

Maintenance of Traffic Memorandum

Lem Turner Road (SR 115) Over Trout River Bridge Replacement Bridge No. 720033

Duval County, Florida

Financial Management (FM) No: 437437-2-22-01
Federal Aid Project ID No: TBD

ETDM # 14449

Prepared For:



Florida Department of Transportation
District Two

The environmental review, consultation, and other actions required by applicable federal environmental laws for this project are being, or have been, carried out by the Florida Department of Transportation (FDOT) pursuant to 23 U.S.C. § 327 and a Memorandum of Understanding dated May 26, 2022, and executed by the Federal Highway Administration and FDOT.

June 2023

TABLE OF CONTENTS

ACRONYMS..... 3

1.0 PURPOSE..... 4

2.0 BACKGROUND..... 4

3.0 SCENARIOS 4

4.0 METHODOLOGY..... 4

 4.1 O-D Methodology..... 4

 4.2 Diversion Analysis Methodology..... 8

5.0 TRAFFIC VOLUME DEVELOPMENT 9

6.0 ANALYSIS AND RESULTS..... 12

 6.1 Peak Hour Operations..... 12

 6.2 Hours of Failure Analysis..... 12

 6.3 Queue Lengths 13

7.0 CONCLUSION..... 15

LIST OF FIGURES

Figure 1: O-D Patterns from Lem Turner Bridge Southbound to I-95 7

Figure 2: 2027 Base Operations-No Diversion: Lem Turner Bridge AM (PM) Peak Hour Volume..... 10

Figure 3: MOT Diversion Scenario: Lem Turner Bridge AM (PM) Peak Hour Volume with 25% Diversion 11

LIST OF TABLES

Table 1: O-D Zones 5

Table 2: Peak Hour Traffic Volumes and Level of Service 12

Table 3: Capacity Summary..... 13

Table 4: Lem Turner Bridge Maximum Queues..... 14

LIST OF APPENDICES

ATTACHMENT A: I-95 ORIGIN-DESTINATION COUNT LOCATIONS

ATTACHMENT B: MOT CONCEPT PLANS

ACRONYMS

AADT	Annual Average Daily Traffic
FDOT	Florida Department of Transportation
FPID	Financial Project Identification Number
FTO	Florida Traffic Online
GSVT	Generalized Service Volume Tables
IDs	Zone Identification
LOS	Level of Service
O-D	Origin-Destination
MOT	Maintenance of Traffic
NB	Northbound
Q/LOS	Quality/Level of Service
SB	Southbound
SR	State Road

Lem Turner Road (SR 115) Over Trout River Bridge Replacement
FM 437437-2-22-01

1.0 PURPOSE

The purpose of this memorandum is to determine the segment level of service (LOS), hours of potential failing conditions and queue lengths for the Lem Turner Bridge if a southbound lane closure was implemented.

2.0 BACKGROUND

The State Road (SR) 115 Lem Turner Bridge on Trout River is a four-lane Class I arterial roadway with two-lanes northbound and two-lanes southbound. Due to construction, it is considered to close one southbound lane on the bridge. The two northbound lanes will remain open. The planned year of construction and the year for this analysis is 2027.

This memorandum utilizes the Lem Turner Bridge Origin-Destination (O-D) analysis to determine how traffic on Lem Turner Road (SR 115) is accessing the Lem Turner Bridge from peripheral O-D node locations and understand how many trips are going south to north and north to south of the bridge.

3.0 SCENARIOS

Base Operations without construction and requirement of maintenance of traffic (MOT) for year 2027 assumed the existing four-lane Lem Turner Bridge where no vehicles are diverted. One diversion scenario during construction with MOT was analyzed.

- The MOT diversion scenario assumed that one of the two southbound lanes was closed on the Lem Turner Bridge and 25 percent of the traffic diverts

4.0 METHODOLOGY

Travel patterns in the area were examined to understand the potential traffic that may divert from the Lem Turner Bridge during construction. This data serves as the basis for determining the segment LOS, hours of failure and resulting queue lengths.

4.1 O-D Methodology

Streetlight Insight web platform was used to extract and analyze travel patterns along the bridge and surrounding areas. Streetlight data collection locations are referred to as zones. Twenty-eight zones were placed in the Streetlight web platform to capture trips going north and south of the Lem Turner Bridge. These zone identifications (IDs) were grouped into relative locations to the bridge and are included in Table 1 below. A visual of the Streetlight O-D zone IDs is provided in Attachment A.

Lem Turner Road (SR 115) Over Trout River Bridge Replacement

FM 437437-2-22-01

The primary O-D zone IDs that were used to perform the analysis include:

- Zone ID 276 – Lem Turner Bridge
- Zone ID 289 – I-95 South of Lem Turner Road
- Zone ID 292 – I-95 South of Zoo Parkway
- Zone ID 296 – I-95 South of I-295

These O-D zone IDs were used to determine the number and percentage of trips north and south of the bridge accessing I-95 and from I-95 to the bridge northbound during the AM and PM peak periods.

Table 1: O-D Zones		
O-D Zone ID	O-D Zone Description	Zone Group
276	Lem Turner Bridge	Lem Turner Bridge
263	Dunn Avenue West of Lem Turner Road	North of Lem Turner Bridge
265	Trout River Blvd West of Lem Turner Road	South of Lem Turner Bridge
266	Ribault Avenue West of Lem Turner Road	
271	Lem Turner Road South of Lem Turner Bridge	
279	Broward Road East of Lem Turner Road	North of Lem Turner Bridge
281	Lem Turner Road North of Lem Turner Bridge	
283	Capper Road West of Lem Turner Road	
285	Leonid Road East of Lem Turner Road	
287	Dunn Avenue East of Lem Turner	
258	New Kings Road South of I-295	Southwest of Lem Turner Bridge
259	I-295 South of Pritchard Road	
260	Pritchard Road West of I-295	
261	I-295 North of New Kings Road	West of Lem Turner Bridge
262	New Kings Road North of I-295	Northwest of Lem Turner Bridge
264	I-295 North of Dunn Avenue	
267	I-295 East of I-95	Northeast of Lem Turner Bridge
288	Lem Turner Road North of I-295	Northwest of Lem Turner Bridge
289	I-95 South of Lem Turner Road	Southeast of Lem Turner Bridge
290	Norwood Avenue East of I-95	
291	Tallulah Avenue East of I-95	

Lem Turner Road (SR 115) Over Trout River Bridge Replacement

FM 437437-2-22-01

Table 1: O-D Zones		
292	I-95 South of Zoo Parkway	
293	Zoo Parkway East of I-95	
294	I-95 South of Busch Drive	
295	Busch Drive East of I-95	East of Lem Turner Bridge
296	I-95 South of I-295	Northeast of Lem Turner Bridge
297	Duval Road North of I-295	
298	I-95 North of I-295	

From Lem Turner Bridge Southbound to I-95

For trips south of the bridge, the number of vehicles accessing I-95 northbound was counted from O-D zone ID 276 to 292, and the number of vehicles accessing I-95 southbound was counted from O-D zone ID 276 to 289. The following was determined from the O-D analysis for the traffic on the Lem Turner Bridge.

- Trips southbound on the bridge accessing I-95 northbound from O-D zone ID 276 to zone ID 292 was 2% (2%)
- Trips southbound on the bridge accessing I-95 southbound from O-D zone ID 276 to zone ID 289 was 42% (20%)

Figure 1 shows the O-D patterns from Lem Turner Bridge southbound to I-95.

