US-1 Federal Highway Complete Streets Study

Boca Raton, Florida

Lane Repurposing Traffic Analysis
for Submittal to the
Florida Department of Transportation

Kimley»Horn

Revised March 2021
Updated February 2021
September 2020
040741067

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Concept Report for Formal Application

US-1 Federal Highway Complete Streets Study Boca Raton, Florida

Prepared for:
The City of Boca Raton

Prepared by:
Kimley-Horn and Associates, Inc.

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EXECUTIVE SUMMARY

The City of Boca Raton desires to proceed with the recommendations of the US-1 Multimodal Corridor Study adopted by the Palm Beach Transportation Planning Agency (TPA) in May 2018 along US-1/Federal Highway in the downtown area. Currently, US-1/Federal Highway is a 6-lane divided (6LD) roadway between Camino Real and SE Mizner Boulevard, and a 4-lane divided (4LD) roadway north of SE Mizner Boulevard. The existing posted speed limit is 35 miles per hour (mph). The recommendations of the US-1 Multimodal Corridor Study include a 0.3-mile lane repurposing, which proposes to shift the 6-lane to 4-lane transition on US-1/Federal Highway from Camino Real to SE Mizner Boulevard.

The intent of this study is to assess the impact of repurposing one (1) northbound and one (1) southbound lane on US-1/Federal Highway for the 0.3-mile section from Camino Real to SE Mizner Boulevard.

US-1/Federal Highway between Camino Real and SE Mizner Boulevard currently has 6-foot sidewalks along the east and west sides of the roadway with no separation between the sidewalk and the 2-foot Type F curb-and-gutter. There are also 4-foot conventional bicycle lanes along the east and west sides of the roadway. A range of multimodal facilities are under consideration for the proposed study corridor including separated bicycle lanes, wider sidewalks, street trees, and other forms of landscaping.

The forecasted annual traffic growth rate was determined to be 0.80 percent (0.80%) for the study corridor throughout the 2040 future year conditions. The growth rate was determined based upon historical growth trends at nearby FDOT traffic count stations, volume comparisons from the Florida Standard Urban Transportation Model Structure (FSUTMS) Southeast Florida Regional Planning Model (SERPM), and historical growth trends plus 2045 model data. A diversion analysis was conducted using SERPM 8.501 to compare the “build” future year 2040 conditions with lane repurposing in place to the “no-build” future year 2040 conditions. The results show that approximately 4,500 daily trips are expected to divert from US-1/Federal Highway to other routes in the year 2040, which corresponds to 11 percent (11%) of the

future 2040 "no-build" traffic volumes. A proportional diversion of 11 percent (11%) was also applied to the future 2023 volumes to account for trip diversion in all future "build" analysis conditions.

The roadway segment analyses found that US-1/Federal Highway will operate at an acceptable level of service in the future year 2040 if the lane repurposing is implemented (project build conditions). Pedestrian level of service (PLOS) and bicycle level of service (BLOS) will improve in the project build conditions due to increases in sidewalk width, separation from traffic, and increased bicycle lane width. Although there is an expected increase in traffic volumes along S Dixie Highway from motorists choosing to divert, the roadway segment analysis determined that S Dixie Highway has ample capacity to receive these diverted trips without changing the acceptable level of service performance. The peak period intersection capacity analyses show the study intersections are expected to operate at LOS E or better during the A.M. and P.M. peak hours under all analysis conditions with the exception of the signalized intersection of US-1/Federal Highway and Camino Real, which is expected to operate at LOS F under long-term future 2040 build conditions during the P.M. peak hour.

The study offers the following additional recommendations to improve pedestrian, bicycle, and motor vehicle conditions as a result of implementing the US-1 lane repurposing from Camino Real to SE Mizner Boulevard.

- Provide a second northbound-to-westbound left turn lane at Camino Real (dual left turn lanes) to accommodate diverting traffic and to lengthen the green time for the southbound US-1 movement. This can be accomplished by converting the northbound through lane that must be dropped for the lane repurposing into a second left-turn lane.
- Construct a raised side boarding island for bus passenger boarding and alighting to eliminate the conflict between transit users and bicyclists at bus stops.

The City Council passed Resolution 123-2020 on Tuesday, August 25, 2020, supporting the lane repurposing from 6 lanes to 4 lanes between Camino Real to SE Mizner Boulevard.

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INTRODUCTION

Kimley-Horn and Associates, Inc. was retained by the City of Boca Raton to conduct a traffic impact analysis and evaluate the feasibility of the lane repurposing strategy for US-1/Federal Highway from Camino Real to SE Mizner Boulevard, as shown in Figure 1. The study corridor was identified in the US-1 Multimodal Corridor Study, adopted by the Palm Beach Transportation Planning Agency (TPA) in May 2018. The intent of this traffic analysis is to assess the impact of repurposing one (1) northbound and one (1) southbound lane on US-1/Federal Highway between Camino Real to SE Mizner Boulevard. The study also assesses the potential diversion impact on adjacent arterial roadways, particularly South Dixie Highway.

The proposed conceptual design plan is included in Appendix A.

Currently US-1/Federal Highway is a 6-lane divided (6LD) roadway between Camino Real and SE Mizner Boulevard, and a 4-lane divided (4LD) roadway north of SE Mizner Boulevard. The study corridor currently has 6-foot sidewalks with a 2-foot curb-and-gutter along the east and west sides of the roadway. There currently is no separation between the sidewalk and the roadway curb-and-gutter in the typical section. There are also 4-foot conventional bicycle lanes along the east and west sides of the roadway. The existing posted speed limit is 35 miles per hour (mph).

The purpose of this concept report traffic study is to provide a detailed evaluation of the proposed 0.3-mile US-1/Federal Highway lane repurposing from Camino Real to SE Mizner Boulevard. The report summarizes the data collection, existing traffic, future growth rate analyses, roadway segment analyses, intersection capacity analyses, travel time analyses, and diversion analyses.

The analysis accounts for other projects already under construction, in the design phase, and/or approved including the removal of the northbound “hot-right” at SE Mizner Boulevard, the proposed traffic signal at SE 8th Street, and approved future land development projects in Downtown Boca Raton.

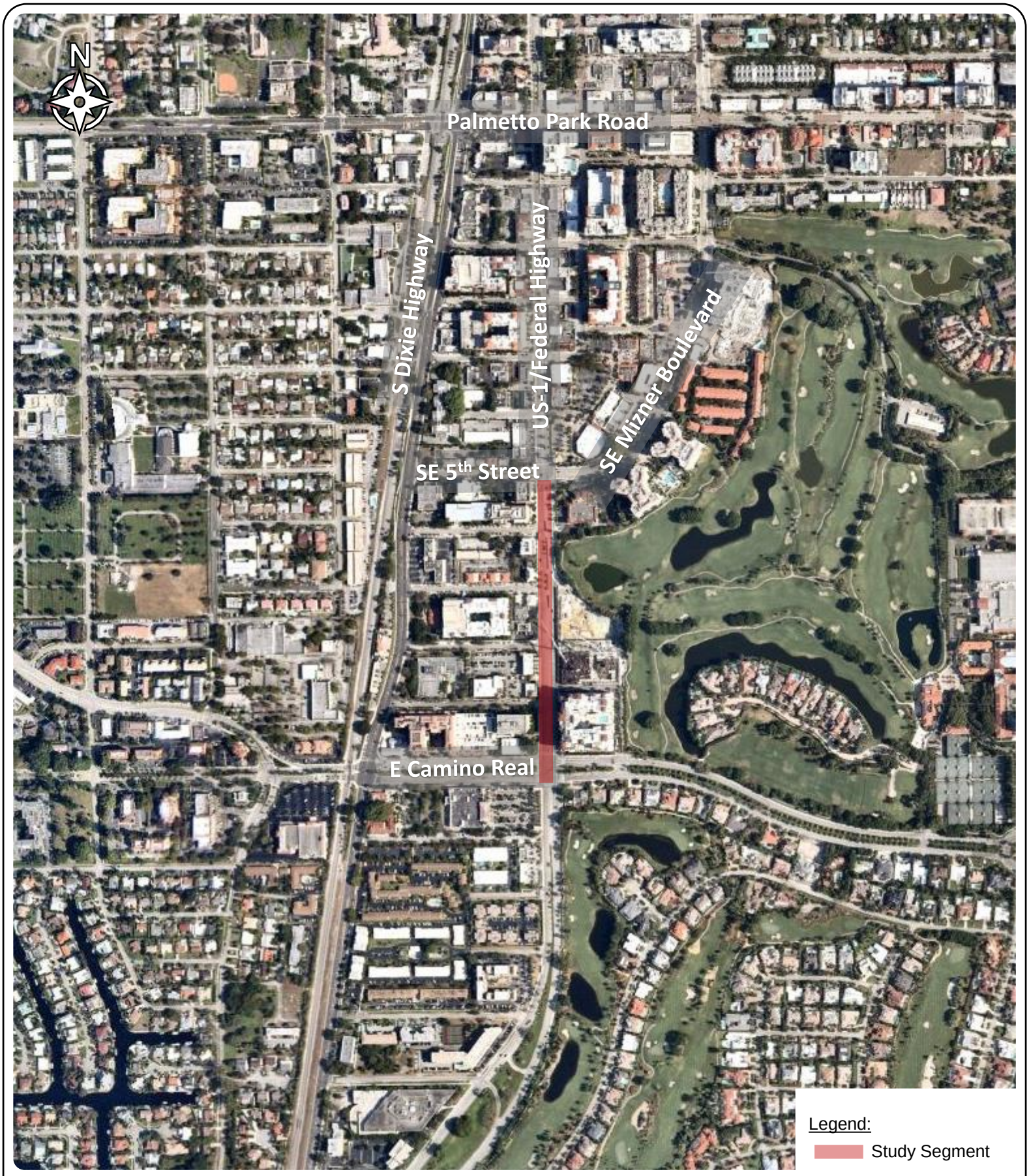

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Figure 1
Project Location Map
US-1 Complete Streets Study
Boca Raton, Florida

EXISTING TRAFFIC

Twenty-four (24) hour continuous traffic counts were collected in 15-minute intervals on Tuesday, March 3, 2020, along the following roadway segments:

- US-1/Federal Highway between SE 7th Street and SE 6th Street
- US-1/Federal Highway between SE 2nd Street and SE 1st Street
- S Dixie Highway between SE 7th Street and SE 6th Street

A.M. peak period (7:00 A.M. to 9:00 A.M.) and P.M. peak period (4:00 P.M. to 6:00 P.M.) turning movement counts were collected in 15-minute intervals on Tuesday, March 3, 2020, and included pedestrians and bicyclists at the following intersections:

- US-1/Federal Highway and Camino Real
- US-1/Federal Highway and SE Mizner Boulevard/SE 5th Street
- S Dixie Highway and Camino Real
- S Dixie Highway and Palmetto Park Road

Please note that all traffic data collection for this study was performed prior to any local or national restrictions or guidance on gathering or traveling due to the COVID-19 pandemic.

The appropriate Florida Department of Transportation (FDOT) peak season conversion factor is 0.99. To provide for a conservative analysis, a peak season conversion factor of 1.00 was applied to all turning movement counts to adjust for peak season conditions. The FDOT seasonal factor of 0.94 was applied to all twenty-four (24) hour continuous counts. Signal timing information was obtained from the City of Boca Raton Traffic and Transportation Management Division for all study area signalized intersections. The twenty-four (24) hour continuous counts, turning movement counts, trip generation calculations, FDOT peak season factor category report, and signal timing data are included in Appendix B. Figure 2 presents the existing turning movement volumes at the study intersections during the weekday A.M. and P.M. peak hours. Figure 3 summarizes existing lane configuration for the study intersections.

