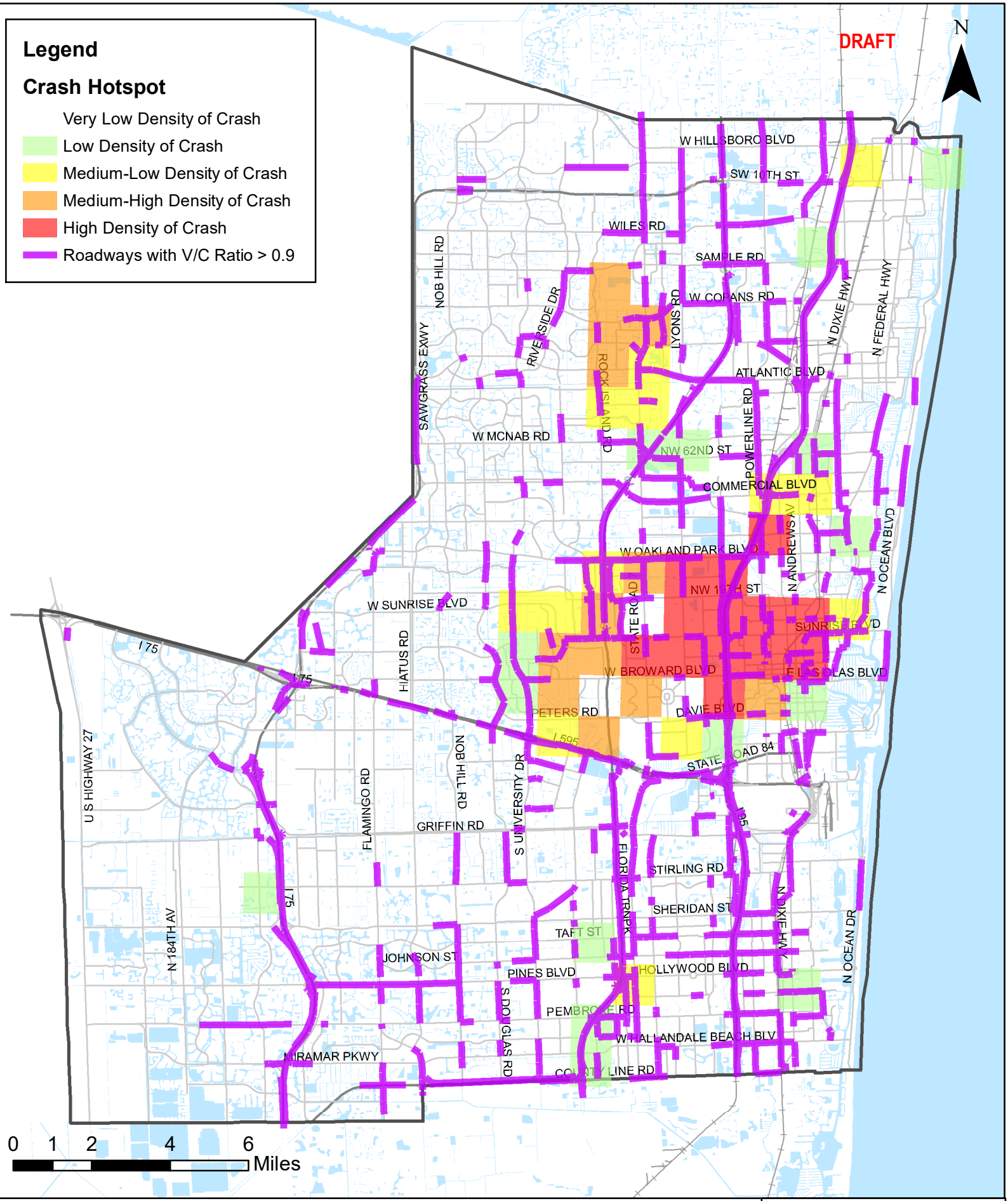
Figure 2-11

The crash hotspots were overlaid with congested corridors (V/C ratio of 0.9 or higher) for the Year 2015. While V/C ratio maps for Year 2019 were not available, it was safe to assume that the congestion patterns in Year 2019 would generally be analogous to Year 2015 given than land use patterns in Broward County remained stable during this four-year period between Year 2015 and 2019. **Figures 2-12a** and **2-12b** illustrate crash hotspots relative to congested corridors in Broward County. It is evident that there is a strong spatial correlation between crash hotspots and congested corridors patterns. However, these figures demonstrate a need for detailed investigation of crashes and potential countermeasures as part of congestion management strategies in certain corridors.



Crash Hotspots and High V/C Ratio Roadways
PM Peak Hour, Year 2015

Figure 2-12a



Crash Hotspots and High V/C Ratio Roadways
PM Peak Hour, Year 2019

Figure 2-12b

2.2.3 Planned Event-Related Congestion

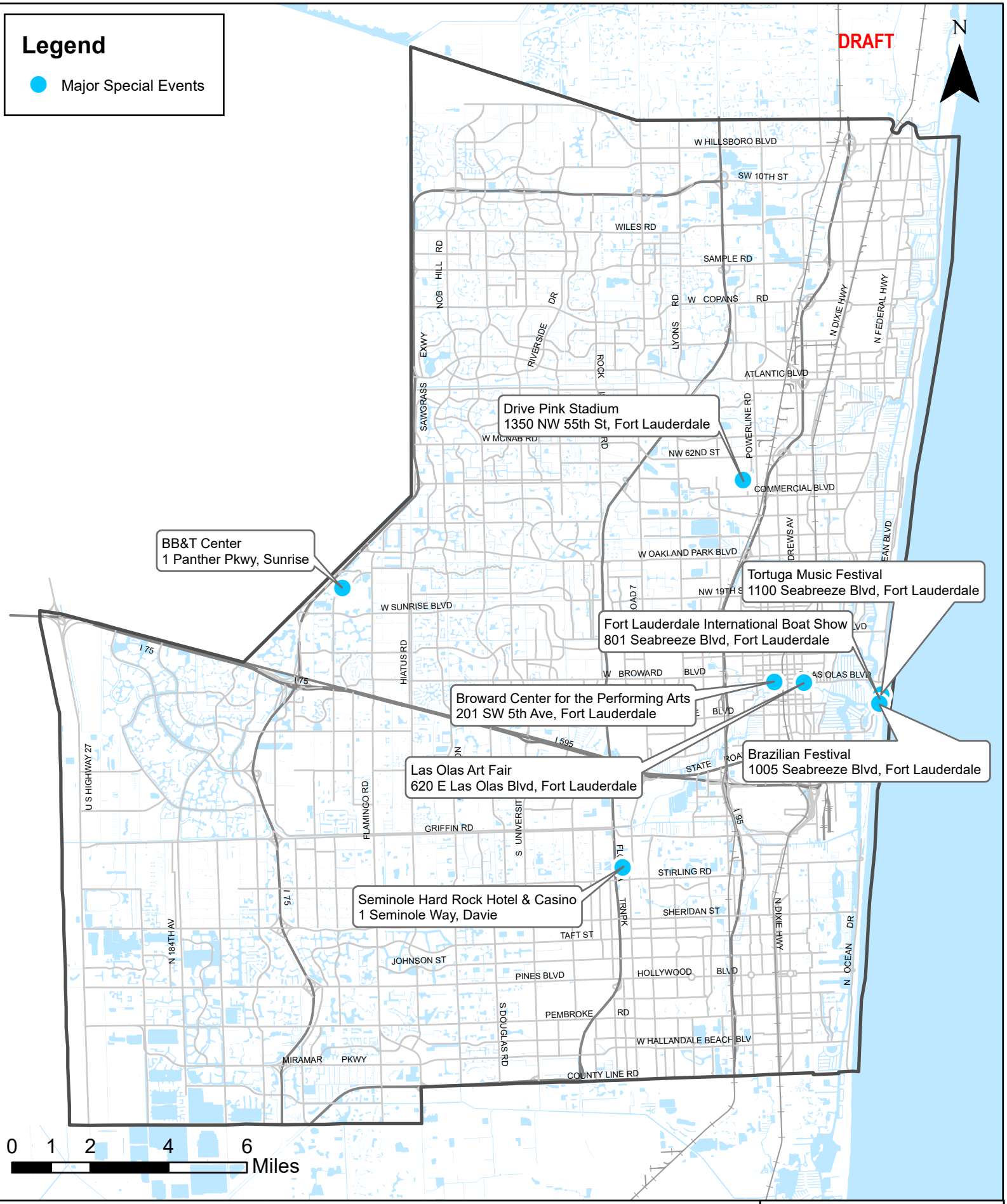
As explained in **Section 2.1.1,** planned event-related congestion which includes delay resulting from special events and work zones accounted for merely 2% of total congestion in Broward County in Year 2019. Not only this type of congestion contributes a miniscule percentage of overall systemwide congestion, but motorists also generally have higher tolerance for delay when attending special events or traversing a work zone. In addition, motorists' factor in extra time to get to and from special events. Further, typically event sponsors work with local jurisdictions and put in place special event maintenance of traffic (MOT) plans. In these MOT plans, traffic signals are under police enforce control and special traffic circulation plans are implemented to move people and vehicles. In addition, public agencies require contractors to develop and implement MOT plans for construction projects.

While **Figure 2-13** illustrates locations or venues for major special events in Broward County that attract people from all over South Florida and beyond, **Table 2-7** includes all the events the BMPO conducted detailed analysis for.

Table 2-7: Detailed Congestion Analysis for Select Major Special Events

Special Event	Date/Day	Time
Fort Lauderdale International Boat Show	10/30/2019 (Wed)	10:00 AM to 5:00 PM
Tortuga Music Festival	4/12/2019 (Fri)	12:00 PM to 10:00 PM
BB&T Center – Hockey Game	3/21/2019 (Thu)	1:00 PM to 10:00 PM
BB&T Center – Cirque du Soleil	7/26/2019 (Fri)	3:30 PM to 10:00 PM
Seminole Hard Rock Hotel & Casino*	3/15/2019 (Fri)	8:00 PM to 11:00 PM

This section of the technical report discusses BMPO's analysis findings from the Fort Lauderdale International Boat Show. **Appendix-C** provides similar information and metrics for planned event-based congestion for other major special events included in **Table 2-7**.



Major Special Events, Broward County

Figure 2-13

Using the bottleneck ranking and congestion scan tools available in RITIS, the BMPO analyzed traffic congestion on October 30, 2019. The Fort Lauderdale International Boat Show began at 10:00 am and ended at 5:00 pm.

Figure 2-14 shows congested corridors, SR-A1A and SE 17th Street that provide access and egress from the venue. The chart at the bottom illustrates how congestion builds up over the entire day along SR-A1A and SE 17th Street corridors.

Figure 2-15 demonstrates speed profile and travel time index for congested corridors or bottlenecks along SR-A1A and SE 17th Street.

Figures 2-14 and **2-15** illustrate that as congestion builds up along SR-A1A and SE 17th Street, speed reduces and travel time index (TTI) increases.

The key aspect of this analysis is the level of detail and granular data that is available from past events. These data in conjunction with lessons learned as well as institutional knowledge, local jurisdictions can develop a data-driven approach to refine and adjust their MOT plans for specific events to address congestion. The BMPO could serve as a resource to share this type of information with partner agencies as well as provide technical support.

Figure 2-14: Fort Lauderdale International Boat Show – Bottleneck Locations, October 30, 2019

Rank	Head Location	Average max length	Total duration	All events/incidents	Volume Estimate	Base Impact	Speed differential	Congestion	TOTAL DELAY
1	SR-A1A N @ SR-842/LAS OLAS BLVD	0.9	11 h 6 m	0	36,750	941	12,858	1,609	2,906,281
2	SR-A1A S @ SEABREEZE BLVD (SOUTH)	0.31	4 h 58 m	0	36,750	91	1,206	190	414,096
3	SR-A1A N @ SEABREEZE BLVD (SOUTH)	2.65	11 m	0	36,752	29	338	32	33,874

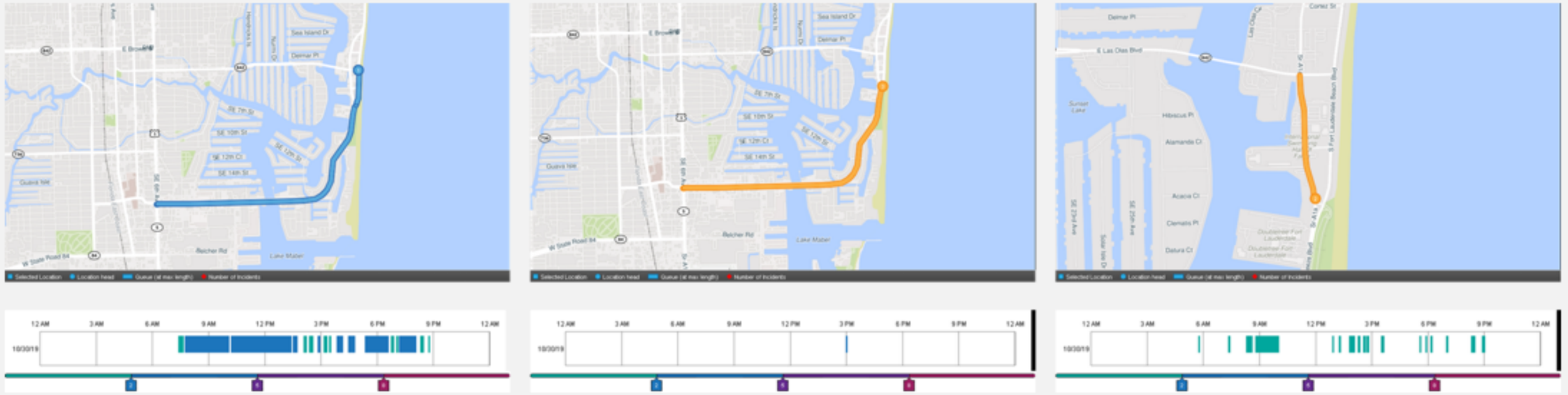
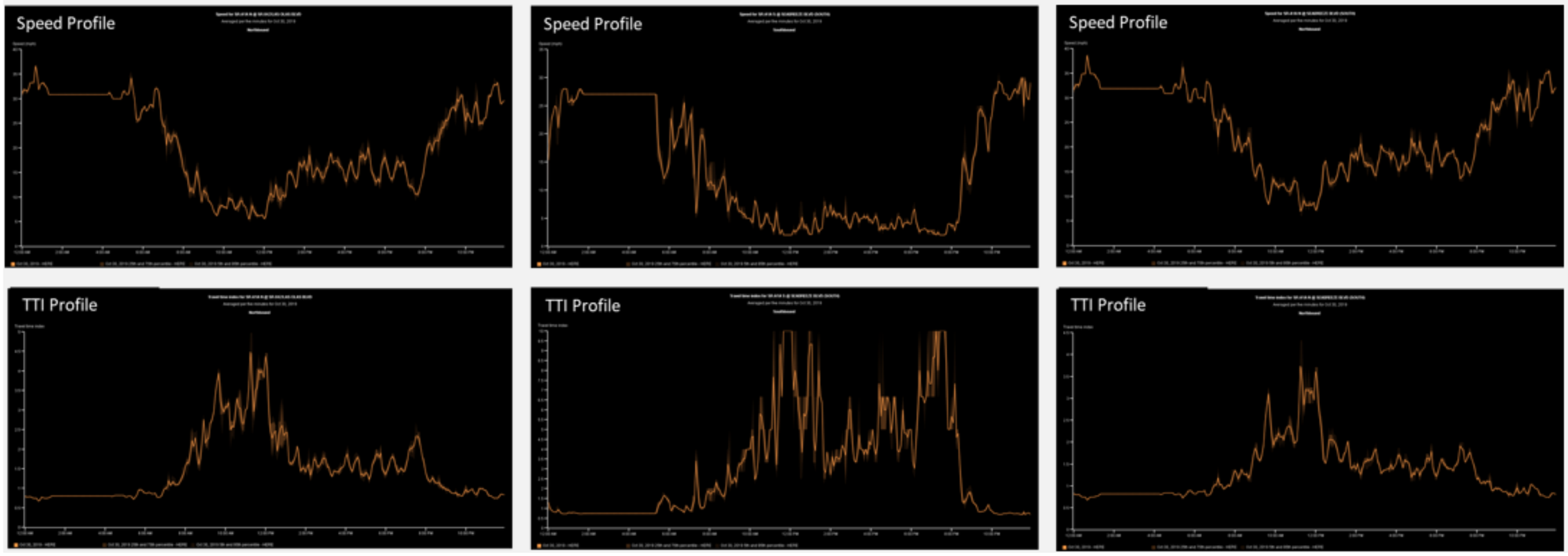


Figure 2-15: Fort Lauderdale International Boat Show – Bottleneck Speed Profile and TTI, October 30, 2019



2.2.4 Extreme Weather-Related Congestion

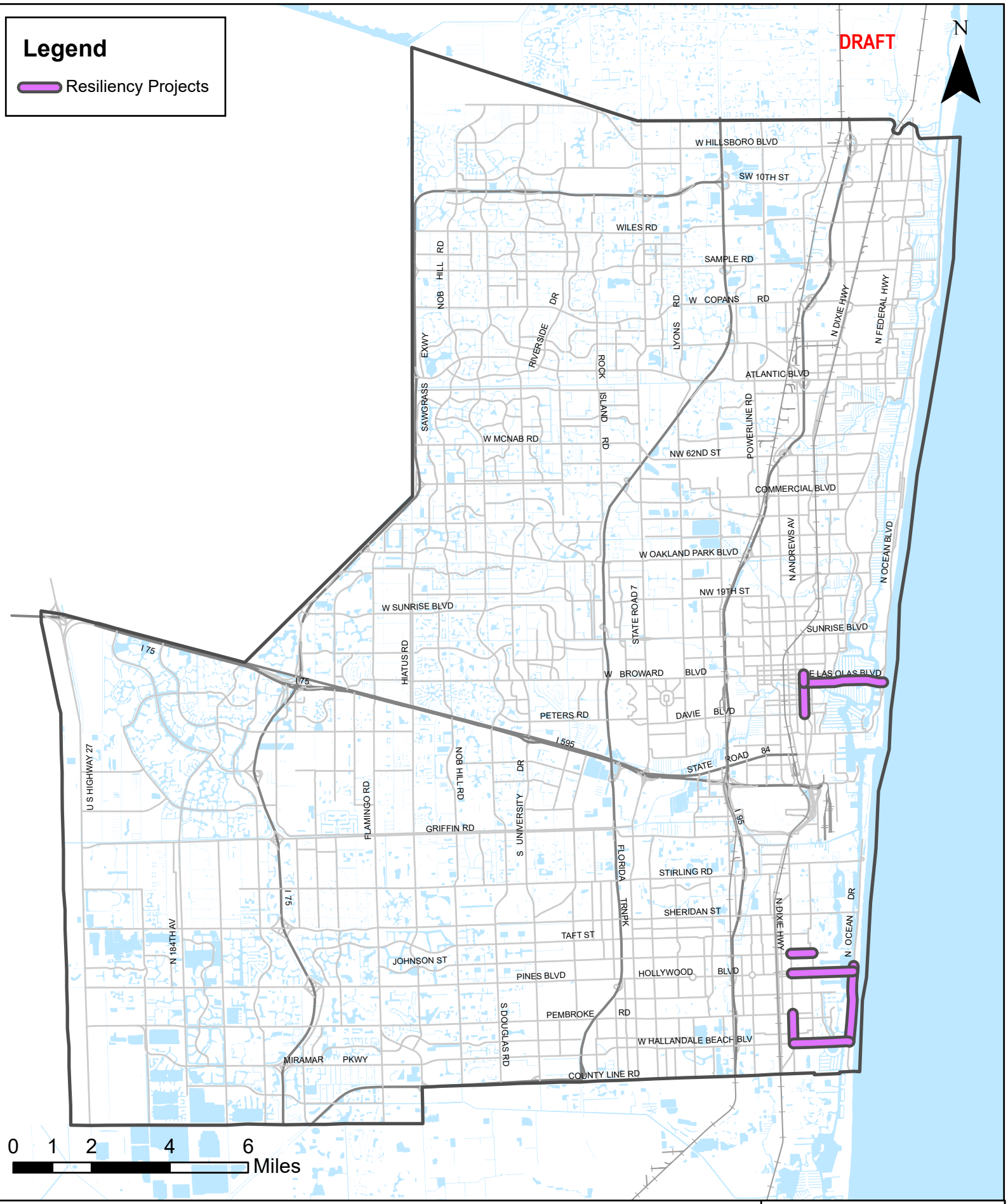
Typically, CMPs do not address extreme weather-related congestion. However, based on USDOT's *Planning Emphasis Areas (PEAs)* issued in December 2021 and local context, the BMPO included the following eight resiliency projects identified in the MPO's 2045 MTP and shown in **Figure 2-16** to inform the CMP.

- SR-858/Hallandale Beach Blvd from US-1/SR-5 to SR-A1A
- SR-820/Hollywood Blvd from US-1/SR-5 to SR-A1A
- Johnson St from US-1/SR-5 to N 14th Ave
- E Las Olas Blvd from US-1/SR-5 to SR-A1A
- US-1/SR-5 from SR-824/Pembroke Rd to SR-858/Hallandale Beach Blvd
- US-1/SR-5 from E Las Olas Blvd to SR-736/Davie Blvd
- US-1/SR-5 from SR-842/Broward Blvd to E Las Olas Blvd
- SR-A1A from S of Arizona St to SR-858/Hallandale Beach Blvd

While long-term strategies to make these corridors resilient is outside the purview of CMP, the BMPO's intent was to identify some solutions that can be implemented in the next five years or so as part of CMP to address congestion in these corridors during extreme weather events, such as "king tides" or heavy precipitation.

Is should be noted that the following five corridors overlap with congested corridors identified through data-driven analyses discussed in **Section 2.2.2**. Further, except Johnson Street and Las Olas Boulevard corridors, all other facilities are state roads.

- SR-858/Hallandale Beach Blvd from US-1/SR-5 to SR-A1A
- US-1/SR-5 from SR-824/Pembroke Rd to SR-858/Hallandale Beach Blvd
- US-1/SR-5 from E Las Olas Blvd to SR-736/Davie Blvd
- US-1/SR-5 from SR-842/Broward Blvd to E Las Olas Blvd
- SR-A1A from S of Arizona St to SR-858/Hallandale Beach Blvd



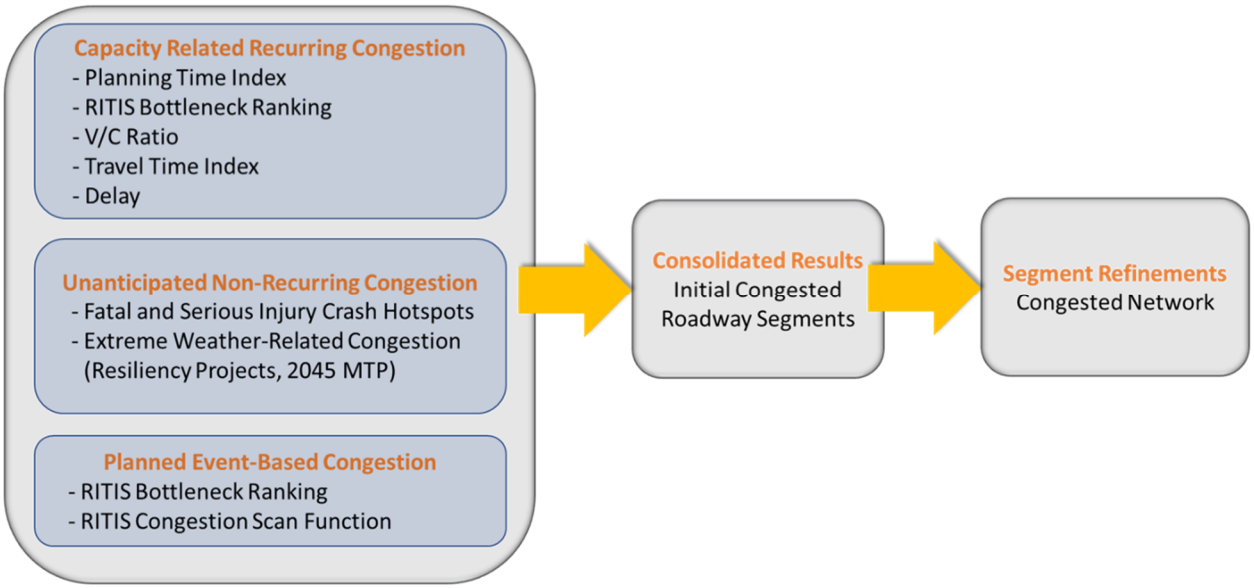
Resiliency Projects, 2045 MTP

Figure 2-16

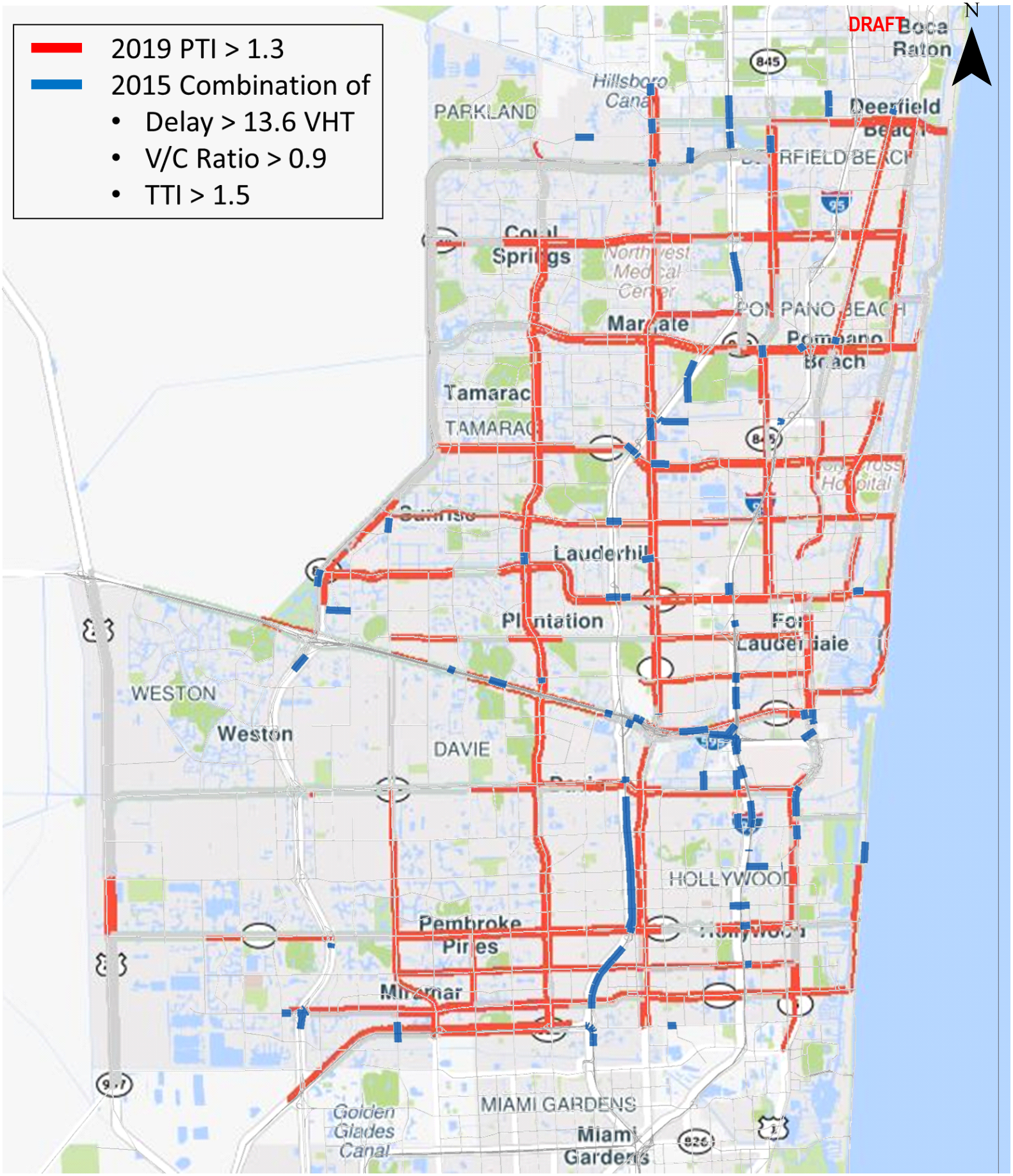
2.2.5 Consolidated Results

The BMPO used a two-step process illustrated in **Figure 2-17** to combine various types of data driven congestion analyses discussed in **Sections 2.2.1** through **2.2.4** to derive initial congested roadway segments and refine them to develop Broward County's congested network.