Northbound trips were included in the O-D analysis for a previous memo dated October 2022, which examined a northbound lane closure but were not utilized in this analysis.

Lem Turner Road (SR 115) Over Trout River Bridge Replacement
 FM 437437-2-22-01

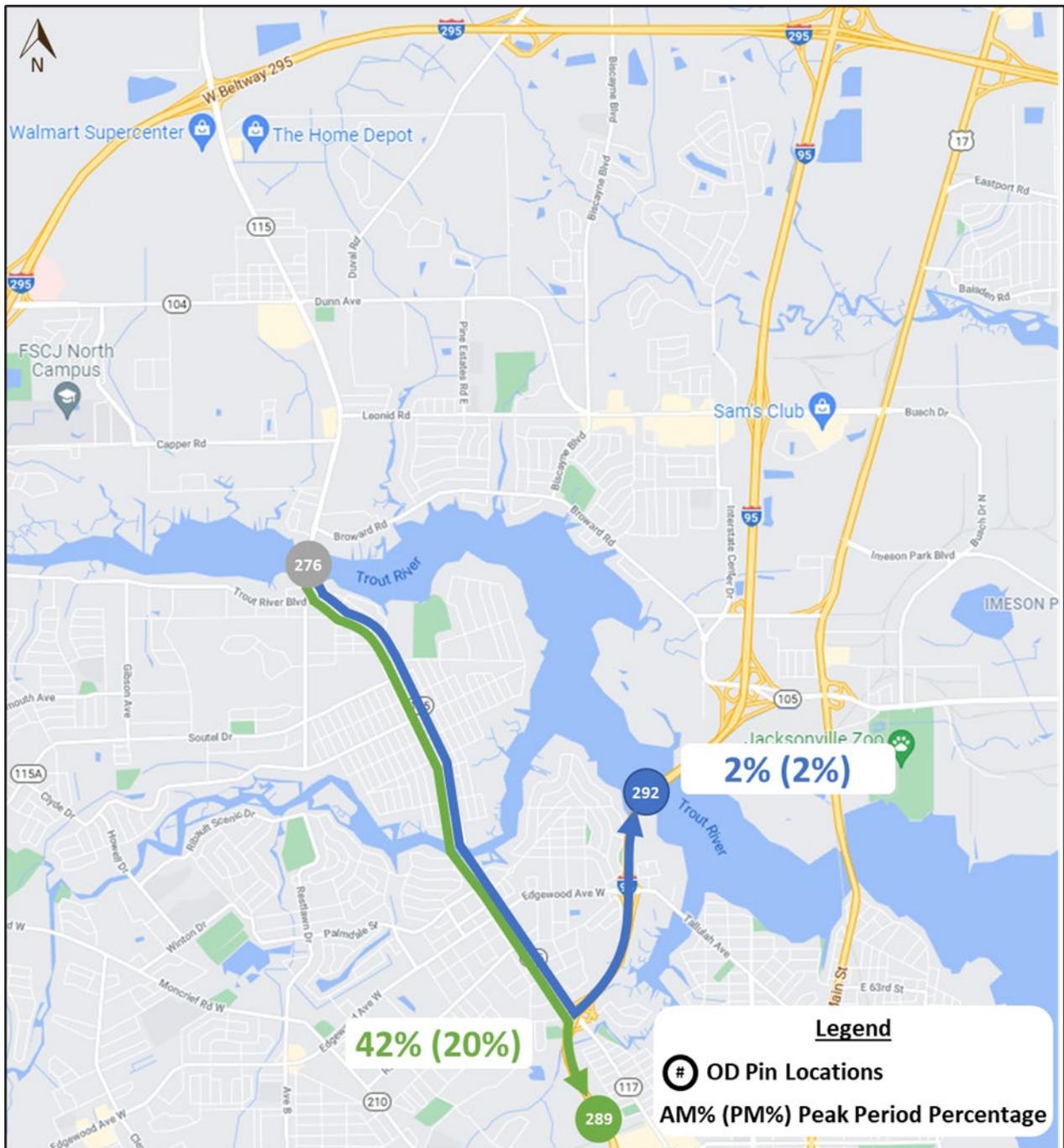


Figure 1: O-D Patterns from Lem Turner Bridge Southbound to I-95

Lem Turner Road (SR 115) Over Trout River Bridge Replacement

FM 437437-2-22-01

4.2 Diversion Analysis Methodology

Based on the O-D analysis, multiple traffic diversion scenarios were considered when the bridge closed one southbound lane. This closure would occur either north or south of Broward Road, north of the Lem Turner Bridge. Three diversion rate scenarios were considered: 30 percent, 25 percent, and 20 percent. Per discussion and agreement with FDOT, a 25 percent diversion rate was used for the analysis.

The diversion percentage was applied to the forecasted 2027 traffic volumes to obtain the number of vehicles diverted and the remaining vehicles utilizing the bridge.

The LOS on the bridge was determined for 2027 conditions with a diversion (one lane closed). The LOS was determined using the 2020 Quality/Level of Service (Q/LOS) Handbook Generalized Service Volume Tables (GSVTs). The peak hour directional volumes were compared with the Class I urbanized arterial GSVT to determine the bridge's LOS.

Vissim version 11 was used to determine maximum queue lengths resulting from 25 percent of the traffic being diverted, as requested by FDOT.

Lem Turner Road (SR 115) Over Trout River Bridge Replacement

FM 437437-2-22-01

5.0 Traffic Volume Development

Future Year 2027 traffic volumes were developed using 2016 Florida Traffic Information synopsis report and application of a growth rate. Hourly and AM and PM peak hour volumes were obtained from 2016 Florida Traffic Information station 723020 synopsis report located north end of the Lem Turner Bridge. Based on the synopsis report, southbound is the peak direction in AM and northbound is the peak direction in PM. A growth rate for the bridge was determined by comparing growth in Annual Average Daily Traffic (AADT) for station 723020 from year 2016 to year 2021 to determine year 2027 volumes. A growth rate of 0.5% was deemed appropriate and applied to the peak hour 2016 volumes to obtain the 2027 peak hour volumes used for the analysis.

Traffic for the MOT diversion scenario was calculated by multiplying the total 2027 existing conditions peak hour volume on the Lem Turner Bridge southbound by the 25 percent diversion percentage due to the one southbound lane being closed on the Lem Turner Bridge (as discussed earlier in the Methodology). The number of lanes remain consistent between the existing and MOT diversion scenario for the Lem Turner Bridge northbound and therefore no diversion was assumed for the Lem Turner Bridge northbound. **Figures 2 through 4** show the analysis scenario's 2027 peak hour volumes and resulting hours of failure, which **Section 6.0 Analysis and Results** discusses in detail.

