APPENDIX K

TRANSPORTATION ANALYSIS

URBAN | CROSSROADS

MCDONALD'S – 2109 E SANTA CLARA AVENUE

TRAFFIC ANALYSIS
DP NO. 2022-06
2109 E SANTA CLARA AVENUE, SANTA ANA, CA 92705

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Reference Number	Agency	Date
15173-02 TA Report REV	City of Santa Ana	January 4, 2023 (Revised: August 16, 2023)

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LIST OF ABBREVIATED TERMS

(1)	Reference
ADT	Average Daily Traffic
CAMUTCD	California Manual on Uniform Traffic Control Devices
Caltrans	California Department of Transportation
CEQA	California Environmental Quality Act
CMP	Congestion Management Program
DIF	Development Impact Fee
E+P	Existing plus Project
HCM	Highway Capacity Manual
ICU	Intersection Capacity Utilization
ITE	Institute of Transportation Engineers
LOS	Level of Service
MUTCD	Manual on Uniform Traffic Control Devices
NP	No/Without Project
OCTA	Orange County Transportation Authority
OCTAM	Orange County Transportation Analysis Model
OPR	Office of Planning and Research
PHF	Peak Hour Factor
Project	McDonald's – 2109 E Santa Clara Avenue
sf	Square Feet
SHS	State Highway System
TA	Traffic Analysis
WP	With Project
v/c	Volume to Capacity
VMT	Vehicle Miles Traveled
vphgpl	Vehicles per Hour Green per Lane

1 INTRODUCTION

This report presents the results of the Traffic Analysis (TA) for McDonald's – 2109 E Santa Clara Avenue development ("Project"), which is located at 2109 E Santa Clara Avenue in the City of Santa Ana, as shown on Exhibit 1-1. The purpose of this TA is to evaluate the potential circulation system deficiencies that may result from the development of the proposed Project, and where necessary recommend improvements to achieve acceptable operations consistent with the City's General Plan level of service goals and policies. This TA has been prepared in accordance with the City of Santa Ana's adopted City of Santa Ana Traffic Impact Study Guidelines (2019) and through consultation with City of Santa Ana staff during the scoping process. (1) The Project traffic study scoping agreement is provided in Appendix 1.1 of this TA, which has been reviewed by the City of Santa Ana.

1.1 SUMMARY OF FINDINGS

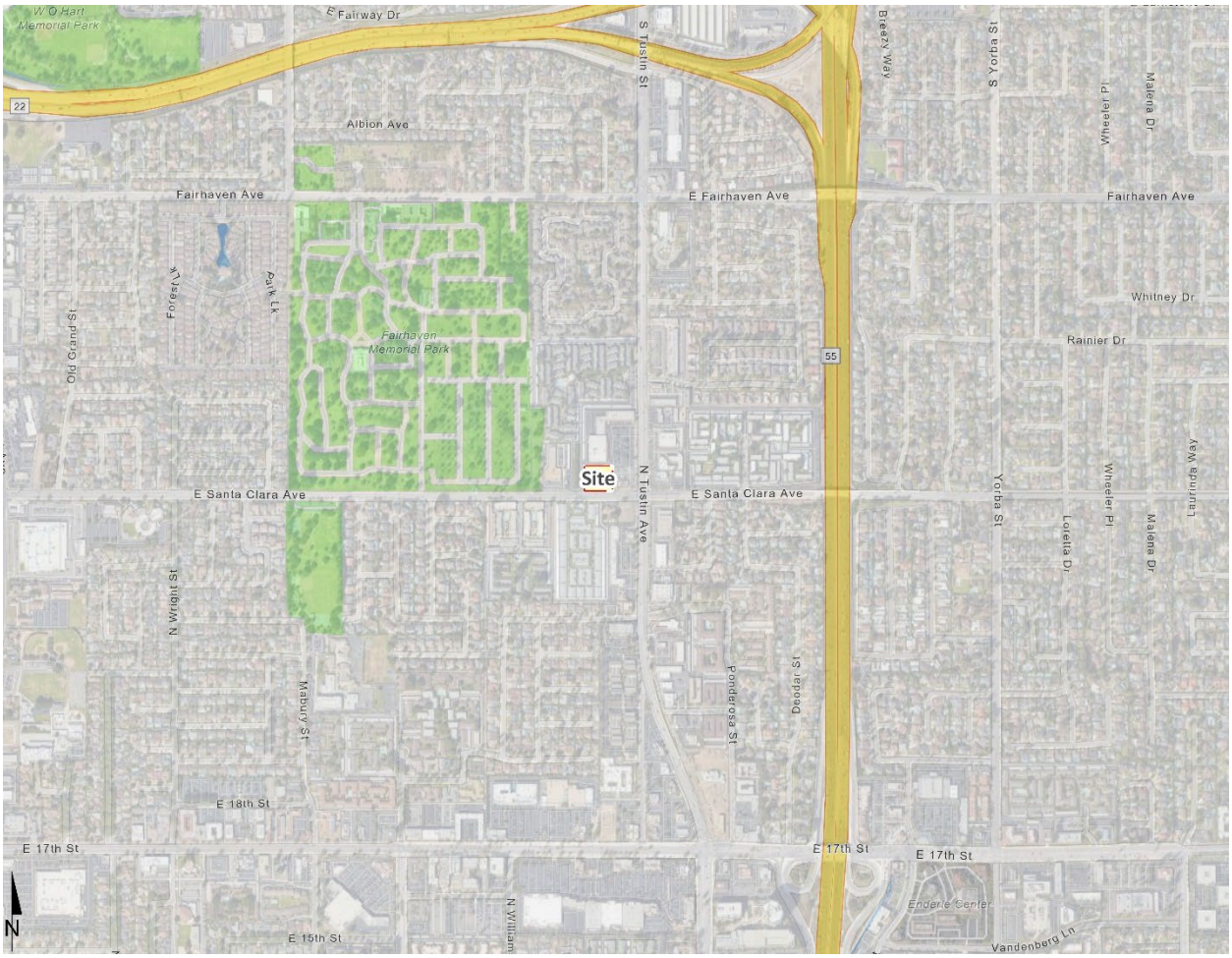
The Project is to construct the following improvements as design features in conjunction with development of the site:

- Project to maintain existing traffic controls and configuration at Project driveways. On-site traffic signing and striping should be implemented agreeable with the provisions of the California Manual on Uniform Traffic Control Devices (CA MUTCD) and in conjunction with detailed construction plans for the Project site.

Additional details and intersection lane geometrics are provided in Section 1.6 *Recommendations* of this report. The Project Applicant's responsibility for the Project's contributions towards deficient off-site intersections is fulfilled through payment into pre-existing fee programs (if applicable) that would be assigned to the future construction of any future local/regional improvement needs. The Project Applicant would be required to pay requisite fees consistent with the City's requirements (see Section 9 *Local and Regional Funding Mechanisms*).

The drive-thru analysis suggests that the Project provides stacking accommodations for approximately 16 vehicles within the drive-thru. Our evaluation indicates that the proposed drive-thru lane will provide sufficient capacity to accommodate average and peak vehicle demands for the proposed Project. Additional details on the drive-thru analysis are provided in Section 8 *Drive-thru Evaluation*.

EXHIBIT 1-1: LOCATION MAP



1.2 PROJECT OVERVIEW

The proposed Project consists of developing a 3,975 square foot (SF) McDonald's restaurant with a drive-thru window. The drive-through restaurant will be accommodated by redeveloping the existing residential uses. The Project is proposed to utilize two existing driveways: one on Tustin Avenue and one on Santa Clara Avenue. A preliminary site plan of which the traffic study will be based on is shown on Exhibit 1-2.

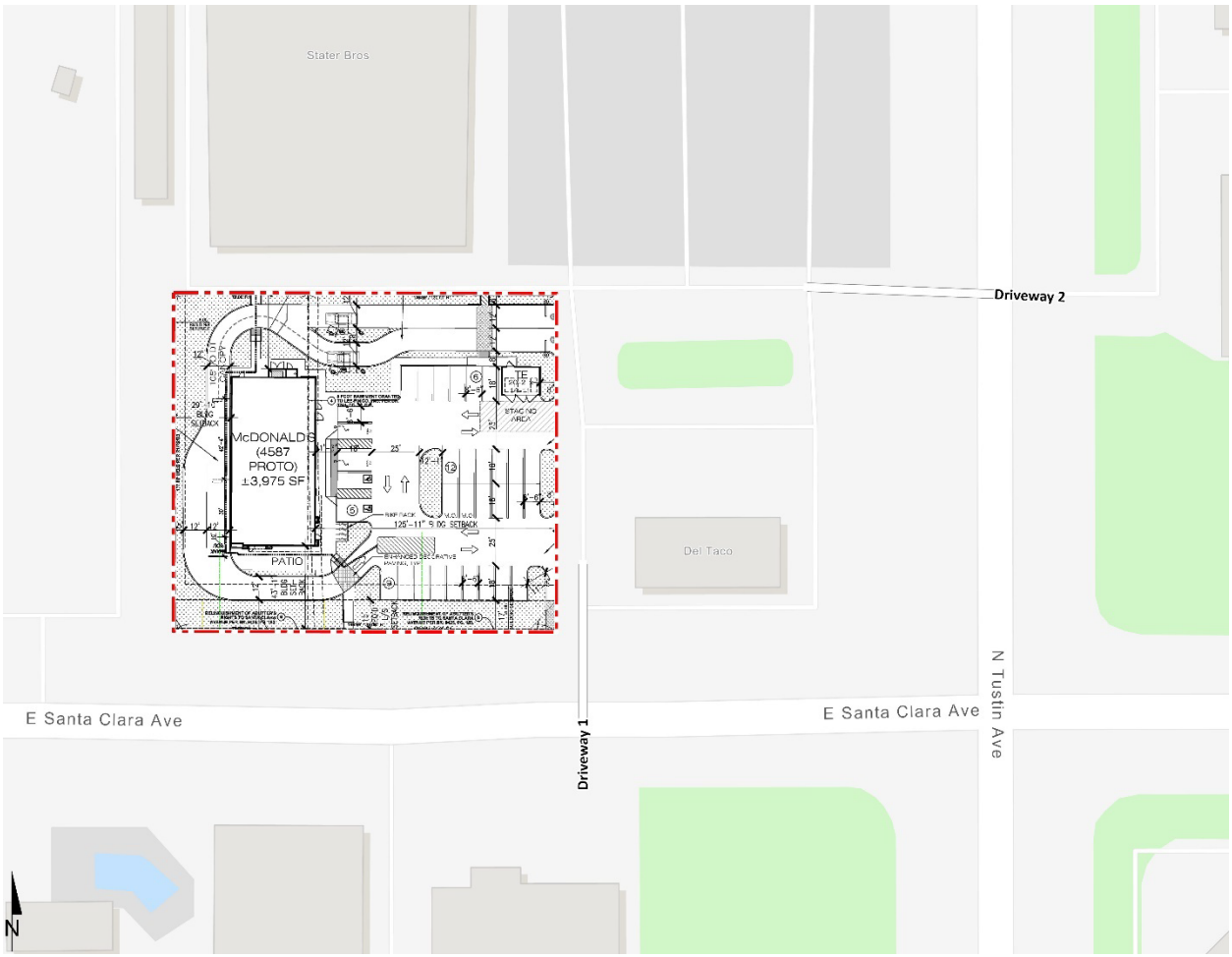
In order to develop the traffic characteristics of the proposed project, trip-generation statistics published in the Institute of Transportation Engineers (ITE) Trip Generation Manual (11th Edition, 2021). (2) The Project is anticipated to generate a net total of 930 two-way trips per day with 89 AM peak hour trips and 67 PM peak hour trips. The assumptions and methods used to estimate the Project's trip generation characteristics are discussed in greater detail in Section 4.1 *Project Trip Generation* of this report.

1.3 ANALYSIS SCENARIOS

For the purposes of this traffic study, potential deficiencies to traffic and circulation have been assessed for each of the following conditions:

- Existing (2022)
- Existing plus Project (E+P)
- Opening Year Cumulative (2023) Without Project
- Opening Year Cumulative (2023) With Project
- Horizon Year (2040) Without Project
- Horizon Year (2040) With Project

EXHIBIT 1-2: PRELIMINARY SITE PLAN



1.3.1 EXISTING (2022) CONDITIONS

Information for Existing (2022) conditions is disclosed to represent the baseline traffic conditions as they existed at the time this report was prepared. For a detailed discussion on the existing traffic counts, see Section 3.5 *Existing Traffic Counts*.

1.3.2 EXISING PLUS PROJECT CONDITIONS

The Existing plus Project (E+P) conditions analysis determines the potential circulation system deficiencies based on a comparison of the E+P traffic conditions to Existing conditions. The roadway network is similar to Existing conditions except for new connections to be constructed by the Project. Cumulative development projects and ambient growth are not included for E+P traffic conditions.

1.3.3 OPENING YEAR CUMULATIVE (2023) CONDITIONS

The Opening Year Cumulative (2023) traffic conditions analysis determines the potential near-term cumulative circulation system deficiencies. The roadway network is similar to Existing conditions except for new connections to be constructed by the Project. To account for background traffic growth, an ambient growth factor from Existing (2022) conditions of 1.0% (1 percent per year over 1 year) is included for Opening Year Cumulative (2023) traffic conditions. Conservatively, this TA estimates the area ambient traffic growth and then adds traffic generated by other known or probable related projects. These related projects are at least in part already accounted for in the assumed ambient growth rates; and some of these related projects may not be implemented and operational within the 2023 Opening Year time frame assumed for the Project. The resulting traffic growth utilized in the TA (ambient growth factor plus traffic generated by related projects) would therefore tend to overstate rather than understate background cumulative traffic deficiencies under 2023 traffic conditions.

1.3.4 HORIZON YEAR (2040) CONDITIONS

Traffic projections for Horizon Year (2040) conditions were derived from the Orange County Transportation Analysis Model (OCTAM) using accepted procedures for model forecast refinement and smoothing. The Horizon Year conditions analysis will be utilized to determine if improvements funded through regional transportation mitigation fee programs can accommodate the long-range cumulative traffic at the target Level of Service (LOS) identified in the City of Santa Ana (lead agency) General Plan. Each of the applicable transportation fee programs are discussed in more detail in Section 9 *Local and Regional Funding Mechanisms*.

1.4 STUDY AREA

To ensure that this TA satisfies the City of Santa Ana's traffic study requirements, Urban Crossroads, Inc. prepared a Project traffic study scoping package for review by City of Santa Ana staff prior to the preparation of this report. This agreement provides an outline of the Project study area, trip generation, trip distribution, and analysis methodology. The agreement provided to the City is included in Appendix 1.1 of this TA.