Figure 2-17: Congested Network Identification Process

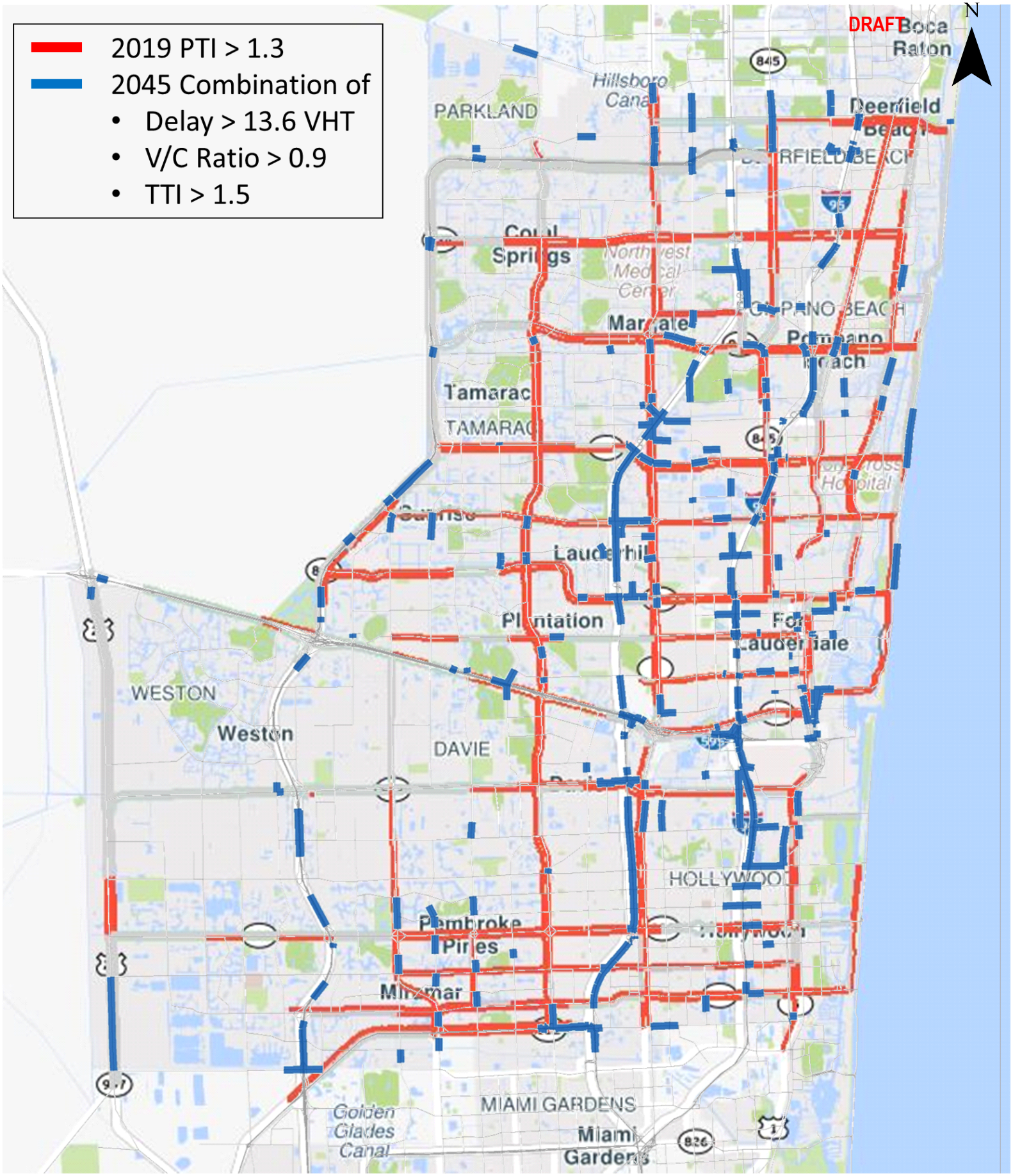


In the first step, the BMPO combined analyses findings and results for capacity-related recurring congestion, unanticipated non-recurring congestion, and planned event-based congestion to develop consolidated result to identify initial congested roadway segment. **Figure 2-18** and **2-19** show maps of the initial congested roadway segments in Broward County based on different metrics under existing conditions and future year. It should be noted that for existing conditions, the BMPO used PTI for Year 2019 in conjunction with Year 2015 metrics, such as delay, V/C ratio and TTI while future conditions do not include PTI metric. Figure 2-19 includes PTI data for Year 2019 to provide relative comparison. The second step focused on initial roadway segments refinement and adjustment.



Initial Congested Roadway Segments
Existing Conditions

Figure 2-18



Initial Congested Roadway Segments
Future Conditions

Figure 2-19

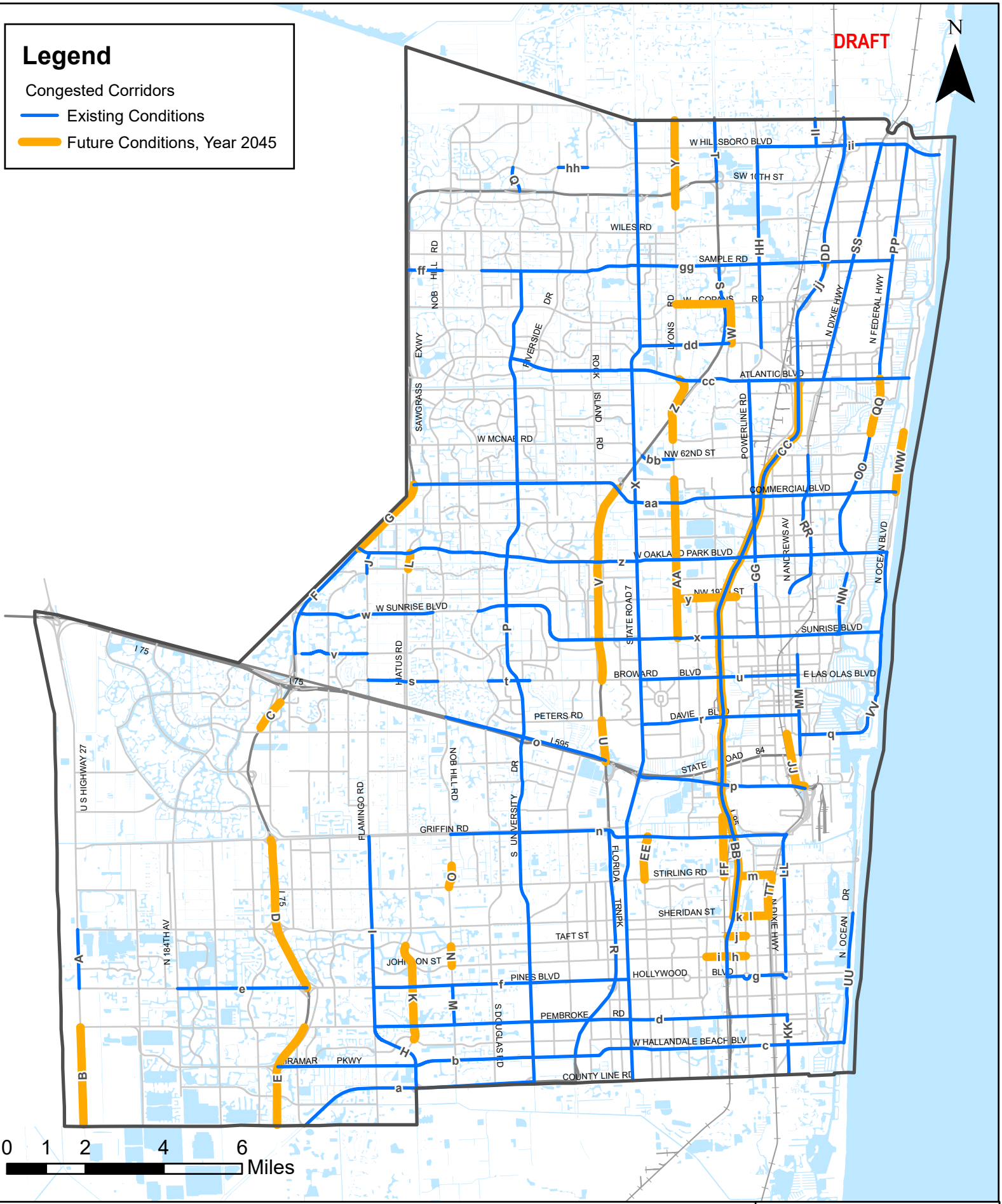
2.2.6 Congested Network

In the second step, the BMPO adjusted the consolidated results to develop a refined congested network for Broward County CMP update. This refinement process included adjusting roadway links and nodes to "smooth out" initial roadway segments into corridors with appropriate termini. **Figure 2-20** shows refined congested network in Broward County. **Appendix-D** includes a tabulation of congested corridors with unique map identifier (Map ID) that cross references congested network shown in **Figure 2-20**.

Below are highlights of the congested network in the County.

- # of Roadway Segments
    - East-west: 35 (29 existing + 6 future)
    - North-south: 50 (27 existing + 23 future)
- # of Miles of Congested Corridors
    - East-west: 152 miles (146 existing + 6 future)
    - North-South: 200 miles (146 existing + 54 future)

It should be noted that the future year corridors are based on select subset of congestion metrics compared to existing conditions map. Primarily PTI metric is not included in the future year congested network since it is a historic metric. This metric would be incorporate to revise and update future year congested network as part of subsequent CMP update efforts.



Congested Network

Figure 2-20

3. Congestion Management Strategies

Chapter 3 discusses congestion management strategies "toolbox" and identifies corridor/area specific select strategies based on Florida Department of Transportation (FDOT) District Four's *Transportation Systems Management & Operations (TSM&O) Master Plan, September 2021* and Broward County's *Mobility Advancement Program's (MAP)* Congestion Management (CM) projects. In addition, this chapter describes congested network stratification approach and evaluation tools available to assess different congestion management strategies.

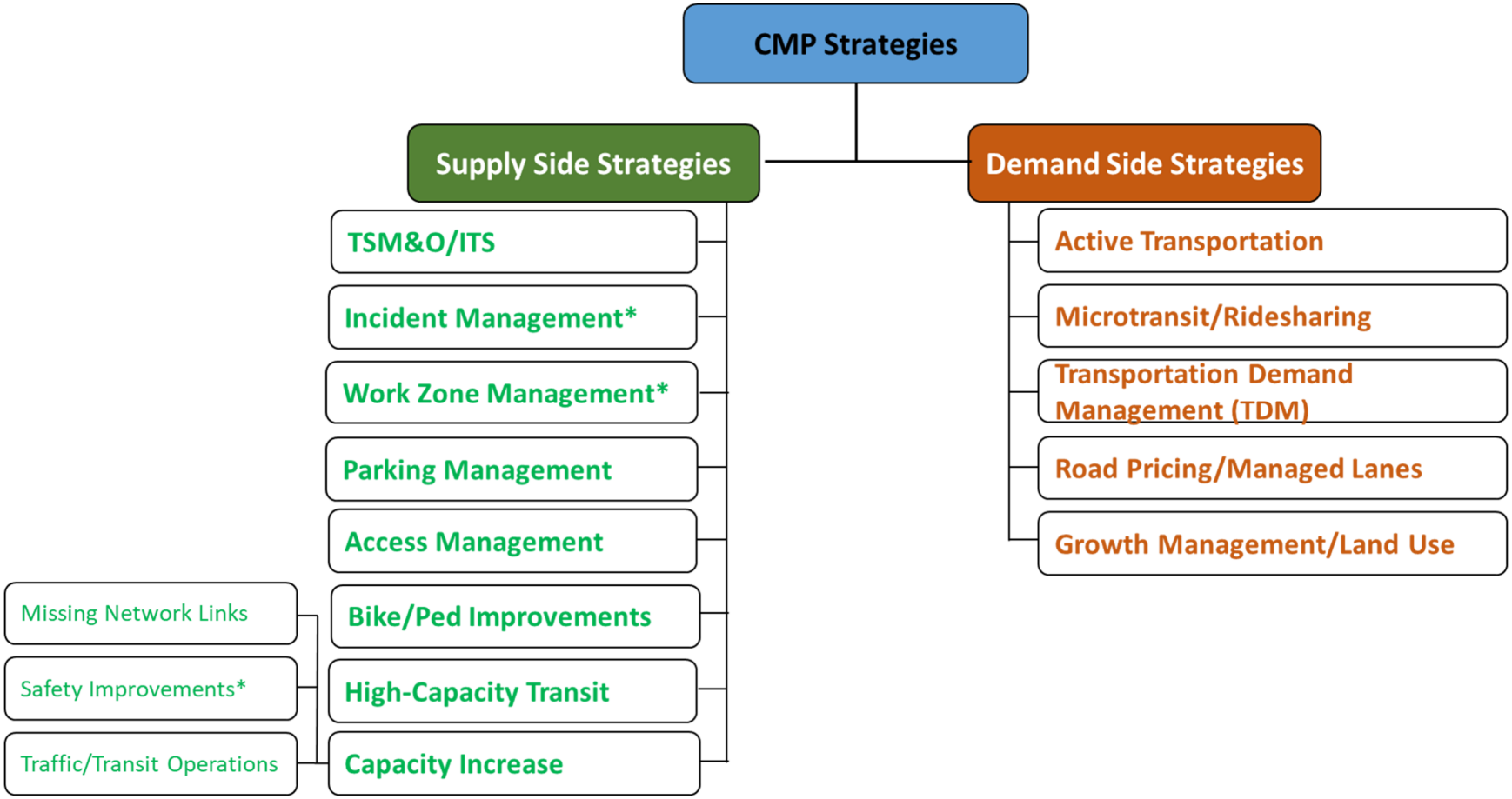
3.1 Congestion Management Strategies Toolbox

The CMP focuses on a "management" solution to address traffic problems by targeting resources to operational management and trip reduction strategies. The CMP strategies can be classified into the following two groups or categories to mitigate congestion:

- Supply side strategies, and
- Demand side strategies.

The supply side strategies tend to increase the efficiency of existing transportation network using a variety of operational improvements, while the demand side strategies try to influence traveler behavior to reduce single occupant vehicle (SOV) trips or spread peak period travel demand. **Figure 3-1** identifies various supply and demand side congestion management strategies that are available to the BMPO to address traffic and safety issues in Broward County.

Figure 3-1: Supply Side and Demand Side Strategies



*Non-recurring congestion

Special Event Transportation Management Plan (Planned event-based congestion)

As shown in **Figure 3-1**, Transportation Systems Management and Operations/Intelligent Transportation Systems (TSM&O/ITS), incident management, work zone management, parking management, and access management are operational strategies. Work zone management and incident management strategies are targeted to address non-recurring congestion. While not identified in **Figure 3-1**, special event management transportation management plans are used to manage planned event-based congestion.

Albeit supply side strategies focus on operational improvements to optimize transportation network efficiency, where necessary certain projects may be needed to increase network capacity to enhance mobility and safety. It should be noted that "capacity increase" projects under supply side include construction of critical missing network links, intersection projects to improve traffic operations without compromising bicycle and pedestrian safety. For instance, an intersection improvement that would consider adding turn lanes should include lead pedestrian interval (LPI), pedestrian refuge or bicycle boxes to enhance pedestrian and bicycle safety. Transit operational improvements that increase capacity include transit signal priority (TSP) and queue jump lane. Bicycle and pedestrian improvements under this category provide additional infrastructure to support non-vehicular trips.

Demand side strategies in **Figure 3-1** include active transportation, microtransit or ridesharing, and Transportation Demand Management (TDM) strategies that encourage mode shift, while road pricing aims at reducing peak period travel demand by spreading it over a longer duration or shift demand to off peak periods. Finally, growth management/land use focuses on eliminating the vehicular trips.

Both the supply and demand side strategies should be used as the "universe of strategies" when conducting detail corridor studies to evaluate various alternatives in any given congested corridor.

3.1.1 Supply Side Strategies

Table 3-1 identifies thirty-three supply side strategies to address congestion problems in Broward County under eight categories. All these strategies have different impacts in managing congestion as indicated in **Table 3-1** for reference purposes. In addition, each of these strategies have different implementation timeframe, ease of implementation and associated order of magnitude costs.

Ease of Implementation

This includes political, institutional, and other barriers affecting feasibility. The following metric or guidance was used to assign high, medium, and low rating:

- High - Challenging barriers (e.g., strong political opposition or lack of public acceptance, major institutional coordination required) – typical for strategies with limited or no implementation;
- Medium - Some barriers, but have been overcome in practice; and
- Low - Few/relatively easy barriers to overcome.

Implementation Timeframe

Strategies differ widely in the timeframe over which they can be implemented, and their benefits realized. Some – especially operational strategies – can be implemented in a relatively short timeframe. Major capital investments may take five to 10 years or even longer to design, program, and implement. Some factors, such as land use, evolve and change over time. The following timeframe metrics were used:

- Short-term – less than or within five years;
- Mid-term – between five to 10 years; and
- Long-term –10 years or more.

Order of Magnitude Cost

The order of magnitude cost rating was assigned is based on the following metrics:

- High – Typically major construction projects, other major infrastructure costs (e.g., areawide intelligent transportation systems), or costly services (e.g., transit operations) – ranging in the tens of millions per mile or per location covered, and the hundreds of millions for areawide applications.
- Medium – Modest infrastructure improvements (e.g., lane additions at intersections, more modest intelligent transportation systems or operational costs) – in the range of approximately $1 to $10 million per mile or per location covered, and the tens of millions for areawide applications.
- Low – Operations strategies (e.g., changing signal timing), minor construction, or strategies that primarily incur administrative/programmatic costs (e.g., land use policies) – typically less than $1 million per mile or per location covered, and the low millions for areawide applications.

Table 3-1: Supply Side Congestion Management Strategies

Congestion Management Strategy	Congestion Impacts	Ease of Implementation	Implementation Timeframe	Order of Magnitude Cost
Transportation System Management & Operations (TMS&O)				
Integrated Corridor Management (ICM)	Increase travel time reliability, Improve network efficiency enhance safety	Medium	Short-term (within 5 years)	Medium
Active Traffic Management System (ATMS)	Increase travel time reliability, Improve network efficiency	High	Short-term (within 5 years)	Medium
Adaptive Traffic Control System (ATCS)	Increase travel time reliability, Improve network efficiency	High	Short-term (within 5 years)	Medium
Traveler Information System/Traffic Information Dissemination	Reduce non-recurring congestion, Reduce travel time, Increase mode shift	High	Short-term (within 5 years)	Medium
Regional Traffic Management	Reduce travel time and delay, Shift peak period travel demand	Medium	Short-term (within 5 years)	Medium
Standard Railroad Grade Crossing and Operations Coordination	Improve safety, Reduce delay at railroad crossing	Low	Short-term (within 5 years)	Low
Reversible Traffic Lanes	Increase capacity	Low	Short-term (within 5 years)	High
Freight Operational Improvements	Improve safety, Improve traffic flow	Medium	Short-term (within 5 years)	Medium
Incident Management				
Traffic Incident Management System	Reduce non-recurring congestion, Improve travel time reliability, Shift peak period travel demand	High	Short-term (within 5 years)	Medium
Work Zone Management				
Roadway Closure Management	Reduce non-recurring congestion	High	Short-term (within 5 years)	Low

Table 3-1: Supply Side Congestion Management Strategies (continued)

Congestion Management Strategy	Congestion Impacts	Ease of Implementation	Implementation Timeframe	Order of Magnitude Cost
Parking Management				
Parking Facility Management	Increase HOV trips	High	Short-term (within 5 years)	Low
Parking Agreements (Employer/Landlord)	Reduce VMT, Increase mode shift	Medium	Short-term (within 5 years)	Low
On-Street and Valet and Delivery Truck Restrictions	Reduces arterial congestion, Increase peak hour capacity	Low	Short-term (within 5 years)	Medium
Parking Ordinances/Maximums	Reduce VMT, Increase mode shift	Low	Medium-term (5 to 10 years)	High
Preferential Treatment - Carpool/Vanpool, Electric Vehicles	Reduce VMT, Increase HOV trips	High	Short-term (within 5 years)	Low
Special Event Traffic Management Plan	Improve network efficiency and safety during special events	Medium	Short-term (within 5 years)	Medium
Access Management				
Turn Restrictions, Directional Medians, Driveway Consolidation	Increases efficiency on arterials	Low	Short-term (within 5 years)	Low
Bicycle and Pedestrian Improvements				
Missing Sidewalk and Bicycle Facilities to fill network gaps	Increase bike/ped trips, Increase safety, Increase mobility and access	High	Short-term (within 5 years)	Low
Bicycle Facilities (Local and Arterial Streets)	Increase bike trips, Increase safety, Increase mobility and access	Medium	Short-term (within 5 years)	Medium
Trails and Greenways (along canal or railroad right-of-way)	Increase non-automobile more share, Improve safety	Low	Medium-term (5 to 10 years)	Medium
Shared Use Path (if right-of-way is available)	Increase non-automobile more share, Improve safety	Medium	Short-term (within 5 years)	Medium
Bicycle/Pedestrian Safety/ADA Improvements	Improve safety, Increase bike/ped trips	High	Short-term (within 5 years)	Low
Bicycle/Pedestrian Oriented Design/Development Guidelines	Increase bike/ped trips	Low	Medium-term (5 to 10 years)	Medium

Table 3-1: Supply Side Congestion Management Strategies (continued)

Congestion Management Strategy	Congestion Impacts	Ease of Implementation	Implementation Timeframe	Order of Magnitude Cost
Capacity Increase				
Safety Improvements - Geometric/Operational	Reduces VHT, Increase safety	Medium	Short-term (within 5 years)	Medium
Center Turn Overpass (CTO)	Reduce VHT, Increase, safety include bike/ped	Low	Long-term (10 years or more)	High
New Facilities/Missing Roadway Network Links	Reduce congestion temporarily	Low	Long-term (10 years or more)	High
Interchange Modifications	Eliminates bottlenecks, Improve throughput	Low	Long-term (10 years or more)	High
Transit Operational Improvements (TSP, Queue Jump Lane)	Increase travel time reliability, Increase ridership	Medium	Short-term (within 5 years)	Medium
High-Capacity Transit/Transit Service Expansion				
Rail or Bus Rapid Transit (BRT)	Increase ridership, Reduce VMT, Reduce SOV trips	Low	Long-term (10 years or more)	High
Express or Rapid Bus Service	Increase ridership, Reduce VMT, Reduce SOV trips	Medium	Medium-term (5 to 10 years)	Medium
Park-and-Ride Lots	Increase ridership, Reduce SOV trips	Medium	Medium-term (5 to 10 years)	High
Service Expansion (Geographic or Temporal - headway and service span)	Increase ridership, Reduce vehicle trips	Medium	Short-term (within 5 years)	Medium
Fare Collection/Subsidized Fares based on Eligibility	Increase ridership	High	Short-term (within 5 years)	Medium

Majority of the supply side strategies can be implemented within five years consistent with the BMPO's Transportation Improvement Program (TIP) timeframe, while some are longer term that could be prioritized through the MTP process as well as others could be advanced through other studies and initiatives at BMPO with support from its partner agencies. In addition, approximately a third of these strategies are easy to implement from process, regulations, infrastructure needs standpoint while the others require varying level of planning and project development effort. Depending on the project goals and context, a variety of these strategies should be evaluated. Below is a short description of supply side strategies.