Lem Turner Road (SR 115) Over Trout River Bridge Replacement

FM 437437-2-22-01

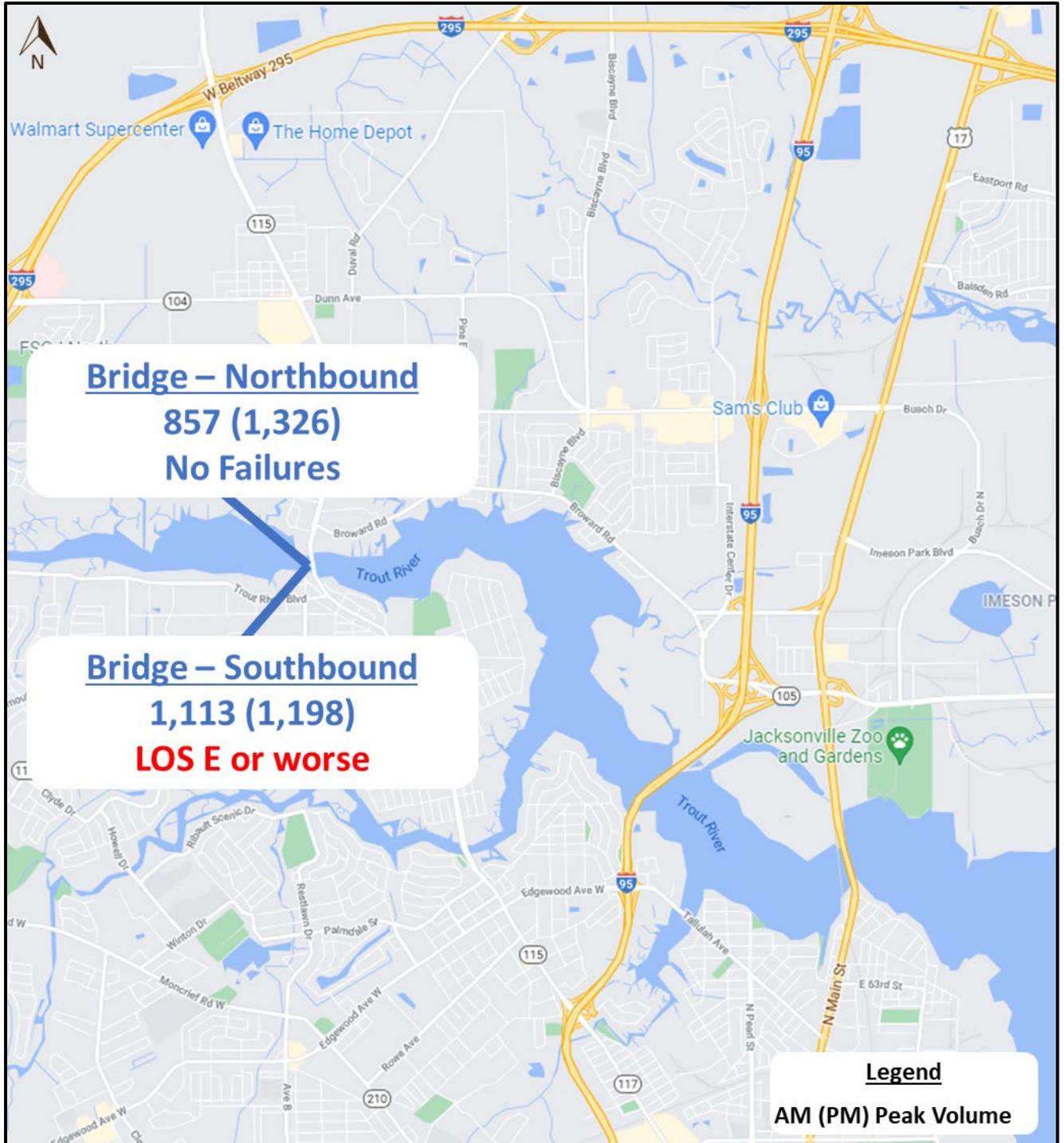


Figure 2: 2027 Base Operations-No Diversion: Lem Turner Bridge AM (PM) Peak Hour Volume

Lem Turner Road (SR 115) Over Trout River Bridge Replacement

FM 437437-2-22-01

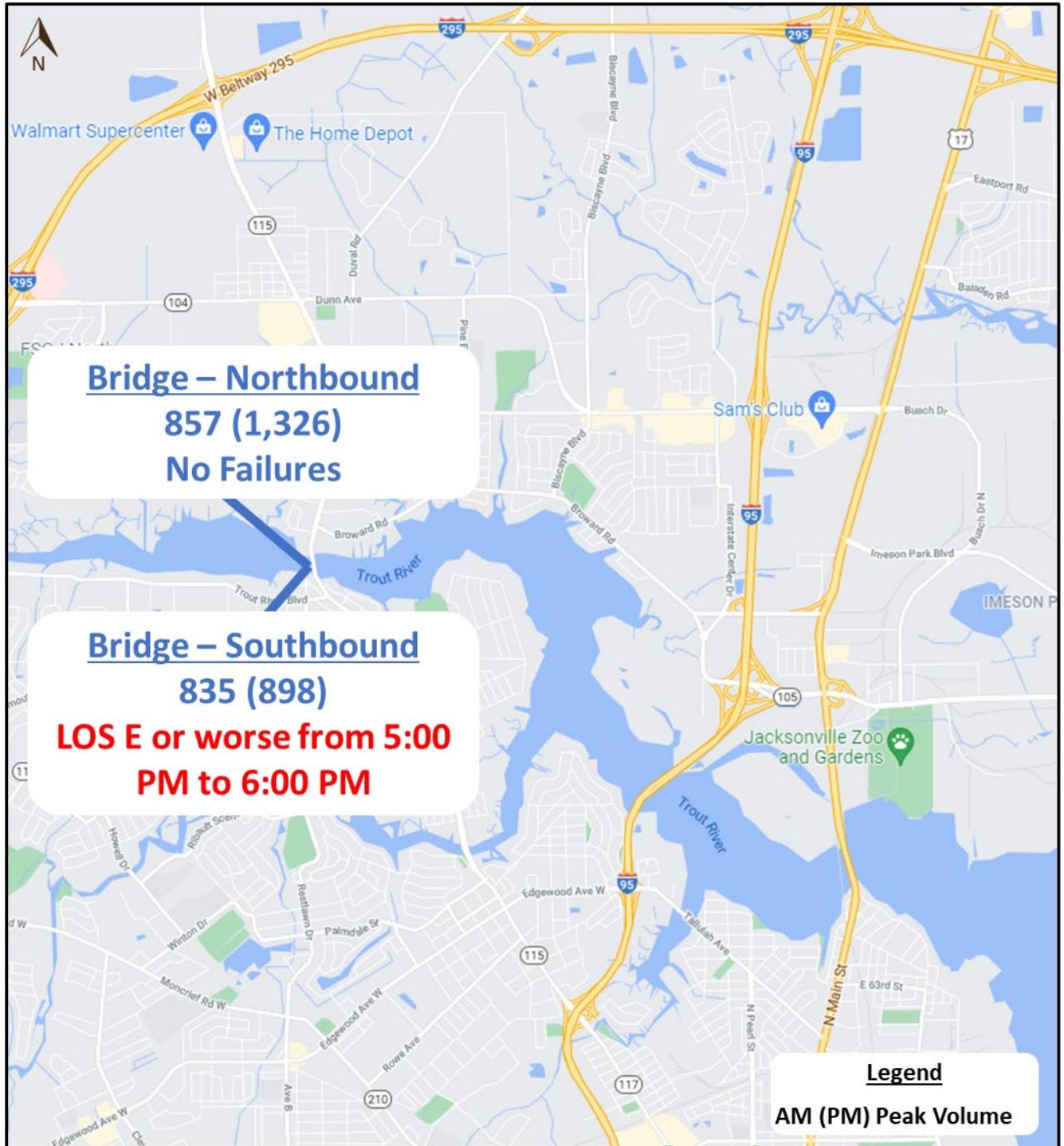


Figure 3: MOT Diversion Scenario: Lem Turner Bridge AM (PM) Peak Hour Volume with 25% Diversion

6.0 ANALYSIS AND RESULTS

Segment analysis was performed on the Lem Turner Bridge using the Q/LOS Handbook GSVTs. Using the peak hour volumes, the LOS was determined for the Lem Turner Bridge during MOT with three lanes (with and without a 25 percent diversion rate). Hourly traffic volumes from 6:00 AM to 8:00 PM were compared with the Q/LOS Handbook GSVTs capacity thresholds to analyze impact of lane closure during AM and PM peak periods.