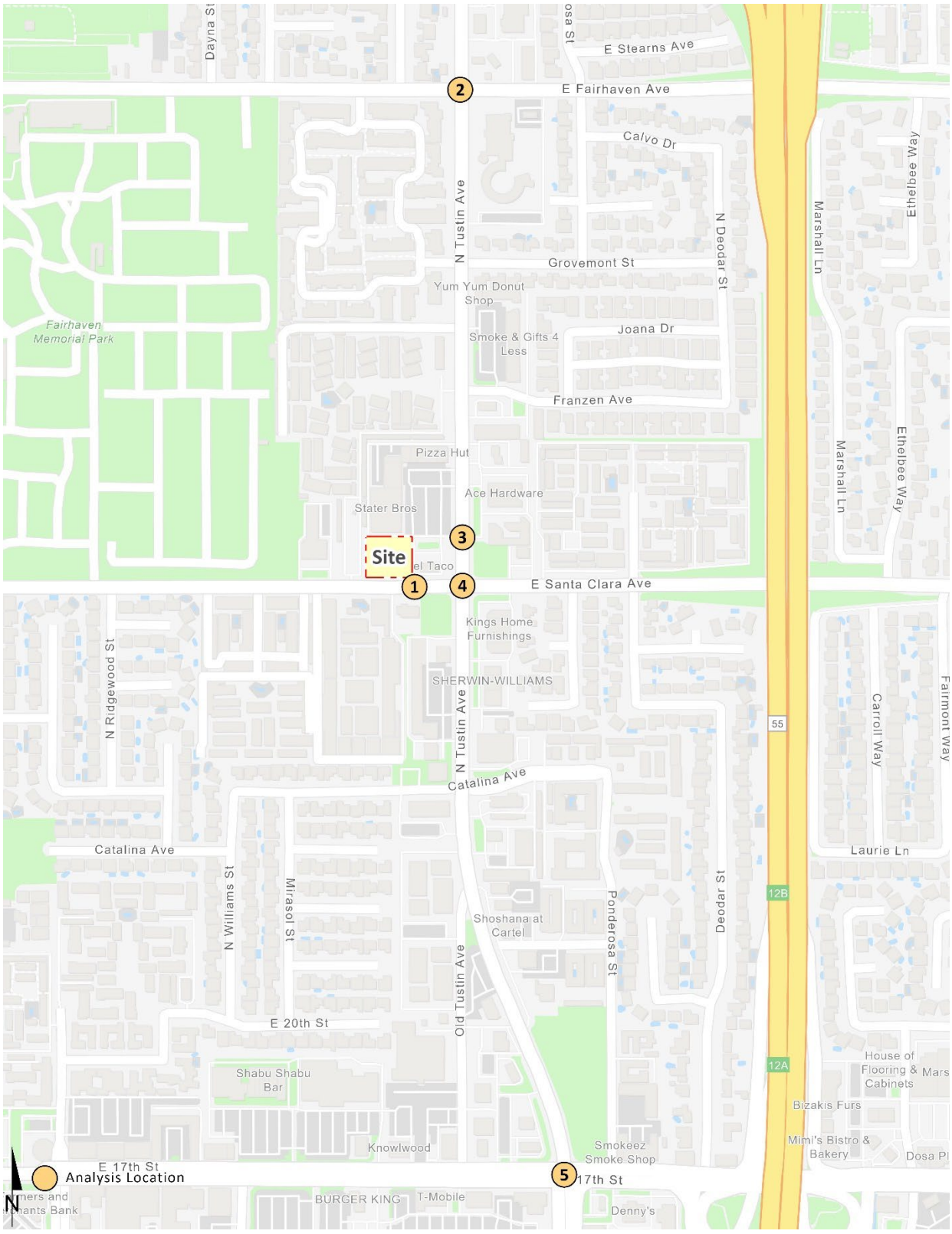
The 5 study area intersections shown on Exhibit 1-3 and listed in Table 1-1 were selected for evaluation in this TA based on consultation with City of Santa Ana staff. At a minimum, the study area includes intersections where the Project is anticipated to contribute 50 or more peak hour trips per the City's Guidelines. (1) The "50 peak hour trip" criterion represents a minimum number of trips at which a typical intersection would have the potential to be affected by a given development proposal. The 50 peak hour trip criterion is a traffic engineering rule of thumb that is accepted and used throughout the City for the purposes of estimating a potential area of influence (i.e., study area). Additional study area intersections were requested by the City of Santa Ana to be included with this traffic study.

TABLE 1-1: INTERSECTION ANALYSIS LOCATIONS

#	Intersection	Jurisdiction	Signalized?
1	Driveway 1 & Santa Clara Av.	Santa Ana	No
2	Tustin Av. & Fairhaven Av.*	Santa Ana, Orange	Yes
3	Tustin Av. & Driveway 2	Santa Ana	No
4	Tustin Av. & Santa Clara Av.*	Santa Ana	Yes
5	Tustin Av. & 17th St.*	Santa Ana	Yes

* Requested by the City of Santa Ana

EXHIBIT 1-3: STUDY AREA



1.5 DEFICIENCIES

This section provides a summary of deficiencies by analysis scenario. Section 2 *Methodologies* provides information on the methodologies used in the analysis and Section 5 *E+P Traffic Conditions*, Section 6 *Opening Year Cumulative (2023) Traffic Conditions* and Section 7 *Horizon Year (2040) Traffic Conditions* include the detailed analysis. A summary of level of service (LOS) results for all analysis scenarios is presented on Table 1-2.

1.5.1 EXISTING (2022) CONDITIONS

The study area intersections are currently operating at an acceptable LOS during the peak hours with exception of the following study area intersection:

- Tustin Av. & Driveway 2 (#3) – LOS E AM peak hour only

1.5.2 E+P CONDITIONS

No additional study area intersections are anticipated to operate at an unacceptable LOS for E+P traffic conditions, consistent with Existing traffic conditions. The addition of Project traffic would not trigger the City of Santa Ana's significance criteria.

1.5.3 OPENING YEAR CUMULATIVE (2023) CONDITIONS

The following study area intersections are anticipated to operate at an unacceptable LOS under Opening Year Cumulative (2023) Without Project traffic conditions, consistent with Existing and E+P traffic conditions:

- Tustin Av. & Driveway 2 (#3) – LOS E AM peak hour

With the addition of Project traffic, no additional study area intersections are anticipated to operate at an unacceptable LOS for Opening Year Cumulative (2023) With Project traffic conditions. The addition of Project traffic would not trigger the City of Santa Ana's significance criteria.

1.5.4 HORIZON YEAR (2040) CONDITIONS

The following study area intersections are anticipated to operate at an unacceptable LOS under Horizon Year (2040) Without Project traffic conditions:

- Tustin Av. & Fairhaven Av. (#2) – LOS F AM peak hour
- Tustin Av. & Driveway 2 (#3) – LOS F AM peak hour
- Tustin Av. & Santa Clara Av. (#4) – LOS F AM peak hour
- Tustin Av. & 17th St. (#5) – LOS F AM peak hour

With the addition of Project traffic, no additional study area intersections are anticipated to operate at an unacceptable LOS for Horizon Year (2040) With Project traffic conditions. The addition of Project traffic would trigger the City of Santa Ana's significance criteria for the following intersection:

- Tustin Av. & Santa Clara Av. (#4) – the project increases traffic demand at the study intersection by 1% of capacity (ICU increase is greater than 0.010

TABLE 1-2: SUMMARY OF LOS

		Existing		E+P		2023 Without Project		2023 With Project		2040 Without Project		2040 With Project	
#	Intersection	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
1	Driveway 1 & Santa Clara Av.	A - D	A - D	A - D	A - D	A - D	A - D	A - D	A - D	A - D	A - D	A - D	A - D
2	Tustin Av. & Fairhaven Av.	A - D	A - D	A - D	A - D	A - D	A - D	A - D	A - D	F	A - D	F	A - D
3	Tustin Av. & Driveway 2	E	A - D	F	A - D	E	A - D	F	A - D	F	A - D	F	A - D
4	Tustin Av. & Santa Clara Av.	A - D	A - D	A - D	A - D	A - D	A - D	A - D	A - D	F	A - D	F	A - D
5	Tustin Av. & 17th St.	A - D	A - D	A - D	A - D	A - D	A - D	A - D	A - D	F	A - D	F	A - D

A - D = A - D E = E F = F

1.6 RECOMMENDATIONS

1.6.1 SITE ACCESS RECOMMENDATIONS

Project to maintain existing traffic controls and configuration at Project driveways. On-site traffic signing and striping should be implemented agreeable with the provisions of the California Manual on Uniform Traffic Control Devices (CA MUTCD) and in conjunction with detailed construction plans for the Project site.

1.6.2 OFF-SITE RECOMMENDATIONS

The improvements needed to address the cumulative deficiencies identified under Horizon Year (2040) traffic conditions for With Project conditions are summarized in Table 1-3. For those improvements listed in Table 1-3 not constructed as part of the Project, the Project Applicant's responsibility for the Project's contributions towards deficient intersections is fulfilled through payment of fair share and/or fees for the applicable pre-existing fee programs (see Section 9 *Local and Regional Funding Mechanisms)*.

TABLE 1-3: SUMMARY OF IMPROVEMENTS

#	Intersection	Jurisdiction	Existing	E+P	2023 With Project	2040 With Project	Improvements in DIF?[1]	Project Responsibility[2]	Project Fair Share[4]
4	Tustin Av. & Santa Clara Av.	Santa Ana	- None	- None	- None	- Add 2nd NB left turn lane	No	Fair Share	4.5%

[1] Improvements included in City of Santa Ana CIP projects

[2] Identifies the Project's responsibility to construct an improvement or contribute fair share towards the implementation of the improvements shown.

[3] Program improvements constructed by project may be eligible for fee credit, at discretion of the City. See Table 8-1 for Fair Share Calculations.

1.7 QUEUING ANALYSIS

The traffic modeling and signal timing optimization software package SimTraffic has been utilized to assess the queues. SimTraffic is designed to model networks of signalized and unsignalized intersections, with the primary purpose of checking and fine-tuning signal operations. SimTraffic uses the input parameters from Synchro to generate random simulations. These random simulations generated by SimTraffic have been utilized to determine the 95th percentile queue lengths observed for each applicable turn lane. A SimTraffic simulation has been recorded up to 5 times, during the weekday AM and weekday PM peak hours, and has been seeded for 15-minute periods with 60-minute recording intervals. The results of the queuing analysis worksheets for the weekday AM and PM peak hours are provided in Appendix 1.2 of this report for Horizon Year (2040) traffic conditions.

TABLE 1-4: QUEUING ANALYSIS FOR HORIZON YEAR (2040) CONDITIONS WITH PROJECT

#	Intersection	Movement	Available Stacking Distance (Feet)[2]	2040 WP 95th % Queue (Feet) AM Peak	2040 WP 95th % Queue (Feet) PM Peak	Acceptable?[1] AM	Acceptable?[1] PM
1	Driveway 1 & Santa Clara Av.	EBL	**230**	111	57	Yes	Yes

[1] Stacking Distance is acceptable if the required stacking distance is less than or equal to the stacking distance provided.

[2] An additional 15 feet of stacking which is assumed to be provided in the transition for turn pockets is reflected in the stacking distance shown on this table.

2 METHODOLOGIES

This section of the report presents the methodologies used to perform the traffic analyses summarized in this report. The methodologies described are consistent with City of Santa Ana's and City of Orange's Guidelines. (1) (3)

2.1 LEVEL OF SERVICE

Traffic operations of roadway facilities are described using the term "Level of Service" (LOS). LOS is a qualitative description of traffic flow based on several factors, such as speed, travel time, delay, and freedom to maneuver. Six levels are typically defined ranging from LOS A, representing completely free-flow conditions, to LOS F, representing breakdown in flow resulting in stop-and-go conditions. LOS E represents operations at or near capacity, an unstable level where vehicles are operating with the minimum spacing for maintaining uniform flow.

2.2 INTERSECTION CAPACITY ANALYSIS

The definitions of LOS for interrupted traffic flow (flow restrained by the existence of traffic signals and other traffic control devices) differ slightly depending on the type of traffic control. The LOS is typically dependent on the quality of traffic flow at the intersections along a roadway. The 6th Edition Highway Capacity Manual (HCM) methodology expresses the LOS at an intersection in terms of delay time for the various intersection approaches. (4) The HCM uses different procedures depending on the type of intersection control. In comparison, the Intersection Capacity Utilization (ICU) methodology expresses the LOS at a signalized intersection in terms of volume-to-capacity ratio (v/c). (5)

2.2.1 SIGNALIZED INTERSECTIONS

The City of Santa Ana and City of Orange requires signalized intersection operations analysis based on the methodology described in the ICU for signalized intersections and HCM for unsignalized intersections. (4) (5) ICU LOS operations are based on an intersection's intersection capacity per the ICU methodology. Signalized intersections located within the City of Santa Ana have been analyzed using Traffix (Version 8). The ICU methodology is utilized at signalized intersections only. A minimum clearance interval of 0.05 in association with lane capacities of 1,600 vehicles per hour of green time for turn lanes and 1,700 vehicles per hour of green time for through lanes were assumed for the ICU calculations.

TABLE 2-1: SIGNALIZED INTERSECTION LOS THRESHOLDS FOR ICU

Description	ICU	Level of Service [1]
Little or no capacity deficiencies.	< 0.60	A
Short-term capacity deficiencies.	0.61 – 0.70	B
Average capacity deficiencies.	0.71 – 0.80	C
Long-term capacity deficiencies.	0.81 – 0.90	D
Very high capacity deficiencies.	0.91 – 1.00	E
Extremely high capacity deficiencies, with intersection capacity exceeded.	> 1.00	F

[1] Source: County of Orange CMP, ICU Methodology

2.2.2 UNSIGNALIZED INTERSECTIONS

The City of Santa Ana requires the operations of unsignalized intersections be evaluated using the methodology described in the HCM. (4) The LOS rating is based on the weighted average control delay expressed in seconds per vehicle (see Table 2-2). At two-way or side-street stop-controlled intersections, LOS is calculated for each controlled movement and for the left turn movement from the major street, as well as for the intersection as a whole. For approaches composed of a single lane, the delay is computed as the average of all movements in that lane. Delay for the intersection is reported for the worst individual movement at a two-way stop-controlled intersection. For all-way stop controlled intersections, LOS is computed for the intersection as a whole (average delay).

TABLE 2-2: UNSIGNALIZED INTERSECTION LOS THRESHOLDS

Description	Average Control Delay (Seconds), V/C ≤ 1.0	Level of Service, V/C ≤ 1.0[1]
Little or no delays.	0 to 10.00	A
Short traffic delays.	10.01 to 15.00	B
Average traffic delays.	15.01 to 25.00	C
Long traffic delays.	25.01 to 35.00	D
Very long traffic delays.	35.01 to 50.00	E
Extreme traffic delays with intersection capacity exceeded.	> 50.00	F

Source: HCM, 6th Edition

[1] If V/C is greater than 1.0 then LOS is F per HCM.

2.3 TRAFFIC SIGNAL WARRANT ANALYSIS METHODOLOGY

The term "signal warrants" refers to the list of established criteria used by Caltrans and other public agencies to quantitatively justify or determine the potential need for installation of a traffic signal at an otherwise unsignalized intersection. This TA uses the signal warrant criteria presented in the latest edition of the Caltrans California Manual on Uniform Traffic Control Devices (CA MUTCD). (6)

The signal warrant criteria for Existing study area intersections are based upon several factors, including volume of vehicular and pedestrian traffic, frequency of accidents, and location of school areas. The CA MUTCD indicates that the installation of a traffic signal should be considered if one or more of the signal warrants are met. (6) Specifically, this TA utilizes the Peak Hour Volume-based Warrant 3 as the appropriate representative traffic signal warrant analysis for existing traffic conditions and for all future analysis scenarios for existing unsignalized intersections. Warrant 3 is appropriate to use for this TA because it provides specialized warrant criteria for intersections with urban characteristics. For the purposes of this study, the speed limit was the basis for determining whether Urban or Rural warrants were used for a given intersection. Urban warrants have been used as posted speed limits on the major roadways with unsignalized intersections are over 40 miles per hour while urban warrants have been used where speeds are 40 miles per hour or below. Traffic signal warrant analyses were performed for the following study area intersection shown on Table 2-3:

TABLE 2-3: TRAFFIC SIGNAL WARRANT ANALYSIS LOCATIONS

#	Intersections	Jursidiction
1	Driveway 1 & Santa Clara Av.	Santa Ana
3	Tustin Av. & Driveway 2	Santa Ana

The Existing conditions traffic signal warrant analysis is presented in the subsequent section, Section 3 *Area Conditions* of this report. The traffic signal warrant analyses for future conditions are presented in Section 5 *E+P Traffic Conditions*, Section 6 *Opening Year Cumulative (2023) Traffic Conditions,* and Section 7 *Horizon Year (2040) Traffic Conditions* of this report. It is important to note that a signal warrant defines the minimum condition under which the installation of a traffic signal might be warranted. Meeting this threshold condition does not require that a traffic control signal be installed at a particular location, but rather, that other traffic factors and conditions be evaluated in order to determine whether the signal is truly justified. It should also be noted that signal warrants do not necessarily correlate with LOS. An intersection may satisfy a signal warrant condition and operate at or above acceptable LOS or operate below acceptable LOS and not meet a signal warrant.