Transportation System Management & Operations (TMS&O)

The Federal Highway Administration (FHWA) defines Transportation Systems Management and Operations (TSM&O) as "an integrated program to optimize the performance of existing multimodal infrastructure through implementation of systems, services, and projects to preserve capacity and improve the security, safety, and reliability of our transportation system." TSM&O strategies include:

- *Integrated Corridor Management (ICM)* – Per FDOT TSM&O Master Plan, ICM provides solutions by evaluating the overall effects of an integrated series of traffic management strategies on a multimodal transportation network to optimize the movement of people and goods at a system level instead of for an individual roadway. ICM consists of a collection of ITS/TSM&O devices and strategies that are coordinated and integrated for systemwide optimizations of safety and mobility. These devices and strategies could be installed at different times, managed by different agencies, and originally serve different modes. Through proactive design and communication, ICM could maximize the performance of the transportation system.
- *Active Traffic Management System (ATMS)* and *Active Traffic Control System (ATCS)* – Involves ensuring that traffic signals are timed to work in a synchronized manner. This can be accomplished through pre-set phasing and timing plans for existing signals with the plans updated at regular intervals based on real-world data, the introduction of adaptive traffic signal control via enhanced communications capabilities with existing signals (where possible), and the installation of new signals that allow for remote management to optimize the signal network. FDOT District Four and Broward County Traffic Engineering Department (BCTED) have an extensive ATMS and ATCS in Broward County, which both the agencies continue to build and expand to manage congestion.
- *Freight operational improvements* – Includes freight signal priority, intersection improvements to accommodate turning radii for trucks, truck only lanes and other enhancements to improve freight traffic flow, truck parking, and others.

Several other sub systems that are part of the TSM&O/ITS strategies are identified in **Table 3-1**.

Incident Management

Includes detection and verification of deteriorating operating conditions resulting from all forms of congestion to provide for efficient response to and clearance of the source of delay, allowing for return to normal conditions. Quick clearance can reduce the potential for secondary incidents such as rear end crashes resulting from sudden backups and braking. Some incidents, such as disabled vehicles, can be cleared relatively quickly. In the event of crashes, the safety needs of first responders need to be incorporated into incident management protocols.

Work Zone Management

Repair of roads and bridges is a necessary activity to ensure their safety and suitability for the volumes they carry. The associated construction can result in delays. Managing work zones to limit their impact on traffic can take the forms of limiting construction to off-peak travel hours; ensuring roadways in proximity or those that serve as alternate routes for each other are not repaired at the same time; and using traditional and social media to make the public aware of the construction and alternate routes in advance of the work commencing.

Parking Management

Parking management strategies include:

- *Parking Facility Management* – Parking strategies offer the opportunity to address the timing, destination, and type of trips made through pricing and supply. Raising prices (especially, during certain times) and limiting supply for single occupancy vehicles can induce the use of other modes (e.g., public transportation, biking, ridesharing, etc.) by commuters. Conversely, discounts during certain time periods and for high occupancy vehicles can achieve similar effects.
- *Parking Agreements* – Employers can negotiate leases so that they pay only for the number of spaces used by employees. In turn, employers can pass along parking savings by purchasing transit passes or reimbursing non-driving employees with the cash equivalent of a parking space.
- *On-Street and Valet and Delivery Truck Restrictions* – Enforcement of existing regulations can substantially improve traffic flow in urban areas. Peak-period parking prohibitions can free up extra general-purpose travel lanes or special bus or HOV “diamond” lanes.
- *Parking Ordinances/Maximums* –Parking requirements can be adjusted for factors such as availability of transit, a mix of land uses, or pedestrian-oriented development that may reduce the need for on-site parking. This encourages transit-oriented and mixed-use development.
- *Preferential Treatment - Carpool/Vanpool, Electric Vehicles* – This provides an incentive for workers to carpool.
- *Special Event Traffic Management Plan* – Prepared by event sponsor and required by local jurisdictions these plans help manage traffic flow, pedestrian circulation, and transit connections in an areawide transportation network.

Access Management

Increasing the space between access points, altering the design and location of driveways, and requiring left turns at dedicated points can improve traffic flow and reduce crashes, resulting in decreases in Recurring and Unanticipated Recurring congestion. Outreach to businesses to explain the benefits of access management and clear directions to drivers via signage and visual cues are recommended components of access management implementation.

Bicycle and Pedestrian Improvements

Increasing coverage and quality of bicycle and pedestrian improvements is critical to enhance first and last mile connectivity to transit service as well as provide alternative and health options for commute as well as recreational trips. These improvements should be considered a priority in transportation equity areas, which have a high concentration of environmental justice population groups – low-income households, minorities, zero auto households, elderly, and Limited English Proficiency (LEP). The BMPO's Complete Streets Master Plan (CSMP) should be considered when evaluating congestion management strategies in specific corridors. Candidate lane elimination projects should also be assessed as part of the alternative strategies evaluation along with safety improvements for bicyclist and pedestrians. Public awareness campaigns of the availability and benefits (e.g., monetary, environmental, health, etc.) of bicycling and walking can increase usage and their contributions to congestion mitigation. The BMPO conducts several promotional programs and events throughout the year to encourage bicycling and walking in Broward County.

Capacity Increase

This category of strategies addresses adding more base capacity to the road network, such as adding additional lanes, redesigning specific bottlenecks (such as interchanges and intersections) to increase their capacity, as well as safety improvements (geometric and operational). Given the expense and possible adverse environmental impacts of new single occupant vehicle capacity, the BMPO's approach is to consider additional highway capacity management as the strategy of last resorts. It should be noted that increasing highway capacity on limited access facility, such as I-95 and Florida's Turnpike incorporates an envelope for express transit service. Other improvements in this category include TSP and queue jump lane to increase transit capacity in certain travel corridors.

High-Capacity Transit/Transit Service Expansion

Providing high-capacity transit service as well as increasing geographic and/or temporal coverage of local and express bus service can result in mode shift. The extent to which travelers will use public transportation depends on the location of origins and destinations relative to public transportation routes. Through its Mobility Advancement Program (MAP), the Broward County has a planned an extensive network of high-capacity transit in several congested corridors identified through the BMPO's CMP. In addition, the FDOT District Four has a Park-and-Ride Master Plan in place as well. Fare subsidy based on eligibility is focused on equity.

3.1.2 Demand Management Strategies

Table 3-2 lists 15 demand side congestion management strategies grouped under five different categories. Eleven of the 15 strategies can be implemented in the short-term while the land use/growth management strategies require a much longer lead time. Although, more than 70% strategies included in **Table 3-2** can be implemented in the short-term, only 33% are easy to implement. The demand side strategies should also be part of the toolbox to be used as a starting point when conducting detailed corridor or project level assessments.

Table 3-2: Demand Side Congestion Management Strategies

Congestion Management Strategy	Impact on Congestion	Ease of Implementation	Implementation Timeframe	Cost
Active Transportation				
Electric Scooters and Electric Bikes	Reduce VMT and SOV, Increase mode shift	Medium	Short-term (within 5 years)	Medium
Bike Share Program	Increase bicycle trips	Low	Short-term (within 5 years)	High
Microtransit/Ridesharing				
Microtransit Zones	Reduce VMT, vehicle trips; Increase mode shift	Low	Short-term (within 5 years)	High
On-Demand Ridesharing Service (first and last mile connection)	Reduce VMT, vehicle trips; Increase mode shift, transit ridership	Low	Short-term (within 5 years)	High
Transportation Demand Management (TDM)				
Telecommuting	Reduce VMT, vehicle trips	High	Short-term (within 5 years)	Low
Flex Work Schedule	Reduce peak hour congestion	High	Short-term (within 5 years)	Low
Carpool/Vanpool, Guaranteed Ride Home	Increase HOV, Reduce VMT	Medium	Short-term (within 5 years)	Medium
Employer Based Discount Programs	Reduce SOV trips, Increase mode shift	High	Short-term (within 5 years)	Medium
Marketing, Communication and Advocacy for TDM Programs	Reduce SOV trips, Increase mode shift	High	Short-term (within 5 years)	Low
Trip Reduction Ordinance	Reduce SOV trips	High	Short-term (within 5 years)	Medium
Road Pricing/Managed Lanes/HOT Lanes				
Congestion Pricing/Variable Pricing	Reduce peak hour congestion	Medium	Short-term (within 5 years)	High

Table 3-2: Demand Side Congestion Management Strategies (continued)

Congestion Management Strategy	Impact on Congestion	Ease of Implementation	Implementation Timeframe	Cost
Growth Management/Land Use				
Transit-Oriented Development (TOD)	Increase mode shift; Reduce VMT, VHT, and vehicle trips	Low	Long-term (10 years or more)	High
Affordable Housing	Increase mode shift Increase bike/ped trips	Low	Medium-term (5 to 10 years)	High
Mixed Use Development	Reduce VMT; VHT, and vehicle trips; Increase walk/bike trips	Low	Medium-term (5 to 10 years)	High
Infill Development	Reduce VMT; VHT, and vehicle trips; Increase walk/bike, transit trips	Medium	Medium-term (5 to 10 years)	High

A brief discussion of various demand side strategies follows.

Active Transportation

Active transportation is human-powered mobility, such as biking, walking, or rolling. Active transportation directly replaces motor vehicle miles traveled, so these modes are effective at conserving fuel, reducing vehicle emissions, bridging the first- and last-mile gap, and improving individual and public health. Bicycles, electric bikes, wheelchairs, scooters, and even walking are all considered active transportation. Active transportation requires a dedicated network of sidewalks, bike lanes, bike paths, overpasses, crosswalks, and bike racks to ensure people can get where they need to go safely and efficiently. Shared micromobility refers to fleets of fully or partially human-powered vehicles including manual bikes, e-bikes, and e-scooters that individuals can access for short-term use. Broward County and some of the local jurisdictions have an extensive bike-sharing program.

Microtransit/Ridesharing

Transit agencies are implementing microtransit solutions that improve the rider's experience by operating small-scale, on-demand public transit services that that can offer fixed routes and schedules, as well as flexible routes and on-demand scheduling. Ridesharing is typically arranged/ encouraged through employers or transportation management agencies (TMA), which provides ride-matching services. Several transit agencies are also using third party vendors to consolidate trip making apps. In Broward County, BCT and SFRTA are offering microtransit options to riders for first and last mile connections.

Transportation Demand Management (TDM)

South Florida Commuter Services (SFCS), an FDOT program, seeks to reduce vehicle miles traveled (VMT) in South Florida through a variety of Transportation Demand Management (TDM) strategies. These strategies include the following:

- *Telecommuting* – This involves employees to work at home or regional tele-commute center instead of going into the office. They might do this all the time, or only one or more days per week. Work from home policies have gained popularity during the COVID-19 pandemic and current research indicates that losses in productivity were not experienced by many employers, making it feasible that these policies may continue following the pandemic. Beyond working from home, some employers have multiple locations and can allow employees to work from satellite offices to reduce commuting times.
- *Flex Work Schedule* – This allows workers to arrive and leave work outside of the traditional commute period. It can be on a scheduled basis or a true flex-time arrangement.
- *Carpool/Vanpool, Guaranteed Ride Home* – Participants of ridesharing programs are matched with other commuters that carpool or vanpool. These programs can be offered and/or encouraged by employers. Many ridesharing programs offer participants a guaranteed ride home in the event of illness, family emergency, or other situation that requires leaving work before the scheduled carpool or vanpool. Guaranteed rides home can reduce the hesitancy that keeps some people from

participating in the ridesharing. South Florida Commuter Services (SFCS) provides TMD services in South Florida region.

- *Employer Based Discount Programs* – These programs typically include incentives and support for employees to shift travel modes, increase vehicle occupancy rates, and/or reduce the need for travel. A variety of incentives and options may be included in employer TDM programs, such as, transit pass subsidies, parking cash-out programs as well as reward and recognition programs.
- *Marketing, Communication and Advocacy for TDM Programs* – As part SFCS' TMD program, it conducts robust year-round activities and promotional events for employers and workers in South Florida.
- *Trip Reduction Ordinance* – Trip reduction ordinances (TROs) are regulations that typically require employers of a certain size to reduce the single occupancy vehicle (SOV) commute rate of their employees. TROs can be implemented locally or at the state level.

Road Pricing/HOT Lanes/Managed Lanes

This involves pricing facilities to encourage off-peak or HOV travel, and includes time-variable road, and cordon (area) tolls, high-occupancy/toll (HOT) lanes and vehicle-use fees. The FDOT has extensive experience with congestion pricing. An extensive network of managed lanes which includes an envelop for express buses existing in Broward County and much of South Florida. Some of BCT's most successful express bus service between Broward County and Miami-Dade County using I-95 managed lanes.

Growth Management/Land Use

Land use patterns are inextricably linked to transportation. While growth management and land use patterns have a long lead time, they have a strong influence on commuting and other trip making patterns. Key growth management/land use strategies include the following:

- *Transit-Oriented Development (TOD)* – Encouraging and incentivizing land uses that promote the use of public transportation can increase ridership and reduce existing as well as future trips that would be made by private automobile. Transit Supportive Development generally includes denser, mixed-use development, enhanced transit stops with shelters and other amenities, and street configurations that promote connectivity for pedestrians and bicyclists.
- *Affordable Housing* – Incorporating and encouraging affordable housing enhances equity by providing access and mobility options to low-income households and those that do have automobiles. It increases transit ridership.
- *Mixed Use Development* –This allows many trips to be made without automobiles. People can walk to restaurants and services rather than use their vehicles.
- *Infill Development* – This takes advantage of infrastructure that already exists, rather than building new infrastructure on the fringes of the urban area. It helps increase density, encourage non single occupant vehicle travel, and promote transit usage and shorter trips.

Broward County and other local jurisdictions have taken a proactive approach and integrated the above strategies in their comprehensive plans and zoning.

3.2 Stratified Congested Network

The BMPO stratified the congested network identified in CMP Step #5 into four groups based on a review of FDOT's TSM&O Master Plan, September 2021 and Broward County's surtax projects, which are part of the MAP. The purpose of congested network stratification was two-fold.

- First, the stratification helped identify specific congestion management strategies for certain corridors and/or area while ensuring consistency between various partner agency plans and programs.
- Second, it allowed the BMPO to breakdown the network into more manageable groups, which would help advance projects from the CMP into the TIP, MTP and other initiatives.

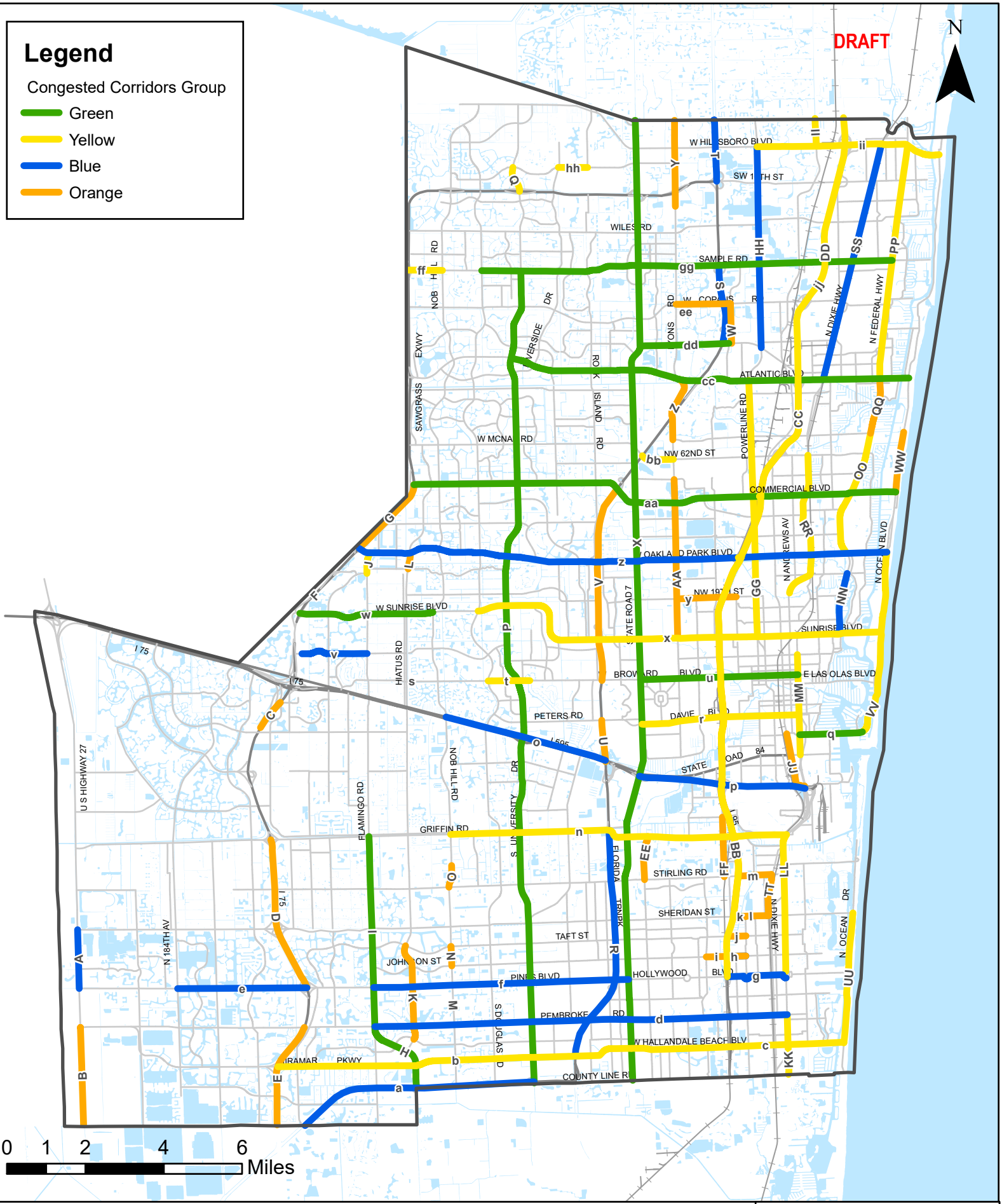
The BMPO assigned different colors to these groups - Orange, Green, Yellow and Blue. It should be noted that that the BMPO did not assign numbers or letters to these group of corridors to avoid any potential confusion it may cause regarding priority.

The following rationale was used to stratify the corridors. If a congested corridor either in its entirety or a part of it was -

- Identified as a future year (Year 2045) corridor it was assigned an orange color.
- Identified on all three plans/studies
    - FDOT TSM&O Master Plan,
    - Broward County's MAP - congestion management (CM) project, fiber optic network, or potential high-capacity corridor and
    - BMPO's CMP Update include 2045 MTP resiliency corridors

  it was assigned green color
- Identified on any two of these three plans listed above were assigned yellow color, and
- Identified on only one of these three plans/projects were color coded blue.

Figure 3-2 shows stratified congested network for Broward County. **Appendix D** includes a corresponding table that identifies each of the corridors shown on **Figure 3-2** and cross-references it based on a unique identifier - *Map ID*.



Stratified Congested Network

Figure 3-2

3.2.1 Corridor/Area Specific Select Congestion Management Strategies

To identify and align corridor/area specific congestion management strategies, the BMPO reviewed the FDOT's TSM&O Master Plan, Sept. 2021 as well as Broward County's MAP projects. In addition, the BMPO considered crash hotspots and evening peak period congestion analysis findings as well as BMPO's Transportation Equity Areas from 2045 MTP. These maps are included in **Appendix E** for reference purposes.

The Broward County MAP's congestion management (CM) projects include Adaptive Traffic Control System (ATCS) projects and installation of fiber optic network in certain corridors. This fiber optic network would serve as the backbone to expand the TSM&O/ITS improvement including ATCS and Advanced Traffic Management Systems (ATMS). Potential TSM&O integrated projects in Broward County from FDOT's Master Plan were also aligned with specific corridors/areas. It should be noted that there is significant overlap between BMPO's congested network and Broward County and FDOT's plans and projects.

Further, findings from unanticipated non-recurring congestion were used to identify specific corridors that should be targeted for safety improvements as part of congestion management. In addition, the BMPO's Transportation Equity Areas were used to inform and classify corridors/areas to be considered for non-automobile focused congestion management strategies, such as bicycle and pedestrian improvements, active transportation, microtransit/ridesharing, first and last mile connections to transit, and TDM strategies.

While **Table 3-3** shows a sample matrix listing supply and demand side congestion management strategies corresponding to specific congested corridors/areas in Broward County based on the approach described above, **Appendix-E** provides a full list of congested corridors with corresponding select congestion management strategies.

Table 3-3: Sample Matrix showing Corridor/Area Specific Select CM Strategies

Direction	Map ID	Road Name	From	To	Length (in miles)	Timeframe	Corridor/Area Specific Select CMP Strategies		FDOT TSM&O Master Plan Group/Tier	Broward County CM or Fiber Optic Project	BMPO Congested Corridors	BMPO CMP Group Color
							Supply Side	Demand Side				
North-South	A	US-27	Pines Boulevard	Sheridan Street	1.50	Existing	TSM&O Improvements from Pembroke Rd. to Griffin Rd. (US-27 Grade Separation Study)	US-27 Grade Separation Study	-	-	Existing	Blue
North-South	B	US-27	Miami-Dade/Broward Co. Line	Pembroke Road	2.47	2045	TSM&O Improvements from Pembroke Rd. to Griffin Rd. (US-27 Grade Separation Study)	US-27 Grade Separation Study	-	-	Future	Orange
North-South	C	I-75	Just south of I-595	N/A	0.83	2045	Integrated Corridor Management (ICM)		-	-	Future	Orange
North-South	D	I-75	Griffin Road	Pines Boulevard	3.96	2045	Integrated Corridor Management (ICM)		-	-	Future	Orange
North-South	E	I-75	Pembroke Road	Miami-Dade/Broward Co. Line	2.70	2045	Integrated Corridor Management (ICM)		-	-	Future	Orange
North-South	F	Sawgrass Expressway	NW 8th Street	Oakland Park Boulevard	3.29	Existing	Increase Roadway Capacity (6 to 10 Lanes)		3	-	Existing	Yellow
North-South	G	Sawgrass Expressway	Oakland Park Boulevard	Commercial Boulevard	2.18	2045	Increase Roadway Capacity (6 to 10 Lanes)		-	-	Future	Orange
North-South	H	Red Road	Florida's Turnpike	Pembroke Road	2.14	Existing	TSM&O (Miami-Dade Co. Line to Miramar Pkwy), ATCS (Miami-Dade Co. Line to Griffin Rd.)		2	Surtax Project	Existing	Green
North-South	I	Flamingo Road	Pembroke Road	Griffin Road	4.84	Existing	TSM&O (Miami-Dade Co. Line to Miramar Pkwy), ATCS (Miami-Dade Co. Line to Griffin Rd.), Center Turn Overpass (CTO) at Flamingo Rd. and Pines Blvd.		2	Surtax Project	Existing	Green
North-South	J	Flamingo Road	NW 136th Ave	Oakland Park Boulevard	0.53	Existing	TSM&O		3	-	Existing	Yellow
North-South	K	Hiatus Road	Miramar Blvd	Taft Street	2.51	2045	TSM&O	Microtransit/Ridesharing, Active Transportation	-	-	Future	Orange
North-South	L	Hiatus Road	NW 29th Manor	Oakland Park Boulevard	0.41	2045	TSM&O	Capacity Increase (Lane Configuration)	-	-	Future	Orange
North-South	M	Palm Avenue	Pembroke Road	Pines Boulevard	1.01	Existing		Microtransit/Ridesharing, Active Transportation, Targeted TMD strategies	-	-	Existing	Blue
North-South	N	Palm Avenue	Johnson Street	Taft Street	0.51	2045		Microtransit/Ridesharing, Active Transportation, Targeted TMD strategies	-	-	Future	Orange
North-South	O	Palm Avenue	Stirling Road	SW 53rd Street	0.57	2045		Microtransit/Ridesharing, Active Transportation, Targeted TMD strategies	-	-	Future	Orange
North-South	P	University Drive	Florida's Turnpike	W Sample Road	21.00	Existing	Adaptive Traffic Control System (Stirling Rd. to Sunrise Blvd.), Transit Signal Priority, TSM&O (Southgate Blvd. to Ramblewood Dr.), (Sunrise Blvd. to Sunset Strip), High-Capacity Transit		1	Surtax Project	Existing	Green
North-South	Q	University Drive	Sawgrass Expressway	Holmberg Road	0.66	Existing	Transit Signal Priority, High-Capacity Transit		1	-	Existing	Yellow
North-South	R	Florida's Turnpike	Miramar Parkway	Griffin Road	6.08	Existing	TSM&O - Add Auxiliary Lanes		-	-	Existing	Blue
North-South	S	Florida's Turnpike	Coconut Creek Parkway	W Sample Road	2.02	Existing	PD&E Study - Capacity Increase (8 to 10 Lanes from I-595 to Wiles Rd)		-	-	Existing	Blue

The BMPO envisions a phased approach to implementing congestion management strategies based on corridor context. For instance, along US-1 seven congested roadway segments were identified. There are several TSM&O/ITS improvements in US-1 corridor including scalable Integrated Corridor Management (ICM), transit signal priority that would be implemented in the short term (i.e., within five years) followed by high-capacity improvements in the medium term (five to 10 years). Several areas along US-1 could be benefit from improving first and last mile connectivity to high-capacity transit. In the long term (more than 10 years), Broward Commuter Rail could be developed to relieve pressure on US-1 and even I-95. This approach can be applied to other congested corridors in Broward County as well.