6.1 Peak Hour Operations

The AM and PM peak hours were determined to be 7:00 AM to 8:00 AM and 5:00 PM to 6:00 PM, respectively. **Table 2** shows peak hour volume and LOS results for the MOT scenarios.

- 2027 Base Operations (with no diversion)

2027 Base Operations assumes that one southbound lane on the Lem Turner Bridge is closed. The Lem Turner Bridge will be a total of three lanes, one southbound lane and two northbound lanes. The segment analysis shows that the Lem Turner Bridge southbound operates at LOS E or worse in the AM and PM peak hours. No northbound failures are observed.

- MOT Diversion Scenario (with 25 percent diversion)

The MOT diversion scenario assumes one southbound lane on the Lem Turner Bridge is closed, and 25 percent of the vehicles will divert from the Lem Turner Bridge to I-95. The Lem Turner Bridge will be a total of three lanes, one southbound lane and two northbound lanes. After the diversion of traffic on the Lem Turner Bridge, the segment analysis shows that the Lem Turner Bridge southbound operates at LOS E or worse during the PM peak hour. Southbound bridge traffic is anticipated to not experience any failures during the AM peak hour. No northbound failures are observed.

Table 2: Peak Hour Traffic Volumes and Level of Service								
Lem Turner Bridge	Base Operations No Diversion				MOT Diversion Scenario			
	AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour	
	Vol	LOS	Vol	LOS	Vol	LOS	Vol	LOS
Southbound	1,113	E*	1,198	E*	835	D	898	E*
Northbound	857	C	1,326	C	857	C	1,326	C

*LOS E or worse

6.2 Hours of Failure Analysis

Hourly traffic volumes from 6:00 AM to 8:00 PM were compared with the Q/LOS Handbook GSVTs capacity thresholds to analyze the impact of lane closure during AM and PM peak periods. **Table 3** summarizes the hours of failure and the total number of failing hours from the capacity analysis. There is one hour of failure expected during the MOT diversion scenario, where the bridge operates unacceptably southbound from 5:00 PM to 6:00 PM.

Table 3: Capacity Summary	
Number of Lanes	1
Diversion Percentage	25%
Hours of Failure	5:00-6:00 PM
Total Number of Failing Hours	1

6.3 Queue Lengths

Vissim version 11 was used to determine maximum queue lengths resulting from 25 percent of the traffic being diverted. The Vissim model network for MOT diversion scenario was created for Lem Turner Road from south of the Trout River Boulevard intersection to north of the Broward Road intersection to analyze traffic operations from 2:00 PM to 8:00 PM.

Two MOT phases for the MOT diversion scenario were analyzed:

- Phase 1B: The southbound through lane drop occurs south of the Broward Road intersection
- Phase 2: The southbound through lane drop occurs north of the Broward Road intersection

In Phase 1B, southbound lane closure conditions were modeled 400 feet upstream from the beginning of the bridge. The lane closure remains through the bridge and adds an additional southbound through lane on the left-side of the roadway before Trout River Boulevard. The two northbound through lanes are maintained on the bridge and through the Broward Boulevard intersection.

In Phase 2, southbound lane closure conditions were modeled 1,000 feet upstream from the beginning of the bridge. The lane closure remains through the bridge and adds an additional southbound through lane on the right-side of the roadway before Trout River Boulevard. The two northbound through lanes are maintained on the bridge, and a right-turn lane is added that is consistent with the existing geometry at the Broward Boulevard intersection.

The Vissim analysis showed volume entering the bridge metered at the point of the lane drop. Traffic was observed to queue in the outside lane to merge into one lane. This slowed down operations upstream of the bridge and affected southbound traffic through the Broward Road intersection, which is located within 750 feet north of the bridge. Southbound queues occasionally extended from the Trout River Boulevard intersection to the bridge. However, this queue cleared from the bridge with the southbound green time at this intersection. **Attachment B** illustrates the MOT phase concepts.

The maximum queue length observed in Phase 1B was 940 feet from the Trout River Boulevard and 266 feet from the point of lane drop upstream of the bridge at Broward Road.

The maximum queue length observed in Phase 2 was 902 feet from the Trout River Boulevard and 777 feet from the point of lane drop upstream of the bridge at Broward Road. These maximum queue lengths at Trout River Boulevard in Phase 1B and Phase 2 extended to the Trout River Bridge.

Lem Turner Road (SR 115) Over Trout River Bridge Replacement

FM 437437-2-22-01

The maximum queues reported for Phase 1B and Phase 2 are less than 1,000 feet. These queues are expected during MOT scenarios with lane reduction. However, the queues are not observed for the entire hour and are expected to clear within two cycle lengths. No congestion remained at the end of the simulation. **Table 4** shows the expected maximum queue lengths during the PM period.

Table 4: Lem Turner Bridge Maximum Queues				
Description	Maximum Queue Length (feet)			
	With 25% Diversion Phase 1B		With 25% Diversion Phase 2	
	NB	SB	NB	SB
Lem Turner Road at Trout River Boulevard	301	940	309	902
Lem Turner Road at Broward Road	451	266	292	777

Lem Turner Road (SR 115) Over Trout River Bridge Replacement

FM 437437-2-22-01

7.0 CONCLUSION

The purpose of this memorandum is to determine the segment LOS, hours of potential failing conditions and queue lengths for the Lem Turner Bridge if a southbound lane closure was implemented.

A 0.5% growth rate was deemed appropriate and applied to the peak hour 2016 volumes to obtain the 2027 peak hour volumes used for the analysis. This memorandum utilizes the Lem Turner Bridge Origin-Destination (O-D) analysis to determine how traffic on Lem Turner Road (SR 115) is accessing the Lem Turner Bridge from different locations. The number and percentage of trips north and south of the bridge accessing I-95 northbound or southbound were used to estimate a MOT diversion rate. The diversion rate percentage was then applied to the forecasted 2027 traffic volumes to obtain the number of vehicles diverted and the remaining vehicles utilizing the bridge.

Per discussion and agreement with FDOT, a 25 percent diversion rate was used for the MOT diversion scenario analysis. This analysis analyzes how the bridge will operate with a southbound lane closure and 25 percent of the bridge traffic diverting.

I) Segment Analysis

If one southbound lane is closed on the bridge, the segment analysis shows that the Lem Turner Bridge southbound can experience LOS E or worse conditions during the AM and PM without traffic diverting. If 25 percent of the traffic diverts as expected in the MOT diversion scenario, then Lem Turner Bridge southbound operates at LOS E or worse during the PM peak hour. Southbound bridge traffic is anticipated to not experience any failures during the AM peak hour.