2.4 MINIMUM ACCEPTABLE LEVELS OF SERVICE (LOS)

Minimum Acceptable LOS and associated definitions of intersection deficiencies has been obtained from each of the applicable surrounding jurisdictions.

CITY OF SANTA ANA

Per the City's guidelines, the City of Santa Ana adopted LOS "D" as the maximum threshold of significance at all intersections and mid-block locations.

CITY OF ORANGE

Per the City of Orange's General Plan Circulation Element and Growth Management Element requirements, a volume/capacity (V/C) ratio of 0.90 (LOS D) shall be the lowest acceptable Service Level at intersections following implementation of roadway improvements. Improvements required to bring intersections and roadway segments to the acceptable service levels must be identified. In order

to maintain LOS D at intersections, arterial highway links should be maintained at LOS C or better. An intersection will be deemed deficient and require improvements to achieve an acceptable LOS when the LOS is E or F (Final V/C Ratio>0.90) and the project-related increase in V/C is equal to or greater than 0.010.

2.5 DEFICIENCY CRITERIA

This section outlines the methodology used in this analysis related to identifying circulation system deficiencies.

CITY OF SANTA ANA

A transportation impact on an intersection shall be deemed "significant" in accordance with the following table:

- The peak hour Level of Service (LOS) exceeds the maximum City threshold. The City of Santa Ana considers LOS D to be the minimum acceptable LOS for all intersections, except for those locations located within the City's defined major development areas, where LOS E is considered acceptable.
- The project increases traffic demand at the study intersection by 1% of capacity (ICU increase ≥ 0.010).
- At unsignalized intersections, an impact is considered to be significant if the project causes an intersection at LOS D or better to degrade to LOS E or F and the traffic signal warrant analysis determines that a signal is justified.

CITY OF ORANGE

An intersection will be deemed deficient and require improvements to achieve an acceptable LOS when the LOS is E or F (Final V/C Ratio>0.90) and the project-related increase in V/C is equal to or greater than 0.010.

3 AREA CONDITIONS

This section provides a summary of the existing circulation network, the City of Santa Ana General Plan Mobility Element, and a review of existing peak hour intersection operations and traffic signal warrant analyses.

3.1 EXISTING CIRCULATION NETWORK

Pursuant to the scoping agreement with City of Santa Ana staff (Appendix 1.1), the study area includes a total of 5 existing intersections as shown previously on Exhibit 1-3. Exhibit 3-1 illustrates the study area intersections located near the proposed Project and identifies the number of through traffic lanes for existing roadways and intersection traffic controls.

3.2 CITY OF SANTA ANA GENERAL PLAN MOBILITY ELEMENT

As noted previously, the Project site is located within the City of Santa Ana. Exhibit 3-2 shows the City of Santa Ana General Plan Mobility Element. The roadway classifications and planned (ultimate) roadway cross-sections of the major roadways within the City of Santa Ana in the vicinity of the proposed Project, as identified on the City's General Plan Mobility Element, are described subsequently.

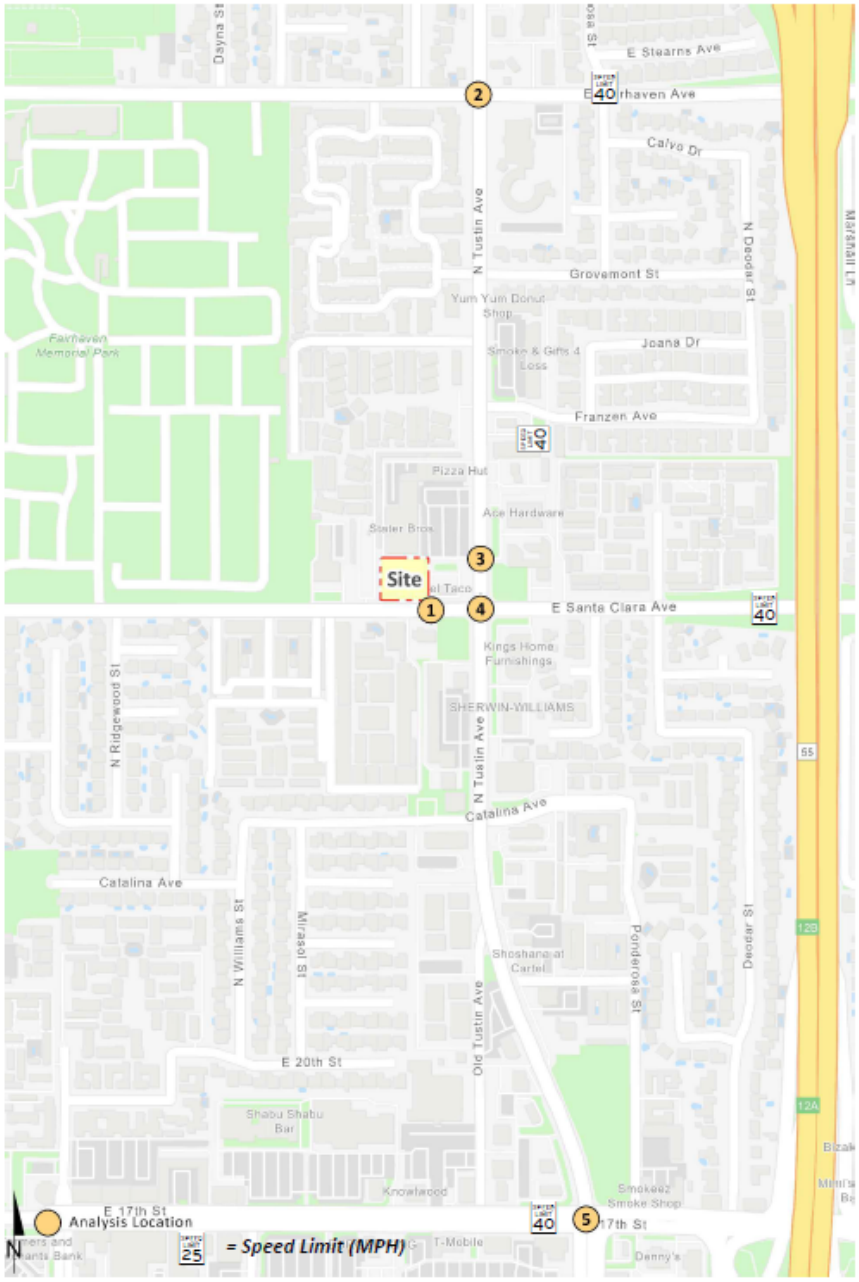
Major Arterial. A street with six travel lanes and a center median. Typically includes bus transit, pedestrian sidewalks, and bicycle lanes. Typical ROW: 120' / 100' curb-to-curb / 14' median / 10' sidewalk. The following study area roadways within the City of Santa Ana are classified as Major Arterials:

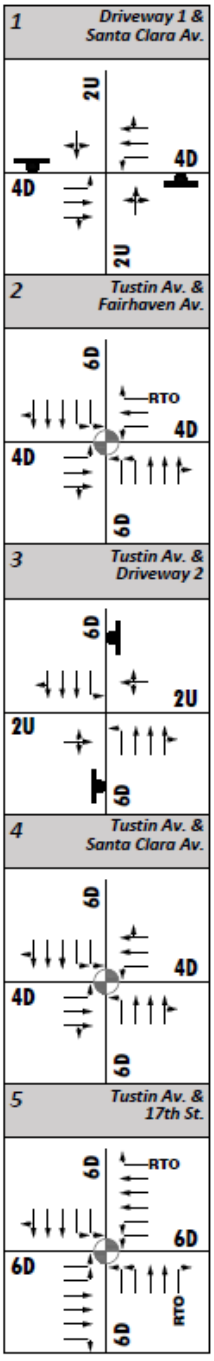
- Tustin Avenue
- 17th Street

Divided Collector Arterial. A street with two travel lanes and a continuous center two-way left turn lane, but may be divided by raised median, with an expanded right-of-way to accommodate bike lanes. Typical ROW: 80' / 64' curb-to-curb / 8' sidewalk. The following study area roadways within the City of Santa Ana are classified as Divided Collector Arterials:

- Fairhaven Avenue
- Santa Clara Avenue

EXHIBIT 3-1: EXISTING NUMBER OF THROUGH LANES AND INTERSECTION CONTROLS

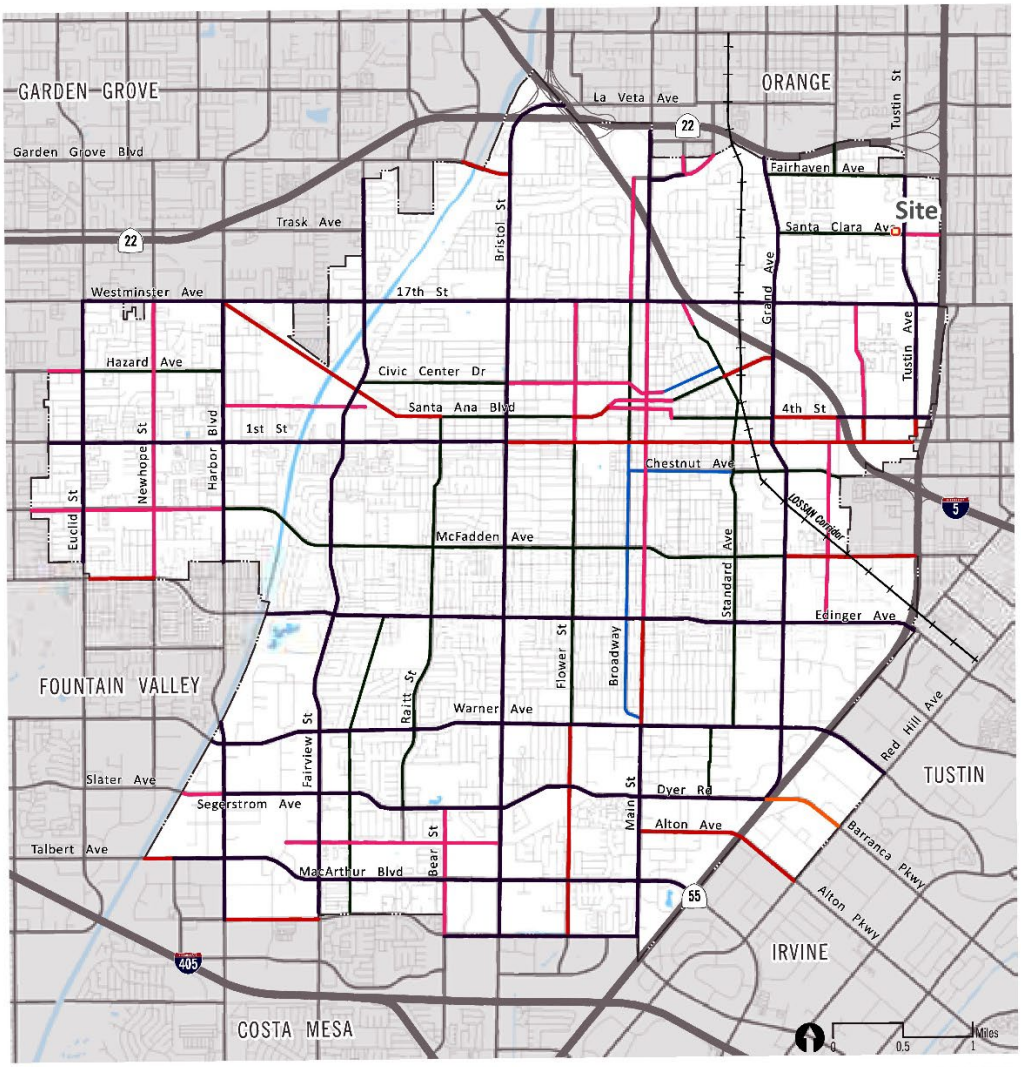




= Traffic Signal
= Stop Sign
4 = Number of Lanes
D = Divided
U = Undivided
RTO = Right Turn Overlap

EXHIBIT 3-2: CITY OF SANTA ANA GENERAL PLAN MOBILITY ELEMENT

ABOUT THE MAP. This map displays the City's long-term plan for an integrated system of streets and highways, with classifications that correspond to the nature and purpose of each roadway. This map reflects the City's efforts to create and maintain a roadway system that fosters the safe and efficient movement of people and vehicles throughout Santa Ana. See Table M-1 for a description of each street classification. Within city limits, the thin grey lines represent local streets.



Source: OCTA Master Plan of Arterial Highways (06/20/2020) and the City of Santa Ana Date Published: 7/12/2021

Principal Arterial
Major Arterial
Primary Arterial
Secondary Arterial
Divided Collector
Collector
Site Boundary

M 06

CITY OF SANTA ANA GENERAL PLAN

FIGURE M-1
MASTER PLAN OF STREETS AND HIGHWAYS

3.3 CITY OF ORANGE GENERAL PLAN CIRCULATION ELEMENT

The roadway classifications and planned (ultimate) roadway cross-sections of the major City of Orange roadways within the study area, as identified on City of Orange General Plan Circulation Element, are described subsequently. Exhibit 3-3 shows the City of Orange General Plan Circulation Element and Exhibit 3-4 illustrates the City of Orange General Plan roadway cross-sections.

3.4 TRANSIT SERVICE

The study area is currently served by Orange County Transportation Agency (OCTA) with bus service along Tustin Street via Route 71 and 17th Street via Route 60. There are currently two bus stops located along Route 71 on Tustin Avenue near the proposed Project. The transit services are illustrated on Exhibit 3-5. These existing transit routes that could potentially serve the site. Transit service is reviewed and updated by OCTA periodically to address ridership, budget, and community demand needs. Changes in land use can affect these periodic adjustments which may lead to either enhanced or reduced service where appropriate.

3.5 BICYCLE & PEDESTRIAN FACILITIES

Field observations indicate active pedestrian and bicycle activity within the study area. Exhibit 3-6 illustrates the City of Santa Ana Master Plan of Bikeways, which includes existing Class II bike lanes along Santa Clara Avenue near the vicinity of the Project. A Class IV cycle track exists along Fairhaven Avenue, Tustin Avenue, and 17th Street. The City of Orange's bike network is shown on Exhibit 3-7. Existing pedestrian facilities within the study area, which include sidewalks, bus stop locations, and crosswalks are shown on Exhibit 3-8.

3.6 EXISTING (2022) TRAFFIC COUNTS

The intersection LOS analysis is based on the traffic volumes observed during the peak hour conditions using traffic count data collected in December 2022 when local schools were in session and operating on normal bell schedules. The following peak hours were selected for analysis:

- Weekday AM Peak Hour (peak hour between 7:00 AM and 9:00 AM)
- Weekday PM Peak Hour (peak hour between 4:00 PM and 6:00 PM)

There were no observations made in the field that would indicate atypical traffic conditions on the count dates, such as construction activity or detour routes and near-by schools were in session and operating on normal schedules. The raw manual peak hour turning movement traffic count data sheets are included in Appendix 3.1. Existing weekday AM and weekday PM peak hour intersection volumes are shown on Exhibit 3-9.