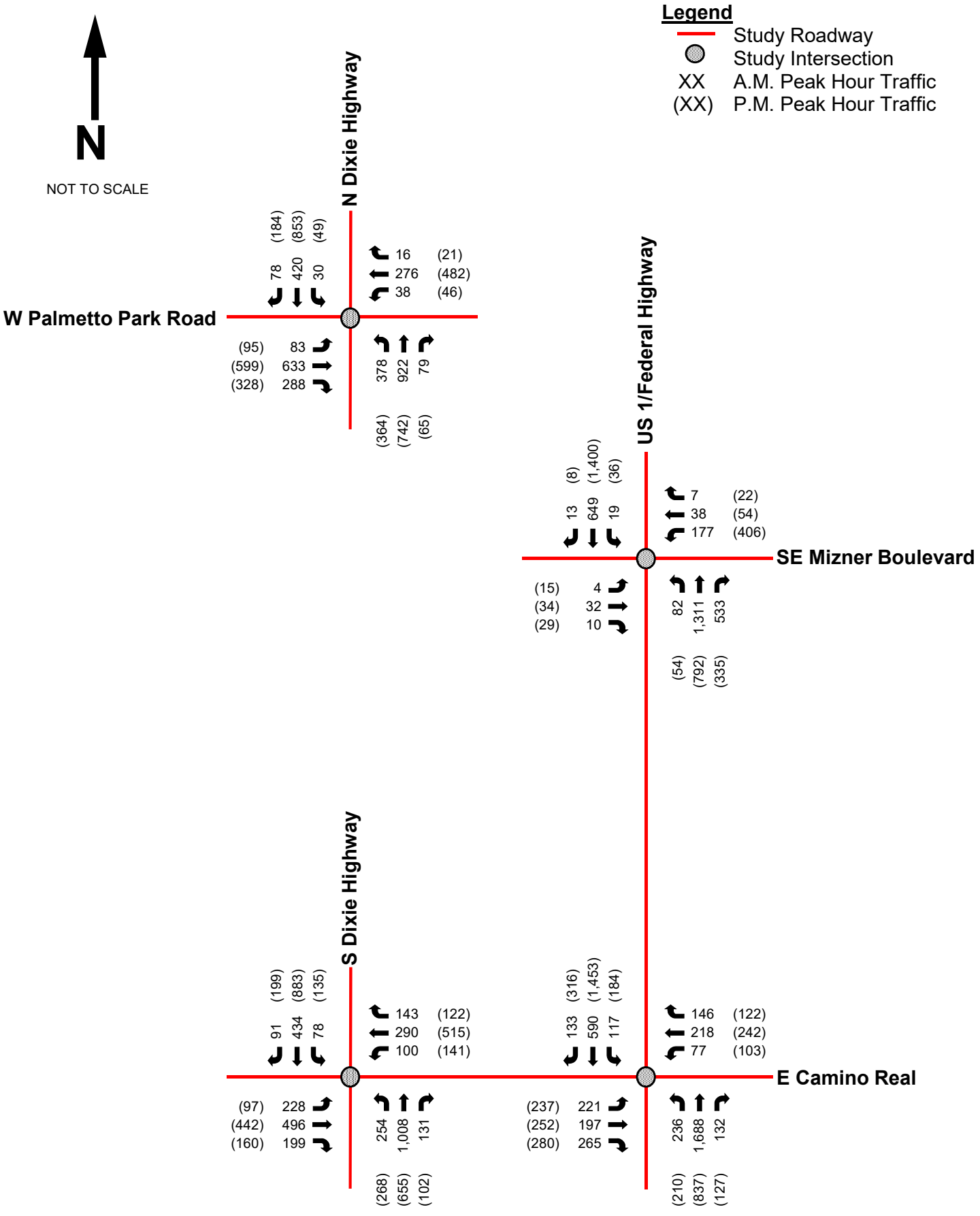

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Figure 2
Existing Peak Hour Traffic
US-1 Complete Streets Study
Boca Raton, Florida

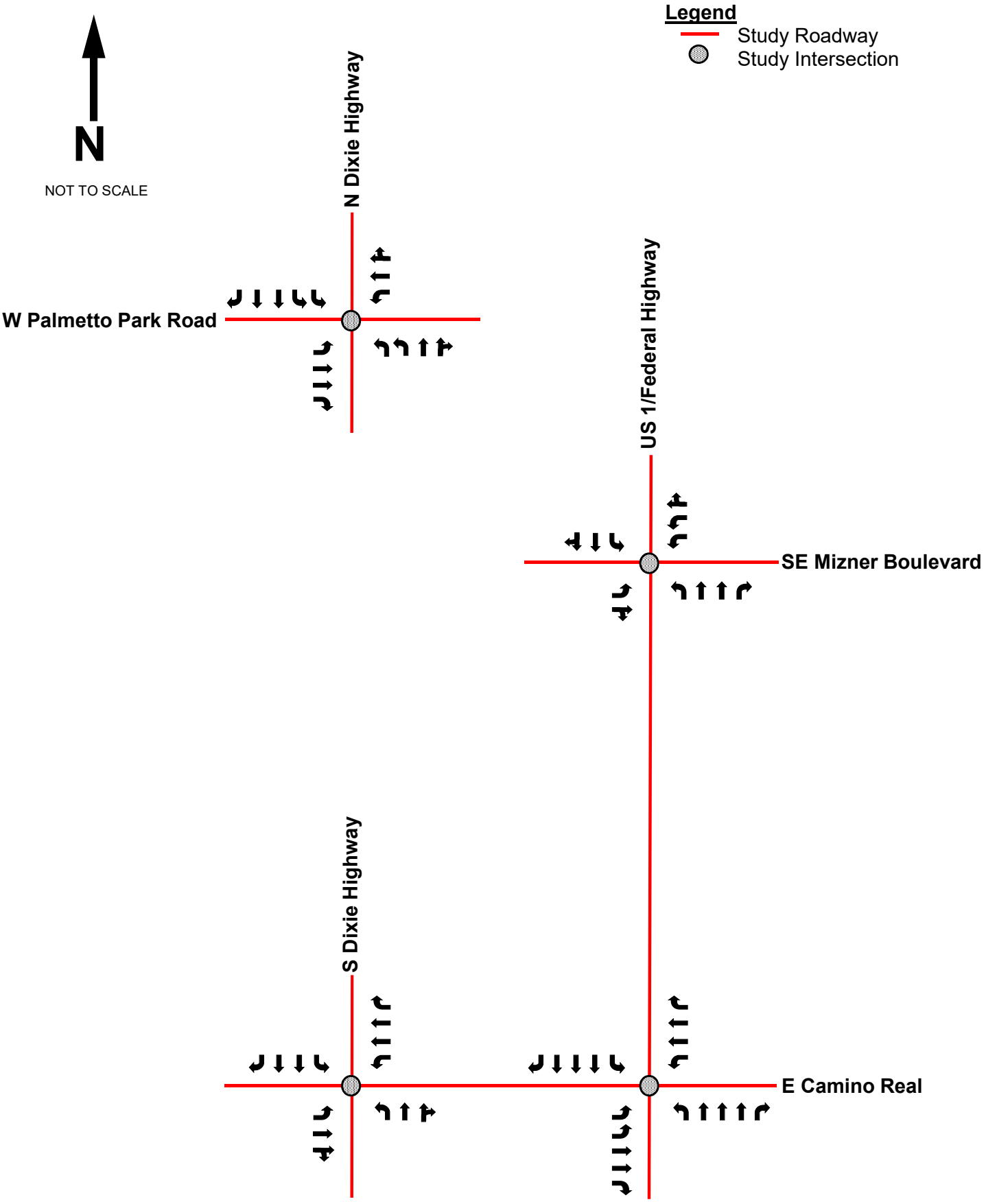

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Figure 3
Existing Lane Configuration
US-1 Complete Streets Study
Boca Raton, Florida

FUTURE NO-BUILD TRAFFIC

Future no-build traffic conditions are defined as expected traffic conditions on the roadway network during the analysis years due to anticipated future traffic growth. Future no-build traffic was developed for the analysis years corresponding to near-term (year 2023) and long-term (year 2040) traffic forecasts. Future no-build traffic volumes used in the analysis are the sum of the existing traffic, an additional amount of traffic generated by growth in the study area, and traffic generated from committed developments in the proximity of the study area.

Growth Rate Calculations

Future traffic growth on the transportation network was determined based upon (a) historical growth trends at nearby FDOT traffic count stations, (b) traffic volume comparisons from the year 2015 and 2045 FSUTMS - SERPM Version 8.501, and (c) historical growth trends at nearby FDOT traffic count stations plus 2045 model data.

The following nearby FDOT count stations were referenced for this analysis (please note that FDOT does not have a count station located within the study segment):

- FDOT Count Station #935001 located on SR-5/US-1, south of Camino Real
- FDOT Count Station #935003 located on SR-5/US-1, south of CR-798/Palmetto Park Road

A summary of the historical growth rate analysis based on FDOT count stations is presented in Table 1. The linear growth trend yielded a growth rate of 2.89 percent (2.89%) over the most recent ten (10) year period. The exponential growth trend yielded a growth rate of 2.47 percent (2.47%) over the most recent ten (10) year period. The decaying exponential growth trend yielded a growth rate of 2.53 percent (2.53%) over the most recent ten (10) year period. Based on the ten (10) year historical growth rate analysis, the resulting growth rates are unreasonably high when considering a long-range planning horizon because they do not include a complete economic cycle. It is important to note that the most recent ten (10) years of data include year 2010 through year 2019. In the year 2010, traffic counts reached a low point as the Great

Recession came to an end. In the years that followed, traffic counts increased as the economy recovered until the year 2019, which represents the peak level of traffic prior to the current recession, which began in the year 2020. Calculating the historical growth rates using only the most recent ten (10) years of data does not include a complete economic cycle and is therefore not reliable for predicting long term traffic growth. It is worth noting that economic reports supported by vehicle miles traveled (VMT) data of the current recession predict that Americans will drive less during the next recovery due to a variety of factors including pandemic fears, the prevalence of work-from-home options, and the increase of online delivery options.

Table 1: Historical Growth Rate Summary

Station No.	Description	Linear (10-yr)	Exponential (10-yr)	Decaying Exponential (10-yr)
5001	SR-5/US-1, south of Camino Real	4.51%	3.74%	3.84%
5003	SR-5/US-1, south of CR-798/Palmetto Park Road	1.26%	1.20%	1.22%
Average		**2.89%**	**2.47%**	**2.53%**

Based on the forecasted volumes obtained from the 2015 and 2045 FSUTMS SERPM, an annual growth rate of 0.78 percent (0.78%) along the study corridor was calculated as shown in Table 2.

Table 2: Growth Rate Calculations for SERPM 8.501 Volumes

Roadway Segment	Limits	2015 Model Volumes	2045 Model Volumes	Calculated Growth Rate
US-1/Federal Highway	**south of E Camino Real**	41,961	52,635	0.85%
	south of SE Mizner Boulevard	36,702	46,883	0.92%
	north of SE Mizner Boulevard	31,541	38,252	0.71%
	south of Palmetto Park Road	31,298	36,956	0.60%
Average				**0.78%**

As shown in Table 3, the linear growth trend including 2045 model data yielded a growth rate of 0.93 percent (0.93%) over the most recent ten (10) year period. The exponential growth trend including 2045 model data yielded a growth rate of 0.90 percent (0.90%) over the most recent ten (10) year period. The decaying exponential growth trend including 2045 model data yielded a growth rate of 0.49 percent (0.49%) over the most recent ten (10) year period. Please

note that the proportional method was applied to account for the large base year model volume deviation between 2015 FDOT historical volumes and 2015 SERPM volumes.

Table 3: Historical Growth Rate plus 2045 Model Data Summary				
Station No.	**Description**	**Linear (2019 to Design Year)**	**Exponential (2019 to Design Year)**	**Decaying Exponential (2019 to Design Year)**
5001	SR-5/US-1, south of Camino Real	0.99%	0.96%	0.58%
5003	SR-5/US-1, south of CR-798/Palmetto Park Road	0.87%	0.84%	0.39%
Average		**0.93%**	**0.90%**	**0.49%**

The historical growth trends at nearby FDOT traffic count stations plus 2045 model data further demonstrate that the ten (10) year historical growth rate analysis results in growth rates that are unreasonably high.

As the historical growth rate calculations using FDOT count station information yielded an unrepresentative growth rate, a growth rate of 0.80 percent (0.80%), which is approximately equivalent to the adopted 2015 and 2045 SERPM growth rate, was applied annually to the existing traffic volumes for near-term future (year 2023) and long-term future (year 2040) background conditions. The worksheets used to analyze the historical growth trends along with the FSUTMS travel demand model outputs are included in Appendix C. Volume development worksheets for the study intersections are included in Appendix D.