II) Hours of Potential Failing Conditions

There is one hour of failure expected during the MOT diversion scenario, where the bridge operates unacceptably southbound from 5:00 PM to 6:00 PM.

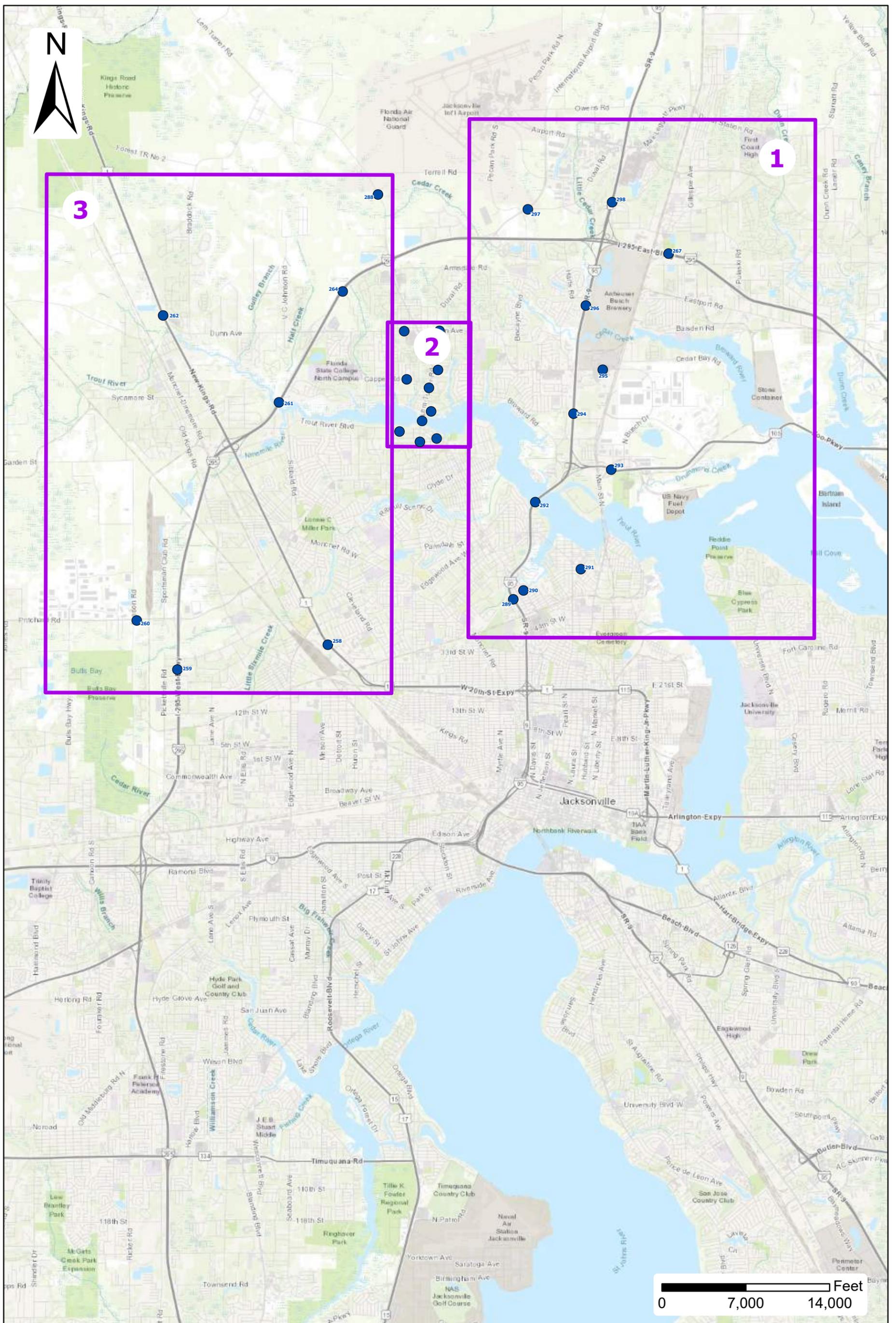
III) Queue Lengths

Vissim analysis was performed to determine maximum queue lengths resulting from 25 percent of the traffic being diverted. Two MOT phases were analyzed. In Phase 1B, the southbound through lane drop occurs south of the Broward Road intersection. In Phase 2, the southbound through lane drop occurs north of the Broward Road intersection.

The maximum queues reported for Phase 1B and Phase 2 are less than 1,000 feet. These queues are expected during MOT scenarios with lane reduction. However, the queues are not observed for the entire hour and are expected to clear within two cycle lengths. No congestion remained at the end of the simulation.

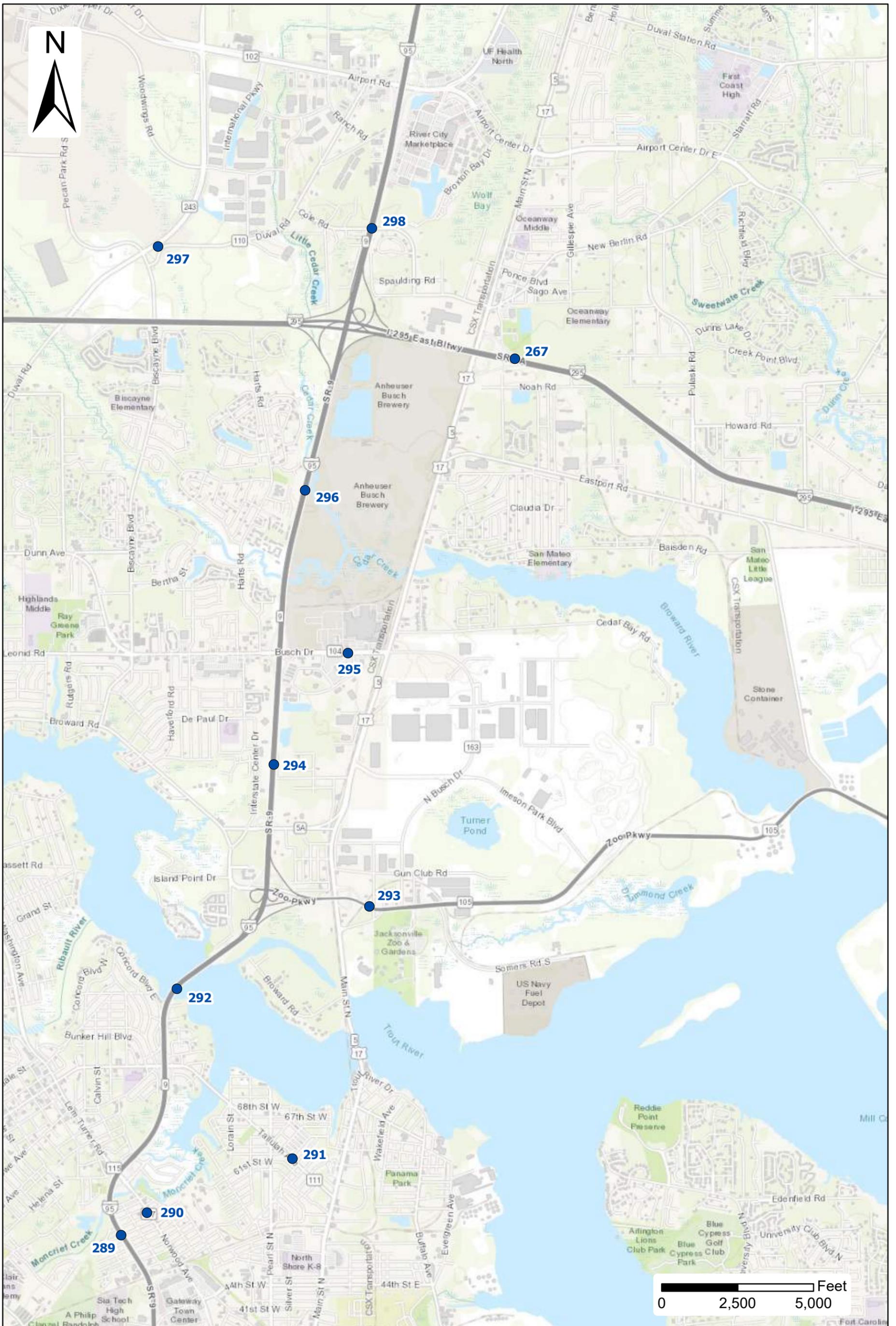
Lem Turner Road (SR 115) Over Trout River Bridge Replacement
FM 437437-2-22-01