EXHIBIT 3-3: CITY OF ORANGE GENERAL PLAN CIRCULATION ELEMENT

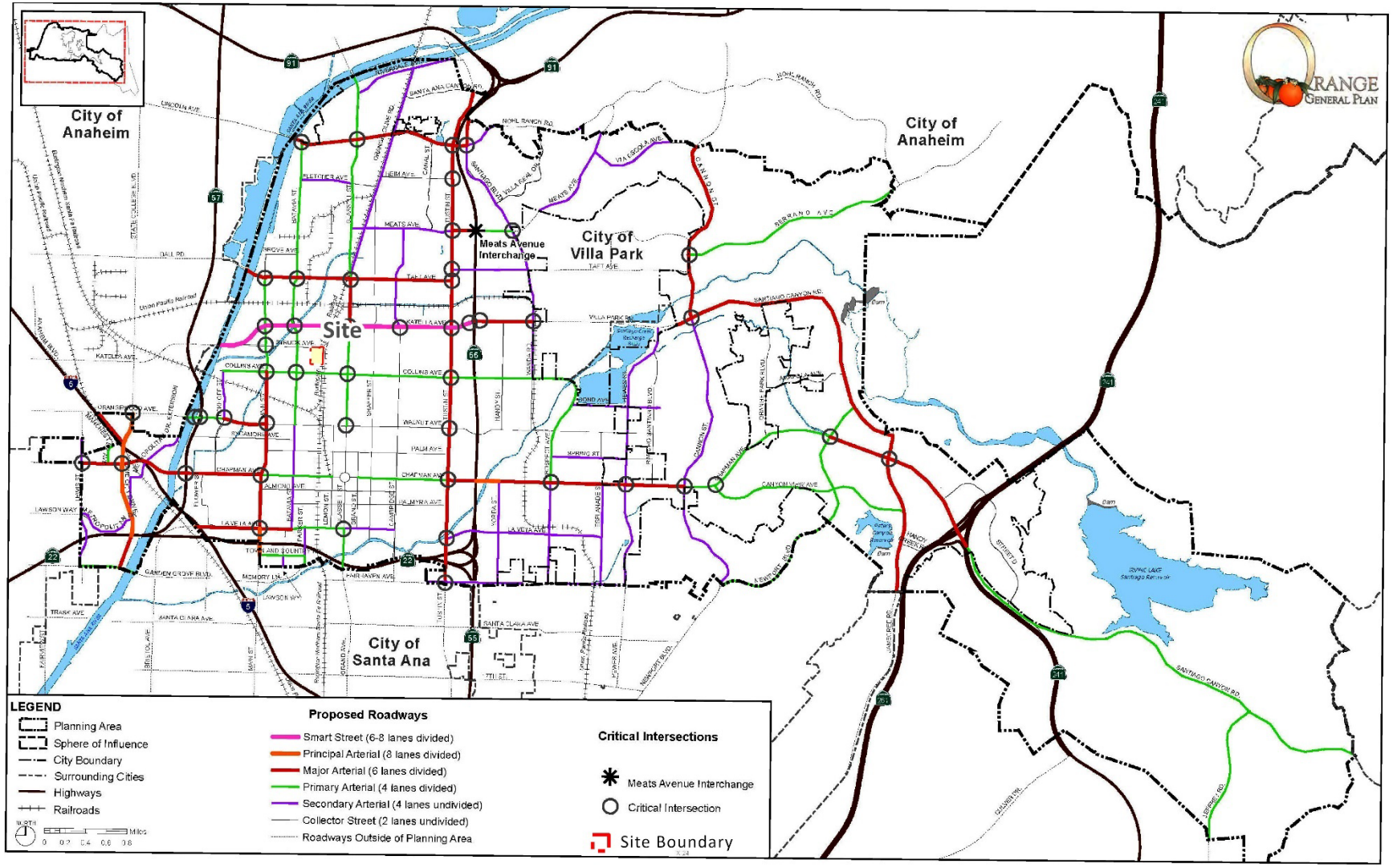


EXHIBIT 3-4: CITY OF ORANGE GENERAL PLAN ROADWAY CROSS-SECTIONS

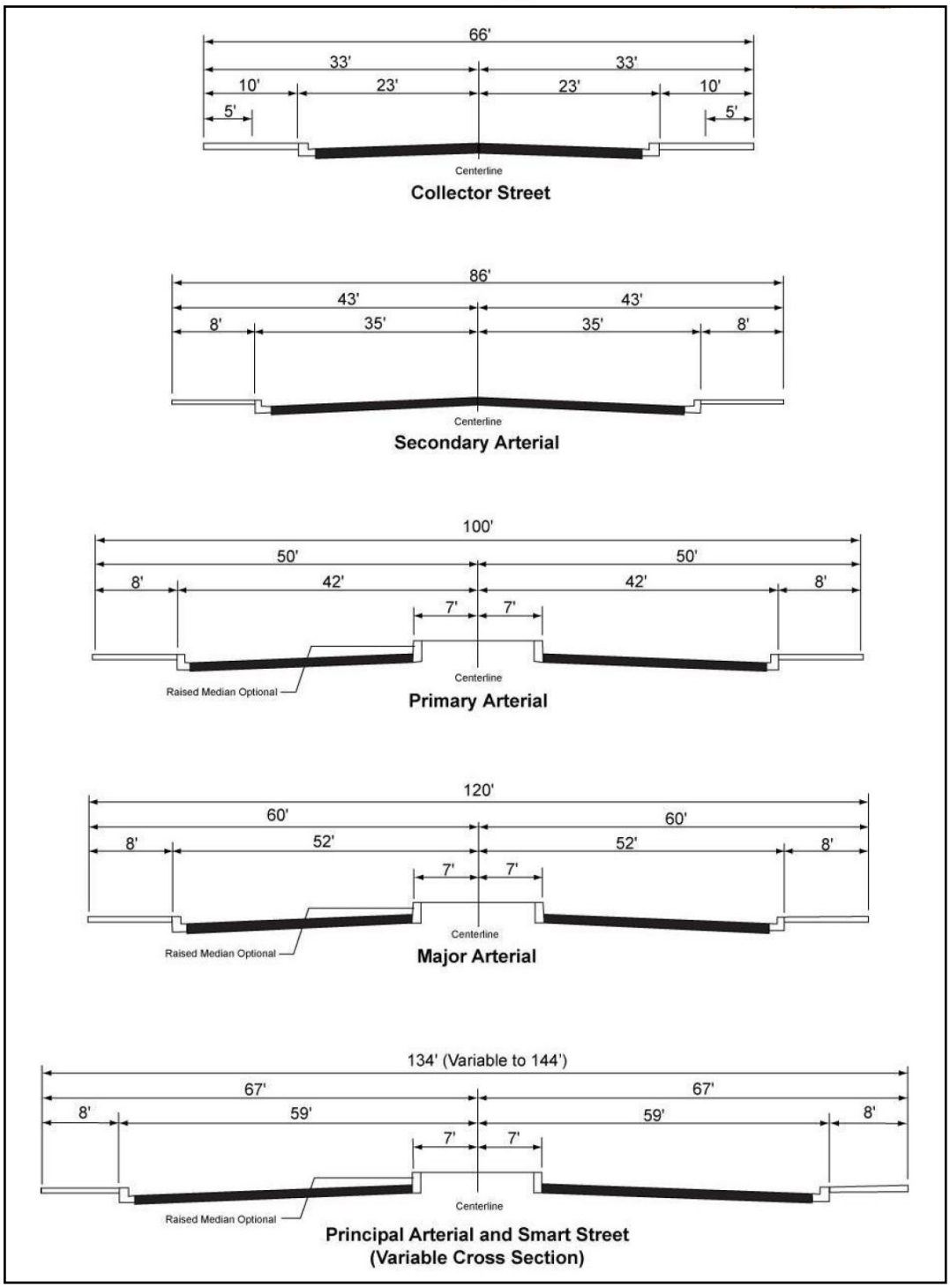


EXHIBIT 3-5: EXISTING TRANSIT ROUTES

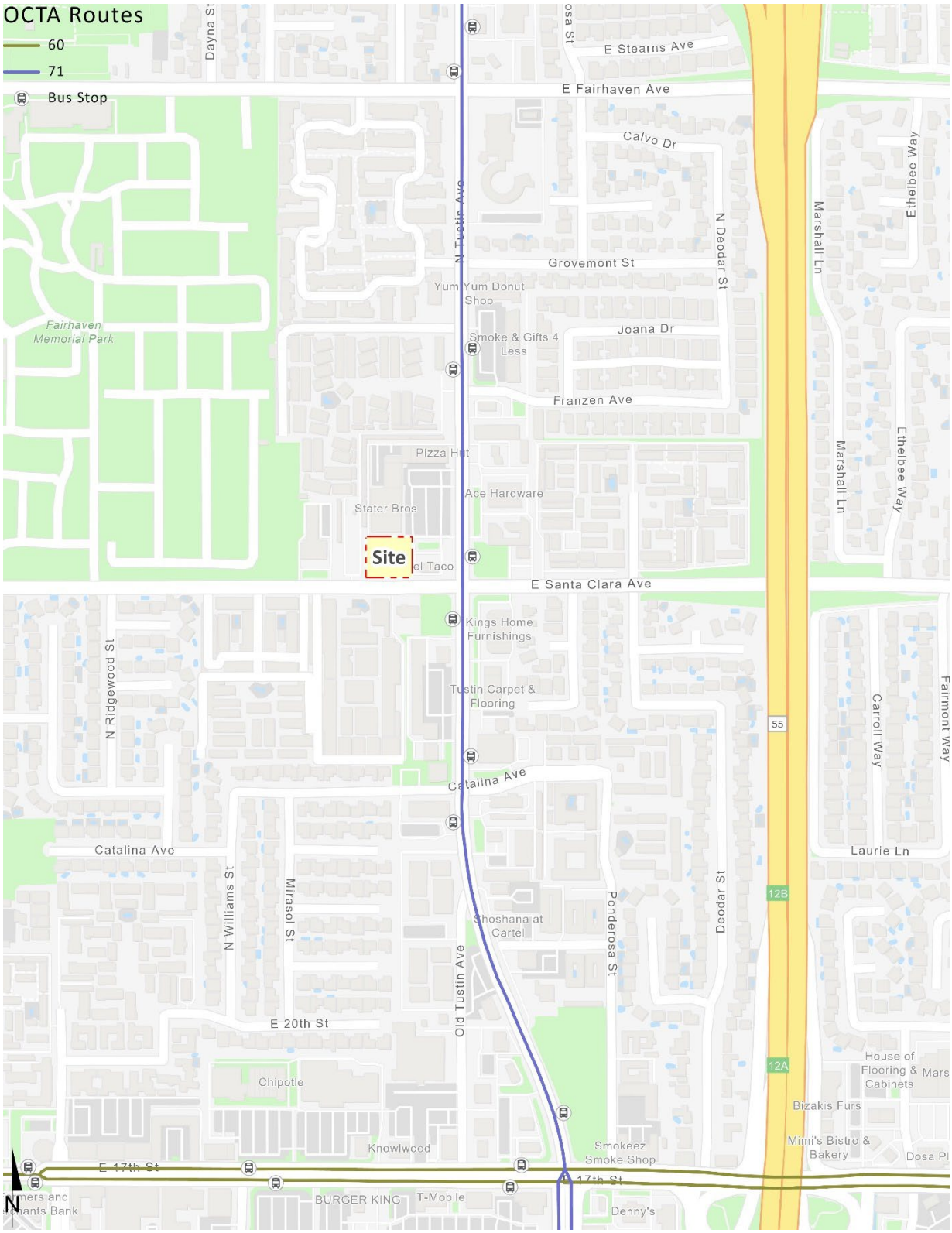
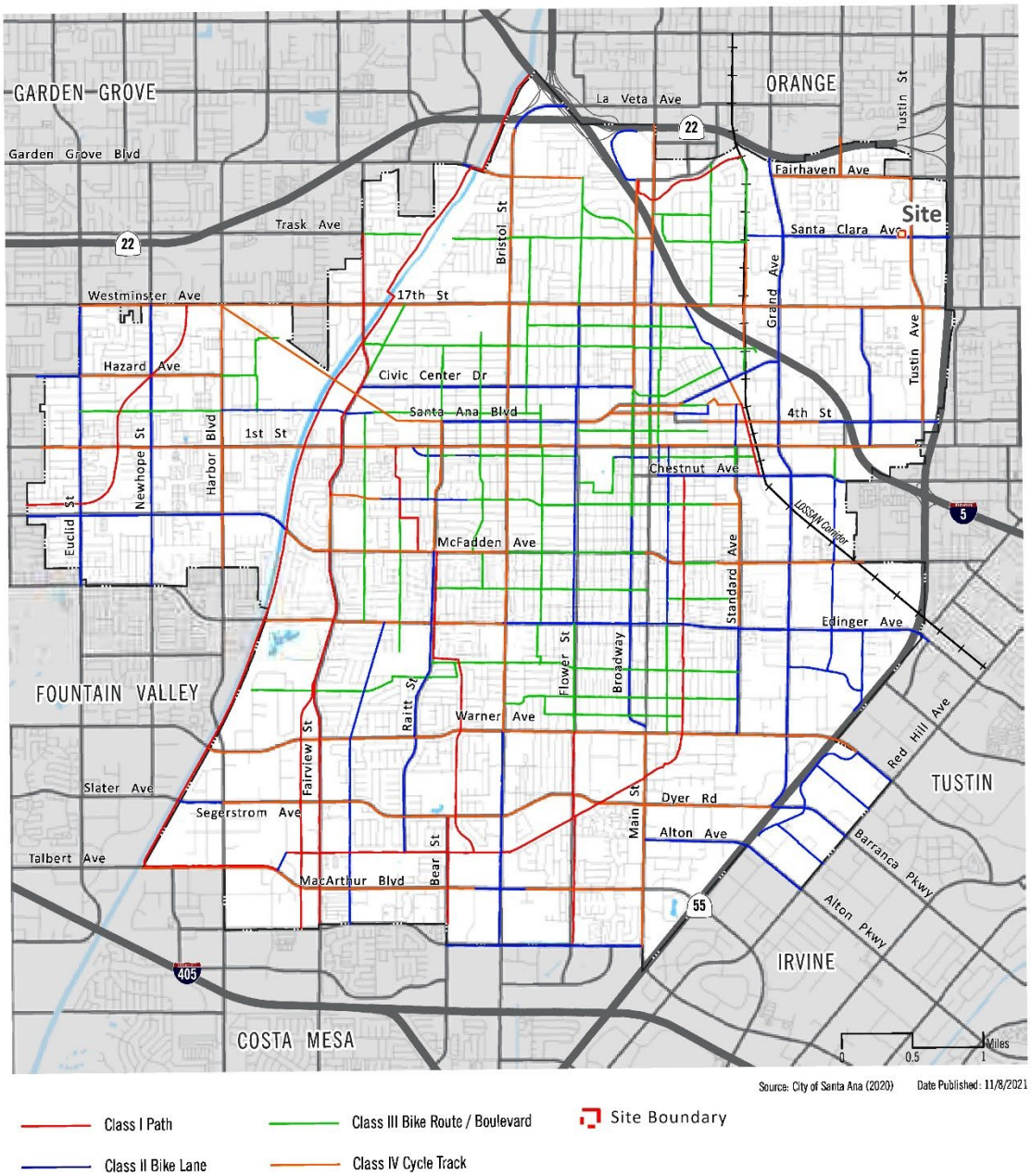


EXHIBIT 3-6: CITY OF SANTA ANA MASTER PLAN OF BIKEWAYS

ABOUT THE MAP. This map displays the City's long-term plan for a comprehensive bicycle network, with a hierarchy of facilities that provide varying levels of design, signage, and separation from vehicles. The City intends to provide a safe and efficient system that reduces the reliance on the automobiles and facilitates an increase in bicycling by choice. Table M-2 describes each bicycle classification.