Committed Developments

The City's approved developments in the downtown area were reviewed and compared to the socioeconomic data included in the corresponding traffic analysis zones (TAZs) in the 2015 and 2045 FSUTMS SERPM. The employment growth amount between 2015 and 2045 in the FSUTMS SERPM is greater than the balance of authorized development in the study area. Therefore, the 2015 and 2045 FSUTMS SERPM adequately represents the expected growth in the study area.

The Mandarin Oriental development project is under construction during the analysis period. A new traffic signalized intersection at US-1/Federal Highway and SE 8th Street has been designed

and will be implemented as part of the development. As the City of Boca Raton is the traffic signal maintaining agency, coordination with the City has been made to confirm that they have endorsed the signal timing plan. The endorsement from the City is included in Appendix E.

Since a traffic impact study is not available for the Mandarin Oriental, trip generation calculations for the approved development program were performed using the Institute of Transportation Engineers' (ITE) *Trip Generation Manual*, 10th Edition and applied at the intersection of US-1/Federal Highway and SE 8th Street. The trip generation for the proposed development was determined using ITE Land Use Codes (LUC) 820 (Shopping Center), LUC 930 (Fast Casual Restaurant), LUC 310 (Hotel), and LUC 222 (Multifamily Housing [High-Rise]). The Mandarin Oriental development is expected to generate 156 net new weekday A.M. peak hour vehicular trips and 334 net new weekday P.M. peak hour vehicular trips. The expected trip generation and assignment was included in future no-build near-term (year 2023) and long-term (year 2040) conditions. Mandarin Oriental trip generation calculations are included in Appendix E.

The Mandarin Oriental trip assignment is shown in Figure 4. The near-term future 2023 and long-term future 2040 no-build turning movement volumes for the A.M. and P.M. peak hours are shown in Figure 5 and Figure 6.

Developer funded improvements at the intersection of S Dixie Highway and Camino Real were included in the future no-build and future build analysis conditions for both near-term 2023 and long-term 2040. The eastbound approach will be modified in the near future to include a second eastbound left-turn lane and an exclusive right-turn lane.

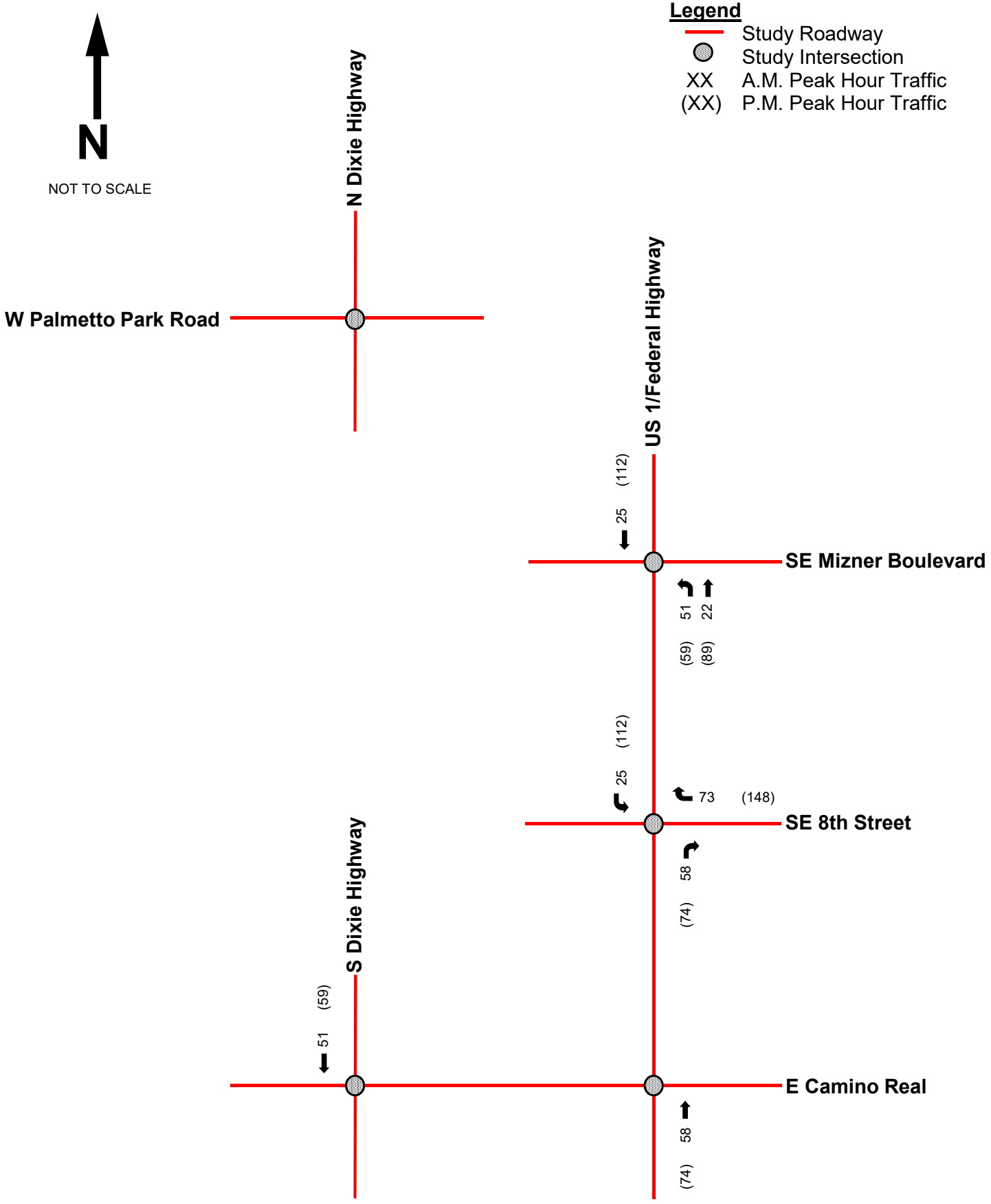

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Figure 4
Mandarin Oriental Peak Hour Trip Assignment
US-1 Complete Streets Study
Boca Raton, Florida

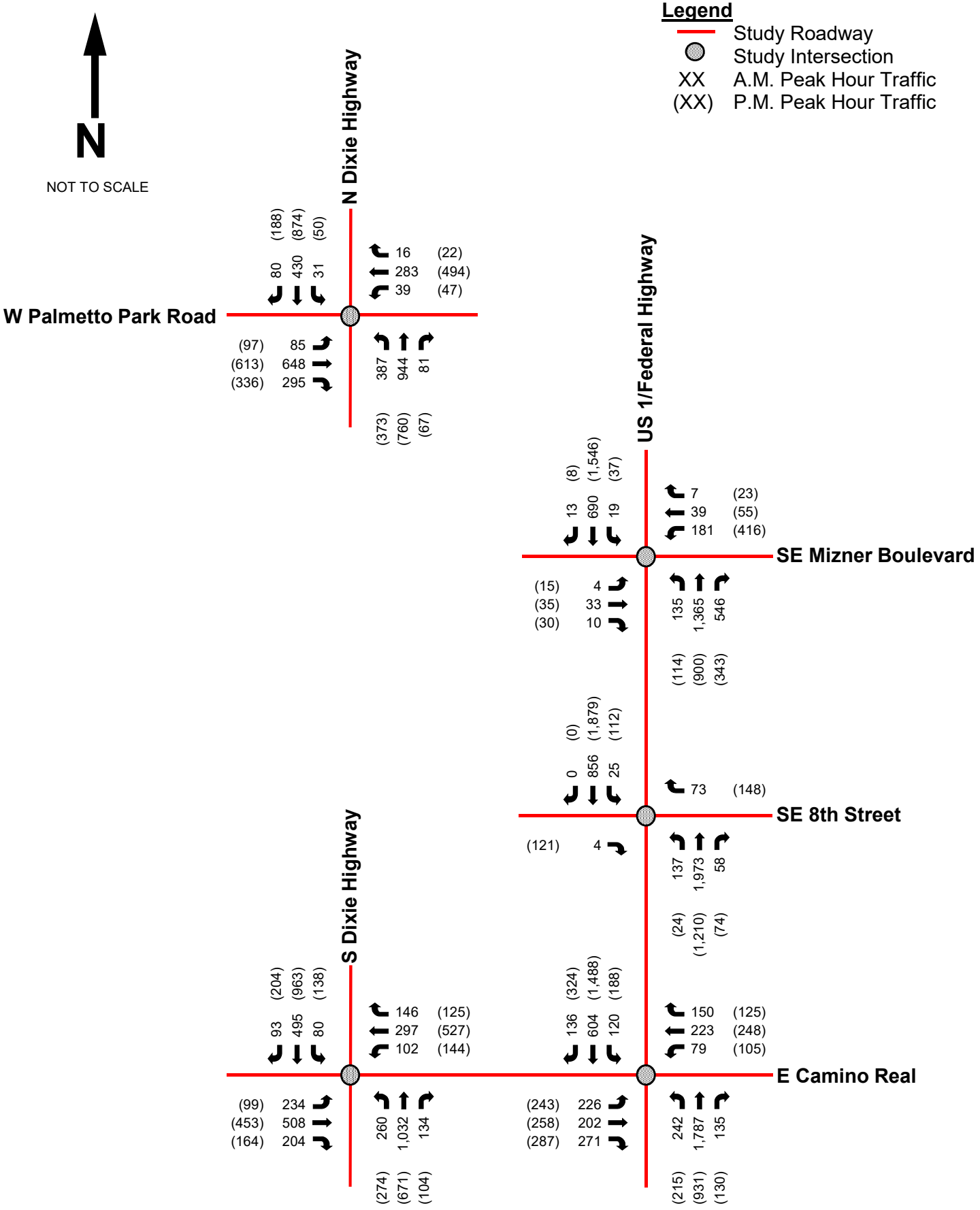

Figure 5
Future 2023 No-Build Peak Hour Traffic
US-1 Complete Streets Study
Boca Raton, Florida

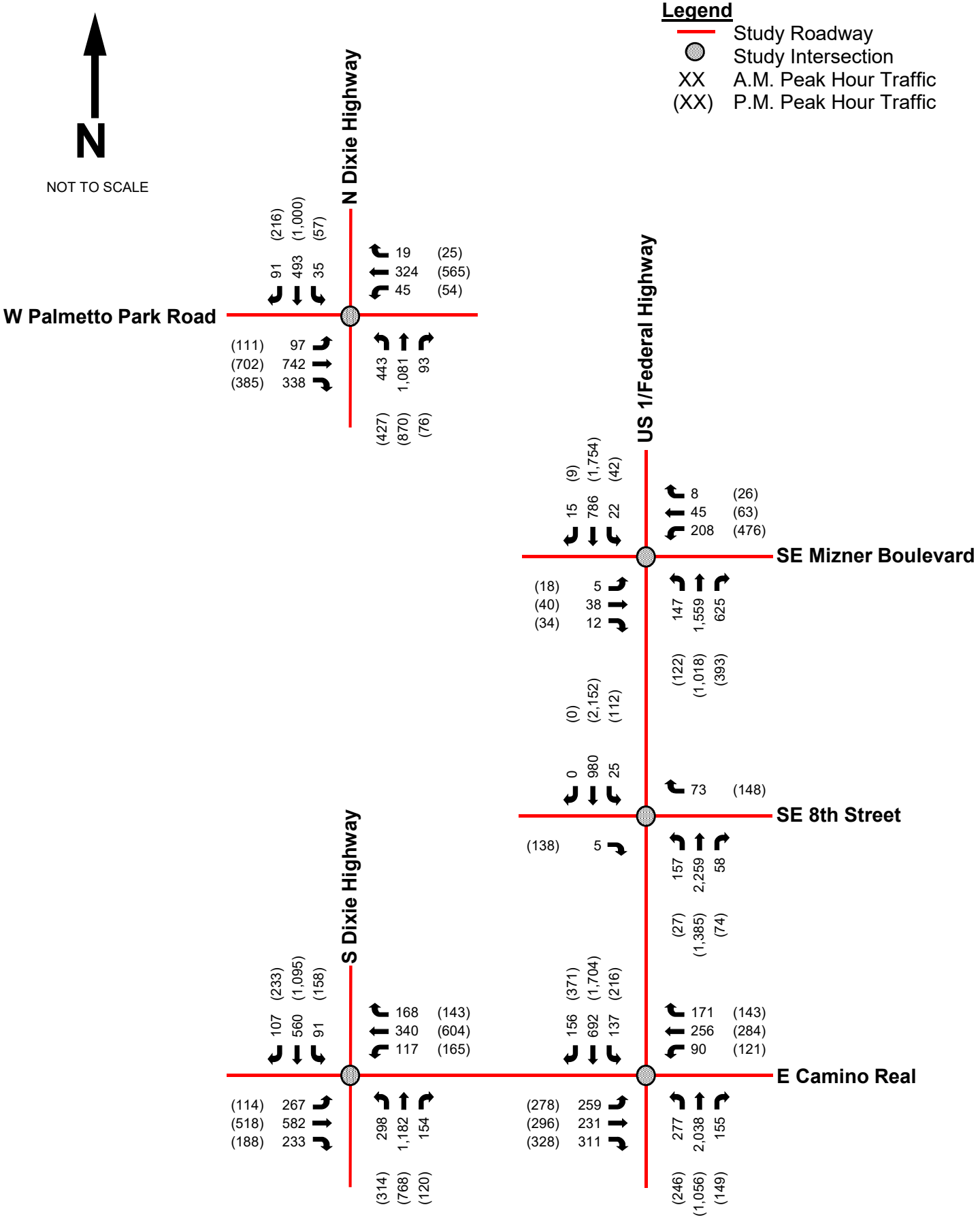

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Figure 6
Future 2040 No-Build Peak Hour Traffic
US-1 Complete Streets Study
Boca Raton, Florida