ATTACHMENT A: I-95 ORIGIN-DESTINATION COUNT LOCATIONS

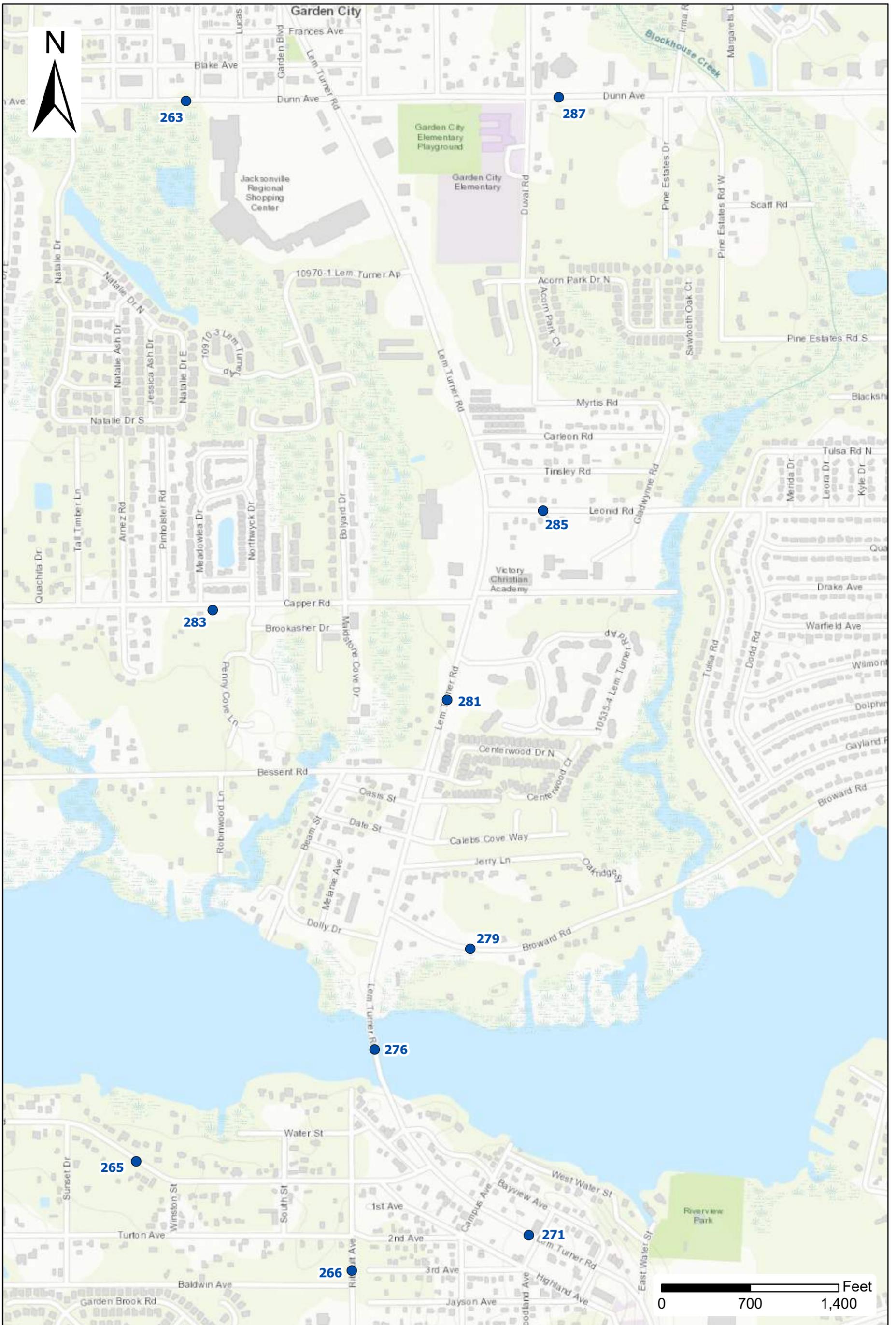


SR 115/Lem Turner Road O-D Zone Locations

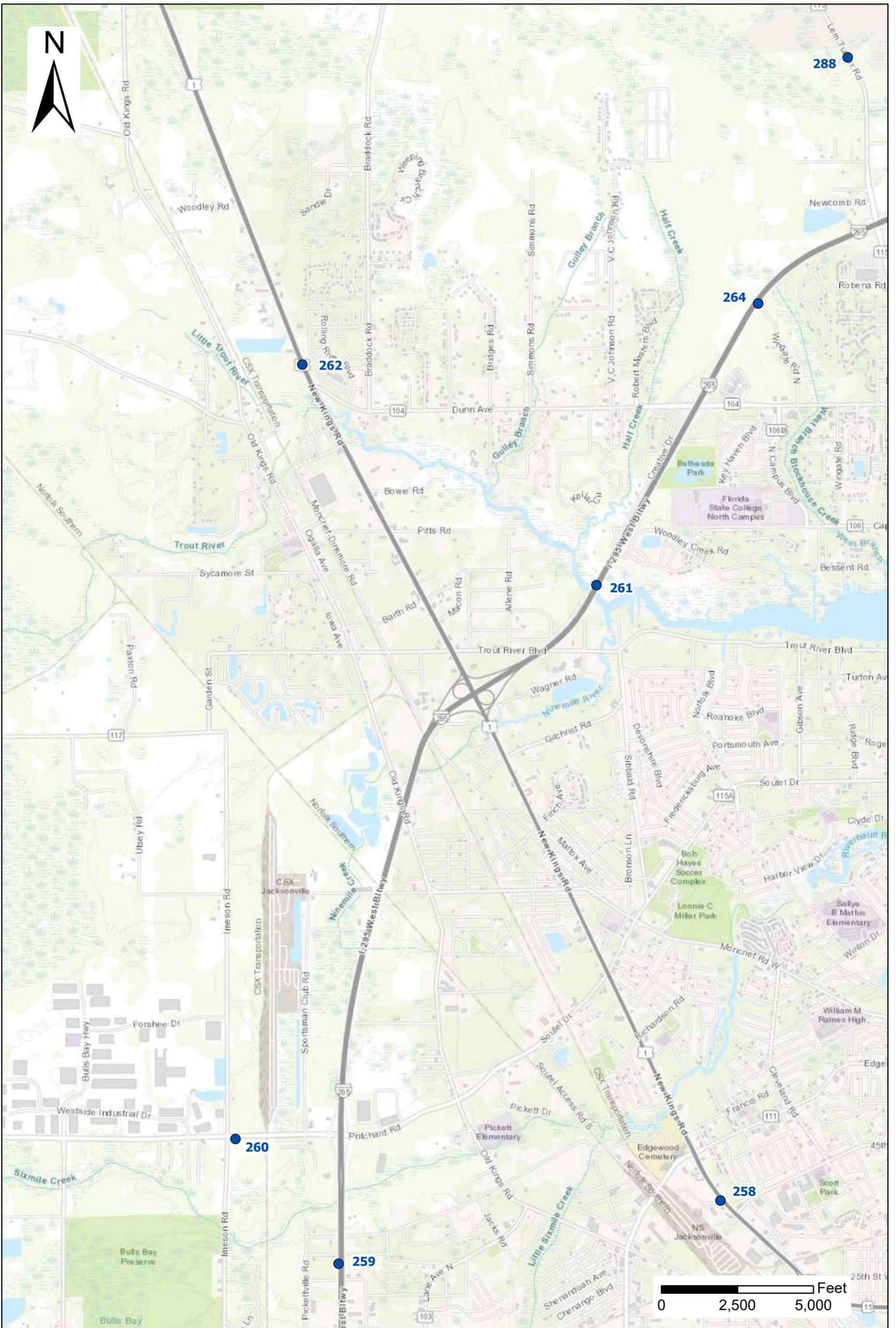
Index



SR 115/Lem Turner Road O-D Zone Locations



SR 115/Lem Turner Road O-D Zone Locations

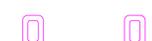


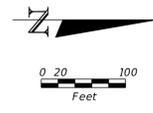
SR 115/Lem Turner Road O-D Zone Locations

Lem Turner Road (SR 115) Over Trout River Bridge Replacement
FM 437437-2-22-01

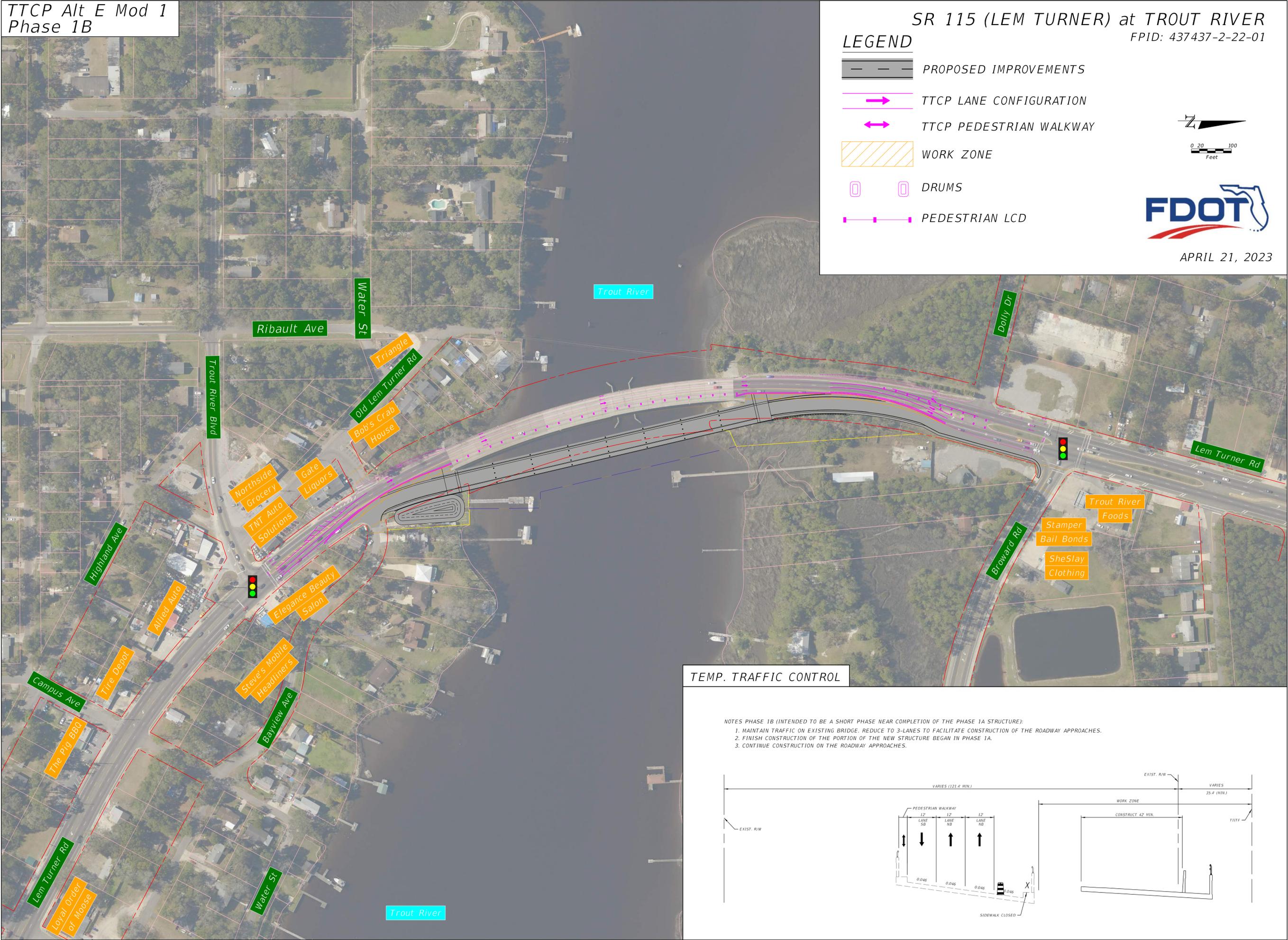
ATTACHMENT B: MOT CONCEPT PLANS