The BMPO recognizes that while some specific congestion management strategies have been identified through the CMP, a more detailed corridor or location specific study should consider the full set of strategies available in the toolbox. In addition, candidate lane elimination projects, resiliency projects, projects from BMPO's other planning efforts, such as Complete Streets Master Plan (CSMP), safety studies should be used as key input when evaluating alternative congestion management strategies.

Consistent with the guidance and intent of the CMP, the BMPO has laid a foundation based on a data-driven approach to prioritize and program congested corridors its MTP, TIP processes and other localized initiatives and studies.

3.3 Congestion Management Strategies Evaluation Tools

A key element of the CMP is assessment and selection of different congestion management strategies discussed in **Section 3.2**. The evaluation of these strategies focuses on effectiveness, implementation costs vs. benefits received, equity impacts, and overall feasibility. Information collected through monitoring of implemented strategies can be most helpful in evaluating the success of individual strategies and targeting specific strategies to applications where they have demonstrated success. This feedback loop provides a continuous refinement of the strategies considered for congestion management in different situations. As shown in the **Table 3-4**, congestion management strategy evaluation toolbox includes techniques and tools that can be grouped into the following six categories:

- Sketch planning tools,
- Regional travel demand model,
- Deterministic tools,
- Optimization tools,
- Simulation tools, and
- Institutional knowledge and experience.

Table 3-4: Congestion Management Strategies Evaluation Tools

Evaluation Tools		Application Geography	Data Needs	Project Development Phase	CMP Strategies
Sketch-Planning Tools	Elasticity-based spreadsheet models, EPA COMMUTER Model, TMD Effectiveness Evaluation Model (TEEM), Worksite Trip Reduction Model (WTRM), Trip Reduction Impacts of Mobility Management Strategies (TRIMMS), ITS Deployment Analysis (IDAS) Screening for ITS (SCRITS)	Specific projects with system focus	Low	Pre-Planning, Planning	TDM, TSM&O/ITS,
Regional Travel Demand Model	Southeast Regional Planning Model (SERPM)	Regional with system focus	High	Pre-Planning, Planning, PD&E	Highway and Transit Capacity Improvements, Road Pricing, Land Use
Analytical/Deterministic Tools (HCM-based)	HCS 2000, SIDRA amongst others	Small scale standalone improvements with bottlenecks focus	Medium	Planning, PD&E, Design, Construction, Operations	Intersection improvements (geometric and operational)
Traffic Control Optimization Tools	Synchro, TRANSYT-7F amongst others	Isolated signalized intersections, smaller arterial and street segments with facility focus	High	PD&E, Design, Construction, Operations	TSM&O, Intersection improvements (geometric and operational)
Traffic Simulation Tools					
Macroscopic	Several	Areawide with system focus	Medium		TSM&O including Traffic Incident Management, Work Zone Management, Transit Operational Improvements
Mesoscopic	DYNASMART, DYANMIT, Avenue (CUBE), TransModeler (Caliper) amongst others	Areawide with bottlenecks, facilities, and system focus	High	PD&E, Design, Construction, Operations	
Microscopic	VISSIM, CORSIM, Paramics, SimTraffic amongst others	Arterials (long multimodal corridors) with bottlenecks, facilities, and system focus	High	PD&E, Design, Construction, Operations	
Institutional Knowledge & Experience	BMPO, FDOT District Four, Broward County, and SFRTA	Varies from project specific or regional	Medium	All Project Phases	All CMP Strategies

Sources: https://ops.fhwa.dot.gov/publications/fhwahop12035/chap9.htm; https://ops.fhwa.dot.gov/trafficanalysistools/tat_vol1/sectapp_a.htm#a4

The column on the far-right in **Table 3-4** identifies types of congestion management strategies that can be assessed vis-à-vis specific evaluation tools. These tools can be used throughout the planning and project development phase as well as during operations and monitoring at varying geographic scale from application standpoint. Further, data needs and outputs in term of accuracy and precision vary significantly between various tools and techniques well as expertise required to use these tools in a meaningful way.

Below is a broad overview of various evaluation tools and techniques available to assess congestion management strategies based on FHWA's *Congestion Management Process – A Guidebook, April 2011*.

Sketch Planning Tools

Sketch planning methodologies typically produce general order-of-magnitude estimates of changes in travel demand and/or speeds in response to different types of transportation strategies and are commonly used to estimate the effects of travel demand management strategies. Typically, these tools are used to evaluate specific projects at systemwide level during early phases of project development, such as pre-planning and planning. Since data needs for sketch planning tools is generally low, the outputs produced are at aggregate level.

Some of the tools identified in **Table 3-4**, such as Environmental Protection Agency's (EPA) COMMUTER Model and the TRIMMS tool are available to estimate the effects of TDM strategies, such as parking management, employer-based programs, and transit subsidies. The ITS Deployment Analysis System (IDAS) and Screening for ITS (SCRITS) work with the outputs of traditional transportation planning models and enable planners to evaluate the costs and benefits of ITS investments. The Surface Transportation Efficiency Analysis Model (STEAM) enables users to assess the safety and mobility benefits of transportation investments, as well as policy alternatives such as road pricing. Spreadsheet- based benefit/cost analysis tools, such as Cal-B/C, can be used to evaluate the costs and benefits of potential roadway or transit improvements.

Regional Travel Demand Model

The BMPO and its partner agencies use Southeast Regional Planning Model (SERPM) – an *activity-based model* as the primary tool in regional travel forecasting to predict future travel patterns based on current conditions and projections of future land use patterns. Travel demand models may be used to analyze the effectiveness of land use planning strategies and transportation infrastructure investments, as well as some pricing strategies, but have only limited capabilities to accurately estimate changes in operational characteristics, such as speed, delay, and queuing resulting from implementation of operations strategies. This tool is also used in early project initiation phases including pre-planning, planning, as well as Project Development and Environment (PD&E) Study. It should be noted that all travel demand models including SERPM requires extensive data.

Analytical/Deterministic Tools

These Highway Capacity Manual (HCM) based tools are good for analyzing the performance of isolated or small-scale transportation facilities; however, they are limited in their ability to analyze network or system effects. For instance, evaluating geometric and operational improvements for standalone intersection modification projects or short corridors. These tools quickly predict capacity, density, speed, delay, and queuing on a variety of transportation facilities and are validated with field data, laboratory test beds, or small-scale experiments. Typically, data needs for HCM-based analytical/deterministic tools could be considered medium. These tools can be used in all the phases of project development, such as planning, PD&E, design, construction, and operations.

Traffic Control Optimization Tools

Traffic signal optimization tools are primarily designed to develop optimal signal-phasing and timing plans for isolated signal intersections, arterial streets, or signal networks. This may include capacity calculations; cycle length; splits optimization, including left turns; and coordination/offset plans. Several commercial software applications are available in the market in this tools category including Synchro, TRANSYT-7F amongst others. All traffic control optimization tools are data-driven and require granular data as inputs. These tools are used in later phases or project development, such as PD&E, design, construction, and operations.

Traffic Simulation Tools

Simulation tools may be used by agencies to analyze the impact of operations strategies in addition to informing alternatives development during the PD&E phase as well as refining design. These simulation tools are used for long multimodal corridors and areawide evaluation. These tools can provide information relating to analysis of incidents and real-time diversion patterns. However, they may also be costly to use because of data requirements and necessary computing capability. There are several categories of simulation tools including macroscopic, mesoscopic, and microscopic simulation models. Several commercially available tools indicated in **Table 3-4** have been used by BMPO and its partner agencies on different types of projects.

Dynamic Traffic Assignment (DTA) models supplement existing travel forecasting models and microscopic traffic simulation models. Travel forecasting models represent the static regional travel analysis capability, whereas microscopic traffic simulation models are superior for dynamic corridor-level travel analysis. DTA models fill the gap between these by enabling dynamic traffic to be modeled at a range of scales from corridors to regions, with expanded and unique functional capabilities enabled by the DTA methodology. Selection of a specific type of simulation tool depends on type of project, goals, purpose and need as well as context.

Institutional Knowledge and Experience

Institutional knowledge and experience are an asset that can be used effectively during all project phases to evaluate a variety of congestion management strategies, including incident management, work zone management, as well as traffic signal coordination along a corridor or in an areawide network. Broward County and FDOT District Four have

extensive experience and expertise with implementing TSM&O/ITS strategies as well as managing operations and monitoring performance. Supplementing this institutional knowledge with data and outputs from technical tools would help justify and assess the potential benefits of alternative congestion management strategies.

Finally, it should be noted that some of the TSM&O/ITS strategies such as ICM, ATMS, ATCS use AMS approach – Analysis, Modeling, and Simulation, which uses a combination of tools and techniques in all the six categories discussed in **Section 3.3** for evaluating congestion management strategies over the project life cycle.

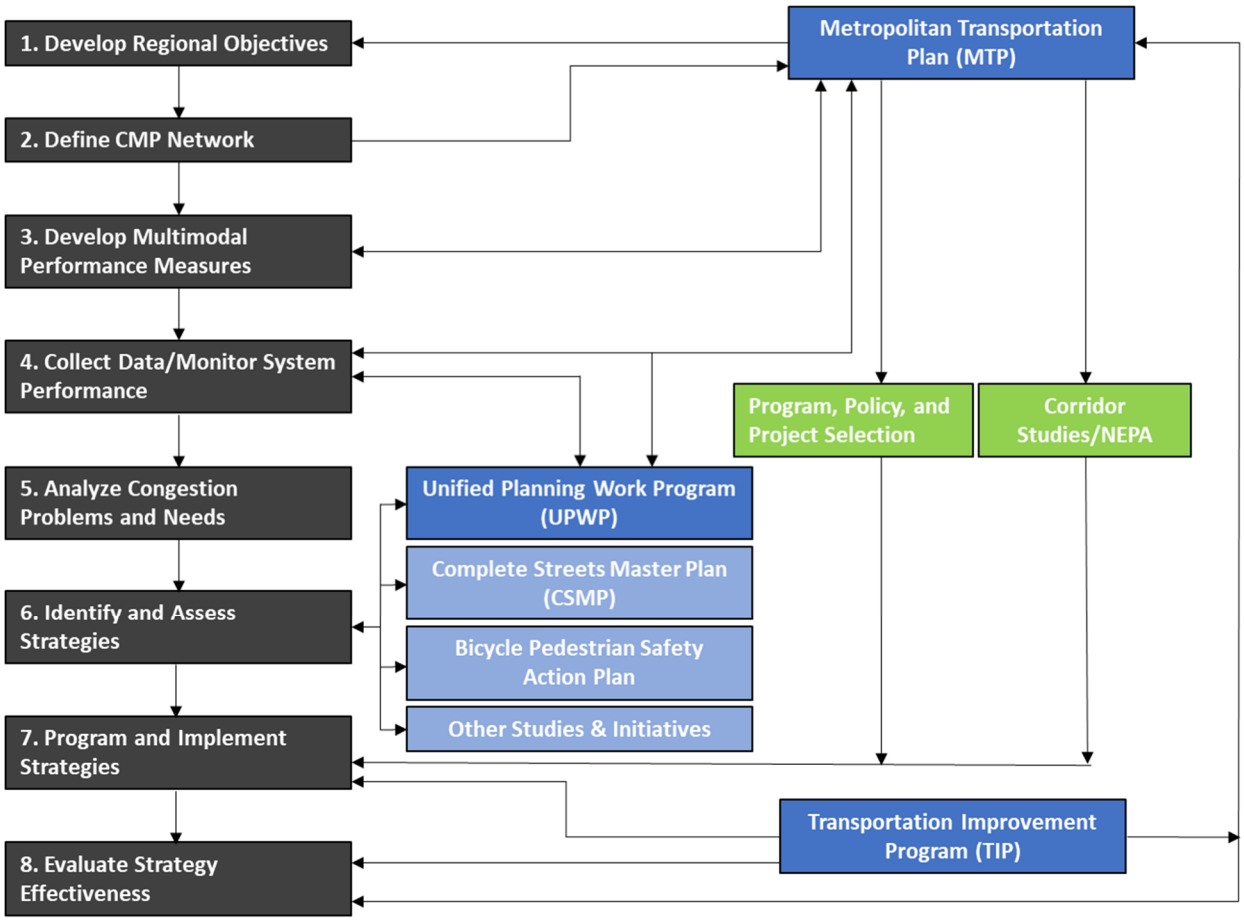
4. Next Steps

Chapter 4 discusses relationship between BMPO's CMP and other core products such as, Metropolitan Transportation Plan (MTP), Transportation Improvement Program (TIP) and Unified Planning Work Program (UPWP) as well as other studies.

4.1 Broward MPO's CMP vis-à-vis Core Products and Other Studies

Consistent with FHWA's guidance for developing CMP and as shown in **Figure 4-1**, the BMPO's CMP is fully integrated into its transportation planning and programming processes. The diagram below illustrates the eight components of the CMP and the role of the conforming Metropolitan Transportation Plan (MTP) and Transportation Improvement Program (TIP), the Unified Planning Work Program (UPWP), as well as inter relationship with various other BMPO studies and initiatives.

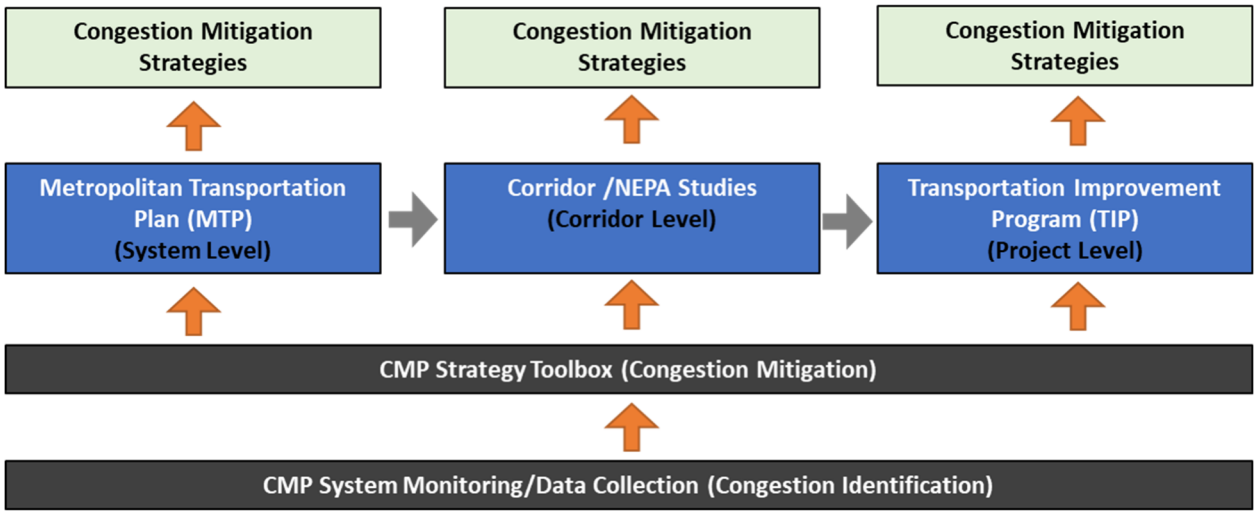
Figure 4-1: CMP & BMPO's Core Products and Other Studies



To complement **Figure 4-1**, **Figure 4-2** identifies how the CMP is integrated into various planning functions. With the identification and mitigation of current and future traffic congestion as the foundation of planning and programming decision making, strategies for congestion mitigation are developed on the system level (in the MTP), on the corridor

level (in corridor/National Environmental Policy Act [NEPA] studies), and on the project level (in the TIP).

Figure 4-2: CMP – Foundation for Transportation Planning and Programming



APPENDIX-A

IWG and EWG Meeting Minutes

T·Y·LIN INTERNATIONAL

Minutes of Meeting

Subject:	**Congestion Management Process (CMP), Broward MPO** **Internal CMP Working Group (WG) Meeting #1**
Meeting Date:	**Wednesday, 9/8/2021 Time: 1:00 pm - 3:00 pm**
Meeting Location:	**Broward MPO Offices** **Virtual Meeting (MS Teams)**
Notes by:	**Vikas Jain**

Attendees:

Fazal Qureshi, Levi Stewart-Figueroa, Christopher Restrepo, Benjamin Restrepo, Paul Flavien, Buffy Sanders, Amanda Christon, James Cromar and Renee Cross (Broward MPO)
Vikas Jain and Rich Perrin (T.Y. Lin International)

Meeting Materials: Meeting agenda, PowerPoint presentation

Meeting Minutes:

Below are highlights, key discussion points, and action items from the first internal CMP WG meeting.

1. Amanda provided an overview of the eight step CMP process, discuss the first four steps that the MPO had completed to date. She then requested the consultant team members, Vikas and Rich to discuss steps five and six. Rich described the methodology developed by the consultant team to identify congested roadway corridors in the County. He explained the different types of congestion, congestion metrics as well as their relationship to performance measures. Vikas pointed out that transit congestion would be identified based on input from Broward County Transit (BCT). Rich also briefly touched on CMP strategies. Renee explained steps seven and eight of the CMP process.
2. Vikas and Rich shared some initial results from RITIS bottleneck ranking and evening rush hour or peak hour travel time index analyses.
3. The following questions and comments were received during the meeting.

   Q1. Will King Tides be considered in analyzing congestion problems?

   A1. Yes. King Tides will be considered under Planned-Event based congestion. However, the analysis will help identify if the issue is mobility related on collector and arterial facilities or access related on local streets.

   Q2. What strategies will be identified to address congestion issues identified through this CMP?

   A2. Both supply side and demand side strategies will be identified and evaluated through the CMP. Some of these strategies will be implemented by other agencies, such as FDOT and Broward County while the Broward MPO's initiative on TDM with Downtown Fort Lauderdale TMA will also potentially implement the demand side strategies. It should be noted that some of the strategies will be programmatic while other will be more project based – areawide, corridor or intersection specific.

   Q3. How will projects from the CMP get programmed for implementation?

   A3. Project identified through the CMP will be prioritized using evaluation criteria and programmed through 2050 MTP. Some of the projects could also be funded through existing "set aside" funds under the TSM&O and safety program as appropriate.

Q4. Will land use be considered in developing CMP strategies?
A4. Yes. Land use will be considered as part of the transit-oriented development (TOD) strategies.
Q5. Would the bottleneck ranking from RITIS show a different results if limited access facilities or state roads were excluded from the analysis?
A5. The consultant team would re-run the analysis to investigate RITIS bottleneck ranking analysis outputs.

4. There was discussion on Broward MPO's existing efforts, such as complete streets (CSLIP program), resiliency, safety effort and TIP as well as how these efforts would be integrated with the CMP as part of identifying and evaluating short-, mid-, and long-range strategies.
5. Vikas explained the next steps included taking a "deep dive' into the data and analysis over the next couple of months as well as continue to coordinate with the MPO and partner agencies. Amanda informed that she will be sending out an email to identify volunteers for the external CMP WG and set up a meeting in early to mid-October timeframe. She also mentioned that project schedule called on the second internal CMP WG meeting in December 2021.
6. The meeting adjourned at 3:01 pm.

Action Items:

- *Amanda to* send out draft methodology memorandum to internal CMP WG members. – ***In progress.***
- *Internal CMP WG to* review and provide comments on the draft methodology memorandum by Sept. 22nd. – ***In progress.***
- *Amanda to* compile internal CMP WG comments and provide to the consultant team. – ***In progress.***
- *Vikas and Rich to* continue external agency coordination through Amanda to gather additional data such as FDOT's TSM&O Master Plan and BCT's transit congestion information. – ***In progress.***
- *Rich and Vikas to* continue internal coordination and data analysis to identify congested roadway and transit corridors in Broward County. – ***In progress.***
- *Amanda to* set up external CMP WG meeting #1. – ***Complete.***
- *Vikas to* coordinate with internal CMP WG members through Amanda to gather information on existing efforts to incorporate them in CMP strategies evaluation. – ***In progress.***

T·Y·LIN INTERNATIONAL

Minutes of Meeting

Subject:	**Congestion Management Process (CMP), Broward MPO** **External Working Group (EWG) Meeting #1**
Meeting Date:	**Monday, 10/25/2021** **Time: 2:00 pm – 4:00 pm**
Meeting Location:	**Virtual Meeting (MS Teams)**
Notes by:	**Vikas Jain**

Attendees:

Raj Shanmugam, Lois Bush, Larry Wallace (FDOT)
Tara Crawford and Laila Kitchen (Broward County)
Natalie Yesbeck (S South Florida Regional Transportation Authority)
Casey Graham (City of Sunrise)
Karen Warfel (City of Fort Lauderdale)
Steveryn Josette (Broward County Resident)
Amanda Christon, James Cromar and Renee Cross (Broward MPO)
Vikas Jain and Rich Perrin (T.Y. Lin International)

Meeting Materials: Meeting agenda, PowerPoint presentation

Meeting Minutes:

Below are highlights, key discussion points, and action items from the first External Working Group (EWG) meeting.

1. Following self-introductions, Amanda opened the meeting and provided an overview of the eight step CMP process. Renee and Amanda discussed the first four steps and highlighted unique aspects, such as equity and resiliency considered in this CMP.
2. Vikas explained the CMP network and various components included in the analysis while Rich discussed the congestion metrics, types of congestion and methodology to analyze and identify congested corridors and intersections. Vikas pointed out that transit congestion would be identified based on input from Broward County Transit (BCT). Rich briefly touched on CMP strategies. Amanda explained steps seven and eight of the CMP process.
3. Vikas shared preliminary results from RITIS bottleneck ranking and evening rush hour or peak hour travel time index (TTI) analyses.
4. The following questions and comments were received during the meeting.

   Q1. Are collectors included in the CMP network and how do you determine which collector should be included?

   A1. Collectors are included in the CMP network. However, the selection of collectors is driven based on availability of traffic counts. The FDOT collects data on state roads on a regular basis with the MPO and County collect traffic counts on off-system roadways every five year. Traffic count data is not collected for all off-system roadways.

   Q2. Why was one-quarter mile radius chosen to analyze access to transit?

   A2. It was consistent with Broward MPO's MTP performance measures as well as reflected a 5-minute walk based on industry standards. There was discussion of using one-half mile radius for evaluating access to transit.

Q3. How will surtax projects be considered in the CMP project?
A3 Surtax projects would be considered when identifying and evaluating CMP strategies in Step 6.
Q4. Do any of the BCT's route experience congestion in term of buses having to pass up passengers?
A4. Pre-Covid a few bus trips were added to the Express Bus Routes. It was noted that Express Bus service allows seated passengers only. Since the pandemic began ridership has dropped and while it has recovered, there isn't a need for additional bus trips. The BCT's fixed bus service did not experience transit congestion pre-Covid. The BCT crush load standard is 1.5, which allows for 40 seated passengers and 20 standees. BCT buses experience issues with on-time performance on certain routes, such as 72 due to vehicular congestion.
Q5. What is the schedule to complete the CMP project?
A5. The CMP project was scheduled to be completed by July 2022.

5. Raj suggested to consider safety, connectivity, truck mobility as part of CMP network analysis and integrate pedestrian improvements in CMP strategies assessment. Casey noted that the City of Sunrise would like to a network of bicycle facilities and increased access to transit through the CMP effort.
6. The following project were identified by various agency representatives that could affect the CMP project:
    - Broward County: Port Bypass project and Sheridan Street widening with shared use path
    - FDOT: County level of service assessment; I-595 Arterial Connectivity Study; 10th Street connection from Sawgrass Expressway to I-95; I-595/SR-7/I-95 interchange improvements; I-95 and Broward Blvd. interchange improvements; I-595 and I-95 Direct Connect; Broward Blvd. Transit Improvements from SR-7 to downtown Fort Lauderdale; Broward Commuter Rail (BCR); US-27 Grade Separation Study – ITS component from Pembroke Road to Griffin Road.
    - BCT: Transit Systemwide Study (TSYS) – high-capacity transit corridors (rail/BRT) and Comprehensive Operational Analysis (COA) in fall 2022 or spring 2023.
    - SFRTA: On-demand pilot project to provide first/last mile connectivity; On-demand Microtransit Demonstration project to replace Cypress Creek-1 commuter bus service; Tri-Rail to downtown Miami connection in 2022; Transit Development Plan (TDP) Major Update in 2022, which will include an on-board survey; and rail fleet management plan.
7. Vikas explained the next steps included taking a "deep dive' into the data and analysis as well as continue to coordinate with the FDOT, Broward County, cities, and partner agencies. Amanda requested the meeting attendees to send brief description of current projects and initiatives that could inform the CMP process. She also mentioned that next EWG meeting would be scheduled in January 2022. The meeting adjourned at 3:59 pm.

Action Items:

- *Amanda to* send out draft methodology memorandum to EWG for review. – ***Completed.***
- *EWG members to* provide short description of current project and initiatives that could impact CMP project. – ***In progress.***
- *Vikas and Rich to* continue to coordinate with EWG through Amanda to gather additional data such as FDOT's TSM&O Master Plan. – ***In progress.***
- *Rich and Vikas to* continue internal coordination and data analysis to identify congested roadway and transit corridors in Broward County. – ***In progress.***

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Minutes of Meeting

Subject:	**Congestion Management Process (CMP), Broward MPO** **Internal CMP Working Group (WG) Meeting #2**
Meeting Date:	**Monday, 2/7/2022** **Time: 1:00 pm - 3:00 pm**
Meeting Location:	**Virtual Meeting (MS Teams)**
Notes by:	**Vikas Jain**

Attendees:

James Cromar, Peter Geis, Andrew Riddle, Darci Mayer, Ricardo Gutierrez, Levi Stewart-Figueroa, Christopher Restrepo, Benjamin Restrepo, Buffy Sanders, Amanda Christon, and Renee Cross (Broward MPO)
Jeanette Berk and Hu Jiangchuan (Gannett Fleming)
Vikas Jain (T.Y. Lin International)

Meeting Materials: Meeting agenda, PowerPoint presentation

Meeting Minutes:

Below are highlights, key discussion points, and action items from the second internal CMP WG meeting.