DIVERSION ANALYSIS

A diversion analysis was performed using SERPM 8.501 future no-build conditions and a SERPM 8.501 model run for the lane repurposing conditions. The purpose of the diversion analysis is to develop an understanding of potential route diversion that may take place to other roadways due to the 6-lane to 4-lane repurposing on US-1/Federal Highway. Appendix F includes the model plot of the diversion analysis highlighting model segments that have greater than 1% change in traffic volumes in the future build conditions model.

The results show that approximately 4,500 daily trips are expected to divert from US-1/Federal Highway to other routes in the year 2040, which corresponds to 11 percent (11%) of the long-term future 2040 no-build traffic volumes. A proportional diversion of 11 percent (11%) was applied to the near-term future 2023 volumes to account for diversions in all future-build analysis conditions.

FUTURE BUILD TRAFFIC

Future build traffic conditions are defined as expected traffic conditions on the roadway network during the analysis years with the implementation of lane repurposing conditions. Future build traffic volumes used in the analysis are the future no-build traffic volumes with potential diversions accounted for. The near-term future 2023 and long-term future 2040 traffic diversions for the A.M. and P.M. peak hours are shown in Figure 7 and Figure 8. Figure 9 and Figure 10 present the near-term future 2023 and long-term future 2040 build intersection turning movement volumes for the A.M. and P.M. peak hours.

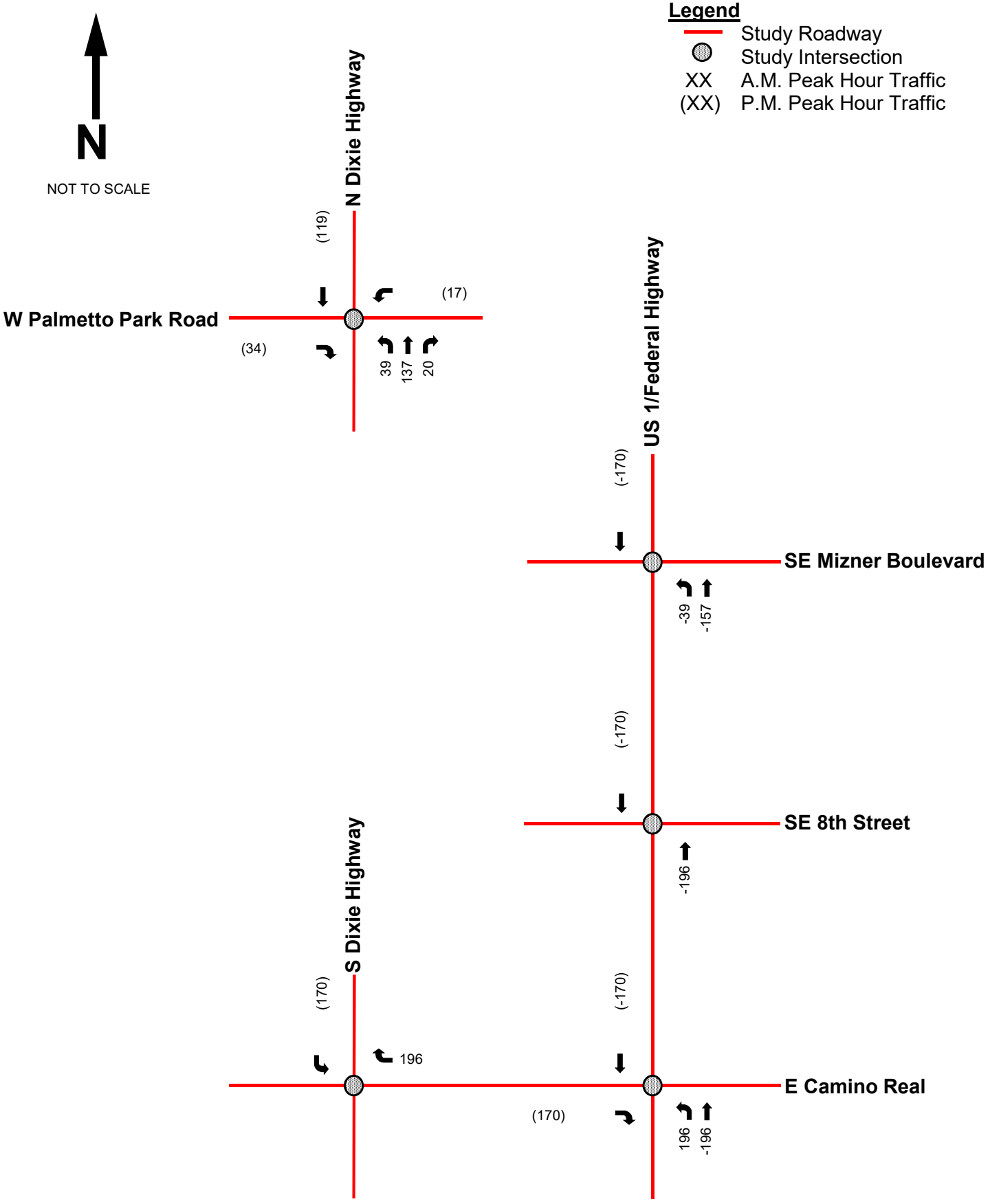

Figure 7
Future 2023 Peak Hour Traffic Diversions
US-1 Complete Streets Study
Boca Raton, Florida

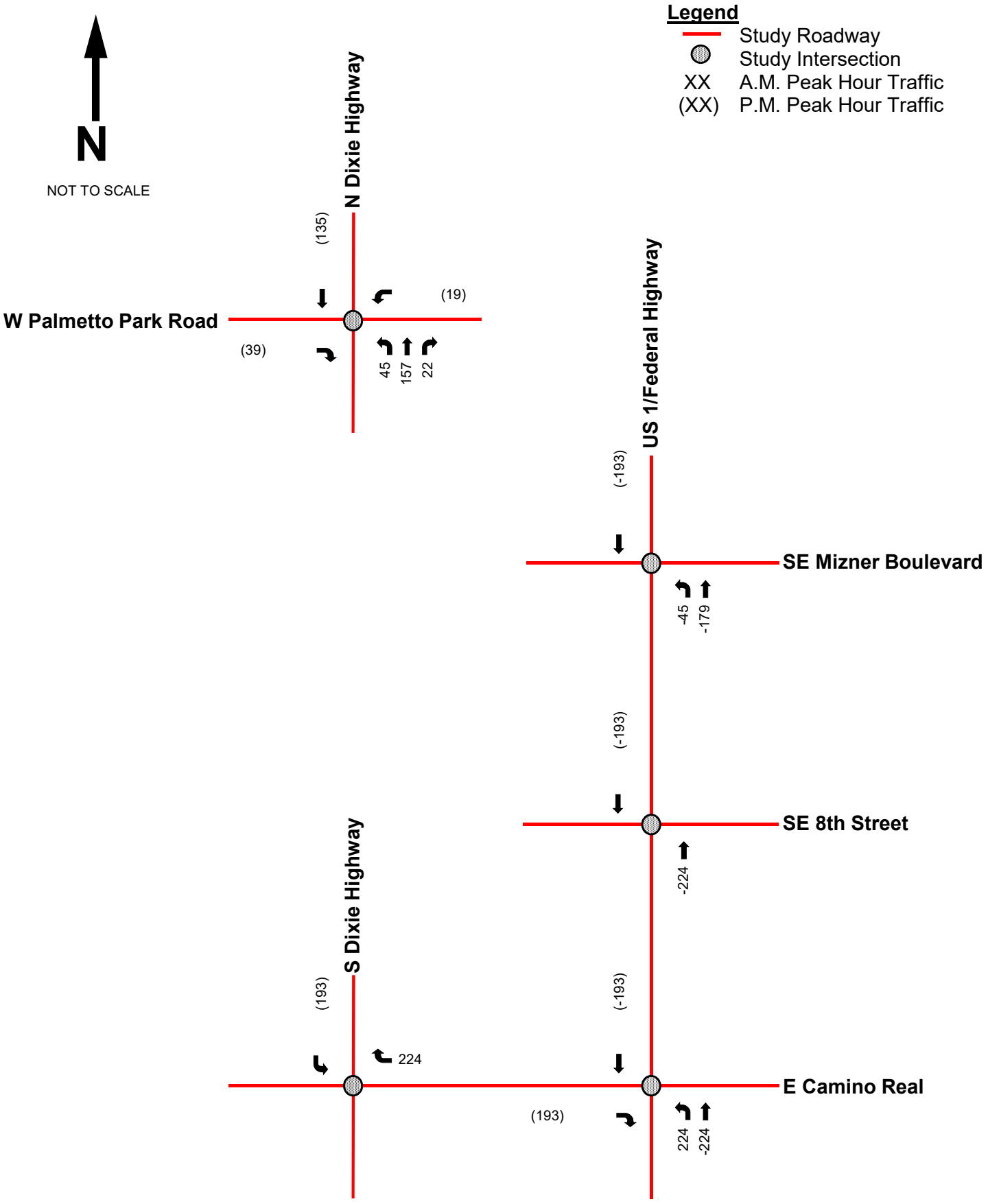

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Figure 8
Future 2040 Peak Hour Traffic Diversions
US-1 Complete Streets Study
Boca Raton, Florida