LEGEND

-  PROPOSED IMPROVEMENTS
-  TTCP LANE CONFIGURATION
-  TTCP PEDESTRIAN WALKWAY
-  WORK ZONE
-  DRUMS
-  PEDESTRIAN LCD

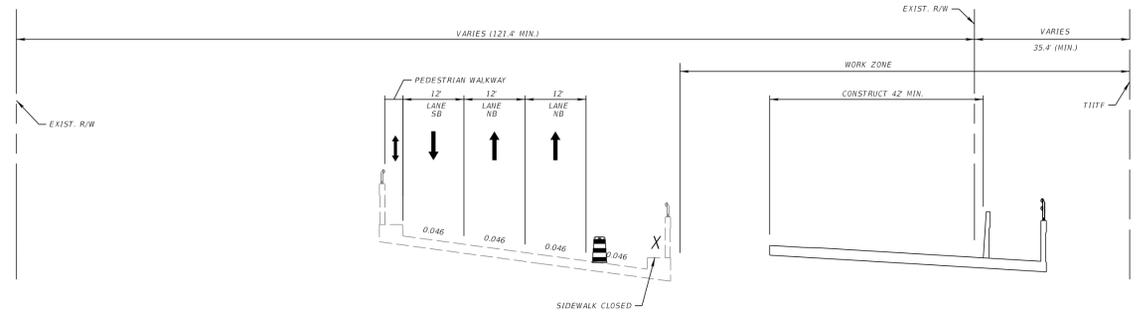


APRIL 21, 2023



TEMP. TRAFFIC CONTROL

- NOTES PHASE 1B (INTENDED TO BE A SHORT PHASE NEAR COMPLETION OF THE PHASE 1A STRUCTURE):
1. MAINTAIN TRAFFIC ON EXISTING BRIDGE. REDUCE TO 3-LANES TO FACILITATE CONSTRUCTION OF THE ROADWAY APPROACHES.
 2. FINISH CONSTRUCTION OF THE PORTION OF THE NEW STRUCTURE BEGAN IN PHASE 1A.
 3. CONTINUE CONSTRUCTION ON THE ROADWAY APPROACHES.