1. Consider revising slide #6 - Replace check marks and 'x' with another description or symbol.
2. Consider revising slide #9 – Change green colored roadway segments showing delay to another color.
3. Include CMP strategies that encourage mode shift including SFCS as well as policies, such as flextime, trip reduction strategies. Minor roadway improvements should also be considered.
4. While increasing throughput is important, speed management and safety should be a priority and needs to be balanced.
5. Even if some of the corridors, such as Wilton Manors Dr. are congested, some of the policy decisions and recently completed improvements should be considered when identifying corridor or location specific strategies. The project team needs to be cognizant of "good congestion" vs. "bad congestion."
6. For certain corridor if there is heavy directional traffic, reversible lanes on arterials should be explored as a CMP strategy.
7. Investigate and identify safety improvements in areas that are crash hotspots.
8. The 2050 MTP will include accessibility metric based on land use, intersection density and equity.
9. Is it possible to identify level of congestion amongst different corridors? If the intent was to prioritize corridor, then it recommended a tiered approach be used to provide flexibility in programming projects.

Action Items:

- *TYLI consultant team to* update the PPT presented based on comments received at the internal CMP WG meeting. – ***In progress.***
- *TYLI consultant team to* identify CMP strategies as part of the Next Steps. – ***In progress.***
- *Amanda and Vikas to* coordinate and set up the 3rd internal WG meeting in April. – ***In progress.***

T·Y·LIN INTERNATIONAL

Minutes of Meeting

Subject:	**Congestion Management Process (CMP), Broward MPO** **Internal CMP Working Group (WG) Meeting #3**
Meeting Date:	**Wednesday, 5/11/2022** **Time: 2:00 pm - 3:30 pm** Meeting Location: **Virtual Meeting (MS Teams)**
Notes by:	**Vikas Jain**

Attendees:

Peter Geis, Paul Flavien, Darci Mayer, Levi Stewart-Figueroa, Christopher Restrepo, Benjamin Restrepo, Fazal Qureshi, and Amanda Christon (Broward MPO)
Vikas Jain (T.Y. Lin International)

Meeting Materials: Meeting agenda, PowerPoint presentation

Meeting Minutes:

Below are highlights, key discussion points, and action items from the third internal CMP WG meeting.

1. **MTP Coordination** – Peter explained the general timeframe for the Broward MPO's 2050 MTP development process. He stated that this effort would kick off in October 2022 with call for projects/needs assessment targeted in the 1st and 2nd quarter of 2023. During the first half of 2023, the Broward MPO staff plans to sit down with Amanda's team to discuss CMP needs for the MTP Needs Assessment. Peter emphasized that the CMP analysis will be vital for this component of the needs assessment and the overall MTP narrative. He noted that the MTP team will keep the internal Broward MPO staff updated on his team's efforts and timing.
2. **Project Development** – In advance of the needs assessment discussion, Peter mentioned that it would be helpful to develop some discrete projects from the CMP analysis to help populate the MPO recommendations for the CMP potion of the MTP needs assessment. He further explained that this should include a basic scope of work (i.e. widen 2-4 lanes, TSM&O integration from Point A to Point B).
3. **TDM Strategies** – There was discussion regarding the need for and importance of demand side strategies in the CMP. It was agreed that while the local jurisdictions would have to take the lead in implementing several demand side CMP strategies, there was merit in included a short narrative on such strategies and coordinating with the Broward MPO's municipal and other relevant partner agencies in implementing these strategies.
4. **Reversible Lanes** - Regarding consideration of reversible lanes for arterial streets, it was clarified that this strategy should be evaluated for arterial streets recognizing operational and infrastructure capacity constraints.
5. **Action Items:**

- *Vikas to* send Amanda maps included in the slide deck for internal working group meeting #3. – ***Complete.***
- *Amanda to* share working group meeting #3 slide presentation and video recording with Broward MPO staff. – ***Complete.***
- *TYLI consultant team to* document CMP Steps 5 and 6 in a tech. memo. – ***In progress.***

T·Y·LIN INTERNATIONAL

Minutes of Meeting

Subject:	**Congestion Management Process (CMP), Broward MPO** **External Working Group (EWG) Meeting #3**
Meeting Date:	**Tuesday, 5/31/2022** **Time: 2:00 pm – 3:30 pm**
Meeting Location:	**Virtual Meeting (MS Teams)**
Notes by:	**Vikas Jain**

Attendees:

Laila Kitchen (Broward County)
Williams Victoria (Florida's Turnpike)
Natalie Yesbeck (South Florida Regional Transportation Authority)
Steve Hamilton (Broward County Resident)
Amanda Christon and James Cromar (Broward MPO)
Jeanette Berk and JC (Gannett Fleming)
Vikas Jain (T.Y. Lin International)

Meeting Materials: Meeting agenda, PowerPoint presentation

Meeting Minutes:

Below are highlights, key discussion points, and action items from the third External Working Group (EWG) meeting.

1. Amanda opened the meeting and provided an overview of the agenda.
2. Before discussing the CMP strategies toolbox and evaluation tools, Vikas provide a recap of EWG meeting #2.
3. The following questions and comments were received during the meeting.
   Q1. How does adding capacity on Florida's Turnpike and Sawgrass Expressway consistent with the CMP's intent or managing congestion without adding lanes?
   A1. Willams explained that while there will not be an upcharge for through lanes, the additional capacity would provide an envelop for express bus, facilitate freight movement and well as improve travel time reliability. These transit, freight, and travel time improvements support CMP's overall intent.
4. James noted that the CMP strategies had been selected based on context of the corridor and would be refined through further studies.
5. Vikas discussed next steps, which included documentation of technical analysis conducted as part of CMP steps #5 an #6. Amanda mentioned that the CMP Update would be an agenda item for the August 2022 TAC/CAC meetings and the Board meeting in September 2022. The meeting adjourned at 2:48 pm.

Action Items:

- *TYLin consultant team to* complete documentation. – ***In progress.***

APPENDIX-B

Regional Integrated Transportation Information System (RITIS) Bottleneck Ranking Backup Data

RITIS Bottleneck Ranking, March 1 through Apirl 30, 2019 - Recurring Capacity-Related Congestion

Rank	Head Location	Starting TMC Code	Latitude	Longitude	Average max length	Average daily duration	Total duration	All events/incidents	Volume Estimate	Base Impact	Speed differential	Congestion	TOTAL DELAY
1	I-95 N @ SR-810/HILLSBORO BLVD/EXIT 42	102P04141	26.32502	-80.11656	4.06	2 h 53 m	7 d 8 h 43 m	2,308	106,256	48,257	1,832,358	79,794	134,713,565
2	I-95 S @ 10TH ST/EXIT 41	102N04140	26.30172	-80.12054	2.79	2 h 18 m	5 d 21 h 11 m	1,093	95,224	31,854	1,205,044	60,768	97,694,522
3	I-95 S @ SR-818/GRIFFIN RD/EXIT 23	102N04127	26.05867	-80.16299	3.07	1 h 56 m	4 d 22 h 31 m	2,279	147,851	21,771	675,054	34,322	89,167,102
4	SR-A1A N @ SEABREEZE BLVD (NORTH)	102P06111	26.12441	-80.10384	1.3	4 h 33 m	11 d 13 h 40 m	0	33,168	22,865	282,725	41,648	78,712,231
5	I-95 N @ ANDREWS AVE	102P04135	26.19921	-80.14839	2.53	2 h 20 m	5 d 22 h 35 m	1,669	135,218	20,797	721,147	31,533	64,699,084
6	I-95 N @ CYPRESS CREEK RD/EXIT 33	102P04136	26.20969	-80.13774	3.34	1 h 8 m	2 d 21 h 59 m	1,912	129,639	12,378	481,704	27,500	64,075,479
7	I-95 S @ SR-814/ATLANTIC BLVD/EXIT 36	102N04137	26.22601	-80.13652	2.9	1 h 2 m	2 d 15 h 1 m	1,271	116,732	11,551	454,469	25,239	52,512,060
8	SR-A1A S @ SR-820/HOLLYWOOD BLVD	102N06105	26.01065	-80.11788	1.63	3 h 37 m	9 d 4 h 29 m	0	44,193	21,618	299,786	30,440	48,368,636
9	SR-A1A N @ SR-822/SHERIDAN ST/16TH ST	102+06106	26.03427	-80.11545	1.5	4 h 51 m	12 d 7 h 49 m	0	45,271	27,268	336,185	32,217	45,501,651
10	I-595 W @ I-95/EXIT 10	102P04169	26.08386	-80.18164	2.65	1 h 57 m	4 d 23 h 4 m	104	76,658	18,488	700,894	32,758	44,641,790
11	I-95 N @ SR-842/BROWARD BLVD/EXIT 27	102P04131	26.12717	-80.16908	1.48	2 h 10 m	5 d 12 h 51 m	1,732	157,567	12,594	358,846	16,970	44,000,006
12	I-95 S @ I-595/SR-736/DAVIE BLVD/EXIT 26	102N04130	26.10154	-80.16899	2.3	1 h 37 m	4 d 2 h 35 m	2,400	145,650	12,707	403,330	18,226	43,002,322
13	I-95 N @ COPANS RD/EXIT 38	102P04138	26.26467	-80.12941	2.81	30 m	1 d 7 h 16 m	1,128	120,401	5,523	249,173	17,467	41,220,098
14	I-95 S @ SR-838/SUNRISE BLVD/EXIT 29	102N04132	26.13316	-80.1695	4.41	48 m	2 d 1 h 5 m	2,347	128,903	13,724	489,017	20,585	40,115,819
15	I-95 N @ SR-870/COMMERCIAL BLVD/EXIT 32	102P04134	26.19273	-80.15145	2.81	1 h 13 m	3 d 2 h 54 m	1,510	134,941	12,324	434,117	18,487	37,715,514
16	I-95 N @ SR-816/EXIT 31	102P04133	26.17073	-80.15767	2.43	50 m	2 d 3 h 32 m	1,762	144,286	8,318	299,949	14,534	35,953,352
17	I-95 S @ CYPRESS CREEK RD/EXIT 33	102N04136	26.1998	-80.14812	3.42	49 m	2 d 2 h 6 m	1,417	119,246	10,204	367,160	18,100	35,177,832
18	I-95 S @ SR-820/HOLLYWOOD BLVD/EXIT 20	102N04124	26.00717	-80.167	2.81	11 m	11 h 52 m	2,454	143,595	2,219	88,795	10,469	34,603,598
19	FLORIDA'S TPKE N @ SR-818/GRIFFIN RD/EXIT 53 (SOUTH)	102P04189	26.06535	-80.21532	5.34	44 m	1 d 21 h 32 m	585	55,677	14,871	580,559	34,132	34,534,396
20	SR-858 W @ I-95/SR-9	102N11115	25.98505	-80.16649	1.37	2 h 28 m	6 d 7 h 21 m	0	34,889	11,144	145,064	19,644	33,399,770
21	I-95 N @ HALLANDALE BCH BLVD/EXIT 18	102P04122	25.98817	-80.16559	2.2	8 m	8 h 56 m	2,025	116,631	2,156	91,742	10,958	32,346,934
22	SR-842 W @ I-95/SR-9	102N06227	26.12179	-80.16941	1.31	2 h 8 m	5 d 10 h 20 m	1	39,387	10,204	153,372	17,830	31,424,171
23	I-95 N @ 10TH ST/EXIT 41	102P04140	26.30814	-80.11842	3.02	54 m	2 d 7 h 31 m	1,443	104,302	10,399	382,163	18,389	31,366,830
24	I-95 EXPRESS LN N @ I-95/SR-848/SW 60TH ST	102P21583	26.0483	-80.16227	1.89	46 m	1 d 23 h 19 m	121	111,410	5,988	255,005	14,777	30,668,291
25	FLORIDA'S TPKE S @ SR-820/EXIT 49	102N04188	26.0048	-80.21545	4.52	51 m	2 d 4 h 1 m	673	53,611	14,271	520,687	32,778	30,560,561
26	I-95 S @ SR-810/HILLSBORO BLVD/EXIT 42	102N04141	26.31289	-80.1173	4.01	25 m	1 d 2 h 9 m	826	102,504	7,184	302,313	16,130	29,986,577
27	I-95 S @ SR-834/SAMPLE RD/EXIT 39	102N04139	26.26895	-80.12632	3.32	33 m	1 d 9 h 53 m	1,035	99,589	6,999	286,492	16,315	29,702,280
28	I-95 N @ SR-822/SHERIDAN ST/EXIT 21	102P04125	26.03802	-80.16352	2.25	43 m	1 d 20 h 9 m	1,366	140,109	6,505	197,788	11,088	29,563,485
29	I-95 N @ SR-84/EXIT 25	102P04129	26.09529	-80.16868	2.64	12 m	12 h 58 m	1,975	152,183	3,151	123,667	8,465	29,352,988
30	I-95 S @ SR-870/COMMERCIAL BLVD/EXIT 32	102N04134	26.18206	-80.15294	3.55	54 m	2 d 7 h 1 m	1,723	123,025	11,495	397,257	15,968	28,012,151
31	I-95 N @ SR-814/ATLANTIC BLVD/EXIT 36	102P04137	26.23806	-80.13638	2.68	25 m	1 d 1 h 25 m	983	120,361	4,171	185,116	11,959	27,928,771
32	I-595 E @ US-441/FLORIDA'S TPKE/EXIT 8	102N04170	26.08379	-80.19346	1.75	1 h 6 m	2 d 19 h 53 m	348	97,915	6,779	295,469	14,074	24,525,811
33	I-95 S @ I-595/EXIT 24	102N04128	26.07748	-80.16877	1.99	36 m	1 d 12 h 58 m	1,946	146,537	4,399	147,209	8,470	23,979,452
34	I-95 N @ SR-834/SAMPLE RD/EXIT 39	102P04139	26.28089	-80.12502	2.06	31 m	1 d 8 h 21 m	1,299	109,666	4,036	167,350	11,288	23,784,569
35	SR-A1A N @ SR-842/LAS OLAS BLVD	102+06110	26.11929	-80.10456	0.73	2 h 58 m	7 d 13 h 34 m	0	34,015	7,886	96,381	12,908	21,676,425
36	FLORIDA'S TPKE S @ SR-838/SUNRISE BLVD/EXIT 58	102N04192	26.13078	-80.2182	4.81	14 m	14 h 54 m	594	49,556	5,233	233,671	20,598	20,765,007
37	SR-821 S @ SR-823/57TH AVE/RED RD/EXIT 43	102N04229	25.97097	-80.29692	3.24	46 m	1 d 23 h 33 m	158	32,223	9,428	415,208	33,669	18,873,185
38	FLORIDA'S TPKE N @ SR-820/EXIT 49	102P04188	26.00819	-80.21362	2.8	1 h 14 m	3 d 3 h 20 m	289	53,264	13,307	482,761	21,869	18,798,849
39	I-95 S @ ANDREWS AVE	102N04135	26.19572	-80.15091	2.73	45 m	1 d 22 h 28 m	1,431	121,036	6,752	233,154	10,098	18,287,479
40	I-95 EXPRESS LN S @ SR-820/HOLLYWOOD BLVD	102N21581	26.00613	-80.16695	2.22	8 m	8 h 56 m	22	110,789	1,319	63,549	8,201	17,738,613
41	FLORIDA'S TPKE N @ CYPRESS CREEK TOLL PLZ	102P04368	26.21094	-80.19478	2.23	1 h 50 m	4 d 16 h 39 m	837	51,081	17,502	599,449	23,539	16,743,125
42	I-95 EXPRESS LN N @ I-95/SR-858/W HALLANDALE BEACH BLVD	102P21580	25.98909	-80.16574	1.3	8 m	8 h 35 m	15	113,705	1,259	57,551	6,218	16,187,368
43	I-95 N @ SR-820/HOLLYWOOD BLVD/EXIT 20	102P04124	26.01509	-80.16688	1.65	13 m	13 h 42 m	1,086	133,803	1,464	53,509	5,194	15,886,859
44	I-95 S @ SR-842/BROWARD BLVD/EXIT 27	102N04131	26.11692	-80.16906	3.54	18 m	19 h 1 m	2,160	136,608	4,403	154,358	6,826	14,961,029
45	SR-A1A S @ SEABREEZE BLVD (NORTH)	102-06111	26.12468	-80.10413	1.39	1 h 19 m	3 d 8 h 21 m	0	34,352	6,549	70,284	9,200	14,879,342
46	FLORIDA'S TPKE N @ SR-869/SAWGRASS EXPY/EXIT 71	102P04197	26.3069	-80.16951	4.14	53 m	2 d 6 h 30 m	885	42,338	14,021	529,629	22,241	14,671,953
47	I-95 S @ SR-84/EXIT 25	102N04129	26.0836	-80.16872	3.53	18 m	18 h 23 m	1,941	147,491	3,609	116,809	5,667	14,646,194
48	SR-84 W @ S PINE ISLAND RD/SW 88TH AVE	102N11688	26.10336	-80.26606	1.16	35 m	1 d 12 h 13 m	32	93,339	2,746	47,919	4,344	12,873,911
49	I-95 S @ COPANS RD/EXIT 38	102N04138	26.25469	-80.13675	2.3	30 m	1 d 7 h 17 m	1,046	107,820	4,307	155,096	7,248	12,483,459
50	SR-820 E @ DIXIE HWY	102+06264	26.01137	-80.14931	1.12	2 h 20 m	5 d 23 h 13 m	0	27,745	9,514	88,934	11,022	12,270,730

APPENDIX-C

Major Special Events Congestion Analysis

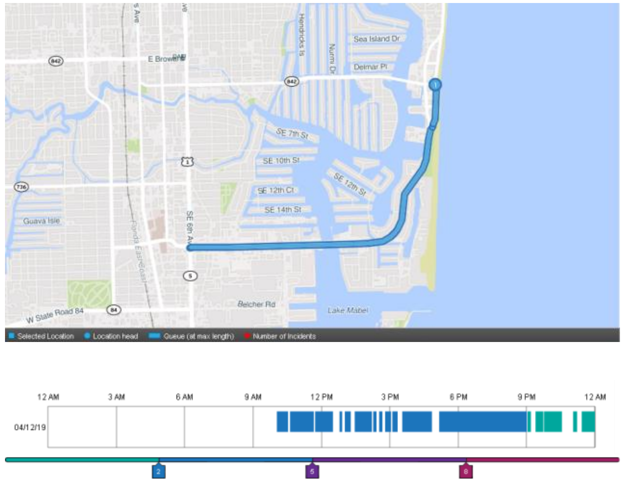
Planned Event-Based Congestion Analysis

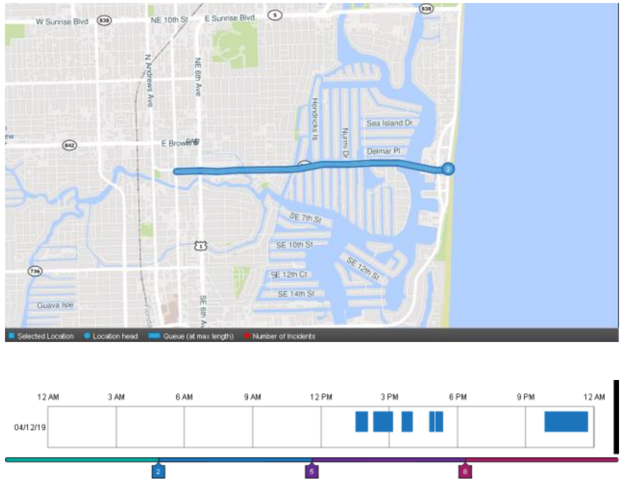
Major Special Events – Broward County

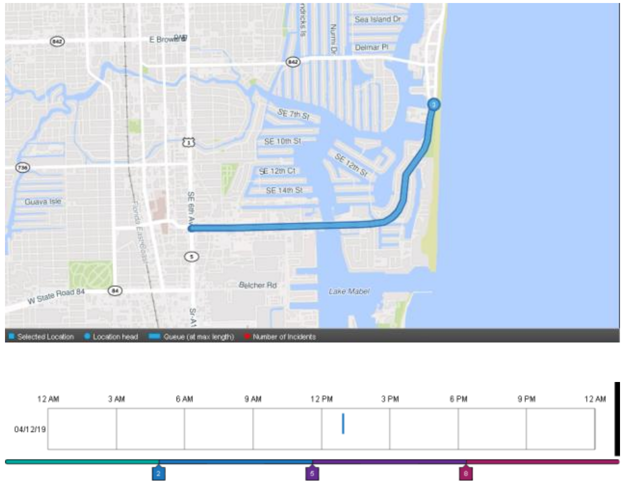
Tortuga Music Festival

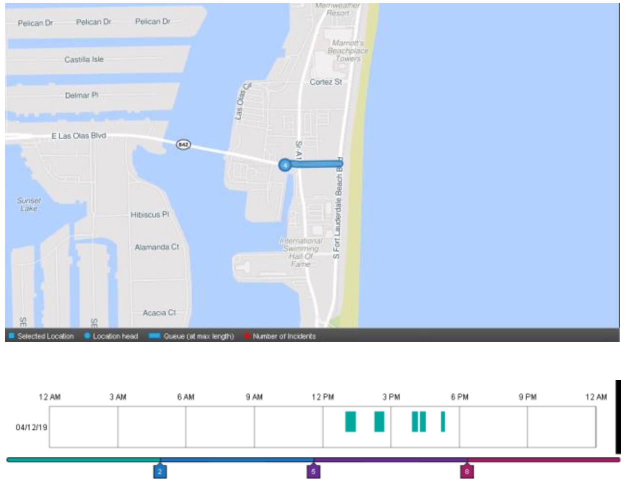
4/12/2019 (Fri) – 12:00 PM to 10:00 PM

Rank	Head Location	Average max length	Total duration	All events/incidents	Volume Estimate	Base Impact	Speed differential	Congestion	TOTAL DELAY
1	SR-A1A N @ SR-842/LAS OLAS BLVD	2.35	12 h 58 m	0	37,786	1,243	15,753	1,759	2,852,853
2	SR-842 E @ SR-A1A/ATLANTIC BLVD/SEABREEZE BLVD	2.14	4 h 37 m	0	24,475	582	6,106	799	937,901
3	SR-A1A N @ SEABREEZE BLVD (SOUTH)	2.64	23 m	0	38,499	60	676	64	67,501
4	SR-842 W @ SR-A1A/ATLANTIC BLVD/SEABREEZE BLVD	0.11	1 h 48 m	0	24,479	12	74	14	20,540









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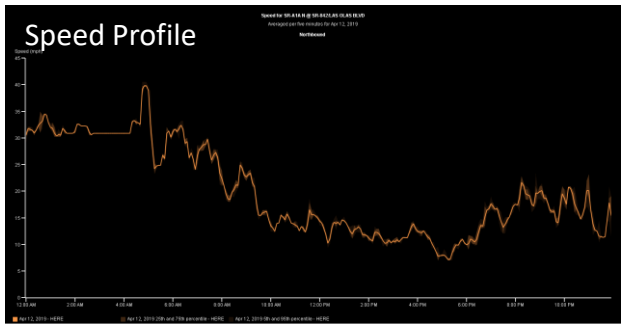
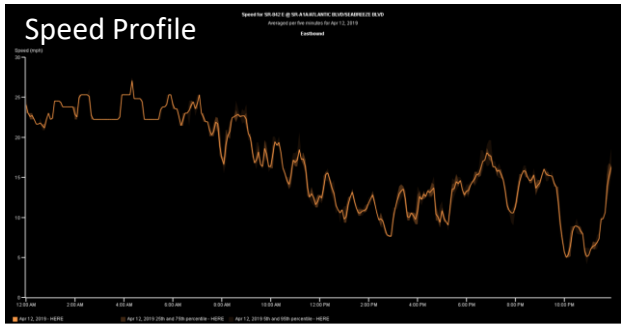
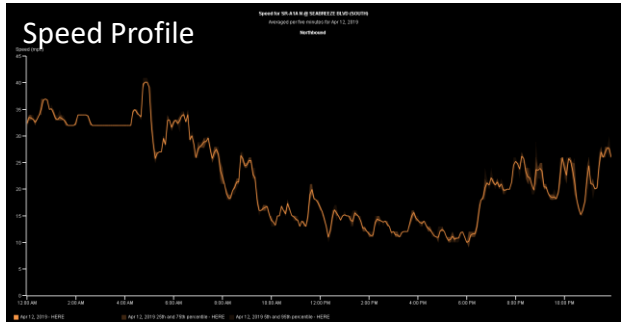
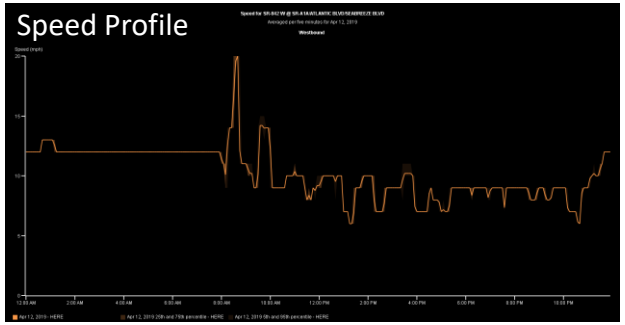
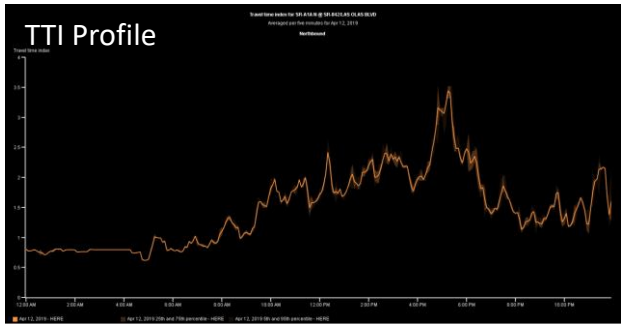
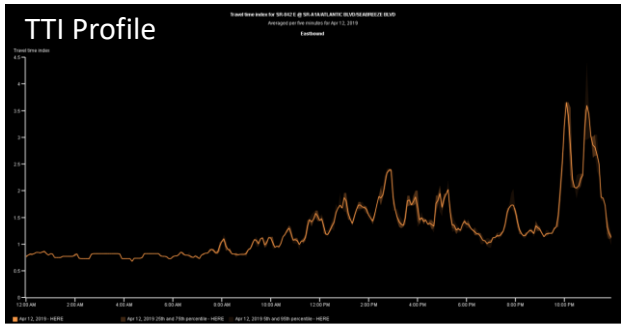