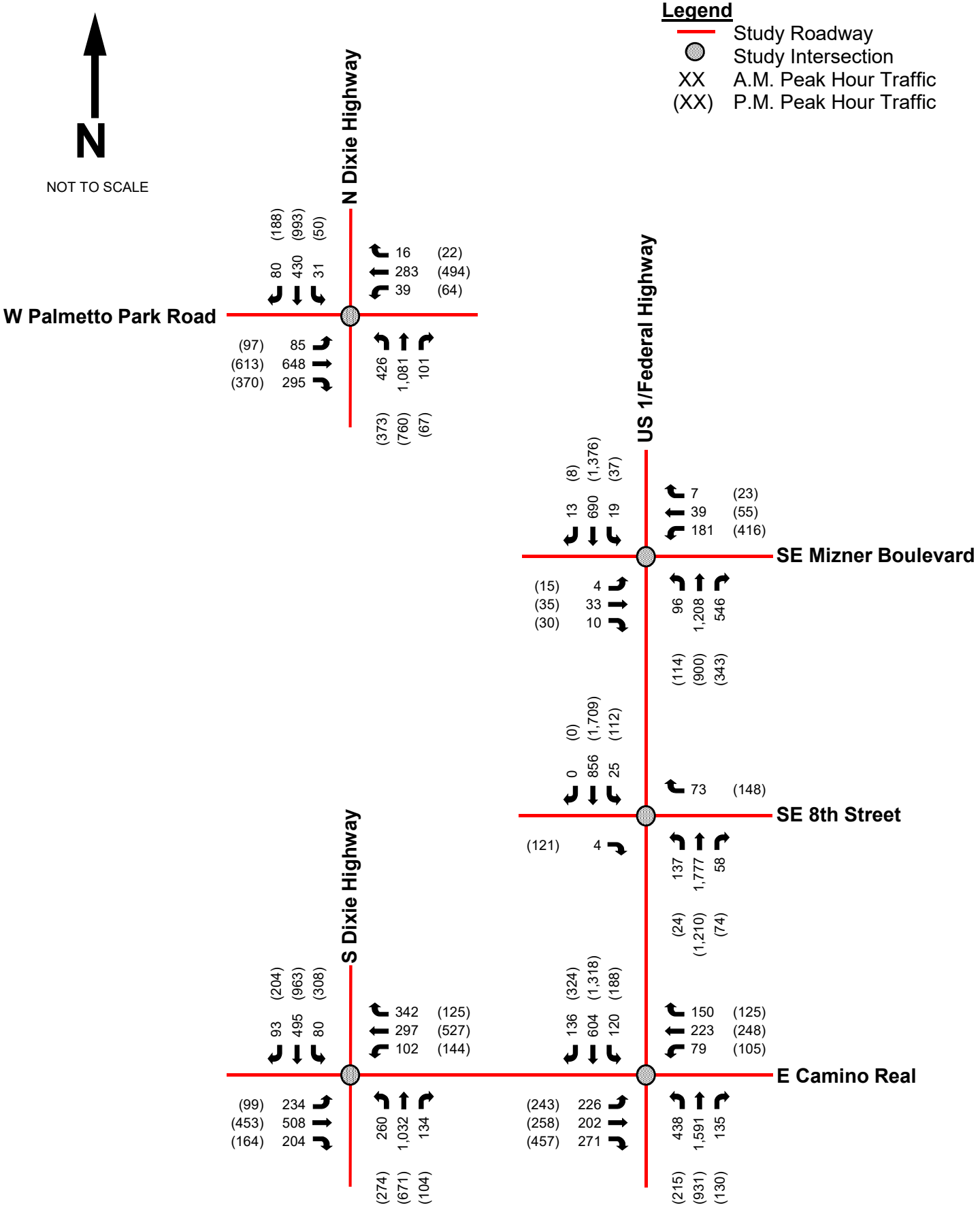

Figure 9
Future 2023 Build Peak Hour Traffic
US-1 Complete Streets Study
Boca Raton, Florida

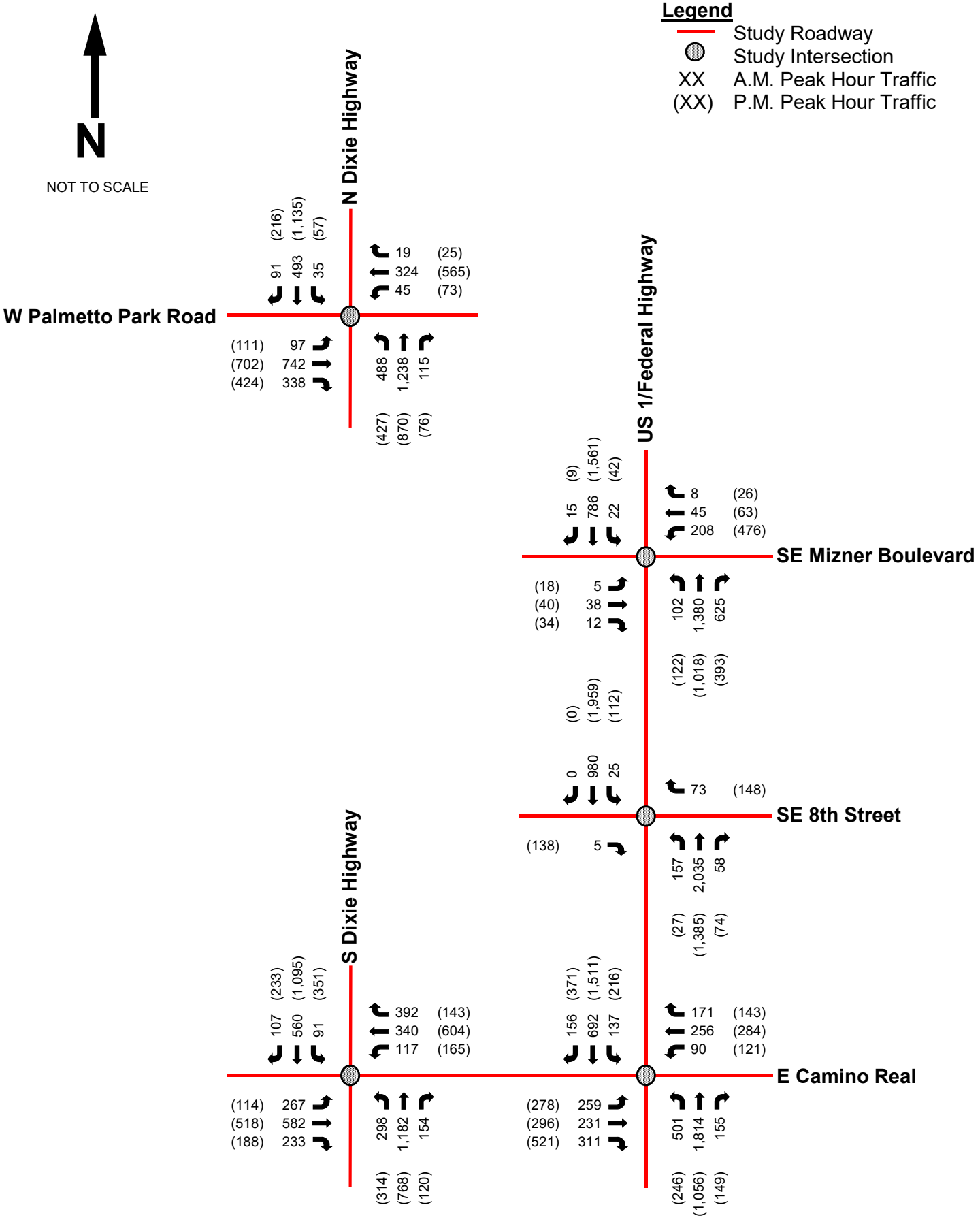

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Figure 10
Future 2040 Build Peak Hour Traffic
US-1 Complete Streets Study
Boca Raton, Florida

ROADWAY SEGMENT ANALYSIS

An analysis was prepared using roadway segment volumes. Five (5) scenarios were analyzed using the methods in FDOT's 2020 Quality/Level of Service (QLOS) Handbook.

1. 2020 Existing Conditions (6LD)
2. 2023 Future No-Build (6LD)
3. 2023 Future Build (4LD)
4. 2040 Future No-Build (6LD)
5. 2040 Future Build (4LD)

Figure 11 summarizes the proposed future lane configuration for the study intersections. Please note that one (1) northbound through lane at the intersection of US-1/Federal Highway and Camino Real is proposed to be converted into a second northbound-to-westbound left-turn lane to minimize impacts to traffic delay.

The following roadway segments were examined for this analysis.

- US-1/Federal Highway between SE 7th Street and SE 6th Street
- US-1/Federal Highway between SE 2nd Street and SE 1st Street
- S Dixie Highway between SE 7th Street and SE 6th Street

The annual growth rate of 0.80 percent (0.80%) was applied to the existing roadway segment traffic volumes. Table 4 through Table 8 provide a summary of the roadway segment analysis for existing traffic conditions, future 2023 no-build conditions, future 2023 build conditions, future 2040 no-build conditions, and future 2040 build conditions.

The roadway segment analyses found that US-1/Federal Highway will operate at an acceptable level service in the long-term future year 2040 if the lane repurposing is implemented (project build conditions). The results of the analysis indicate that implementing lane repurposing measures along the US-1/Federal Highway corridor between Camino Real and SE Mizner

Boulevard will result in a similar traffic operation as US-1/Federal Highway currently operates in the 4-lane section north of SE Mizner Boulevard.

Although there is an expected increase in traffic volumes along S Dixie Highway from motorists choosing to divert, the roadway segment analysis indicates that S Dixie Highway is expected to operate at LOS C under all analysis conditions during the A.M. and P.M. peak hours after accounting for diverted trips, which is no change from the no-build conditions.

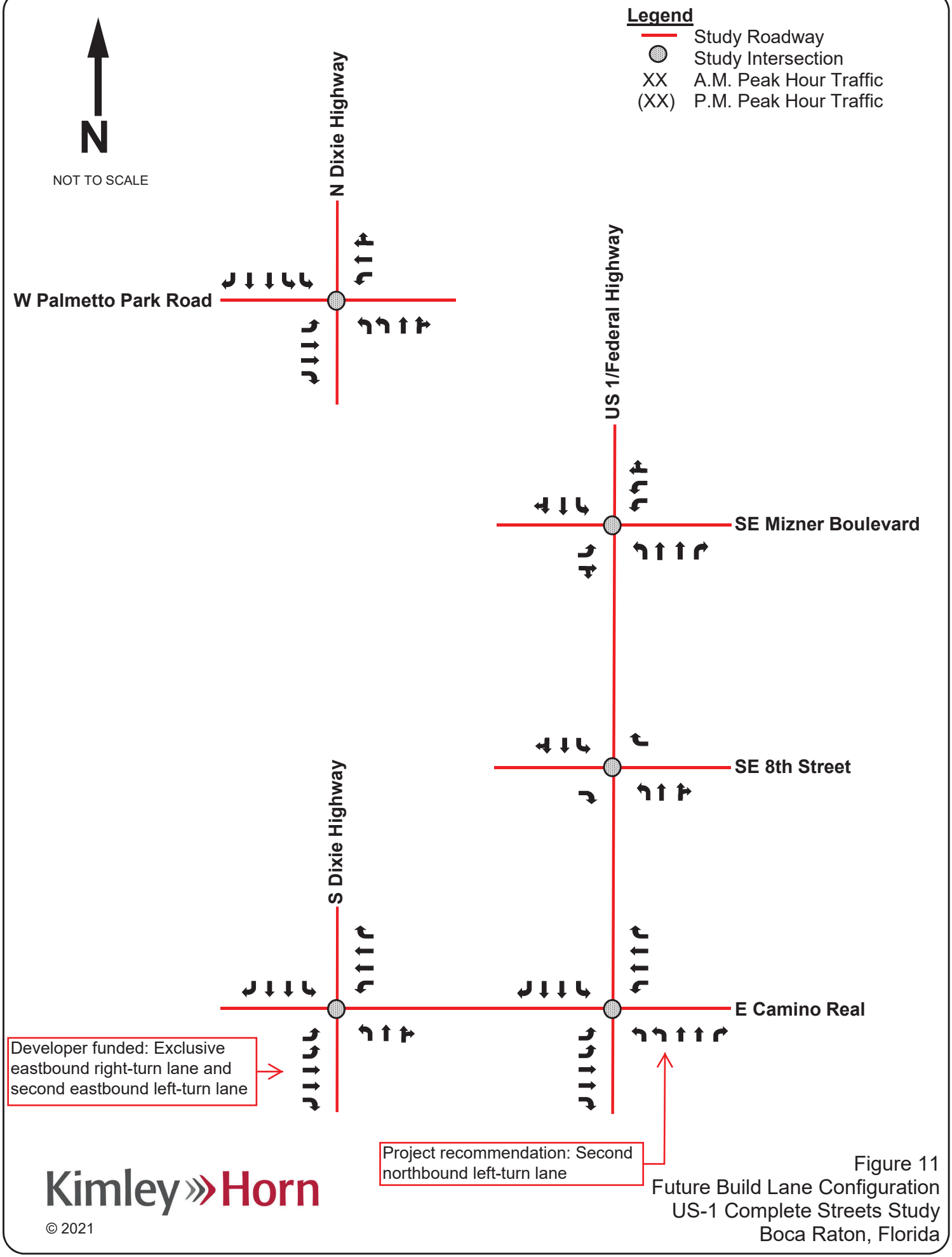

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Figure 11
Future Build Lane Configuration
US-1 Complete Streets Study
Boca Raton, Florida

Table 4: Existing Conditions Roadway Segment Capacity Analysis
Peak Hour Two-Way/**AADT**