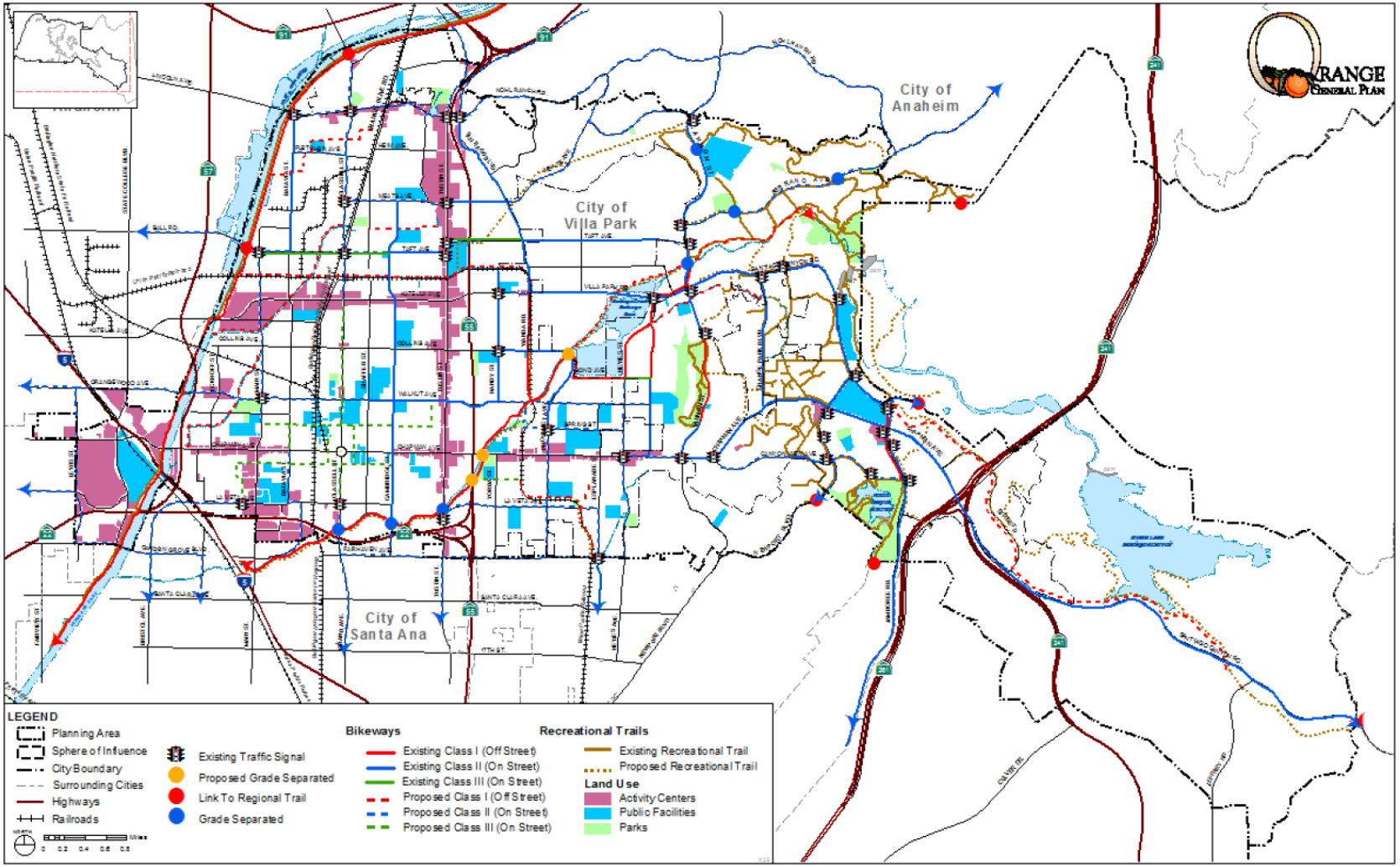


M 08

CITY OF SANTA ANA GENERAL PLAN

FIGURE M-2
MASTER PLAN OF BIKEWAYS

EXHIBIT 3-7: CITY OF ORANGE GENERAL PLAN BIKE NETWORK



Source: City of Orange Community Services Department, 2015.

EXHIBIT 3-8: EXISTING PEDESTRIAN FACILITIES

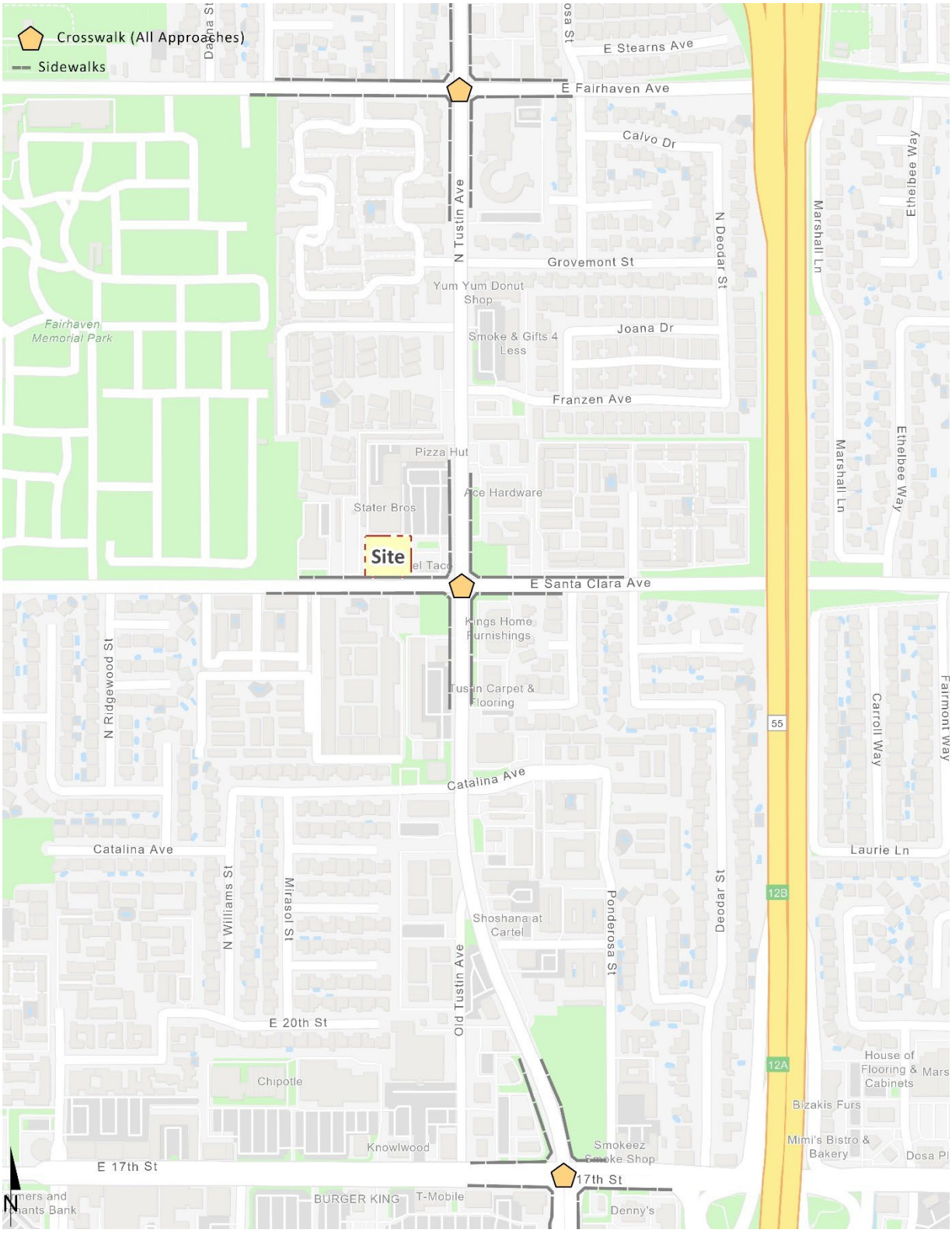
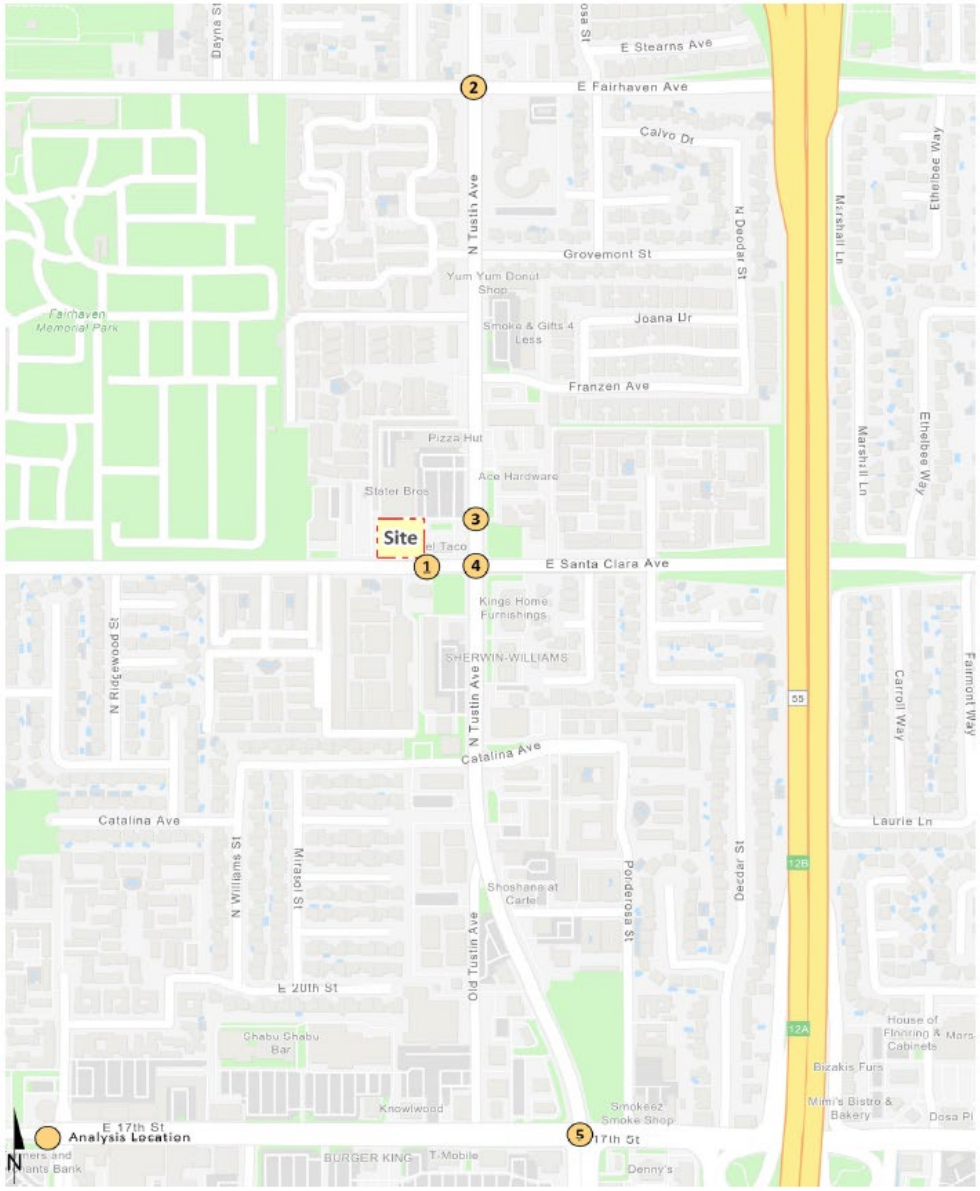


EXHIBIT 3-9: EXISTING (2022) TRAFFIC VOLUMES



##(##) AM(PM) Peak Hour Intersection Volumes

1 Driveway 1 & Santa Clara Av.

48(91) ↳	38(41) ↳	↱ 36(74)
		← 301(427)
28(55) ↳		↰ 11(0)
462(373) →	2(2) ↱	
6(4) ↳		13(2) ↱

2 Tustin Av. & Fairhaven Av.

43(103) ↳	1828(830) ↓	262(283) ↳	↱ 406(210)
			← 309(251)
60(91) ↳			↰ 239(136)
276(171) →	86(255) ↱	495(1237) →	104(144) ↱
339(166) ↳			

3 Tustin Av. & Driveway 2

21(25) ↳	2436(1032) ↓	3(1) ↳	↱ 3(5)
			↰ 2(0)
0(1) ↳		704(1740) →	8(10) ↱
17(57) ↳			

4 Tustin Av. & Santa Clara Av.

87(116) ↳	2261(800) ↓	107(173) ↳	↱ 130(134)
			← 192(203)
109(108) ↳			↰ 112(95)
221(150) →	69(182) ↱	467(1401) →	102(155) ↱
183(158) ↳			

5 Tustin Av. & 17th St.

22(46) ↳	1383(383) ↓	551(368) ↳	↱ 228(409)
			← 648(851)
203(447) ↳			↰ 454(219)
680(801) →	138(197) ↱	207(947) →	228(395) ↱
152(110) ↳			

3.7 INTERSECTION OPERATIONS ANALYSIS

Existing peak hour traffic operations have been evaluated for the study area intersections based on the analysis methodologies presented in Section 2.2 *Intersection Capacity Analysis* of this report. The intersection operations analysis results are summarized on Table 3-1, which indicates that the following existing study area intersection is currently operating at unacceptable LOS during one or both peak hours:

- Tustin Av. & Driveway 2 (#3) – LOS E AM peak hour only

The intersection operations analysis worksheets are included in Appendix 3.2 of this TA.

3.8 TRAFFIC SIGNAL WARRANTS ANALYSIS

Traffic signal warrants for Existing traffic conditions are based on existing peak hour intersection turning volumes. No unsignalized study area intersections currently warrant a traffic signal for Existing traffic conditions. Existing conditions traffic signal warrant analysis worksheets are provided in Appendix 3.3.

3.9 QUEUING ANALYSIS

Pursuant to the City approved scoping agreement, a queuing analysis was performed for the left turning movements at the intersection of Tustin Avenue & Santa Clara Avenue (#4) to assess vehicle queues along the roadways. Queuing analysis findings are presented in Table 3-2. It is important to note that the available stacking distances are consistent with the measured turn pocket lengths. As shown in Table 3-2, the intersection left turning movements currently experience acceptable queuing during the peak hours based on the 95th percentile peak hour traffic flows. Worksheets for Existing (2022) traffic conditions queuing analysis are provided in Appendix 3.4.

TABLE 3-1: INTERSECTION ANALYSIS FOR EXISTING (2022) CONDITIONS

#	Intersection	Traffic Control[1]	Delay (secs.)[2] ICU (v/c) AM	ICU (v/c) PM	Level of Service AM	Level of Service PM
1	Driveway 1 & Santa Clara Av.	CSS	11.7	13.0	B	B
2	Tustin Av. & Fairhaven Av.	TS	0.847	0.657	D	B
3	Tustin Av. & Driveway 2	CSS	**35.1**	28.5	**E**	D
4	Tustin Av. & Santa Clara Av.	TS	0.780	0.611	C	B
5	Tustin Av. & 17th St.	TS	0.663	0.789	B	C

* **BOLD** = LOS does not meet the applicable jurisdictional requirements (i.e., unacceptable

[1] CSS = Cross-Street Stop; TS = Traffic Signal

[2] All signalized intersections will be evaluated utilizing Intersection Capacity Utilization (ICU) methodology. For intersections with all way or cross street stop control, the delay and level of service for the worst individual movement (or movements sharing a single lane) are shown. HCM delay reported in seconds and ICU reported as a volume-to-capacity ratio.