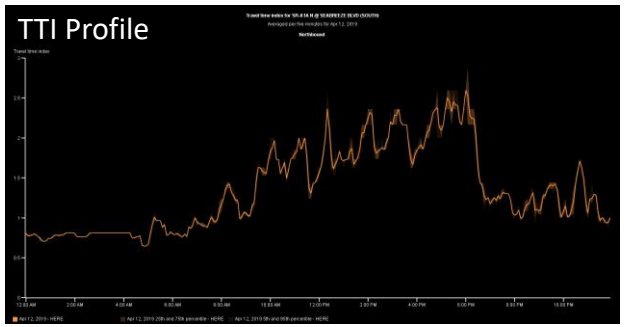


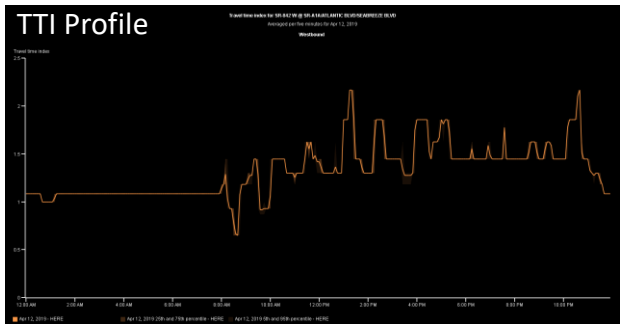








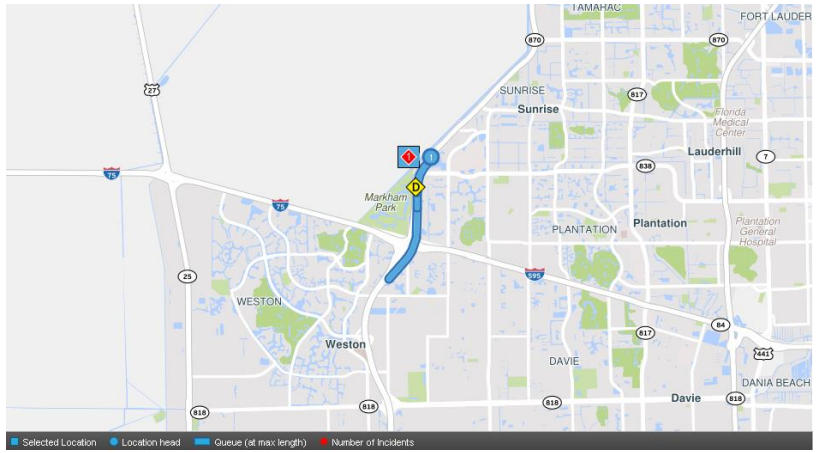


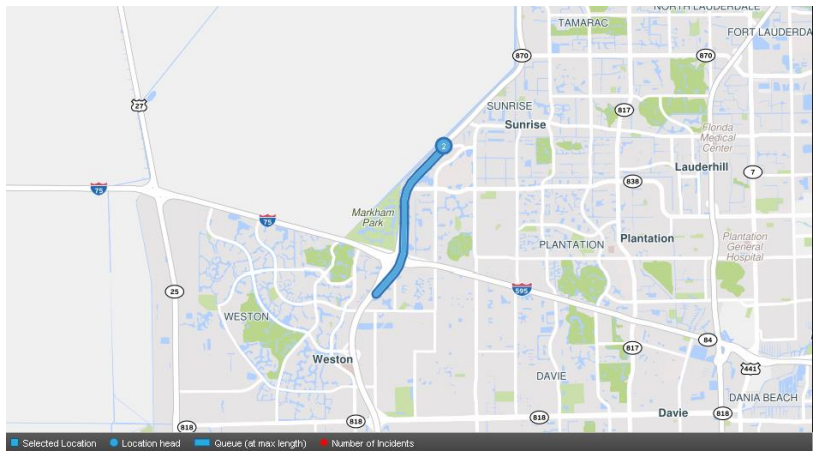


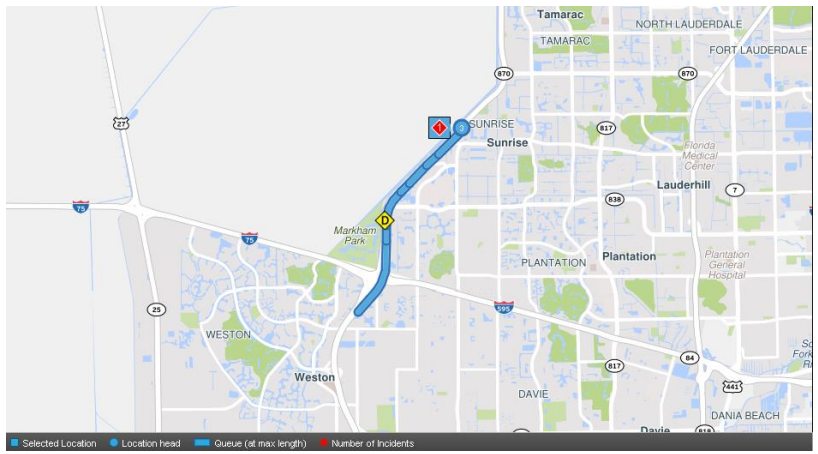
BB&T Center – Hockey Game

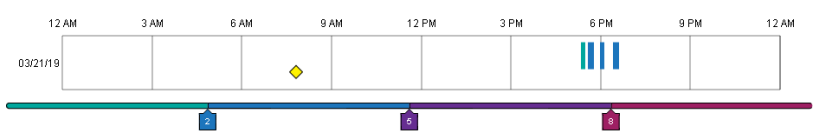
3/21/2019 (Thu) – 1:00 PM to 10:00 PM

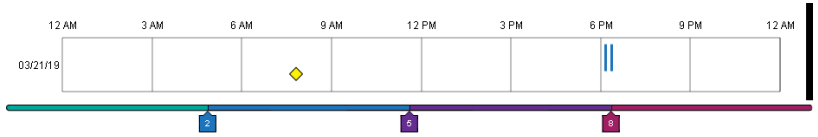
Rank	Head Location	Average max length	Total duration	All events/incidents	Volume Estimate	Base Impact	Speed differential	Congestion	TOTAL DELAY
1	SR-869 E @ SR-838/SUNRISE BLVD/EXIT 1	2.35	52 m	1	46,727	110	3,766	152	102,439
2	SR-869 E @ PAT SALERNO DR/EXIT 1	3.09	24 m	1	45,290	76	2,527	102	65,217
3	SR-869 E @ SR-816/OAKLAND PARK BLVD/EXIT 2	2.97	11 m	1	40,736	29	986	40	24,079

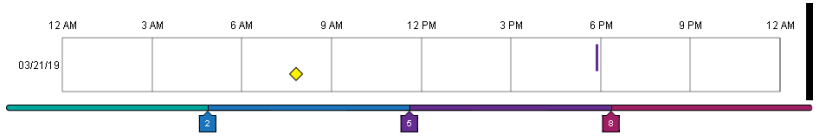












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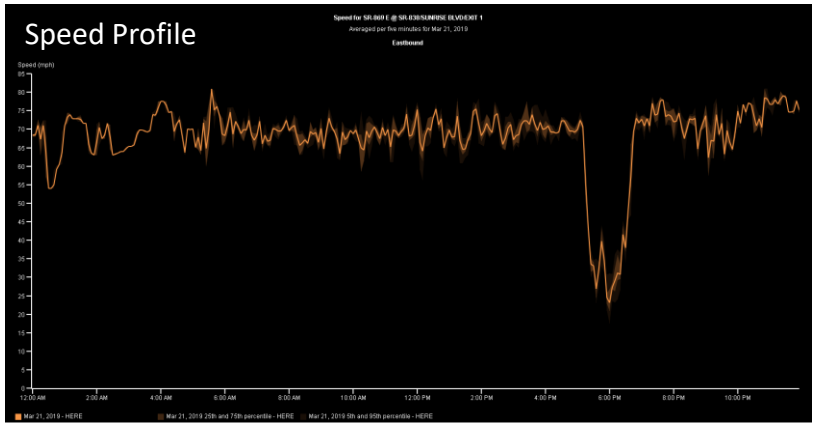
Speed Profile



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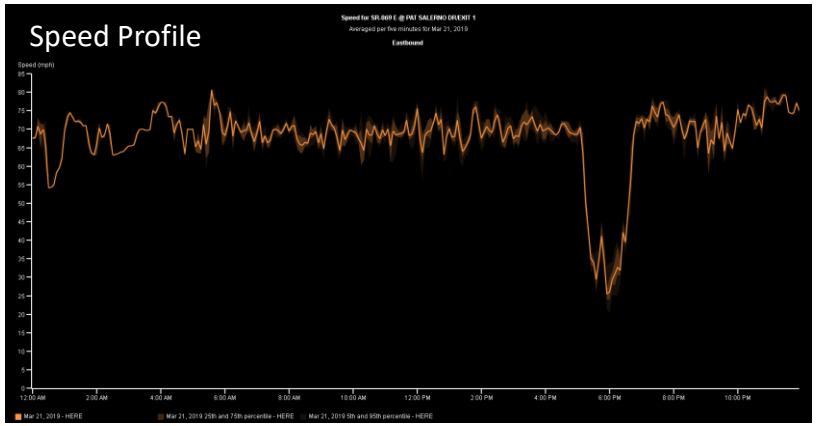
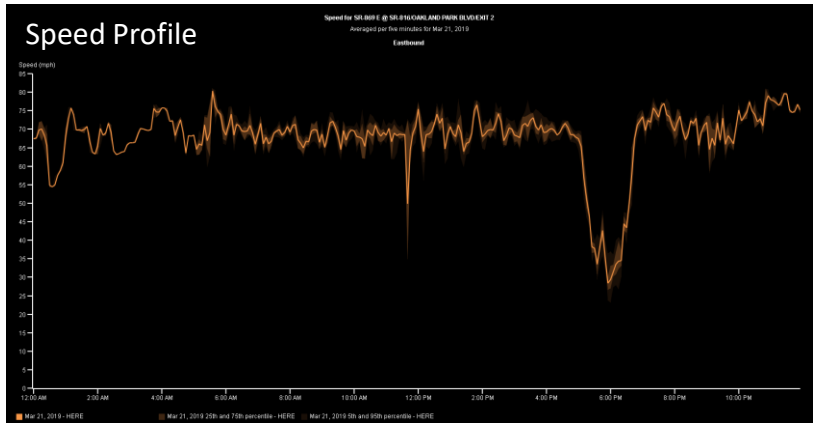


Speed Profile



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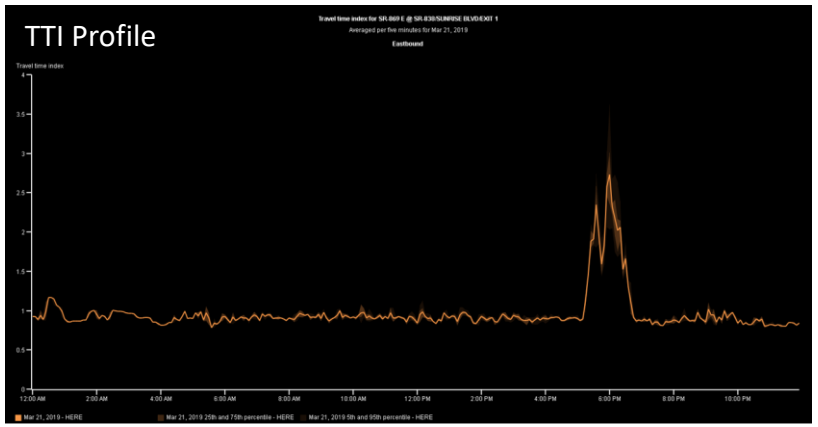

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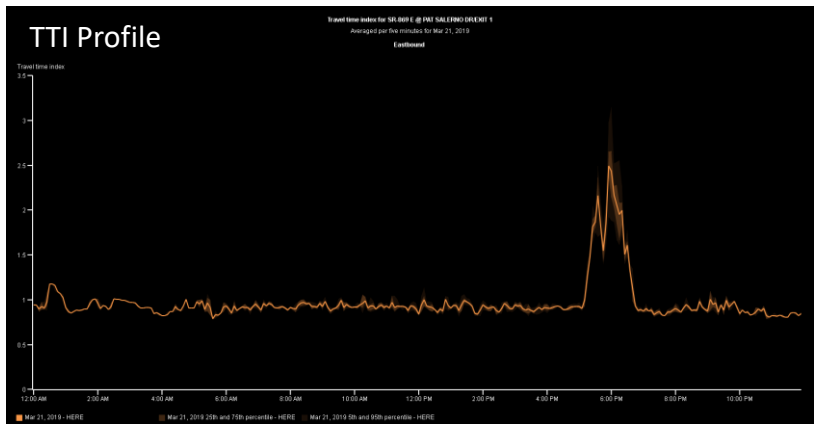

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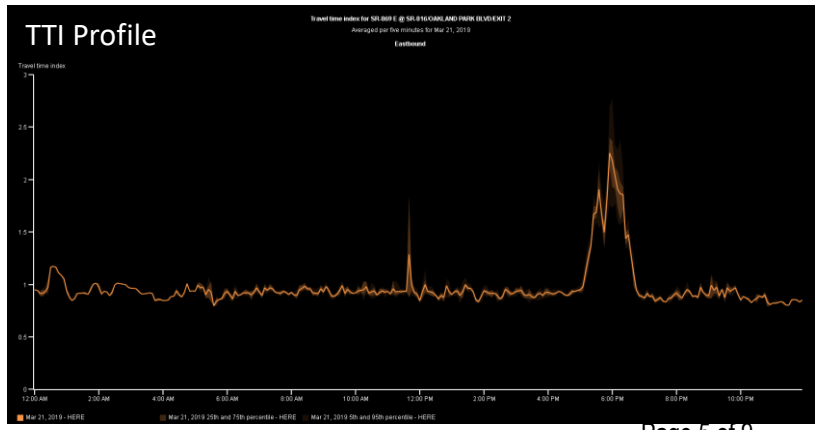
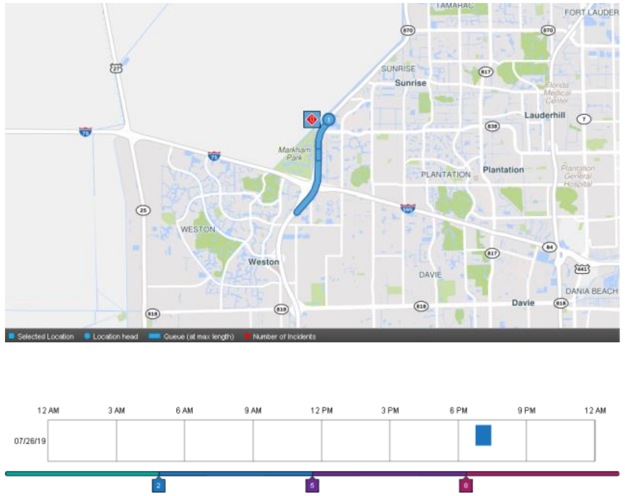
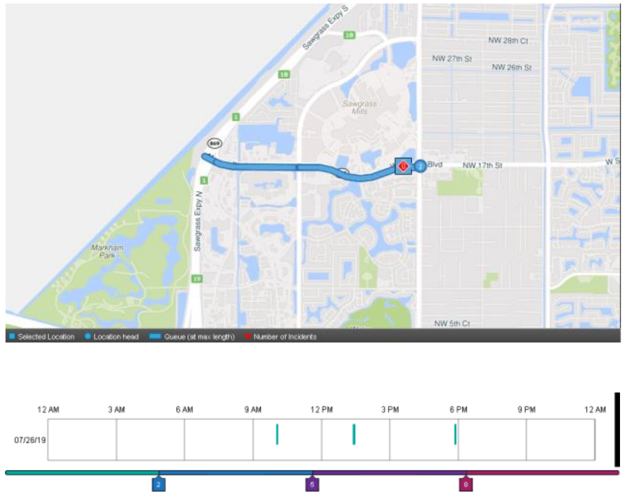


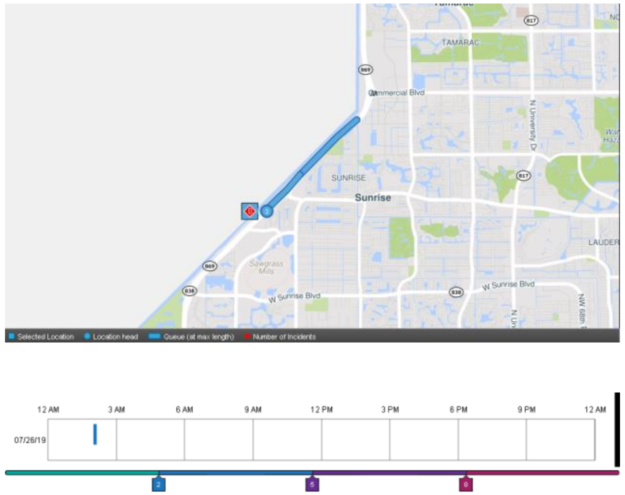
BB&T Center – Cirque du Soleil

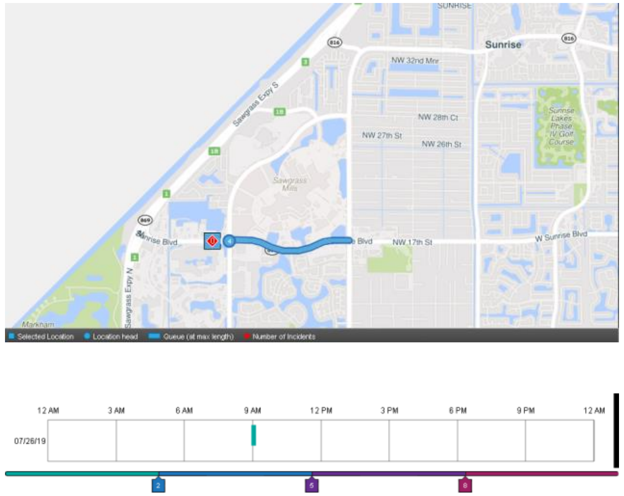
7/26/2019 (Fri) – 3:30 PM to 10:00 PM

Rank	Head Location	Average max length	Total duration	All events/incidents	Volume Estimate	Base Impact	Speed differential	Congestion	TOTAL DELAY
1	SR-869 E @ SR-838/SUNRISE BLVD/EXIT 1	1.69	56 m	0	48,949	82	3,209	142	114,903
2	SR-838 E @ FLAMINGO RD/124TH	1.07	57 m	0	20,954	59	775	64	32,464
3	SR-869 W @ SR-816/OAKLAND PARK BLVD/EXIT 2	2.1	9 m	0	40,190	18	750	36	25,444
4	SR-838 W @ HARRISON PKY/136TH AVE	1.01	36 m	0	20,905	36	465	41	23,731









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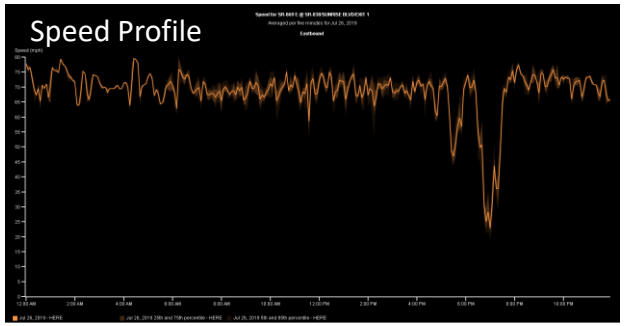

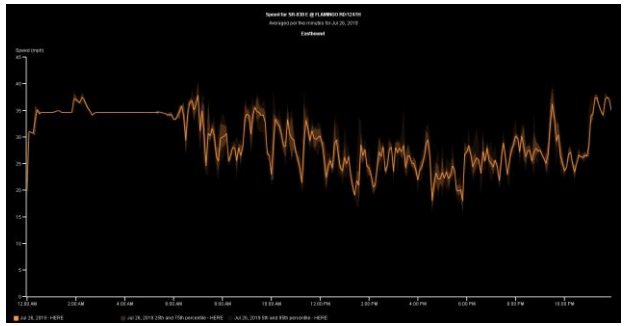

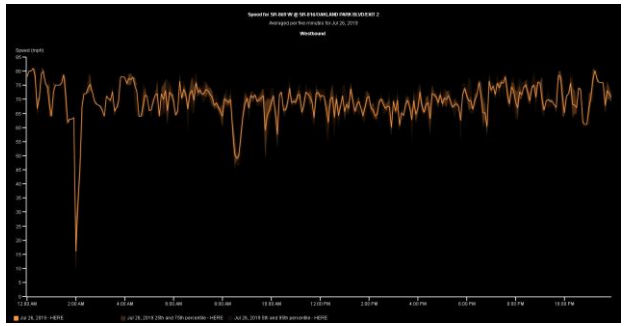

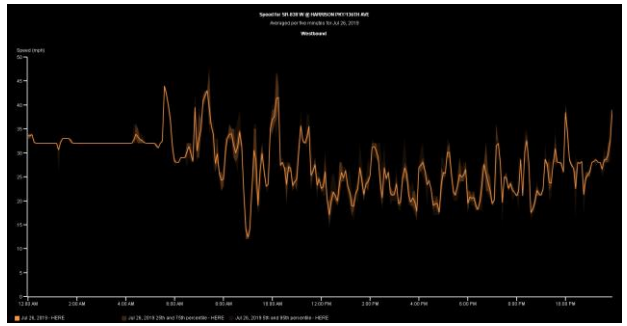

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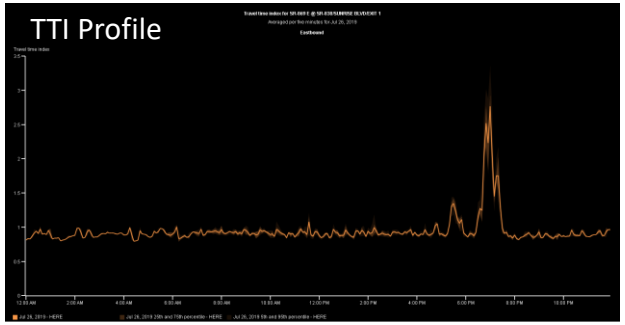
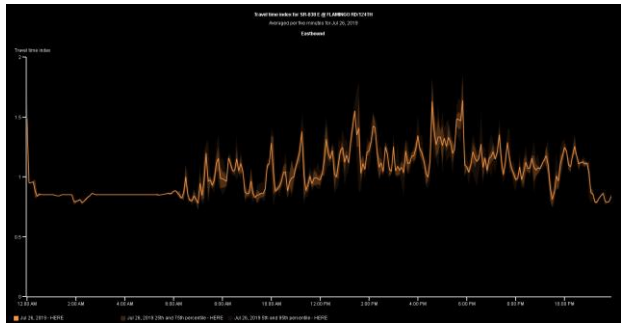
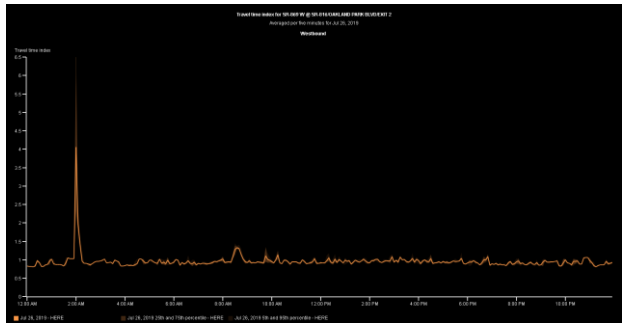
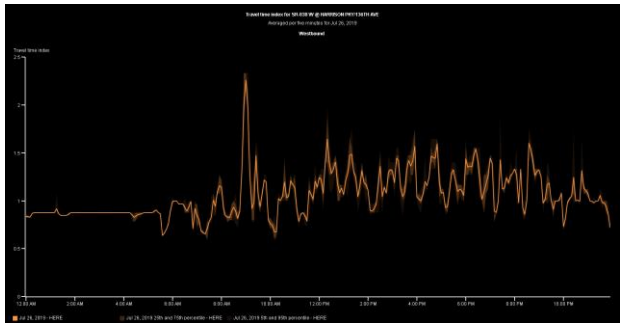