Roadway	Segment		Facility Type[1]	Adopted LOS Standard	2020 Volume	Seasonal Factor	Existing Average Volumes[5]	LOS C Standard Capacity[6]	LOS D Standard Capacity[6]	LOS E Standard Capacity[6]	Existing LOS
	From	To									
US-1/Federal Highway	SE 7th Street	SE 6th Street	6LD[2]	LOS E	3,086	0.94	2,901	2,090	4,500	4,590	D
					35,885	**0.94**	**34,000**	**23,300**	**50,000**	**50,900**	**D**
	SE 2nd Street	SE 1st Street	4LD[3]	LOS E	2,313	0.94	2,174	1,310	2,920	3,040	D
					28,253	**0.94**	**27,000**	**14,500**	**32,400**	**33,800**	**D**
S Dixie Highway	SE 7th Street	SE 6th Street	4LD[4]	LOS E	2,353	0.94	2,212	3,078	3,222	[7]	C
					24,580	**0.94**	**23,500**	**34,110**	**35,820**	**[7]**	**C**

Notes:
[1] 6LD - Six-lane divided, 4LD - four-lane divided
[2] Based on FDOT Class II six-lane divided roadway
[3] Based on FDOT Class II four-lane divided roadway
[4] Based on FDOT Class I four-lane divided roadway with 10 percent capacity reduction for "Non-State Signalized Roadways"
[5] Section 1.6 in FDOT's *Project Traffic Forecasting Handbook* was utilized to round daily traffic volumes
[6] Based on FDOT 2020 *Quality/Level of Service Handbook*
[7] LOS E Standard Capacity not applicable per FDOT 2020 Quality/Level of Service Handbook

Table 5: Future 2023 No-Build Conditions Roadway Segment Capacity Analysis
Peak Hour Two-Way/**AADT**

Roadway	Segment		Facility Type[1]	Adopted LOS Standard	Existing Average Volumes	Growth Rate	Future No-Build (2023) Volumes[5]	LOS C Standard Capacity[6]	LOS D Standard Capacity[6]	LOS E Standard Capacity[6]	Future No-Build (2023) LOS
	From	To									
US-1/Federal Highway	SE 7th Street	SE 6th Street	6LD[2]	LOS E	2,901	0.80%	2,970	2,090	4,500	4,590	D
					33,732	0.80%	**35,000**	**23,300**	**50,000**	**50,900**	**D**
	SE 2nd Street	SE 1st Street	4LD[3]	LOS E	2,174	0.80%	2,226	1,310	2,920	3,040	D
					26,558	0.80%	**27,500**	**14,500**	**32,400**	**33,800**	**D**
S Dixie Highway	SE 7th Street	SE 6th Street	4LD[4]	LOS E	2,212	0.80%	2,265	3,078	3,222	[7]	C
					23,105	0.80%	**24,000**	**34,110**	**35,820**	**[7]**	**C**

Notes:
[1] 6LD - Six-lane divided, 4LD - four-lane divided
[2] Based on FDOT Class II six-lane divided roadway
[3] Based on FDOT Class II four-lane divided roadway
[4] Based on FDOT Class I four-lane divided roadway with 10 percent capacity reduction for "Non-State Signalized Roadways"
[5] Section 1.6 in FDOT's *Project Traffic Forecasting Handbook* was utilized to round daily traffic volumes
[6] Based on FDOT 2020 *Quality/Level of Service Handbook*
[7] LOS E Standard Capacity not applicable per FDOT 2020 Quality/Level of Service Handbook

Table 6: Future 2023 Build Conditions Roadway Segment Capacity Analysis
Peak Hour Two-Way/**AADT**

Roadway	Segment		Facility Type[1]	Adopted LOS Standard	2023 Future No-Build Volumes	Diverted Volume (2023)	Future Build (2023) Volumes[5]	LOS C Standard Capacity[6]	LOS D Standard Capacity[6]	LOS E Standard Capacity[6]	Future Lane Repurposing LOS
	From	To									
US-1/Federal Highway	SE 7th Street	SE 6th Street	4LD[2]	LOS E	2,970	-327	2,643	1,376	3,066	3,192	D
					34,541	**-3,800**	**31,000**	**15,225**	**34,020**	**35,490**	**D**
	SE 2nd Street	SE 1st Street	4LD[3]	LOS E	2,226	-156	2,070	1,310	2,920	3,040	D
					27,195	**-1,904**	**25,500**	**14,500**	**32,400**	**33,800**	**D**
S Dixie Highway	SE 7th Street	SE 6th Street	4LD[4]	LOS E	2,265	204	2,469	3,078	3,222	[7]	C
					23,660	**2,129**	**26,000**	**34,110**	**35,820**	**[7]**	**C**

Notes:
[1] 4LD - four-lane divided
[2] Based on FDOT Class II four-lane divided roadway with 5 percent capacity increase for exclusive right-turn lane
[3] Based on FDOT Class II four-lane divided roadway
[4] Based on FDOT Class I four-lane divided roadway with 10 percent capacity reduction for "Non-State Signalized Roadways"
[5] Section 1.6 in FDOT's *Project Traffic Forecasting Handbook* was utilized to round daily traffic volumes
[6] Based on FDOT 2020 *Quality/Level of Service Handbook*
[7] LOS E Standard Capacity not applicable per FDOT 2020 Quality/Level of Service Handbook

Table 7: Future 2040 No-Build Conditions Roadway Segment Capacity Analysis
Peak Hour Two-Way/**AADT**

Roadway	Segment		Facility Type[1]	Adopted LOS Standard	Existing Average Daily Volumes	Growth Rate	Future No-Build (2040) Volumes[5]	LOS C Standard Capacity[6]	LOS D Standard Capacity[6]	LOS E Standard Capacity[6]	Future No-Build (2040) LOS
	From	To									
US-1/Federal Highway	SE 7th Street	SE 6th Street	6LD[2]	LOS E	2,901	0.80%	3,365	2,090	4,500	4,590	D
					33,732	0.80%	**39,500**	**23,300**	**50,000**	**50,900**	**D**
	SE 2nd Street	SE 1st Street	4LD[3]	LOS E	2,174	0.80%	2,522	1,310	2,920	3,040	D
					26,558	0.80%	**31,000**	**14,500**	**32,400**	**33,800**	**D**
S Dixie Highway	SE 7th Street	SE 6th Street	4LD[4]	LOS E	2,212	0.80%	2,566	3,078	3,222	[7]	C
					23,105	0.80%	**27,000**	**34,110**	**35,820**	**[7]**	**C**

Notes:
[1] 6LD - Six-lane divided, 4LD - four-lane divided
[2] Based on FDOT Class II six-lane divided roadway
[3] Based on FDOT Class II four-lane divided roadway
[4] Based on FDOT Class I four-lane divided roadway with 10 percent capacity reduction for "Non-State Signalized Roadways"
[5] Section 1.6 in FDOT's *Project Traffic Forecasting Handbook* was utilized to round daily traffic volumes
[6] Based on FDOT 2020 *Quality/Level of Service Handbook*
[7] LOS E Standard Capacity not applicable per FDOT 2020 Quality/Level of Service Handbook

Table 8: Future 2040 Build Conditions Roadway Segment Capacity Analysis
Peak Hour Two-Way/**AADT**

Roadway	Segment		Facility Type[1]	Adopted LOS Standard	2040 Future No-Build Volumes	Diverted Volume (2040)	Future Build (2040) Volumes[5]	LOS C Standard Capacity[6]	LOS D Standard Capacity[6]	LOS E Standard Capacity[6]	Future Lane Repurposing LOS
	From	To									
US-1/Federal Highway	SE 7th Street	SE 6th Street	4LD[2]	LOS E	3,365	-387	2,978	1,376	3,066	3,192	D
					39,129	**-4,495**	**35,000**	**15,225**	**34,020**	**35,490**	**E**
	SE 2nd Street	SE 1st Street	4LD[3]	LOS E	2,522	-169	2,353	1,310	2,920	3,040	D
					30,807	**-2,069**	**29,000**	**14,500**	**32,400**	**33,800**	**D**
S Dixie Highway	SE 7th Street	SE 6th Street	4LD[4]	LOS E	2,566	240	2,806	3,078	3,222	[7]	C
					26,802	**2,506**	**29,500**	**34,110**	**35,820**	**[7]**	**C**

Notes:
[1] 4LD - four-lane divided
[2] Based on FDOT Class II four-lane divided roadway with 5 percent capacity increase for exclusive right-turn lane
[3] Based on FDOT Class II four-lane divided roadway
[4] Based on FDOT Class I four-lane divided roadway with 10 percent capacity reduction for "Non-State Signalized Roadways"
[5] Section 1.6 in FDOT's *Project Traffic Forecasting Handbook* was utilized to round daily traffic volumes
[6] Based on FDOT 2020 *Quality/Level of Service Handbook*
[7] LOS E Standard Capacity not applicable per FDOT 2020 Quality/Level of Service Handbook

INTERSECTION CAPACITY ANALYSIS

Operating conditions were analyzed for the study intersections. Five (5) scenarios were analyzed using Trafficware's *SYNCHRO 10* software, which applies methodologies outlined in the Transportation Research Board's (TRB's), *Highway Capacity Manual*, 6th Edition.

1. 2020 Existing Conditions (6LD)
2. 2023 Future No-Build (6LD)
3. 2023 Future Build (4LD)
4. 2040 Future No-Build (6LD)
5. 2040 Future Build (4LD)

Intersection capacity analysis worksheets for the study intersections are included in Appendix G.

A summary of the intersection analyses for the A.M. and P.M. peak hours is presented in Table 9 and Table 10. As Table 9 and Table 10 indicate, the study intersections are expected to operate at LOS E or better during the A.M. and P.M. peak hours under all analysis conditions with the exception of the following:

- The signalized intersection of US-1/Federal Highway and Camino Real is expected to operate at LOS F under long-term future 2040 build conditions during the P.M. peak hour.

The study recommends providing a second northbound-to-westbound left turn lane at Camino Real (dual left turn lanes) to accommodate diverting traffic and to lengthen the green time for the southbound US-1 movement. This can be accomplished by converting the northbound through lane that must be dropped for the lane repurposing into a second left-turn lane.

Please note that signal timing optimization was utilized to improve intersection operations to LOS E at the intersection of S Dixie Highway and Camino Real under long-term future 2040 build conditions during the A.M. peak hour, the intersection of S Dixie Highway and Palmetto Park

Road during the A.M. peak hour, and the intersection of US-1/Federal Highway and Camino Real during the A.M. peak hour. Proposed signal timing adjustments were coordinated through the City of Boca Raton Traffic and Transportation Management Division for all study area signalized intersections.

Table 9: A.M. Peak Hour Intersection Capacity Analysis

Intersection	Traffic Control	Overall LOS/Delay	Approach LOS			
			EB	WB	NB	SB
Existing Conditions (Future 2023 No-Build Conditions) [Future 2023 Build Conditions] {Future 2040 No-Build Conditions} <Future 2040 Build Conditions>						
S Dixie Highway and Camino Real	Signalized	E/67.0 sec (E/70.9 sec) [E/70.9 sec] {F/96.5 sec} <E/68.4 sec>[2]	D (D) [D] {D} <D>	D (D) [D] {D} <D>	F (F) [F] {F} <F>	D (D) [D] {D} <D>
S Dixie Highway and Palmetto Park Road	Signalized	D/46.4 sec (D/47.8 sec) [E/64.4 sec] {E/62.1 sec} <E/77.6 sec>[2]	C (C) [C] {C} <C>	C (C) [C] {C} <C>	E (E) [F] {F} <F>	D (D) [D] {D} <D>
US-1/Federal Highway and E Camino Real	Signalized	D/37.4 sec (D/39.5 sec) [E/61.2 sec] {E/58.3 sec} <E/78.8 sec>[2]	E (E) [E] {E} <F>	D (D) [D] {D} <E>	C (C) [E] {E} <F>	C (C) [C] {D} <C>
US-1/Federal Highway and SE 8th Street	Signalized[1]	[3] (A/6.9 sec) [A/9.9 sec] {A/8.0 sec} <B/13.3 sec>	[3] (D) [D] {D} <D>	[3] (D) [D] {D} <D>	[3] (A) [A] {A} <B>	[3] (A) [A] {A} <A>
US-1/Federal Highway and SE Mizner Boulevard/SE 5th Street	Signalized	B/11.4 sec (B/11.9 sec) [B/11.4 sec] {B/13.8 sec} <B/12.6 sec>	E (E) [E] {E} <E>	E (E) [E] {E} <E>	A (A) [A] {A} <A>	A (A) [A] {A} <A>

Notes: [1] Intersection cannot be analyzed in HCM 6th Edition. Therefore, HCM 2000 was used.
[2] Signal timings optimized.
[3] Signalized intersection does not exist under analysis scenario.