TABLE 3-2: QUEUING SUMMARY FOR EXISTING (2022) CONDITIONS

#	Intersection		Available Stacking Distance (Feet)	95th Percentile Queue (Feet) AM Peak Hour	95th Percentile Queue (Feet) PM Peak Hour	Acceptable?[1] AM	Acceptable?[1] PM
4	Tustin Av. & Santa Clara Av.	NBL	230	105	258 [2]	Yes	Yes[3]
		SBL	150	73	110	Yes	Yes
		EBL	105	185 [2]	184 [2]	Yes	Yes[3]
		WBL	70	190 [2]	165 [2]	Yes[3]	Yes[3]

[1] Stacking Distance is acceptable if the required stacking distance is less than or equal to the stacking distance provided. An additional 15 feet of stacking which is assumed to be provided in the transition for turn pockets is reflected in the stacking distance shown in this table, where applicable.

[2] 95th percentile volume exceeds capacity, queue may be longer. Queue shown is maximum after two cycles.

[3] Additional stacking distance is available in the two-way left turn lane.

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4 PROJECTED FUTURE TRAFFIC

This section presents the traffic volumes estimated to be generated by the Project, as well as the Project's trip assignment onto the study area roadway network. The proposed Project consists of developing a 3,975 square foot (SF) McDonald's restaurant with a drive-thru window. The drive-through restaurant will be accommodated by redeveloping the existing residential uses. The Project is proposed to utilize two existing driveways: one on Tustin Avenue and one on Santa Clara Avenue. A preliminary site plan of which the traffic study will be based on is shown on Exhibit 1-2.

4.1 PROJECT TRIP GENERATION

Trip generation represents the amount of traffic which is both attracted to and produced by a development. Determining traffic generation for a specific project is therefore based upon forecasting the amount of traffic that is expected to be both attracted to and produced by the specific land uses being proposed for a given development. In order to develop the traffic characteristics of the proposed Project, trip-generation statistics published in the Institute of Transportation Engineers (ITE) Trip Generation Manual (11th Edition, 2021) was used to estimate the trip generation. (2)

In order to develop the traffic characteristics of the proposed project, trip-generation statistics published in the ITE Trip Generation Manual (11th Edition, 2021) for Fast-Food Restaurant With Drive-Through Window (ITE Land Use Code 934) land use were utilized. (2) The trip generation rates are shown in Table 4-1. As shown in Table 4-1, the Project is anticipated to generate a net total of 930 two-way trips per day with 89 AM peak hour trips and 67 PM peak hour trips.

TABLE 4-1: PROJECT TRIP GENERATION SUMMARY

		ITE LU	AM Peak Hour			PM Peak Hour			
Land Use	Units[2]	Code	In	Out	Total	In	Out	Total	Daily
Trip Generation Rates[1]									
Fast-Food Restaurant with Drive-Through	TSF	934	22.75	21.86	44.61	17.18	15.85	33.03	467.48

[1] Trip Generation Source: Institute of Transportation Engineers (ITE), Trip Generation Manual, Eleventh Edition (2021).

[2] TSF = Thousand Square Feet

			AM Peak Hour			PM Peak Hour			
Land Use	Quantity	Units[1]	In	Out	Total	In	Out	Total	Daily
Trip Generation Summary									
Fast-Food Restaurant with Drive-Through	3.975	TSF	90	87	177	68	63	131	1,860
Pass-By (50% AM; 55% PM/Daily)[2]:			-44	-44	-88	-32	-32	-64	-930
Total Net Trips:			46	43	89	36	31	67	930

[1] TSF = Thousand Square Feet

[2] Pass-by Source: Institute of Transportation Engineers (ITE), Trip Generation Manual, Eleventh Edition (2021).

4.2 PROJECT TRIP DISTRIBUTION

The Project trip distribution represents the directional orientation of traffic to and from the Project site. Trip distribution is the process of identifying the probable destinations, directions or traffic routes that will be utilized by Project traffic. The potential interaction between the planned land uses and surrounding regional access routes are considered, to identify the route where the Project traffic would distribute. Exhibit 4-1 shows the Project passenger car trip distribution patterns.

4.3 MODAL SPLIT

The potential for Project trips to be reduced by the use of public transit, walking or bicycling have not been included as part of the Project's estimated trip generation. Essentially, the Project's traffic projections are "conservative" in that these alternative travel modes would reduce the forecasted traffic volumes.

4.4 PROJECT TRIP ASSIGNMENT

The assignment of traffic from the Project area to the adjoining roadway system is based upon the Project trip generation, trip distribution, and the arterial highway and local street system improvements that would be in place by the time of initial occupancy of the Project. Based on the identified Project traffic generation and trip distribution patterns, the Project only peak hour intersection turning movement volumes are shown on Exhibit 4-2.

4.5 BACKGROUND TRAFFIC

4.5.1 OPENING YEAR CUMULATIVE CONDITIONS

Future year traffic forecasts have been based upon background (ambient) growth at 1% per year, compounded annually, for 2023 conditions. The total ambient growth is 1.0% for 2023 traffic conditions (compounded growth of 1 percent per year over 1 years or $1.01^{1\ year}$). The ambient growth factor is intended to approximate regional traffic growth. This ambient growth rate is added to existing traffic volumes to account for area-wide growth not reflected by cumulative development projects. Ambient growth has been added to daily and peak hour traffic volumes on surrounding roadways, in addition to traffic generated by the development of future projects that have been approved but not yet built and/or for which development applications have been filed and are under consideration by governing agencies.

EXHIBIT 4-1: PROJECT TRIP DISTRIBUTION

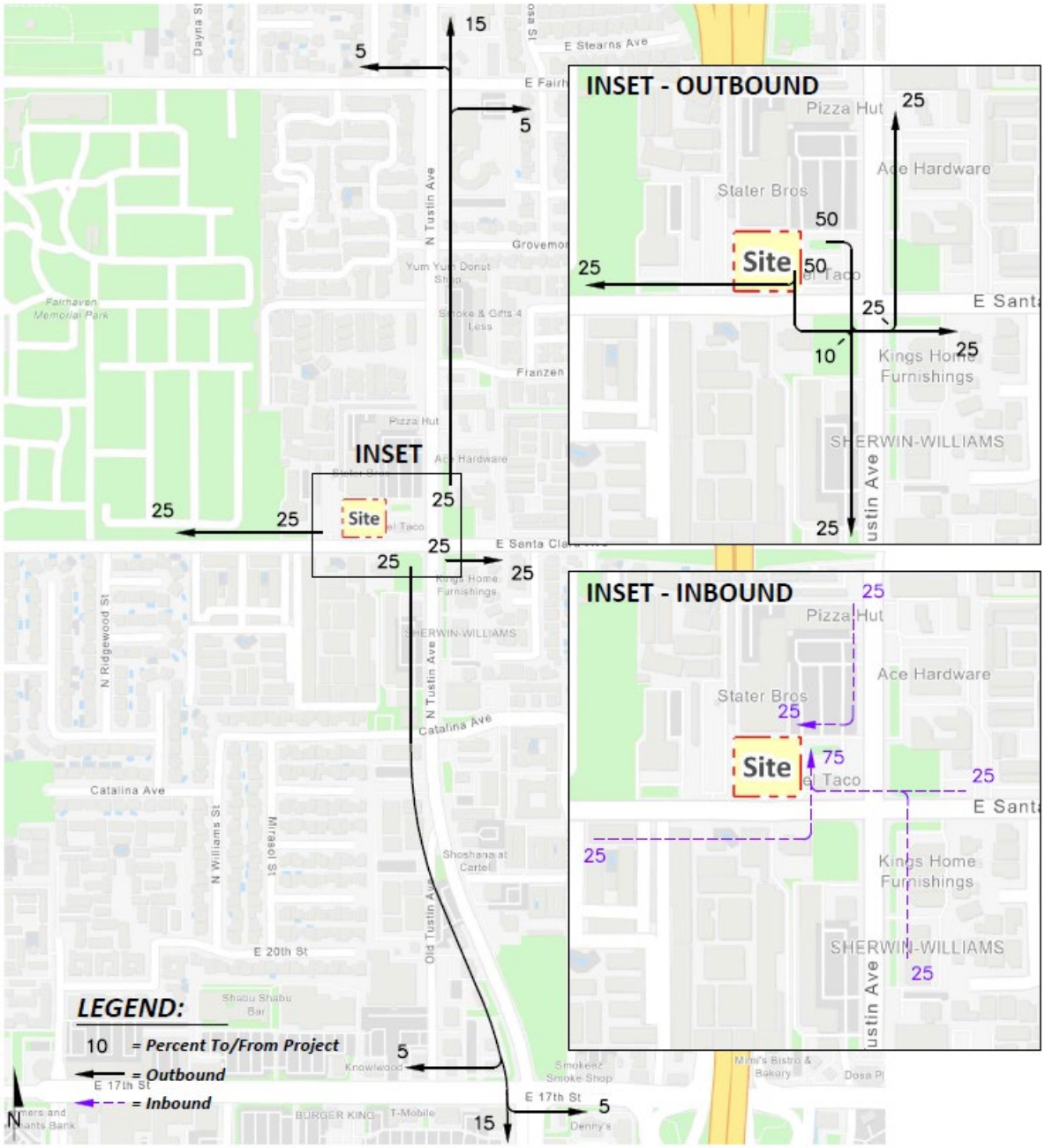
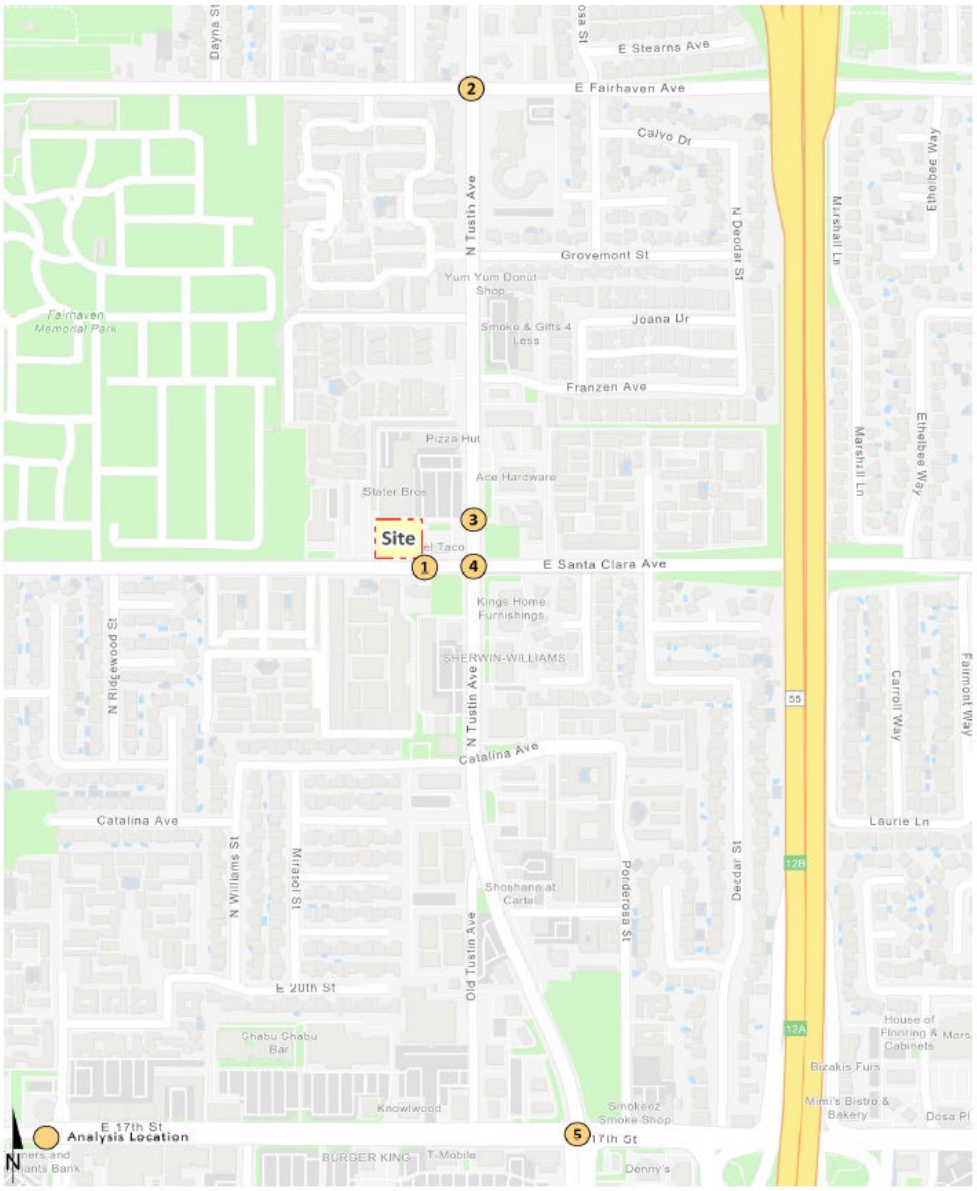
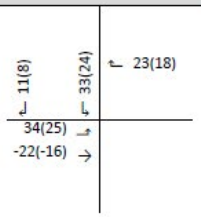


EXHIBIT 4-2: PROJECT ONLY TRAFFIC VOLUMES

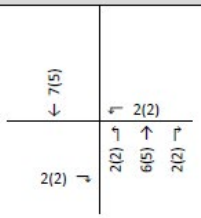


##(##) AM(PM) Peak Hour Intersection Volumes

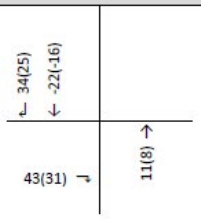
1 Driveway 1 & Santa Clara Av.



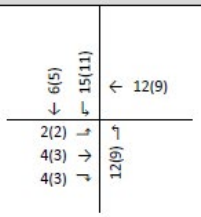
2 Tustin Av. & Fairhaven Av.



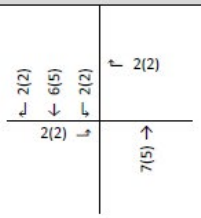
3 Tustin Av. & Driveway 2



4 Tustin Av. & Santa Clara Av.



5 Tustin Av. & 17th St.



4.5.2 HORIZON YEAR CONDITIONS

According to information published by OCTA in the 2018 Long Range Transportation Plan, the population of Orange County is projected to increase by 10.0% in the period between 2015 and 2040, a compounded rate of approximately 0.39% annually. During the same period, employment in Orange County is expected to increase by 17.0% or 0.67% annually. Therefore, the annual growth rate of 1.0% in conjunction with cumulative project traffic would appear to be conservative and tend to overstate as opposed to understate traffic impacts.

Based on a comparison of Existing (2022) traffic volumes to the Horizon Year (2040) forecasts, the average growth rate is greater than 0.94%, compounded annually between Existing (2022) and 2040 traffic conditions. Therefore, the annual growth rate utilized for the purposes of this analysis would appear to conservatively approximate the anticipated regional growth in traffic volumes in the City of Santa Ana for Opening Year Cumulative and Horizon Year (2040) traffic conditions, especially when considered along with the addition of project-related traffic, which would tend to overstate as opposed to understate the potential impacts to traffic and circulation.