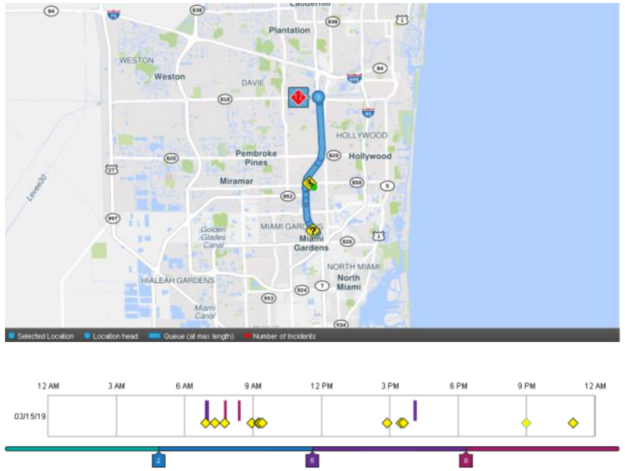


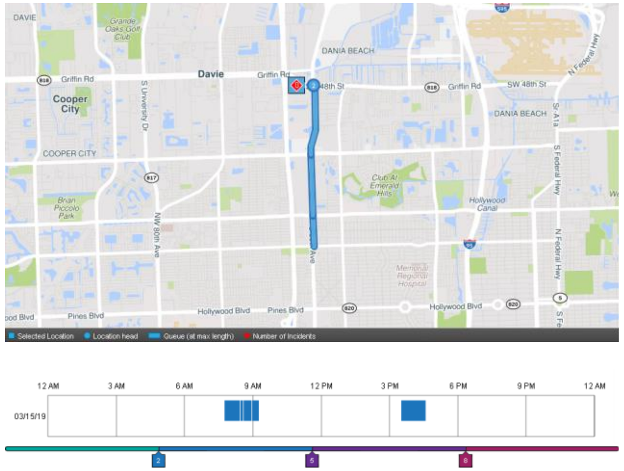


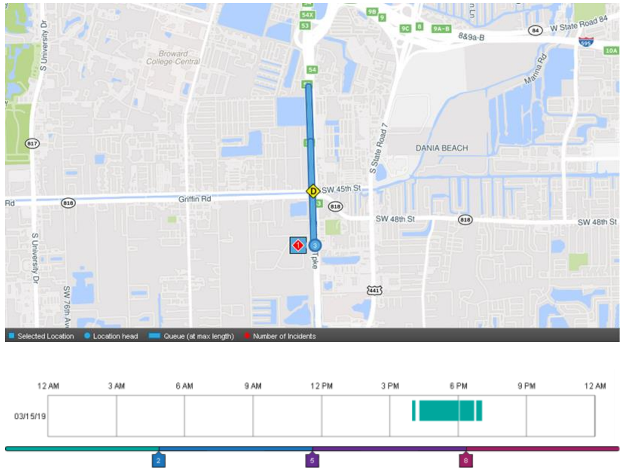
Seminole Hard Rock Hotel & Casino – Trevor Noah

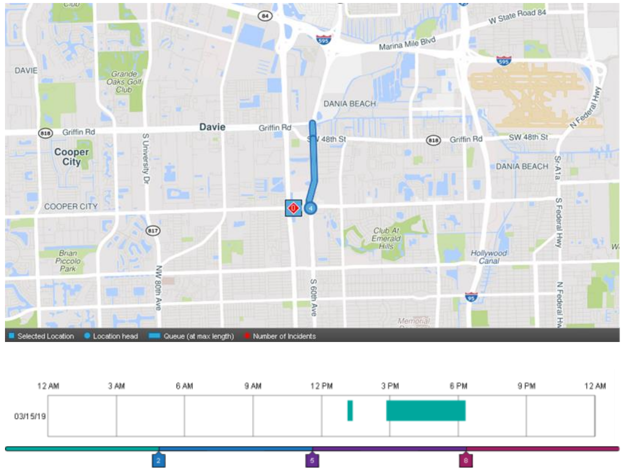
3/15/2019 (Fri) – 8:00 PM to 11:00 PM

Rank	Head Location	Average max length	Total duration	All events/incidents	Volume Estimate	Base Impact	Speed differential	Congestion	TOTAL DELAY
1	FLORIDA'S TPKE N @ SR-818/GRIFFIN RD/EXIT 53 (SOUTH)	7.66	54 m	10	52,616	402	14,498	769	708,735
2	US-441 N @ SR-818/GRIFFIN RD/48TH ST	1.4	2 h 55 m	0	24,565	283	4,234	433	398,794
3	FLORIDA'S TPKE S @ SR-818/GRIFFIN RD/EXIT 53 (SOUTH)	0.8	2 h 59 m	1	58,718	173	7,657	367	386,784
4	US-441 S @ SR-848/STIRLING RD/60TH ST	1.29	4 h	0	24,997	299	4,046	406	376,920









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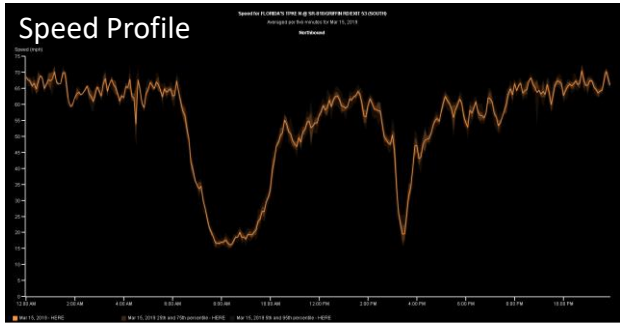
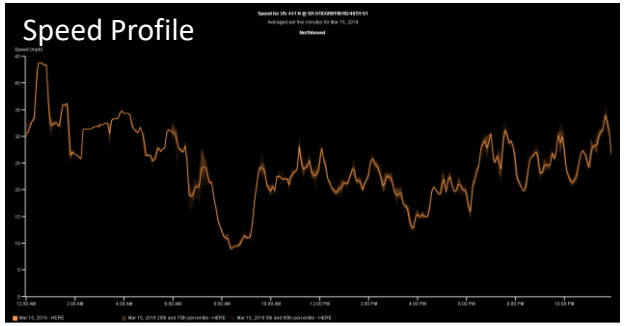
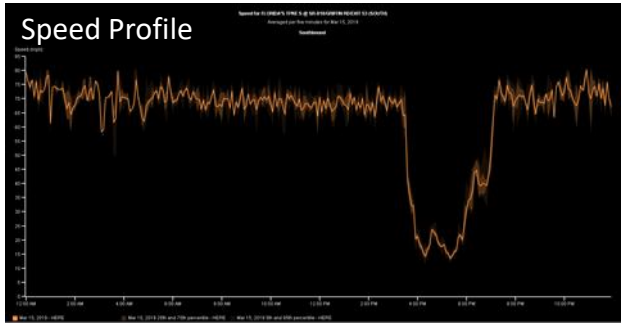
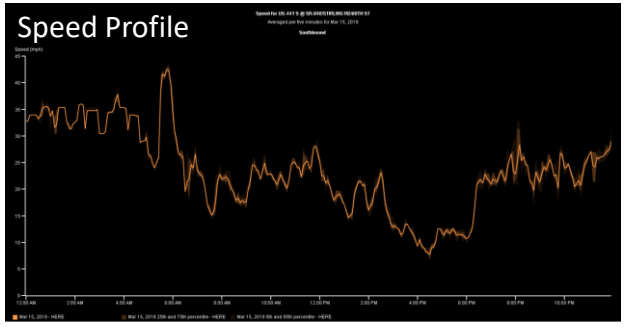
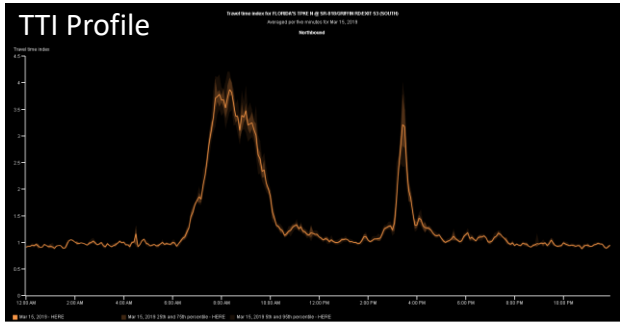
3	FLORIDA'S TPKE S @ SR-818/GRIFFIN RD/EXIT 53 (SOUTH)	0.8	2 h 59 m	1	58,718	173	7,657	367	386,784
4	US-441 S @ SR-848/STIRLING RD/60TH ST	1.29	4 h	0	24,997	299	4,046	406	376,920

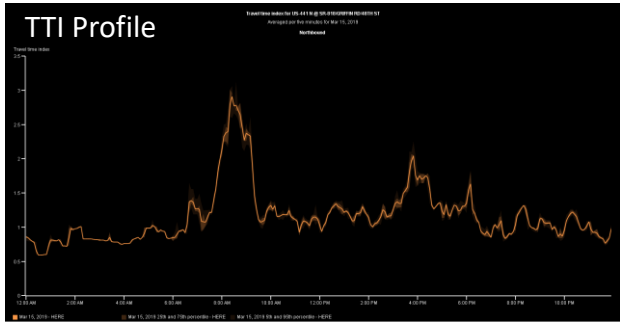


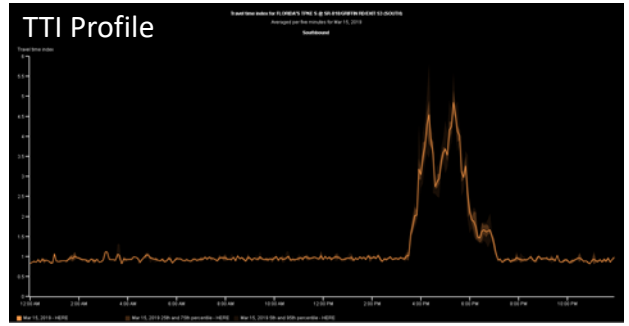


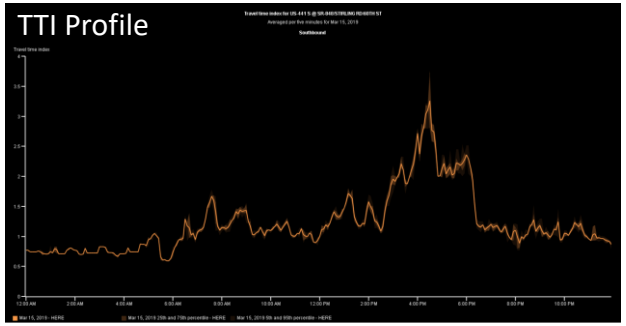












APPENDIX-D

Congested Network - Corridors Tabulation

Congested Network - Congested Corridors

Direction	Map ID	Road Name	From	To	Length (in miles)	Timeframe
North-South	A	US-27	Pines Boulevard	Sheridan Street	1.50	Existing
North-South	B	US-27	Miami-Dade/Broward Co. Line	Pembroke Road	2.47	2045
North-South	C	I-75	Just south of I-595	N/A	0.83	2045
North-South	D	I-75	Griffin Road	Pines Boulevard	3.96	2045
North-South	E	I-75	Pembroke Road	Miami-Dade/Broward Co. Line	2.70	2045
North-South	F	Sawgrass Expressway	NW 8th Street	Oakland Park Boulevard	3.29	Existing
North-South	G	Sawgrass Expressway	Oakland Park Boulevard	Commercial Boulevard	2.18	2045
North-South	H	Red Road	Florida's Turnpike	Pembroke Road	2.14	Existing
North-South	I	Flamingo Road	Pembroke Road	Griffin Road	4.84	Existing
North-South	J	Flamingo Road	NW 136th Ave	Oakland Park Boulevard	0.53	Existing
North-South	K	Hiatus Road	Miramar Blvd	Taft Street	2.51	2045
North-South	L	Hiatus Road	NW 29th Manor	Oakland Park Boulevard	0.41	2045
North-South	M	Palm Avenue	Pembroke Road	Pines Boulevard	1.01	Existing
North-South	N	Palm Avenue	Johnson Street	Taft Street	0.51	2045
North-South	O	Palm Avenue	Stirling Road	SW 53rd Street	0.57	2045
North-South	P	University Drive	Florida's Turnpike	W Sample Road	21.00	Existing
North-South	Q	University Drive	Sawgrass Expressway	Holmberg Road	0.66	Existing
North-South	R	Florida's Turnpike	Miramar Parkway	Griffin Road	6.08	Existing
North-South	S	Florida's Turnpike	Coconut Creek Parkway	W Sample Road	2.02	Existing
North-South	T	Florida's Turnpike	Sawgrass Expressway	Palm Beach/Broward Co. Line	1.58	Existing
North-South	U	Florida's Turnpike	I-595	Davie Boulevard	1.06	2045
North-South	V	Florida's Turnpike	Broward Boulevard	Commercial Boulevard	5.03	2045
North-South	W	Blount Road	Coconut Creek Parkway	Copans Road	1.01	2045
North-South	X	SR-7	Miami-Dade/Broward Co. Line	Palm Beach/Broward Co. Line	24.61	Existing
North-South	Y	Lyons Road	Winston Park Boulevard	Palm Beach/Broward Co. Line	2.19	2045
North-South	Z	NW 31st Avenue	W McNab Road	Atlantic Boulevard	1.67	2045
North-South	AA	NW 21st Avenue	Sunrise Boulevard	Prospect Road	4.04	2045
North-South	BB	I-95	Broward Boulevard	Stirling Road	5.17	Existing
North-South	CC	I-95	Atlantic Boulevard	Sheridan Street	14.36	2045
North-South	DD	I-95	At Sample Road	N/A	0.10	2045
North-South	EE	SW 40th Avenue	Stirling Road	Griffin Road	1.11	2045
North-South	FF	Anglers Avenue	Stirling Road	SW 42nd Street	1.52	2045

Direction	Map ID	Road Name	From	To	Length (in miles)	Timeframe
North-South	GG	Powerline Road	Sunrise Boulevard	Atlantic Boulevard	6.53	Existing
North-South	HH	Powerline Road	Hammondville Road	Hillsboro Boulevard	5.12	Existing
North-South	II	Military Trail	Hillsboro Boulevard	Palm Beach/Broward Co. Line	0.70	Existing
North-South	JJ	Andrews Avenue	I-595	SE 17th Street	1.52	2045
North-South	KK	US-1	Miami-Dade/Broward Co. Line	Pembroke Road	1.52	Existing
North-South	LL	US-1	Hollywood Boulevard	Griffin Road	3.51	Existing
North-South	MM	US-1	Marina Boulevard	NE 6th Street	2.56	Existing
North-South	NN	US-1	Sunrise Boulevard	NE 26th Street	1.66	Existing
North-South	OO	US-1	Oakland Park Boulevard	E McNab Road	3.26	Existing
North-South	PP	US-1	Atlantic Boulevard	Hillsboro Boulevard	5.99	Existing
North-South	QQ	US-1	E McNab Road	Atlantic Boulevard	1.42	2045
North-South	RR	Dixie Highway	NE 20th Street	NE 62nd Street	3.86	Existing
North-South	SS	Dixie Highway	Atlantic Boulevard	Hillsboro Boulevard	6.19	Existing
North-South	TT	Dixie Highway	Sheridan Street	Stirling Road	1.06	2045
North-South	UU	SR-A1A	Hallandale Beach Boulevard	Sheridan Street	3.32	Existing
North-South	VV	SR-A1A	SE 17th Street	Oakland Park Boulevard	4.71	Existing
North-South	WW	SR-A1A	Commercial Boulevard	Bel Air Drive	1.54	2045
East-West	a	Florida's Turnpike	Miami-Dade/Broward Co. Line	University Drive	6.18	Existing
East-West	b	Miramar Parkway	I-75	SR-7	9.11	Existing
East-West	c	Hallandale Beach Boulevard	SR-7	SR-A1A	5.43	Existing
East-West	d	Pembroke Road	Flamingo Road	US-1	10.53	Existing
East-West	e	Pines Boulevard	SW 184th Avenue	I-75	3.30	Existing
East-West	f	Pines Boulevard	Flamingo Road	SR-7	6.51	Existing
East-West	g	Hollywood Boulevard	I-95	US-1	1.63	Existing
East-West	h	Johnson Street	I-95	N 26th Avenue	0.48	Existing
East-West	i	Johnson Street	N Park Road	N 26th Avenue	1.01	2045
East-West	j	Taft Street	I-95	N 26th Avenue	0.47	2045
East-West	k	Sheridan Street	I-95	N 26th Avenue	0.31	Existing
East-West	l	Sheridan Street	I-95	Dixie Highway	0.91	2045
East-West	m	Stirling Road	I-95	SW 4th Avenue	0.85	2045
East-West	n	Griffin Road	Nob Hill Road	US-1	8.67	Existing
East-West	o	I-595	Nob Hill Road	Florida's Turnpike	4.22	Existing
East-West	p	I-595	SR-7	US-1	4.25	Existing

Direction	Map ID	Road Name	From	To	Length (in miles)	Timeframe
East-West	q	SE 17th Street	US-1	SR-A1A	1.61	Existing
East-West	r	Davie Boulevard	SR-7	US-1	4.02	Existing
East-West	s	Broward Boulevard	Flamingo Road	Nob Hill Road	1.79	Existing
East-West	t	Broward Boulevard	Pine Island Rd	Tropical Way	1.06	Existing
East-West	u	Broward Boulevard	SR-7	US-1	4.02	Existing
East-West	v	NW 8th Street	International Parkway	Flamingo Road	1.69	Existing
East-West	w	Sunrise Boulevard	Sawgrass Expressway	Nob Hill Road	3.43	Existing
East-West	x	Sunrise Boulevard	Pine Island Road	SR-A1A	10.96	Existing
East-West	y	NW 19th Street	M.L.K. Jr Avenue	NW 15th Avenue	1.52	2045
East-West	z	Oakland Park Boulevard	Sawgrass Expressway	SR-A1A	13.57	Existing
East-West	aa	Commercial Boulevard	Sawgrass Expressway	SR-A1A	12.54	Existing
East-West	bb	Cypress Creek Road	Florida's Turnpike	NW 31st Avenue	0.83	Existing
East-West	cc	Atlantic Boulevard	University Drive	SR-A1A	10.26	Existing
East-West	dd	Coconut Creek Parkway	SR-7	NW 31st Avenue	2.27	Existing
East-West	ee	Copans Road	Lyons Road	Blount Road	1.39	2045
East-West	ff	Sample Road	Sawgrass Expressway	Coral Ridge Drive	0.87	Existing
East-West	gg	Sample Road	Coral Springs Drive	US-1	10.50	Existing
East-West	hh	Holmberg Road	Riverside Drive	Parkside Drive	0.75	Existing
East-West	ii	Hillsboro Boulevard	Powerline Road	SR-A1A	4.72	Existing
North-South	jj	I-95	Palm Beach/Broward Co. Line	Hollywood Blvd	23.05	Existing

APPENDIX-E

Corridor/Area Specific Congestion Management Strategies

Congested Network and Corridor/Area Specific Select CMP Strategies

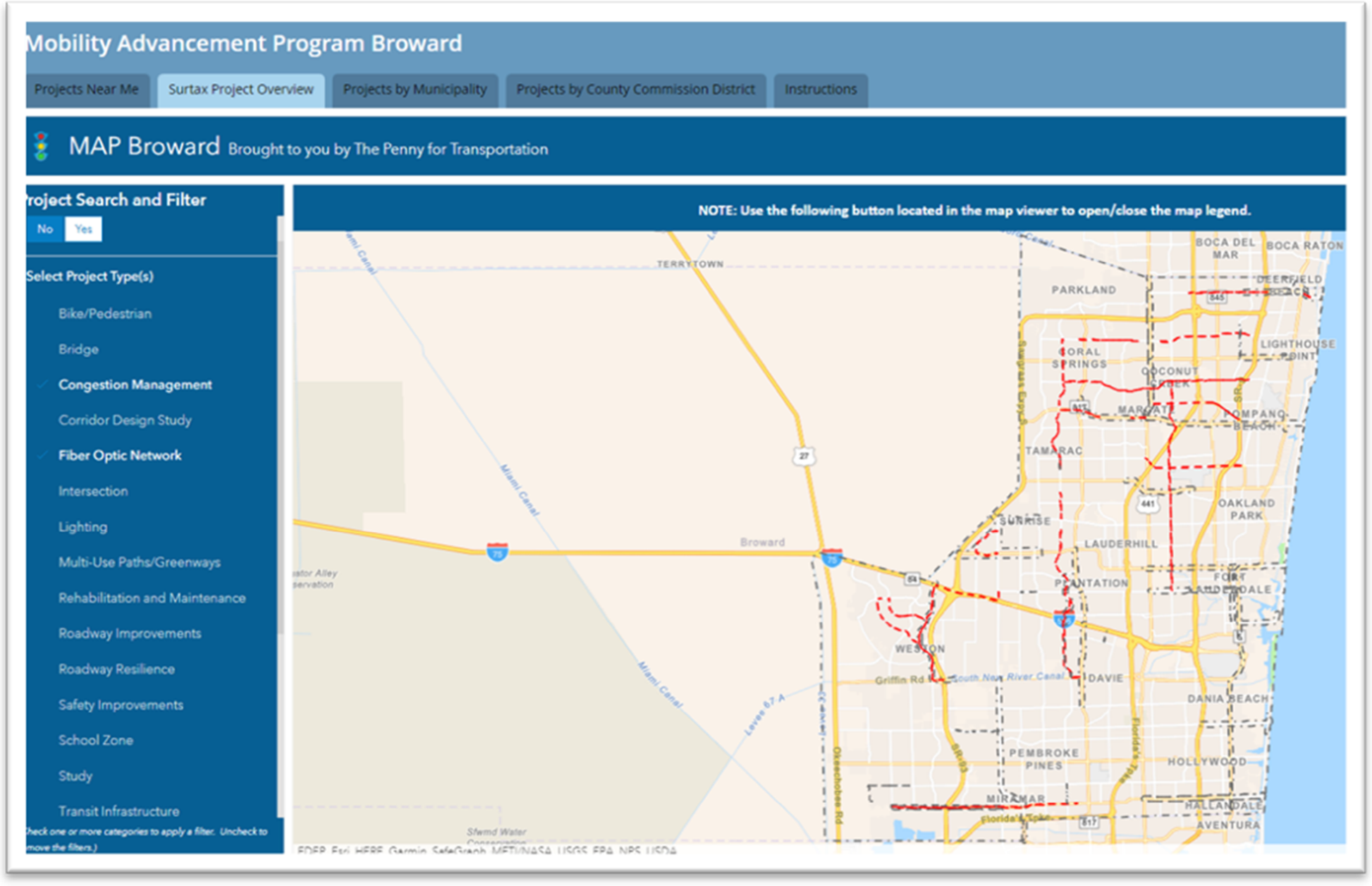
Direction	Map ID	Road Name	From	To	Length (in miles)	Timeframe	Corridor/Area Specific Select CMP Strategies		FDOT TSM&O Master Plan Group/Tier	Broward County CM or Fiber Optic Project	BMPO Congested Corridors	BMPO CMP Group Color
							Supply Side	Demand Side				
North-South	A	US-27	Pines Boulevard	Sheridan Street	1.50	Existing	TSM&O Improvements from Pembroke Rd. to Griffin Rd. (US-27 Grade Separation Study)	US-27 Grade Separation Study	-	-	Existing	Blue
North-South	B	US-27	Miami-Dade/Broward Co. Line	Pembroke Road	2.47	2045	TSM&O Improvements from Pembroke Rd. to Griffin Rd. (US-27 Grade Separation Study)	US-27 Grade Separation Study	-	-	Future	Orange
North-South	C	I-75	Just south of I-595	N/A	0.83	2045	Integrated Corridor Management (ICM)		-	-	Future	Orange
North-South	D	I-75	Griffin Road	Pines Boulevard	3.96	2045	Integrated Corridor Management (ICM)		-	-	Future	Orange
North-South	E	I-75	Pembroke Road	Miami-Dade/Broward Co. Line	2.70	2045	Integrated Corridor Management (ICM)		-	-	Future	Orange
North-South	F	Sawgrass Expressway	NW 8th Street	Oakland Park Boulevard	3.29	Existing	Increase Roadway Capacity (6 to 10 Lanes)		3	-	Existing	Yellow
North-South	G	Sawgrass Expressway	Oakland Park Boulevard	Commercial Boulevard	2.18	2045	Increase Roadway Capacity (6 to 10 Lanes)		-	-	Future	Orange
North-South	H	Red Road	Florida's Turnpike	Pembroke Road	2.14	Existing	TSM&O (Miami-Dade Co. Line to Miramar Pkwy), ATCS (Miami-Dade Co. Line to Griffin Rd.)		2	Surtax Project	Existing	Green
North-South	I	Flamingo Road	Pembroke Road	Griffin Road	4.84	Existing	TSM&O (Miami-Dade Co. Line to Miramar Pkwy), ATCS (Miami-Dade Co. Line to Griffin Rd.), Center Turn Overpass (CTO) at Flamingo Rd. and Pines Blvd.		2	Surtax Project	Existing	Green
North-South	J	Flamingo Road	NW 136th Ave	Oakland Park Boulevard	0.53	Existing	TSM&O		3	-	Existing	Yellow
North-South	K	Hiatus Road	Miramar Blvd	Taft Street	2.51	2045	TSM&O	Microtransit/Ridesharing, Active Transportation	-	-	Future	Orange
North-South	L	Hiatus Road	NW 29th Manor	Oakland Park Boulevard	0.41	2045	TSM&O	Capacity Increase (Lane Configuration)	-	-	Future	Orange
North-South	M	Palm Avenue	Pembroke Road	Pines Boulevard	1.01	Existing		Microtransit/Ridesharing, Active Transportation, Targeted TMD strategies	-	-	Existing	Blue
North-South	N	Palm Avenue	Johnson Street	Taft Street	0.51	2045		Microtransit/Ridesharing, Active Transportation, Targeted TMD strategies	-	-	Future	Orange
North-South	O	Palm Avenue	Stirling Road	SW 53rd Street	0.57	2045		Microtransit/Ridesharing, Active Transportation, Targeted TMD strategies	-	-	Future	Orange
North-South	P	University Drive	Florida's Turnpike	W Sample Road	21.00	Existing	Adaptive Traffic Control System (Stirling Rd. to Sunrise Blvd.), Transit Signal Priority, TSM&O (Southgate Blvd. to Ramblewood Dr.), (Sunrise Blvd. to Sunset Strip), High-Capacity Transit		1	Surtax Project	Existing	Green
North-South	Q	University Drive	Sawgrass Expressway	Holmberg Road	0.66	Existing	Transit Signal Priority, High-Capacity Transit		1	-	Existing	Yellow
North-South	R	Florida's Turnpike	Miramar Parkway	Griffin Road	6.08	Existing	TSM&O - Add Auxiliary Lanes		-	-	Existing	Blue
North-South	S	Florida's Turnpike	Coconut Creek Parkway	W Sample Road	2.02	Existing	PD&E Study - Capacity Increase (8 to 10 Lanes from I-595 to Wiles Rd)		-	-	Existing	Blue
North-South	T	Florida's Turnpike	Sawgrass Expressway	Palm Beach/Broward Co. Line	1.58	Existing	TSM&O - Add Auxiliary Lanes		-	-	Existing	Blue
North-South	U	Florida's Turnpike	I-595	Davie Boulevard	1.06	2045	PD&E Study - Capacity Increase (8 to 10 Lanes from I-595 to Wiles Rd)		-	-	Future	Orange
North-South	V	Florida's Turnpike	Broward Boulevard	Commercial Boulevard	5.03	2045	PD&E Study - Capacity Increase (8 to 10 Lanes from I-595 to Wiles Rd)		-	-	Future	Orange
North-South	W	Blount Road	Coconut Creek Parkway	Copans Road	1.01	2045	Freight Priority Signal , TDM Strategies, Capacity Increase (Lane Configuration)		-	-	Future	Orange
North-South	X	SR-7	Miami-Dade/Broward Co. Line	Palm Beach/Broward Co. Line	24.61	Existing	ATMS Deployment from Commercial Blvd. to Palm Beach/Broward Co. Line; (Hallandale Beach Blvd. to Stirling Road - Under Construction;) ATCS (Hillsboro Blvd. to Atlantic Blvd.), Safety Improvements (Davie Road to Sunrise Blvd. and Coconut Creek Pkwy to Copans Rd.), TSM&O (Southgate Blvd. To Atlantic Blvd. - NB & Hillsboro Blvd. to Holmberg Rd.), Intersection improvement at SR-7 and Oakes Rd., High-Capacity Transit		1	Surtax Project	Existing	Green
North-South	Y	Lyons Road	Winston Park Boulevard	Palm Beach/Broward Co. Line	2.19	2045	TSM&O	Microtransit/Ridesharing, Active Transportation, Targeted TMD strategies	-	-	Future	Orange
North-South	Z	NW 31st Avenue	W McNab Road	Atlantic Boulevard	1.67	2045	TSM&O - Fiber Optic Network (Commercial Blvd to Copans Rd)		-	Surtax Project	Future	Orange
North-South	AA	NW 21st Avenue	Sunrise Boulevard	Prospect Road	4.04	2045	Safety Improvements (Sunrise Blvd. to Oakland Park Blvd.)	Microtransit/Ridesharing, Active Transportation, Targeted TMD strategies	-	-	Future	Orange
North-South	BB	I-95	Broward Boulevard	Stirling Road	5.17	Existing	Integrated Corridor Management (ICM)		1	-	Existing	Yellow
North-South	CC	I-95	Atlantic Boulevard	Sheridan Street	14.36	2045	Integrated Corridor Management (ICM)		-	-	Future	Orange
North-South	DD	I-95	At Sample Road	N/A	0.10	2045	Capacity Increase (Interchange Improvements (FM# 436958.1))		-	-	Future	Orange
North-South	EE	SW 40th Avenue	Stirling Road	Griffin Road	1.11	2045		Microtransit/Ridesharing, Active Transportation, Targeted TMD strategies	-	-	Future	Orange
North-South	FF	Anglers Avenue	Stirling Road	SW 42nd Street	1.52	2045	Parking Management	Microtransit/Ridesharing, Active Transportation, Targeted TMD strategies	-	-	Future	Orange
North-South	GG	Powerline Road	Sunrise Boulevard	Atlantic Boulevard	6.53	Existing	Safety Improvements (Sunrise Blvd. to Prospect Rd.), TSM&O - Freight Improvements		3	-	Existing	Yellow
North-South	HH	Powerline Road	Hammondville Road	Hillsboro Boulevard	5.12	Existing	TSM&O - Freight Improvements		-	-	Existing	Blue
North-South	II	Military Trail	Hillsboro Boulevard	Palm Beach/Broward Co. Line	0.70	Existing	TSM&O (Along Hillsboro Blvd.)		-	Surtax Project	Existing	Yellow
North-South	JJ	Andrews Avenue	I-595	SE 17th Street	1.52	2045	TSM&O (Commercial Blvd. to I-595)		2	Surtax Project	Future	Orange
North-South	KK	US-1	Miami-Dade/Broward Co. Line	Pembroke Road	1.52	Existing	TSM&O (Miami-Dade Co. Line to Broward Blvd.); High-Capacity Transit		1	-	Resiliency Corridor	Yellow
North-South	LL	US-1	Hollywood Boulevard	Griffin Road	3.51	Existing	TSM&O (Miami-Dade Co. Line to Broward Blvd.); High-Capacity Transit		1	-	Existing	Yellow