Table 10: P.M. Peak Hour Intersection Capacity Analysis						
Intersection	**Traffic Control**	**Overall LOS/Delay**	**Approach LOS**			
			EB	**WB**	**NB**	**SB**
Existing Conditions (Future 2023 No-Build Conditions) [Future 2023 Build Conditions] {Future 2040 No-Build Conditions} <Future 2040 Build Conditions>						
S Dixie Highway and Camino Real	Signalized	D/51.4 sec (D/53.5 sec) [E/57.3 sec] {E/68.6 sec} <E/76.2 sec>	D (D) [D] {D} <D>	D (D) [D] {D} <D>	D (D) [D] {D} <E>	E (E) [E] {F} <F>
S Dixie Highway and Palmetto Park Road	Signalized	D/45.8 sec (D/47.0 sec) [E/55.5 sec] {E/57.6 sec} <E/73.4 sec>	C (C) [D] {D} <D>	C (C) [C] {D} <D>	D (D) [D] {D} <D>	E (E) [F] {F} <F>
US-1/Federal Highway and E Camino Real	Signalized	D/45.1 sec (D/45.1 sec) [E/79.7 sec] {D/54.4 sec} <F/91.4 sec>	E (F) [F] {F} <F>	E (E) [E] {E} <E>	C (C) [D] {D} <D>	D (C) [D] {D} <D>
US-1/Federal Highway and SE 8th Street	Signalized[1]	[2] (B/11.2 sec) [B/13.6 sec] {B/10.5 sec} <B/13.7 sec>	[2] (E) [E] {E} <E>	[2] (E) {E] {E} <E>	[2] (A) [A] {A} <A>	[2] (A) [B] {A} <B>
US-1/Federal Highway and SE Mizner Boulevard/SE 5th Street	Signalized	C/21.9 sec (C/24.5 sec) [C/22.8 sec] {D/35.5 sec} <C/28.2 sec>	E (E) [E] {E} <E>	E (E) [E] {E} <E>	A (B) [B] {B} <B>	B (C) [B] {D} <C>

Notes: [1] Intersection cannot be analyzed in HCM 6th Edition. Therefore, HCM 2000 was used.
[2] Signalized intersection does not exist under analysis scenario.

TRAVEL TIME ANALYSIS

The corridor travel time was calculated using Trafficware SYNCHRO's Arterial Level of Service. The 0.3-mile segment along US-1/Federal Highway extending from E Camino Real to SE Mizner Boulevard was examined in the Travel Time Analysis. A summary of the existing conditions analysis is presented in Table 11 and the future conditions analysis is presented in Table 12.

The results between the future 2023 no-build conditions and the future 2023 build conditions indicate that northbound travel times are expected to experience a decrease of 4.2 seconds during the A.M. peak hour and an increase of 7.3 seconds during the P.M. peak hour as a result of the lane repurposing and the southbound travel times are expected to experience an increase of 1.7 seconds during the A.M. peak hour and 31.2 seconds during the P.M. peak hour as a result of the lane repurposing.

The results between the future 2040 no-build conditions and the future 2040 build conditions indicate that northbound travel times are expected to experience an increase of 1.9 seconds during the A.M. peak hour and 8.3 seconds during the P.M. peak hour as a result of the lane repurposing and the southbound travel times are expected to experience an increase of 3.8 seconds during the A.M. peak hour and 67.3 seconds during the P.M. peak hour as a result of the lane repurposing.

Travel time analysis worksheets for the study segments are included in Appendix H.

Table 11: Existing Conditions Peak Hour Corridor Travel Time			
Direction	**Roadway Segment**	**A.M. Peak Hour (sec)**	**P.M. Peak Hour (sec)**
Existing Conditions			
Northbound	E Camino Real to SE Mizner Boulevard/SE 5th Street	71.4	50.7
Southbound	SE Mizner Boulevard/SE 5th Street to E Camino Real	67.6	72.1

Table 12: Future Conditions Peak Hour Corridor Travel Time			
Direction	**Roadway Segment**	**A.M. Peak Hour (sec)**	**P.M. Peak Hour (sec)**
Future 2023 No-Build Conditions (Future 2023 Build Conditions) [Future 2040 No-Build Conditions] {Future 2040 Build Conditions}			
Northbound	E Camino Real to SE 8th Street	19.9 (24.5) [22.4] {33.0}	20.7 (21.0) [20.5] {20.7}
	SE 8th Street to SE Mizner Boulevard/SE 5th Street	55.4 (46.6) [54.8] {46.1}	41.2 (48.2) [48.2] {56.3}
	Total	75.3 (71.1) [77.2] {79.1}	61.9 (69.2) [68.7] {77.0}
Southbound	SE Mizner Boulevard/SE 5th Street to SE 8th Street	25.0 (26.9) [25.1] {27.5}	25.2 (29.4) [25.3] {31.6}
	SE 8th Street to E Camino Real	44.8 (44.6) [49.3] {50.7}	56.2 (83.2) [71.0] {132.0}
	Total	69.8 (71.5) [74.4] {78.2}	81.4 (112.6) [96.3] {163.6}

CRASH ANALYSIS

A crash data analysis was conducted along US-1/Federal Highway between E Camino Real and SE Mizner Boulevard. The following sections summarize the analysis.

Crashes by Year

A total of 224 crashes occurred between January 2015 and December 2019. The general frequency of crashes decreased over the five-year period, although an increase occurred in the year 2019 compared to 2018, as illustrated in Figure 12.

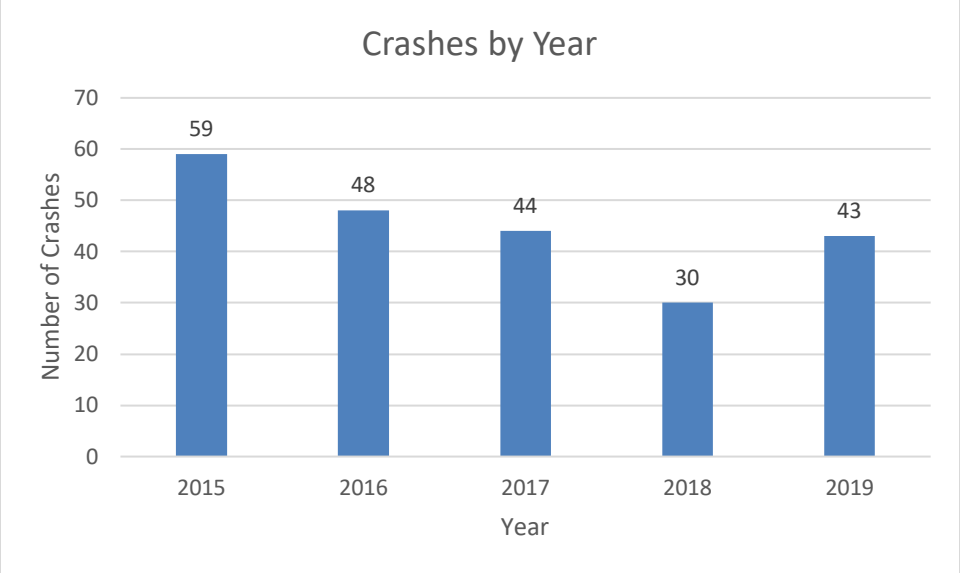


Figure 12: Crashes by Year

Crashes by Severity

There was one (1) fatal crash and fifty (50) injury crashes. Property damage only (PDO) crashes accounted for 77 percent of crashes during the five-year period as shown in Table 13.

Table 13: Crashes by Severity

Severity	2015	2016	2017	2018	2019	Total	Percent of Total
Fatality	1	0	0	0	0	1	1%
Injury	7	11	13	8	11	50	22%
PDO	51	37	31	22	32	173	77%
Total	59	48	44	30	43	224	100%

Crashes by Type

As shown in Table 14, the most frequent crash type was rear end (38 percent). There were also four (4) crashes involving pedestrians, and three (3) crashes involving bicycles. Crash types are presented graphically in Figure 13.

Table 14: Crashes by Type		
Severity	**Total**	**Percent of Total**
Angle	12	5%
Bicycle	3	1%
Head On	10	5%
Left Turn	16	7%
Off Road	11	5%
Other	29	13%
Pedestrian	4	2%
Rear End	84	38%
Right Turn	5	2%
Rollover	3	1%
Sideswipe	23	10%
Unknown	24	11%
Total	224	100.00%

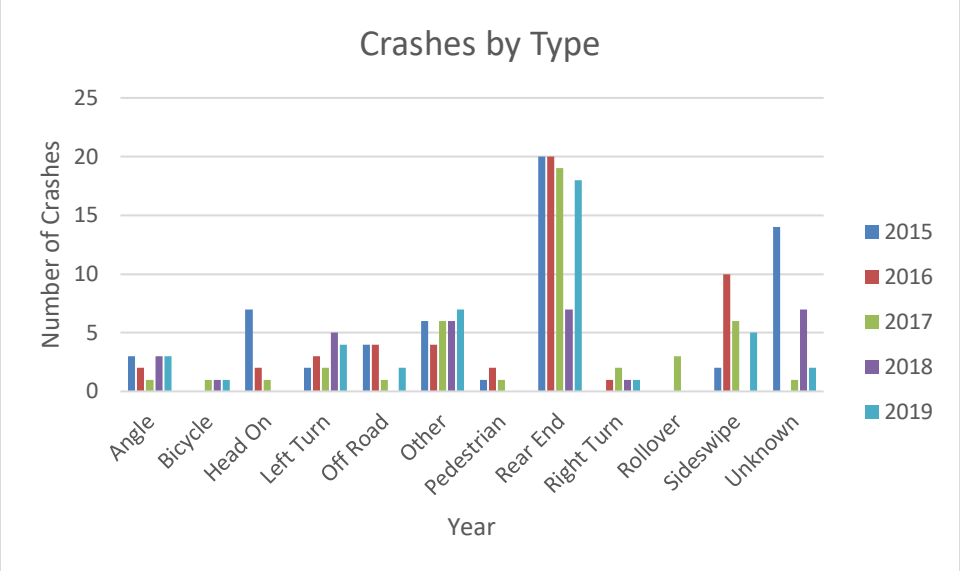


Figure 13: Crashes by Type

Crashes by Lighting Condition

Fifty-seven percent of crashes occurred during daylight conditions, as shown in Table 15. Twenty-four percent of crashes occurred during dark conditions, which is less than the statewide average for the same period (30 percent). Dark conditions include dark-lighted, dusk, dark-not lighted, and dawn.

Table 15: Crashes by Lighting Condition

Lighting Condition	2015	2016	2017	2018	2019	Total	Percent of Total
Dark - Lighted	8	8	10	6	16	48	21%
Dark - Not Lighted	0	0	1	1	0	2	1%
Dawn	2	0	0	0	0	2	1%
Daylight	15	34	31	21	27	128	57%
Dusk	1	0	1	1	0	3	1%
Other	1	0	0	0	0	1	1%
Unknown	32	6	1	1	0	40	18%
Total	59	48	44	30	43	224	100%

QUALITATIVE IMPACT ANALYSIS

Impact on Pedestrian and Bicycle Infrastructure

By removing one travel lane in each direction between Camino Real and SE Mizner Boulevard, the sidewalks are proposed to be widened from 6 feet to 10 feet. In addition, periodic planting strips that are 4 feet in width can be provided between the sidewalk and the curb. The existing conventional 4-foot bicycle lane is proposed to be repurposed into a separated bicycle lane that is 5 feet in width plus a 3-foot separator. The additional width and separation from traffic will result in improved walking and bicycling level of service conditions.