4.6 CUMULATIVE DEVELOPMENT TRAFFIC

A cumulative project list was developed for the purposes of this analysis through consultation with planning and engineering staff from the City of Santa Ana. The cumulative project list includes approved City of Santa Ana projects that are anticipated to contribute traffic to the study area intersections. Cumulative projects from the neighboring jurisdictions of Orange and Tustin have also been included.

Exhibit 4-3 illustrates the cumulative development location map. A summary of cumulative development projects and their proposed land uses are shown on Table 4-2. If applicable, the traffic generated by individual cumulative projects was manually added to the Opening Year Cumulative forecasts to ensure that traffic generated by the listed cumulative development projects on Table 4-2 are reflected as part of the background traffic. In an effort to conduct a conservative analysis, the cumulative projects are added in conjunction with the ambient growth identified in Section 4.5.1 *Background Traffic: Opening Year Cumulative Conditions*. Cumulative ADT and peak hour intersection turning movement volumes are shown on Exhibit 4-4.

EXHIBIT 4-3: CUMULATIVE DEVELOPMENT LOCATION MAP

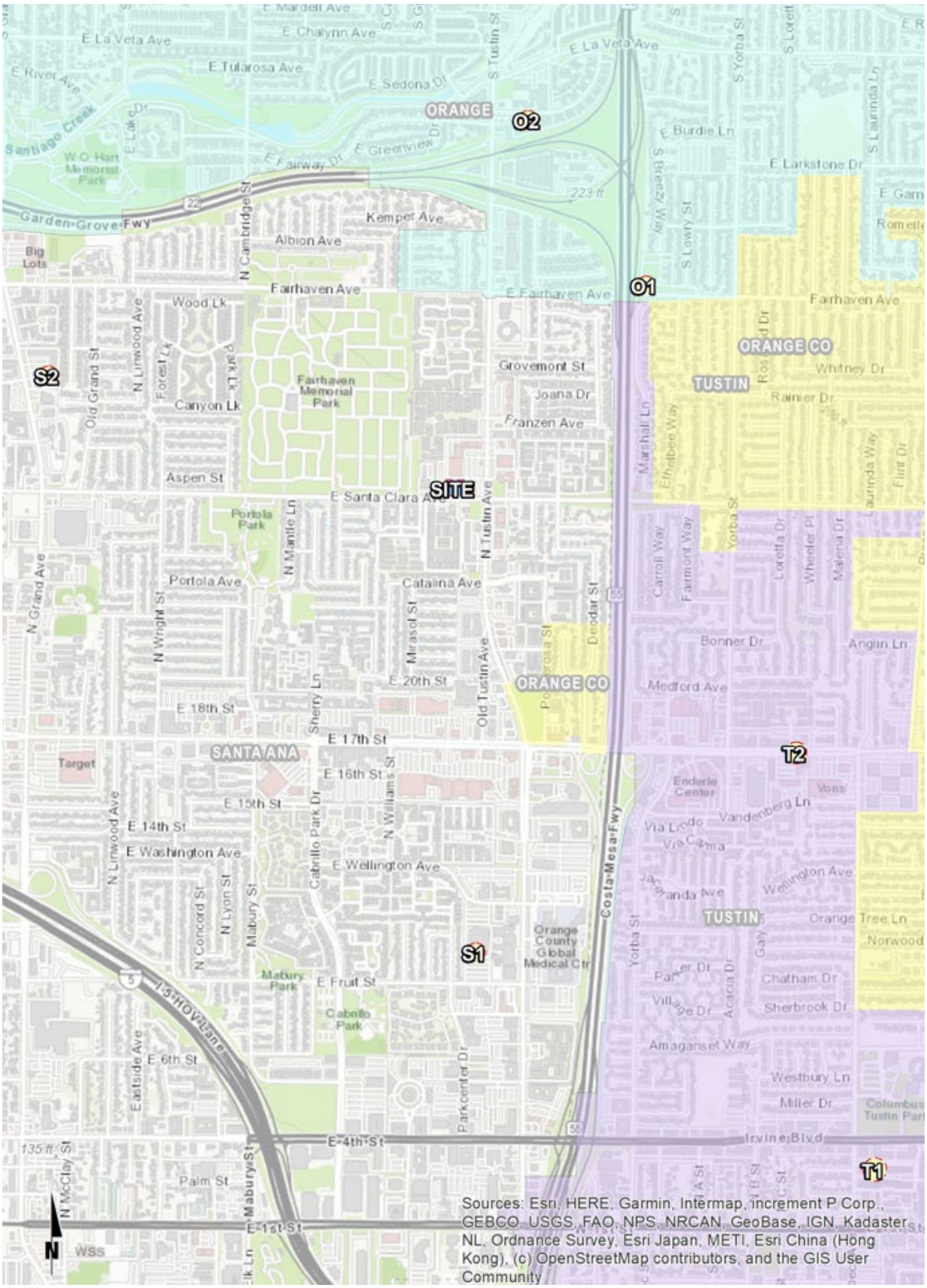
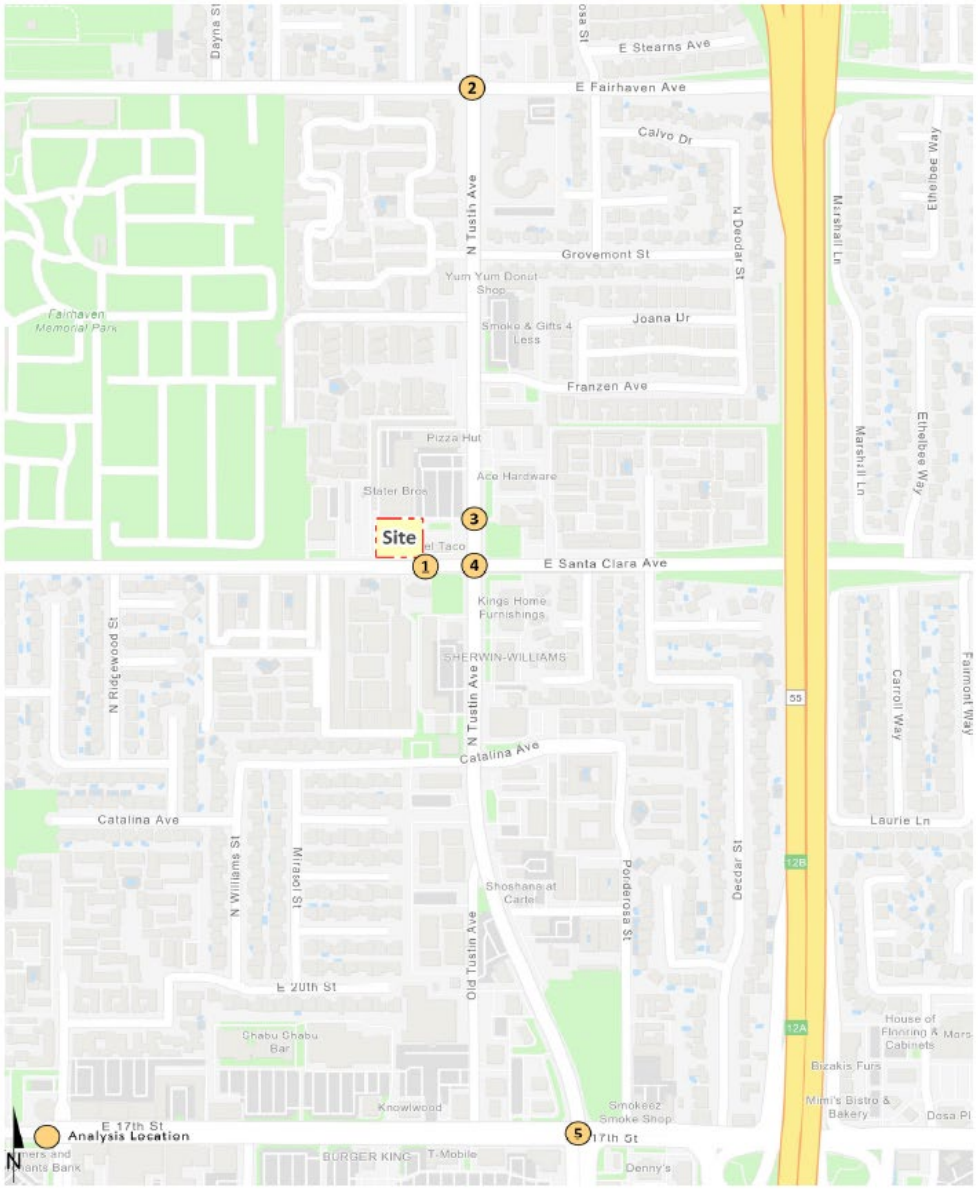


EXHIBIT 4-4: CUMULATIVE ONLY TRAFFIC VOLUMES



##(##) AM(PM) Peak Hour Intersection Volumes

1 Driveway 1 & Santa Clara Av.

		← 2(6)
3(5) →		

2 Tustin Av. & Fairhaven Av.

		↱ 1(1)
2(4) ↳		← 0(3)
8(6) ↓		↰ 1(1)
1(1) ↳		
2(4) ↳	↰	↑ ↱
1(3) →	0(2)	4(8) 0(2)
1(1) ↳		

3 Tustin Av. & Driveway 2

← 11(7)		
		5(11) ↑

4 Tustin Av. & Santa Clara Av.

		↱ 1(1)
1(1) ↳		← 0(3)
9(6) ↓		↰ 1(1)
1(1) ↳		
1(1) ↳	↰	↑ ↱
1(3) →	0(2)	3(9) 0(2)
1(1) ↳		

5 Tustin Av. & 17th St.

		↱ 2(9)
1(1) ↳		← 1(5)
2(2) ↓		↰ 0(2)
8(4) ↳		
1(1) ↳	↰	↑ ↱
3(3) →	0(3)	1(2) 1(1)
1(3) ↳		

TABLE 4-2: CUMULATIVE DEVELOPMENT LAND USE SUMMARY

#	Project	Address	Land Use	Quantity[1]
City of Santa Ana				
S1	Calvary Church Master Plan	1010 N Tustin	Religious/Education	46.840 TSF
S2	Grand and Grovemont Development	2511, 2521, & 2525 North Grand Avenue	Multifamily Units	80 DU
City of Tustin				
T1	Intracorp Multifamily Residential	17802 and 17842 Irvine Boulevard	Multifamily Units	40 DU
T2	CUP 2021-0030, DR 2021-0016	17631 17th Street	Medical Office	11.323 TSF
City of Orange				
O1	Grace Church	2201 Fairhaven Ave	Religious/Education	8.663 TSF
O2	IUSA Properties	1800 E La Veta Ave	Senior Apartments	166 DU

[1] DU = Dwelling Units; TSF = Thousand Square Feet

4.7 HORIZON YEAR (2040) VOLUME DEVELOPMENT

Traffic projections for Horizon Year (2040) without Project conditions were derived from the Orange County Transportation Analysis Model (OCTAM) using accepted procedures for model forecast refinement and smoothing for study area intersections located within the County of Orange. The traffic forecasts reflect the area-wide growth anticipated between Existing (2022) conditions and Horizon Year (2040) traffic conditions. In most instances the traffic model zone structure is not designed to provide accurate turning movements along arterial roadways unless refinement and reasonableness checking is performed. Therefore, the Horizon Year (2040) peak hour forecasts were refined using the model derived long range forecasts, base (validation) year model forecasts, along with existing peak hour traffic count data collected at each analysis location in February 2022. The OCTAM has a base (validation) year of 2016 and a horizon (future forecast) year of 2045. The difference in model volumes (2045-2016) defines the growth in traffic over the 29-year period.

The refined future peak hour approach and departure volumes obtained from the model output data are then entered into a spreadsheet program consistent with the National Cooperative Highway Research Program (NCHRP Report 765), along with initial estimates of turning movement proportions. A linear programming algorithm is used to calculate individual turning movements which match the known directional roadway segment forecast volumes computed in the previous step. This program computes a likely set of intersection turning movements from intersection approach counts and the initial turning proportions from each approach leg.

The OCTAM uses an AM peak period-to-peak hour factor of 0.38 and a PM peak period-to-peak hour factor of 0.28. These factors represent the relationship of the highest single AM peak hour to the modeled 3-hour AM peak period (an even distribution would result in a factor of 0.33) and the highest single PM peak hour to the modeled 4-hour PM peak period (an even distribution would result in a factor of 0.25).

Typically, the model growth is prorated and is subsequently added to the existing (base validation) traffic volumes to represent Horizon Year traffic conditions. In an effort to conduct a conservative analysis, reductions to traffic forecasts from either Existing or Opening Year Cumulative traffic conditions were not assumed as part of this analysis. As such, in conjunction with the addition of cumulative projects that are not consistent with the General Plan, additional growth has also been

applied on a movement-by-movement basis, where applicable, to estimate reasonable Horizon Year (2040) forecasts. Horizon Year (2040) turning volumes were compared to Opening Year Cumulative (2023) volumes in order to ensure a minimum growth as a part of the refinement process. The minimum growth includes any additional growth between Opening Year Cumulative (2023) and Horizon Year (2040) traffic conditions that is not accounted for by the traffic generated by cumulative development projects and ambient growth rates assumed between Existing (2022) and Opening Year Cumulative (2023) conditions. Future estimated peak hour traffic data was used for new intersections and intersections with an anticipated change in travel patterns to further refine the Horizon Year (2040) peak hour forecasts.

The future Horizon Year (2040) Without Project peak hour turning movements were then reviewed by Urban Crossroads, Inc. for reasonableness, and in some cases, were adjusted to achieve flow conservation, reasonable growth, and reasonable diversion between parallel routes. Flow conservation checks ensure that traffic flow between two closely spaced intersections, such as two adjacent driveway locations, is verified in order to make certain that vehicles leaving one intersection are entering the adjacent intersection and that there is no unexplained loss of vehicles. The result of this traffic forecasting procedure is a series of traffic volumes which are suitable for traffic operations analysis. Post processing has been performed for the weekday AM and PM peak hours only as these are the only time periods where traffic model data was readily available (worksheets provided in Appendix 4.1 of this TA). Project traffic was then added for all With Project traffic conditions.

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5 E+P TRAFFIC CONDITIONS

This section discusses the traffic forecasts for Existing plus Project (E+P) conditions and the resulting intersection operations, traffic signal warrant, and queuing analyses.

5.1 ROADWAY IMPROVEMENTS

The lane configurations and traffic controls assumed to be in place for E+P conditions are consistent with those shown previously on Exhibit 3-1, with the exception of the following:

- Project driveways and those facilities assumed to be constructed by the Project to provide site access are also assumed to be in place for E+P conditions only (e.g., intersection and roadway improvements at the Project's frontage and driveways).