Direction	Map ID	Road Name	From	To	Length (in miles)	Timeframe	Corridor/Area Specific Select CMP Strategies		FDOT TSM&O Master Plan Group/Tier	Broward County CM or Fiber Optic Project	BMPO Congested Corridors	BMPO CMP Group Color
							Supply Side	Demand Side				
North-South	MM	US-1	Marina Boulevard	NE 6th Street	2.56	Existing	Transit Signal Priority (SE 20th St. to SE 9th St.); Scalable ICM, TSM&O (Miami-Dade Co. Line to Broward Blvd.); High-Capacity Transit		1	-	Resiliency Corridor(s)	Yellow
North-South	NN	US-1	Sunrise Boulevard	NE 26th Street	1.66	Existing	High-Capacity Transit		-	-	Existing	Blue
North-South	OO	US-1	Oakland Park Boulevard	E McNab Road	3.26	Existing	TSM&O (Oakland Park Blvd. to Commercial Blvd and Atlantic Blvd.), High-Capacity Transit		1	-	Existing	Yellow
North-South	PP	US-1	Atlantic Boulevard	Hillsboro Boulevard	5.99	Existing	TSM&O (Copans Rd. to NE 14th) , High-Capacity Transit		3	-	Existing	Yellow
North-South	QQ	US-1	E McNab Road	Atlantic Boulevard	1.42	2045	High-Capacity Transit		-	-	Future	Orange
North-South	RR	Dixie Highway	NE 20th Street	NE 62nd Street	3.86	Existing	TSM&O (NE 26th St. to Commercial Blvd.), High-Capacity Transit		3	-	Existing	Yellow
North-South	SS	Dixie Highway	Atlantic Boulevard	Hillsboro Boulevard	6.19	Existing	High-Capacity Transit, Bike/Ped Improvements	Microtransit/Ridesharing, Active Transportation, Targeted TMD strategies	-	-	Existing	Blue
North-South	TT	Dixie Highway	Sheridan Street	Stirling Road	1.06	2045	Bike/Ped Improvements	Microtransit/Ridesharing, Active Transportation, Targeted TMD strategies	-	-	Future	Orange
North-South	UU	SR-A1A	Hallandale Beach Boulevard	Sheridan Street	3.32	Existing	TSM&O, Bicycle/Pedestrian Improvements	Microtransit/Ridesharing	3	-	Resiliency Corridor	Yellow
North-South	VV	SR-A1A	SE 17th Street	Oakland Park Boulevard	4.71	Existing	Scalable ICM (TSM&O)		1	-	Existing	Yellow
North-South	WW	SR-A1A	Commercial Boulevard	Bel Air Drive	1.54	2045	TSM&O (Sunrise Blvd. to Atlantic Blvd.), Bicycle/Pedestrian Improvements	Microtransit/Ridesharing	2	-	Future	Orange
East-West	a	Florida's Turnpike	Miami-Dade/Broward Co. Line	University Drive	6.18	Existing		Managed Lane Implementation	-	-	Existing	Blue
East-West	b	Miramar Parkway	I-75	SR-7	9.11	Existing	TSM&O (SW 184th Ave to University Dr)		-	Surtax Project	Existing	Yellow
East-West	c	Hallandale Beach Boulevard	SR-7	SR-A1A	5.43	Existing	TSM&O (SR-7 to SR-A1A and US-1 from SE 9th St. to Atlantic Shores Blvd.)		-	Surtax Project	Resiliency Corridor	Yellow
East-West	d	Pembroke Road	Flamingo Road	US-1	10.53	Existing	TSM&O		-	-	Existing	Blue
East-West	e	Pines Boulevard	SW 184th Avenue	I-75	3.30	Existing	Parking Management (Park and Ride) Microtransit/Ridesharing, Active Transportation, Bike/Ped Improvements, High-Capacity Transit	Targeted TMD strategies	-	-	Existing	Blue
East-West	f	Pines Boulevard	Flamingo Road	SR-7	6.51	Existing	High-Capacity Transit, Microtransit/Ridesharing, Active Transportation, Bike/Ped Improvements, High-Capacity Transit	Targeted TMD strategies	-	-	Existing	Blue
East-West	g	Hollywood Boulevard	I-95	US-1	1.63	Existing	Microtransit/Ridesharing, Active Transportation, Bike/Ped Improvements, High-Capacity Transit	Targeted TMD strategies	-	-	Existing	Blue
East-West	h	Johnson Street	I-95	N 26th Avenue	0.48	Existing	Microtransit/Ridesharing, Active Transportation, Bike/Ped Improvements		-	-	Existing	Blue
East-West	i	Johnson Street	N Park Road	N 26th Avenue	1.01	2045	Microtransit/Ridesharing, Active Transportation, Bike/Ped Improvements		-	-	Future	Orange
East-West	j	Taft Street	I-95	N 26th Avenue	0.47	2045	TSM&O (Signal Coordination, Railroad Crossing, School Crossing), Microtransit/Ridesharing		-	-	Future	Orange
East-West	k	Sheridan Street	I-95	N 26th Avenue	0.31	Existing	TSM&O (ATCS) (I-95 to SR-A1A)		3	Surtax Project	Existing	Green
East-West	l	Sheridan Street	I-95	Dixie Highway	0.91	2045	TSM&O (ATCS) (I-95 to SR-A1A & NW 25tj Ave to Dixie Hwy)		3	Surtax Project	Future	Orange
East-West	m	Stirling Road	I-95	SW 4th Avenue	0.85	2045	TSM&O (I-95 to S Bryan Rd) - Partial, Add Right-Turn Lanes (at I-95) [FM439170-2]		3	-	Future	Orange
East-West	n	Griffin Road	Nob Hill Road	US-1	8.67	Existing	TSM&O , Griffin at Access Road (0.3 mile FDOT)		3	-	Existing	Yellow
East-West	o	I-595	Nob Hill Road	Florida's Turnpike	4.22	Existing	Interchange Improvement (I-95, I-595, SR-7)		-	-	Existing	Blue
East-West	p	I-595	SR-7	US-1	4.25	Existing	Interchange Improvement (I-95, I-595, SR-7)		-	-	Existing	Blue
East-West	q	SE 17th Street	US-1	SR-A1A	1.61	Existing	Scalable ICM (TSM&O), High-Capacity Transit		1	Surtax Project	Existing	Green
East-West	r	Davie Boulevard	SR-7	US-1	4.02	Existing	Arterial Traffic Management [FM444118-1] - Partial, TSM&O (SR-7 to Andrews Ave), Safety Improvements		1	-	Existing	Yellow
East-West	s	Broward Boulevard	Flamingo Road	Nob Hill Road	1.79	Existing	Capacity Increase (Nob Hill Rd. to Hiatus Rd.)		-	Surtax Project	Existing	Yellow
East-West	t	Broward Boulevard	Pine Island Rd	Tropical Way	1.06	Existing	Safety Improvements (Pine Island Rd and Broward), Capacity Increase (Nob Hill Rd. to Hiatus Rd.), High-Capacity Transit		-	Surtax Project	Existing	Yellow
East-West	u	Broward Boulevard	SR-7	US-1	4.02	Existing	Transit Signal Priority, Scalable ICM (Partial), Safety Improvements, Transit Improvements (SR-7 to Downtown. Ft. Lauderdale), High-Capacity Transit		1	Surtax Project	Existing	Green
East-West	v	NW 8th Street	International Parkway	Flamingo Road	1.69	Existing		Microtransit/Ridesharing, TDM strategies	-	-	Existing	Blue
East-West	w	Sunrise Boulevard	Sawgrass Expressway	Nob Hill Road	3.43	Existing	TSM&O (ATSC) (NW 136th Ave from Sunrise Blvd to Flamingo Rd. Flamingo Rd between Sunrise Blvd and Oakland Park Blvd. And, Sunrise Blvd. between Sawgrass Expwy and Nob Hill Rd), TSM&O (Flamingo Rd. to Hiatus Rd., NW 136th Ave. at Sunrise Blvd.)		3	Surtax Project	Existing	Green
East-West	x	Sunrise Boulevard	Pine Island Road	SR-A1A	10.96	Existing	Scalable ICM (US-1 to SR-A1A), Traffic Signal update at Sunrise Blvd. & Powerline Rd , Safety Improvements, TSM&O (SR-7 to SR-A1A), (N. Andrews Ave. to NW 7th Ave. - WB)		1	-	Existing	Yellow
East-West	y	NW 19th Street	M.L.K. Jr Avenue	NW 15th Avenue	1.52	2045	Safety Improvements, Microtransit/Ridesharing, Active Transportation, Bike/Ped Improvements		-	-	Future	Orange
East-West	z	Oakland Park Boulevard	Sawgrass Expressway	SR-A1A	13.57	Existing	Transit Signal Priority, TSM&O (Hiatus to Nob Hill), Safety Improvements (Pine Island Rd. to US-1), TSM&O (SR-7 to Rock Island Rd -WB and Powerline Rd. to N Andrews Ave. -WB), High-Capacity Transit		3	-	Existing	Blue
East-West	aa	Commercial Boulevard	Sawgrass Expressway	SR-A1A	12.54	Existing	TSM&O (ATSC) (Rock Island Rd to NW 21st Ave), TSM&O (University to US-1), TSM&O (Florida's Turnpike to Rock Island Rd - WB)		1	Surtax Project	Existing	Green
East-West	bb	Cypress Creek Road	Florida's Turnpike	NW 31st Avenue	0.83	Existing	TSM&O (Fiber Optic Network)(SR-7 to Dixie Hwy)		-	Surtax Project	Existing	Yellow

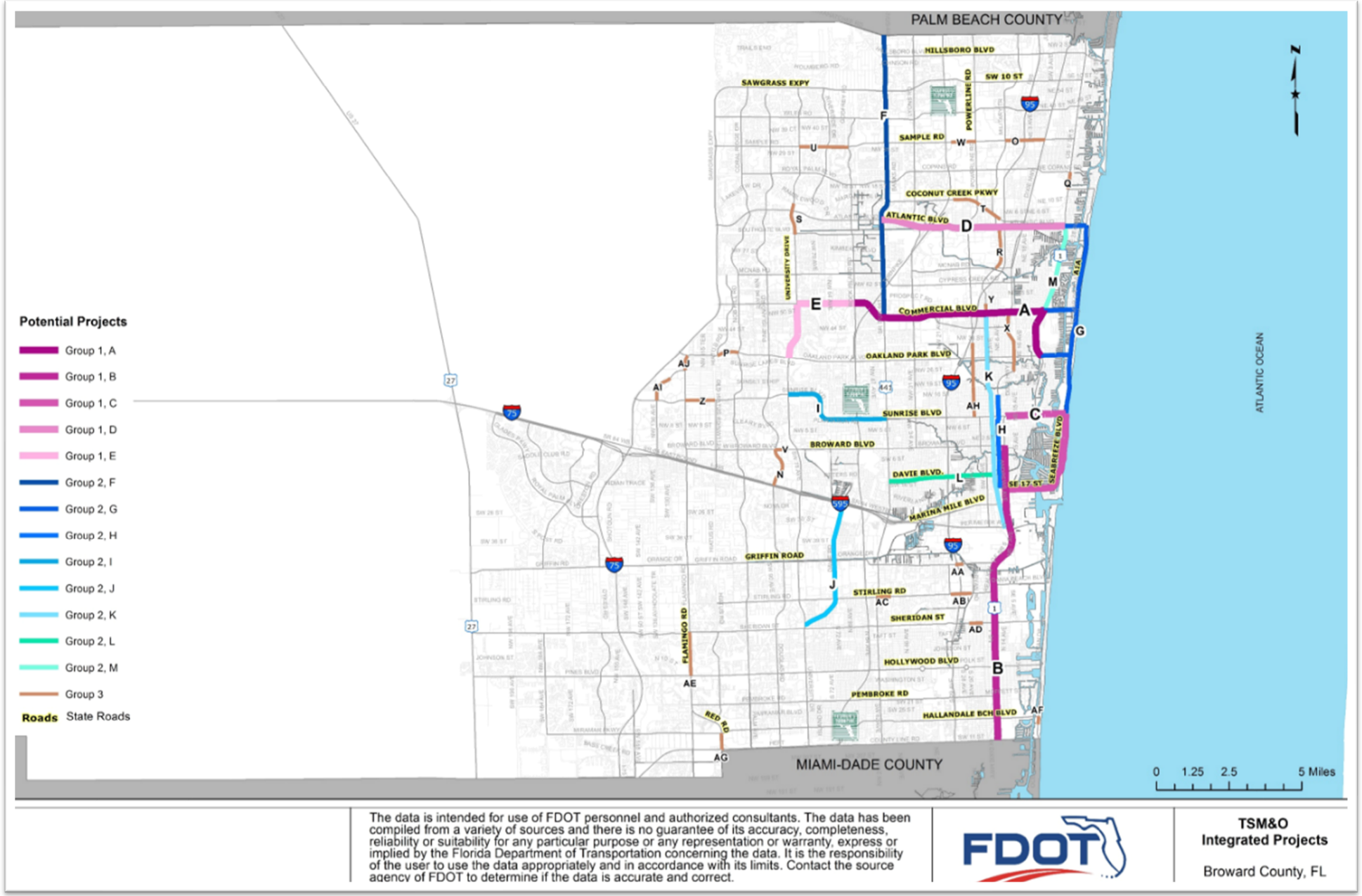
Direction	Map ID	Road Name	From	To	Length (in miles)	Timeframe	Corridor/Area Specific Select CMP Strategies		FDOT TSM&O Master Plan Group/Tier	Broward County CM or Fiber Optic Project	BMPO Congested Corridors	BMPO CMP Group Color
							Supply Side	Demand Side				
East-West	cc	Atlantic Boulevard	University Drive	SR-A1A	10.26	Existing	Arterial Traffic Management [FM444119-1]-Partial; TSM&O (SR7 to SR-A1A), ATCS (University Dr. to SR-A1A)		1	Surtax Project	Existing	Green
East-West	dd	Coconut Creek Parkway	SR-7	NW 31st Avenue	2.27	Existing	TSM&O (Fiber Optic Network) (SR-7 tol-95), TSM&O (Florida's Turnpike to I-95), Safety Improvements		3	Surtax Project	Existing	Green
East-West	ee	Copans Road	Lyons Road	Blount Road	1.39	2045	TSM&O (Fiber Optic Network) (SR-7 tol-95)		-	Surtax Project	Future	Orange
East-West	ff	Sample Road	Sawgrass Expressway	Coral Ridge Drive	0.87	Existing	Transit Signal Priority, Queue Jump, High-Capacity Transit		-	Surtax Project	Existing	Yellow
East-West	gg	Sample Road	Coral Springs Drive	US-1	10.50	Existing	Transit Signal Priority, Queue Jump, TSM&O (University Dr. to Riverside Dr., Florida's Turnpike to Powerline Rd, and Andrews Ave to Dixie Hwy), Rock Island Rd to SR-7 - EB, High-Capacity Transit		3	Surtax Project	Existing	Green
East-West	hh	Holmberg Road	Riverside Drive	Parkside Drive	0.75	Existing	Bike/Ped Improvements	Microtransit/Ridesharing, Active Transportation, Targeted TMD strategies	1	-	Existing	Yellow
East-West	ii	Hillsboro Boulevard	Powerline Road	SR-A1A	4.72	Existing	TSM&O (ATSC) (Military Trail to SR-A1A), Safety/Operational Improvements (Freight) at Hillsboro Blvd. at US=1		-	Surtax Project	Existing	Yellow
North-South	jj	I-95	Palm Beach/Broward Co. Line	Broward/Miami-Dade Co. Line	23.05	Existing	Integrated Corridor Management (ICM) from Hallandale Beach Blvd. to Cypress Creek Rd.		1	-	Existing	Yellow

Key

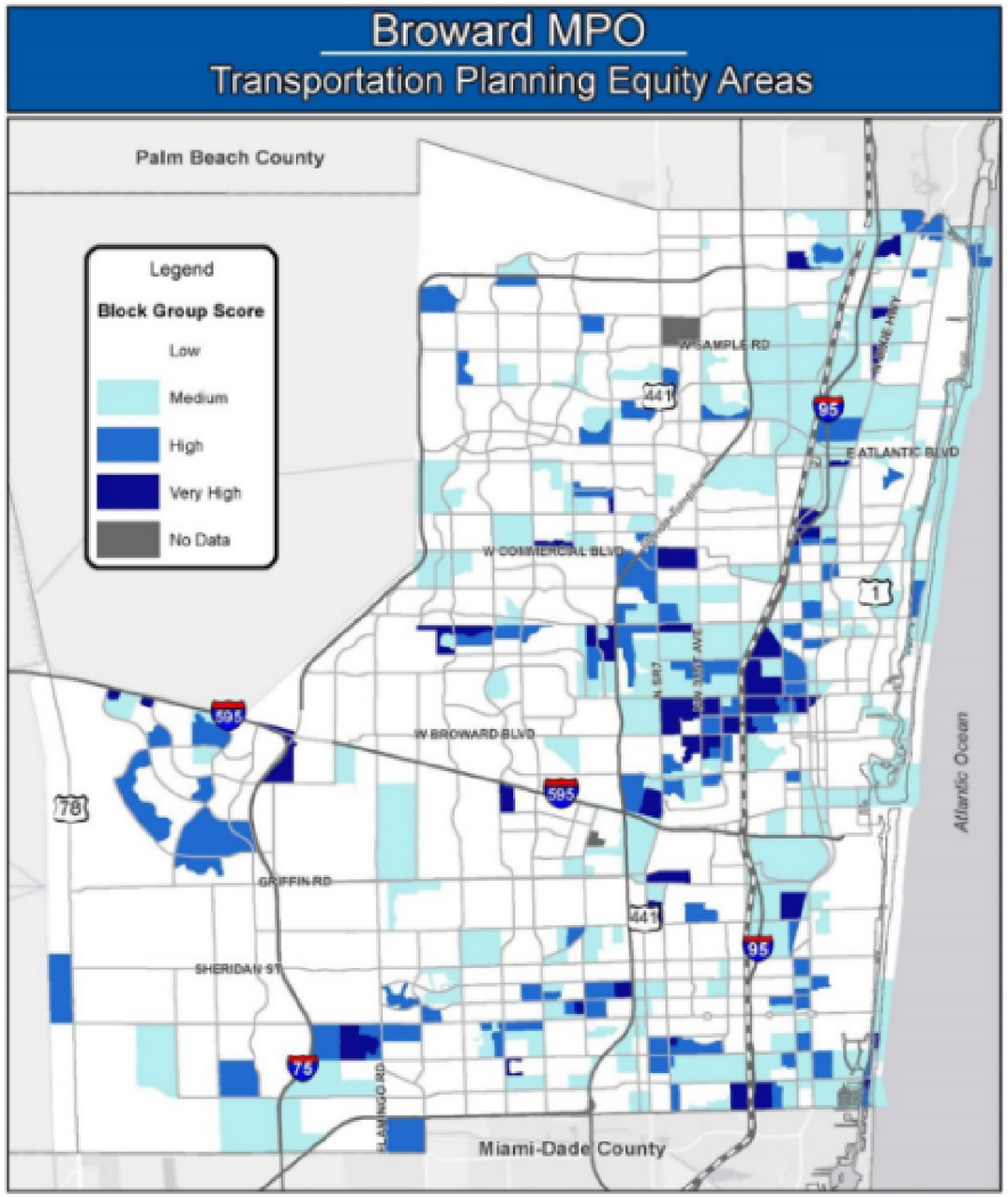
Green	FDOT, County and BMPO Plans/Projects
Yellow	Two of the above Plans/Projects
Blue	One of the above Plans/Projects
Oranage	Future Year 2045



Source: Mobility Advancement Program (MAP), Broward County (https://experience.arcgis.com/experience/20fc2618ab2a41e5b40fa8f2d15f3bbc)



Source: Transportation Systems Management and Operations (TSM&O) Master Plan, FDOT, Sept. 2021



Source: Commitment 2045, Technical Report #16 Equity Analysis, BMPO, Feb. 2020