Impact on Transit Routes/Transit Stop Locations

The following Palm Tran and Broward County Transit (BCT) routes operate along US-1/Federal Highway between Camino Real and SE Mizner Boulevard:

- Palm Tran Route 1
- Palm Tran Route 94
- BCT Route 10

No re-routing of bus routes is anticipated. The bus stop boarding and alighting areas located at southbound SE 8th Street and northbound SE 7th Street will be improved as a result of this project. It is recommended to construct a raised side boarding island for bus passenger boarding and alighting to eliminate the conflict between transit users and bicyclists at bus stops. The bicycle lane should be routed between the boarding island and the sidewalk. A crosswalk across the bicycle lane should be implemented for bus passengers at the same level as the boarding island and the sidewalk, which will result in a raised (tabled) crossing from the perspective of bicyclists. The conceptual design plan is included in Appendix A.

Coordination with transit agencies will occur throughout the project.

Impact on Designated Truck Routes

US-1/Federal Highway between Camino Real and SE Mizner Boulevard is a designated truck route. No modifications to turning radii at intersections are being proposed. The width of the

interior travel lane is proposed to be narrowed from 11 feet to 10 feet, however the exterior lane will remain at a width of 11 feet.

Impact on Emergency Response

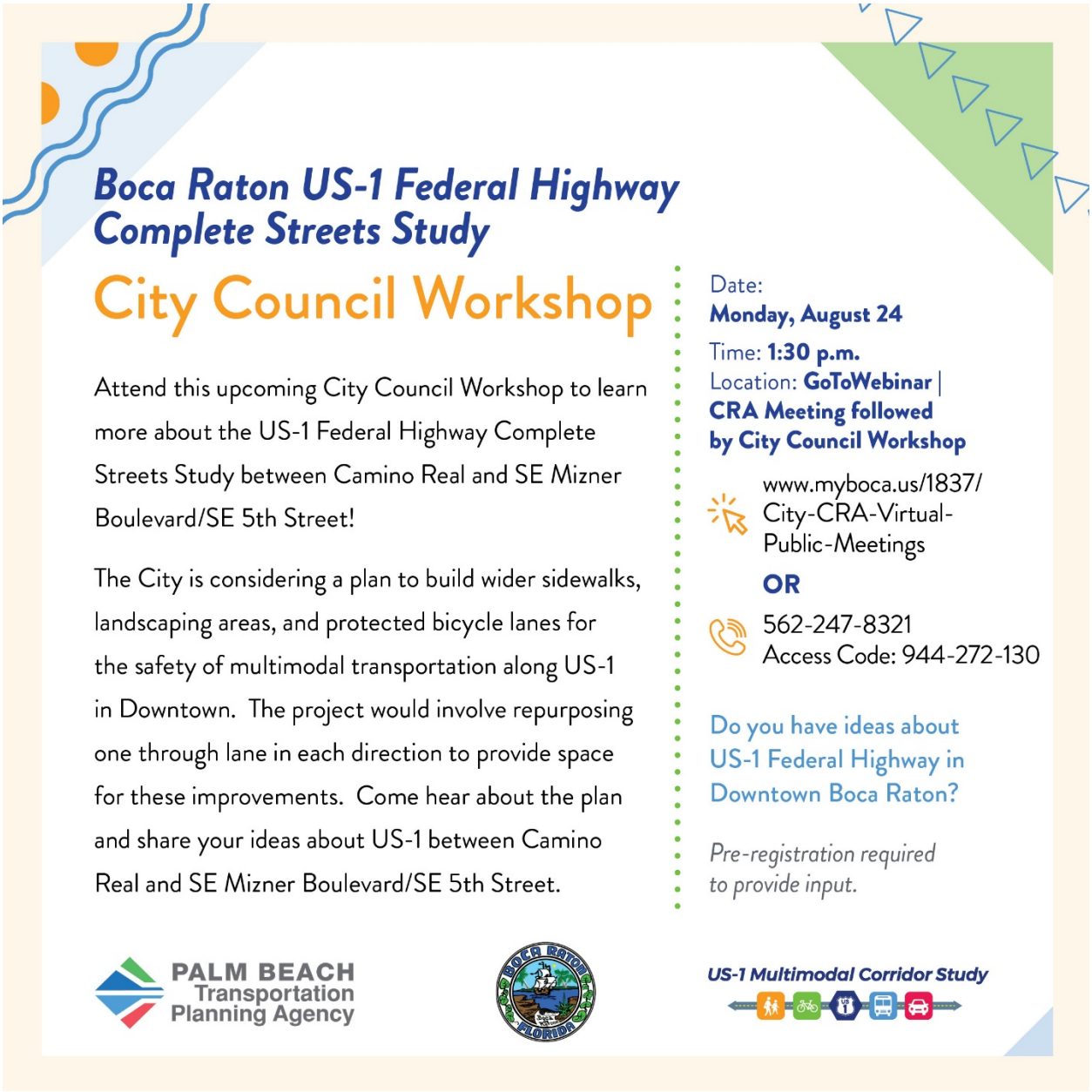
Impacts on emergency responders are anticipated to be minimal as no emergency services are located within the lane repurposing impact zone. Once the project is implemented, multiple lanes per direction will be available on US-1/Federal Highway for motorists to get out of the way of emergency response vehicles. Coordination with emergency responders will occur throughout the project.

Impact on Evacuation Routes

US-1/Federal Highway is a designated evacuation route. However, impacts on emergency evacuation are considered to be negligible because the proposed lane repurposing typical section between Camino Real and SE Mizner Boulevard matches the existing laneage north of SE Mizner Boulevard. Therefore, no additional bottleneck will be created for motorists choosing to evacuate on US-1/Federal Highway.

WORKSHOP

The City of Boca Raton conducted a publicly advertised workshop on August 24, 2020, which was held as a Council Workshop. The City conducted the workshop using an online virtual meeting platform due to COVID-19 meeting restrictions. Both the City and the Palm Beach TPA conducted advertising in advance of the workshop. An e-flyer was developed and distributed to advertise the workshop online and through social media, which included a clickable link directly to the registration page.



The workshop included a presentation from the project team on the US-1 Federal Highway Complete Streets Study, discussion by Council members, and a public comment period. The project team responded to questions. Two comments were received – one supporting the lane repurposing from someone whose opinion is that the project should be implemented since it will provide more and safer multimodal options and one opposing the lane repurposing from someone whose opinion is that the project should not be implemented due to additional traffic congestion.

The presentation included background information, the current FDOT Work Program information for FM# 438386-5 showing preliminary engineering funds in FY 2024 and FY 2025, examples of proposed multimodal improvements, existing-and-proposed typical sections, conceptual design plan views, and the results of the lane repurposing traffic study. There were 62 attendees at the workshop. The presentation slides are included in Appendix I.

The City Council passed Resolution 123-2020 on Tuesday, August 25, 2020, supporting the lane reduction from 6 lanes to 4 lanes between Camino Real to SE Mizner Boulevard. The resolution of support is included in Appendix J.

CONCEPTUAL FUNDING PLAN

The project is a Palm Beach Transportation Planning Agency (TPA) priority project for fiscal years (FY) 2021 through 2025. The design of the project is being funded through District Dedicated Revenue (DDR), District In-House (DIH), and Surface Transportation Program (SU) funds. No funding has currently been programmed for the construction of the proposed lane repurposing project. As a TPA priority project on the state highway system, construction is expected to be funded with a combination of state funds DDR, State Primary Highways (DS), and Public Transit Office (DPTO). The use of these state funds is compatible with the TPA's adopted Long Range Transportation Plan (LRTP), as this project would fall under the State Roadway Modifications Program identified in the LRTP for funding from these sources.

CONTEXT CLASSIFICATION

The systemwide provisional context classification (SPCC) throughout the limits of this project is C5-Urban Center. It is anticipated that a PLCC of C5-Urban Center will be assigned for this project due to the distinguishing characteristics of the area as the civic and economic center of Boca Raton, average block perimeters < 2,500 feet, average block length < 500 feet, the prevalence of shallow (< 20 feet) setbacks, and dense mixed-use development including retail, residential, and office. The context classification supports the proposed 35 mph design speed and the use of 10-foot inside travel lanes, although a design variation may be required for 10-foot inside travel lanes due to designation as a truck route.

CONCLUSION

The City of Boca Raton desires to proceed with the recommendations of the US-1 Multimodal Corridor Study adopted by the Palm Beach Transportation Planning Agency (TPA) in May 2018 along US-1/Federal Highway in the downtown area. Currently, US-1/Federal Highway is a 6-lane divided roadway between Camino Real and SE Mizner Boulevard, and a 4-lane divided roadway north of SE Mizner Boulevard. The recommendations of the US-1 Multimodal Corridor Study include a 0.3-mile lane repurposing, which proposes to shift the 6-lane to 4-lane transition on US-1/Federal Highway from Camino Real to SE Mizner Boulevard for the purpose of implementing enhanced multimodal facilities.

This study evaluates the impact of repurposing one (1) northbound and one (1) southbound lane on US-1/Federal Highway for the 0.3-mile section on US-1/Federal Highway from Camino Real to SE Mizner Boulevard.

A diversion analysis was conducted using SERPM 8.501 to compare the "build" future year 2040 conditions with lane repurposing conditions in place to the "no-build" future year 2040 conditions. The results show that approximately 4,500 daily trips are expected to divert from US-1/Federal Highway to other routes in the year 2040, which corresponds to 11 percent (11%) of the future 2040 no-build traffic volumes.

The results of the roadway segment capacity analysis indicate that implementing lane repurposing measures along the US-1/Federal Highway corridor between Camino Real and SE Mizner Boulevard will result in acceptable level of service (LOS) for all segments analyzed in both the daily and peak hour periods. Although there is an expected increase in traffic volumes along S Dixie Highway from motorists choosing to divert, the roadway segment analysis determined that S Dixie Highway has ample capacity to receive these diverted trips without changing the acceptable level of service performance.

The peak period intersection capacity analyses show the study intersections are expected to operate at LOS E or better during the A.M. and P.M. peak hours under all analysis conditions with the exception of the following:

- The signalized intersection of US-1/Federal Highway and Camino Real is expected to operate at LOS F under future 2040 build conditions during the P.M. peak hour.

Signal timing optimization was utilized to improve intersection operations to LOS E at the intersection of S Dixie Highway and Camino Real under long-term future 2040 build conditions during the A.M. peak hour, the intersection of S Dixie Highway and Palmetto Park Road during the A.M. peak hour, and the intersection of US-1/Federal Highway and Camino Real during the A.M. peak hour.

The study offers the following additional recommendations to improve pedestrian, bicycle, and motor vehicle conditions as a result of implementing the US-1 lane repurposing from Camino Real to SE Mizner Boulevard:

- Provide a second northbound-to-westbound left turn lane at Camino Real (dual left turn lanes) to accommodate diverting traffic and to lengthen the green time for the southbound US-1 movement. This can be accomplished by converting the northbound through lane that must be dropped for the lane repurposing into a second left-turn lane.
- Construct a raised side boarding island for bus passenger boarding and alighting to eliminate the conflict between transit users and bicyclists at bus stops.

It should be noted that the resulting lane deflection at the south end of the lane repurposing section through the Camino Real intersection meets FDOT design criteria for deflection angle on a 35 mph design speed roadway. The design transition at the north end of the lane repurposing section through the SE 5th Street intersection ties into the existing conditions before the intersection. Therefore, the change in deflection angle compared to the existing conditions will be minimal and also meets FDOT design criteria for deflection angle on a 35 mph design speed roadway.

The City Council passed Resolution 123-2020 on Tuesday, August 25, 2020, supporting the lane reduction from 6 lanes to 4 lanes between Camino Real to SE Mizner Boulevard. The resolution of support is included in Appendix J.

The City of Boca Raton and Palm Beach TPA are in coordination with Palm Beach County. A meeting was held on March 5, 2021, to discuss the lane repurposing application. In attendance from Palm Beach County were the County Engineer, Deputy County Engineer, Director of the Traffic Division, Traffic Engineering Operations Engineer, and Roadway Division Director. The project team addressed several questions related to traffic flow, level of service, and roadway design. The County representatives did not express opposition to the project.

Landscaping would not be part of the funding for the lane repurposing project and would have to be installed by the City via permit after the project. If approved, a funding and maintenance commitment is needed for any special sidewalk material such as porous pave or porous rubber ADA-compliant tree wells.

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