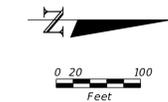
TTCP Alt E Mod 1
Phase 2 & 3

SR 115 (LEM TURNER) at TROUT RIVER

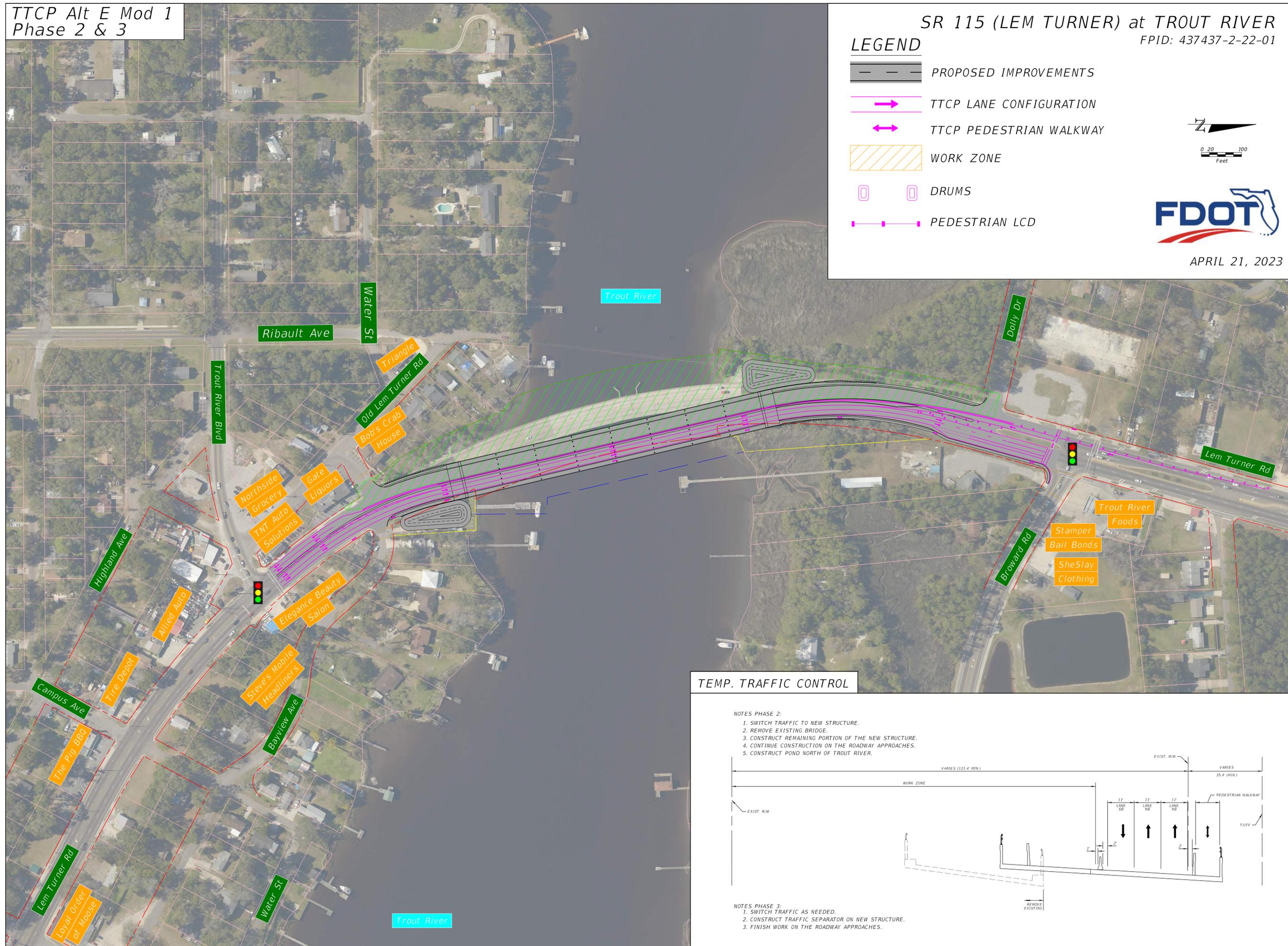
FPID: 437437-2-22-01

LEGEND

-  PROPOSED IMPROVEMENTS
-  TTCP LANE CONFIGURATION
-  TTCP PEDESTRIAN WALKWAY
-  WORK ZONE
-  DRUMS
-  PEDESTRIAN LCD

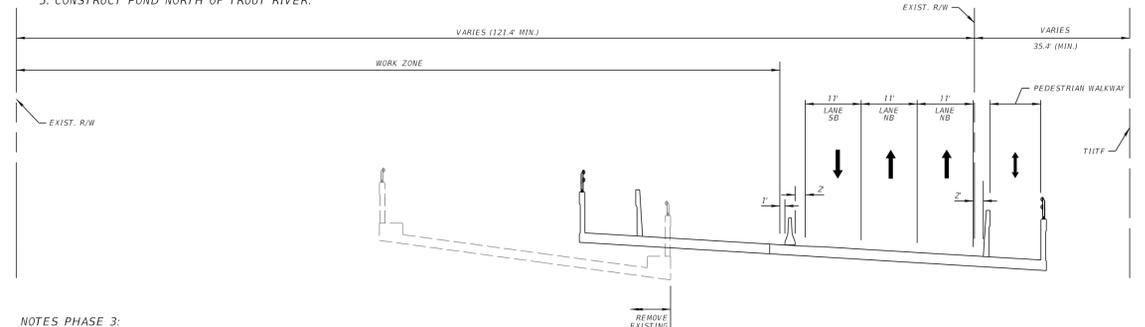


APRIL 21, 2023



TEMP. TRAFFIC CONTROL

- NOTES PHASE 2:
1. SWITCH TRAFFIC TO NEW STRUCTURE.
 2. REMOVE EXISTING BRIDGE.
 3. CONSTRUCT REMAINING PORTION OF THE NEW STRUCTURE.
 4. CONTINUE CONSTRUCTION ON THE ROADWAY APPROACHES.
 5. CONSTRUCT POND NORTH OF TROUT RIVER.



- NOTES PHASE 3:
1. SWITCH TRAFFIC AS NEEDED.
 2. CONSTRUCT TRAFFIC SEPARATOR ON NEW STRUCTURE.
 3. FINISH WORK ON THE ROADWAY APPROACHES.