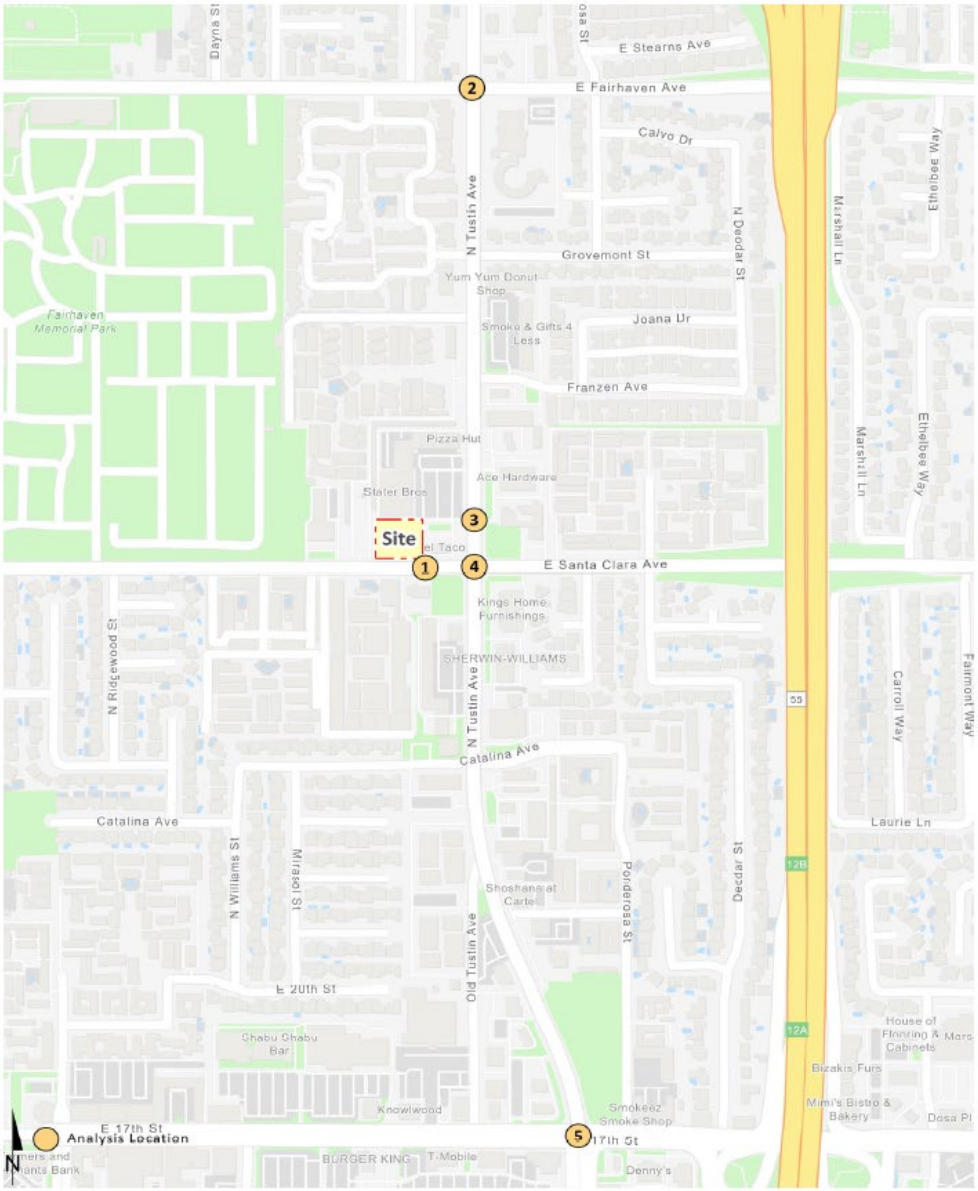
5.2 EXISTING PLUS PROJECT TRAFFIC VOLUME FORECASTS

This scenario includes Existing traffic volumes plus Project traffic. The weekday ADT and weekday peak hour intersection turning movement volumes, which can be expected for E+P traffic conditions are shown on Exhibit 5-1.

5.3 INTERSECTION OPERATIONS ANALYSIS

E+P peak hour traffic operations have been evaluated for the study area intersections based on the analysis methodologies presented in Section 2 *Methodologies* of this TA. The intersection analysis results are summarized on Table 5-1 for E+P traffic conditions, which indicate that there are no additional study area intersections anticipated to operate at an unacceptable LOS under E+P traffic conditions, in addition to the intersections previously identified for Existing traffic conditions. **The addition of Project traffic would not trigger the City of Santa Ana's significance criteria.** The intersection operations analysis worksheets for E+P traffic conditions are included in Appendix 5.1 of this TA.

EXHIBIT 5-1: E+P TRAFFIC VOLUMES



##(##) AM(PM) Peak Hour Intersection Volumes

1 Driveway 1 & Santa Clara Av.

	59(99) ↓ 71(65)	← 59(92) ↑ 301(427) ↖ 11(0)
62(80) →		↗ 2(2)
440(357) ↓		↓
6(4) ↳		↱ 13(2)

2 Tustin Av. & Fairhaven Av.

	43(103) ↓ 1835(835) ↓ 262(283)	← 406(210) ↑ 309(251) ↖ 241(138)
60(91) →		↗ 88(257)
276(171) ↓		↑ 501(1242)
341(168) ↳		↱ 106(146)

3 Tustin Av. & Driveway 2

	55(50) ↓ 2414(1016) ↓ 3(1)	← 3(5) ↖ 2(0)
0(1) →		↑ 715(1748)
60(88) ↳		↱ 8(10)

4 Tustin Av. & Santa Clara Av.

	87(116) ↓ 2267(805) ↓ 122(184)	← 130(134) ↑ 204(212) ↖ 112(95)
111(110) →		↗ 81(191)
225(153) ↓		↑ 467(1401)
187(161) ↳		↱ 102(155)

5 Tustin Av. & 17th St.

	24(48) ↓ 1389(388) ↓ 553(370)	← 230(411) ↑ 648(851) ↖ 454(219)
205(449) →		↗ 138(197)
680(801) ↓		↑ 214(952)
152(110) ↳		↱ 228(395)

TABLE 5-1: INTERSECTION ANALYSIS FOR E+P CONDITIONS

#	Intersection	Traffic Control[1]	Existing (2022) Delay (secs.)[2] ICU (v/c) AM	Existing (2022) Delay (secs.)[2] ICU (v/c) PM	Existing (2022) Level of Service AM	Existing (2022) Level of Service PM	E+P Delay (secs.)[2] ICU (v/c) AM	E+P Delay (secs.)[2] ICU (v/c) PM	E+P Level of Service AM	E+P Level of Service PM	Change in v/c AM	Change in v/c PM	Project-Related Deficiency?[3]
1	Driveway 1 & Santa Clara Av.	CSS	11.7	13.0	B	B	13.8	15.0	B	C	--	--	No
2	Tustin Av. & Fairhaven Av.	TS	0.847	0.657	D	B	0.852	0.659	D	B	0.005	0.002	No
3	Tustin Av. & Driveway 2	CSS	**35.1**	28.5	**E**	D	**51.9**	28.8	**F**	D	--	--	No
4	Tustin Av. & Santa Clara Av.	TS	0.780	0.611	C	B	0.792	0.619	C	B	0.012	0.008	No
5	Tustin Av. & 17th St.	TS	0.663	0.789	B	C	0.665	0.792	B	C	0.002	0.003	No

* **BOLD** = LOS does not meet the applicable jurisdictional requirements (i.e., unacceptable LOS).

[1] CSS = Cross-Street Stop; TS = Traffic Signal

[2] All signalized intersections will be evaluated utilizing Intersection Capacity Utilization (ICU) methodology. For intersections with all way or cross street stop control, the delay and level of service for the worst individual movement (or movements sharing a single lane) are shown. HCM delay reported in seconds and ICU reported as a volume-to-capacity ratio.

[3] City of Santa Ana
A transportation impact on an intersection shall be deemed "significant" in accordance with the following table:
• The peak hour Level of Service (LOS) exceeds the maximum City threshold. The City of Santa Ana considers LOS D to be the minimum acceptable LOS for all intersections, except for those locations located within the City's defined major development areas, where LOS E is considered acceptable.
• The project increases traffic demand at the study intersection by 1% of capacity (ICU increase ≥ 0.010).
• At unsignalized intersections, an impact is considered to be significant if the project causes an intersection at LOS D or better to degrade to LOS E or F and the traffic signal warrant analysis determines that a signal is justified.
City of Orange
An intersection will be deemed deficient and require improvements to achieve an acceptable LOS when the LOS is E or F (Final V/C Ratio>0.90) and the project-related increase in V/C is equal to or greater than 0.010.

5.4 TRAFFIC SIGNAL WARRANTS ANALYSIS

The traffic signal warrant analysis for E+P traffic conditions are based on the peak hour volume-based traffic signal warrants. No study area intersections are anticipated to meet peak hour volume-based warrants with the addition of Project traffic (see Appendix 5.2).

5.5 QUEUING ANALYSIS

Pursuant to the City approved scoping agreement, a queuing analysis was performed for the left turning movements at the intersection of Tustin Avenue & Santa Clara Avenue (#4) to assess vehicle queues along the roadways. Queuing analysis findings are presented in Table 5-2. It is important to note that the available stacking distances are consistent with the measured turn pocket lengths. As shown in Table 5-2, the intersection left turning movements are anticipated to experience acceptable queuing during the peak hours based on the 95th percentile peak hour traffic flows. Worksheets for E+P traffic conditions queuing analysis are provided in Appendix 5.3.

TABLE 5-2: QUEUING SUMMARY FOR E+P CONDITIONS

#	Intersection	Movement	Available Stacking Distance (Feet)	Existing (2022) 95th Percentile Queue (Feet) AM Peak Hour	Existing (2022) 95th Percentile Queue (Feet) PM Peak Hour	Existing (2022) Acceptable? [1] AM	Existing (2022) Acceptable? [1] PM	E+P 95th Percentile Queue (Feet) AM Peak Hour	E+P 95th Percentile Queue (Feet) PM Peak Hour	E+P Acceptable? [1] AM	E+P Acceptable? [1] PM
4	Tustin Av. & Santa Clara Av.	NBL	230	105	258 [2]	Yes	Yes[3]	119	276 [2]	Yes	Yes[3]
		SBL	150	73	110	Yes	Yes	81	117	Yes	Yes
		EBL	105	185 [2]	184 [2]	Yes[3]	Yes[3]	189 [2]	188 [2]	Yes[3]	Yes[3]
		WBL	70	190 [2]	165 [2]	Yes[3]	Yes[3]	190 [2]	165 [2]	Yes[3]	Yes[3]

[1] Stacking Distance is acceptable if the required stacking distance is less than or equal to the stacking distance provided. An additional 15 feet of stacking which is assumed to be provided in the transition for turn pockets is reflected in the stacking distance shown in this table, where applicable.

[2] 95th percentile volume exceeds capacity, queue may be longer. Queue shown is maximum after two cycles.

[3] Additional stacking distance is available in the two-way left turn lane.

6 OPENING YEAR CUMULATIVE (2023) TRAFFIC CONDITIONS

This section discusses the methods used to develop Opening Year Cumulative (2023) Without and With Project traffic forecasts, and the resulting intersection operations, traffic signal warrant, and queuing analyses.

6.1 ROADWAY IMPROVEMENTS

The lane configurations and traffic controls assumed to be in place for Opening Year Cumulative (2023) conditions are consistent with those shown previously on Exhibit 3-1, with the exception of the following:

- Project driveways and those facilities assumed to be constructed by the Project to provide site access are also assumed to be in place for Opening Year Cumulative conditions only (e.g., intersection and roadway improvements along the Project's frontage and driveways).
- If applicable, driveways and those facilities assumed to be constructed by cumulative developments to provide site access are also assumed to be in place for Opening Year Cumulative conditions only.

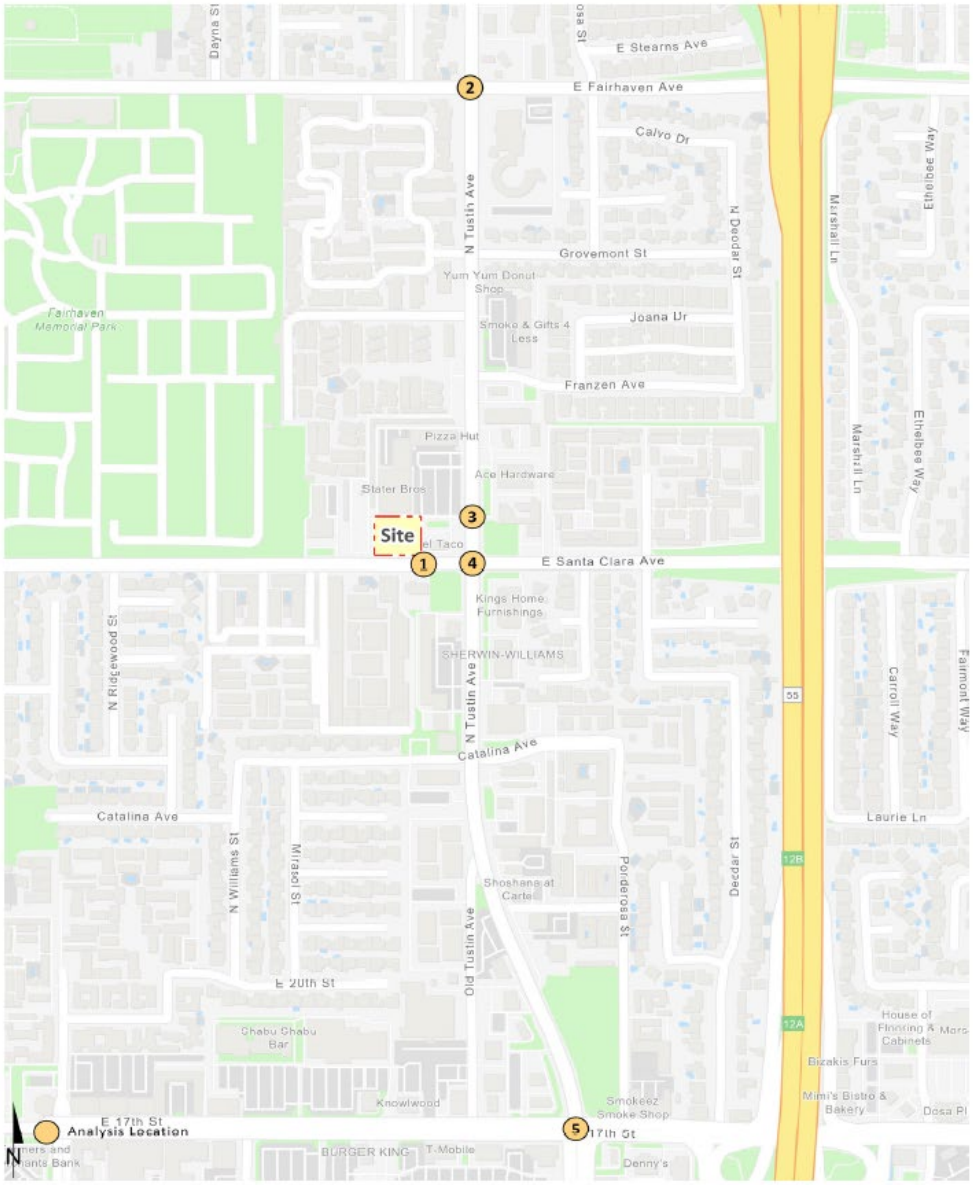
6.2 WITHOUT PROJECT TRAFFIC VOLUME FORECASTS

This scenario includes Existing traffic volumes plus an ambient growth factor of 1.0% plus traffic from pending and approved but not yet constructed known development projects in the area. The weekday peak hour volumes, which can be expected for Opening Year Cumulative (2023) Without Project traffic conditions are shown on Exhibit 6-1.

6.3 WITH PROJECT TRAFFIC VOLUME FORECASTS

This scenario includes Opening Year Cumulative (2023) Without Project traffic in conjunction with the addition of Project traffic. The weekday ADT and weekday peak hour volumes, which can be expected for Opening Year Cumulative (2023) With Project traffic conditions are shown on Exhibit 6-2.

EXHIBIT 6-1: OPENING YEAR CUMULATIVE (2023) WITHOUT PROJECT TRAFFIC VOLUMES



##(##) AM(PM) Peak Hour Intersection Volumes

1 Driveway 1 & Santa Clara Av.

48(92) ↳	38(41) ↳	↱ 36(75)
		← 306(437)
28(56) ↳		↰ 11(0)
470(382) →	2(2) ↱	
6(4) ↲		13(2) ↱

2 Tustin Av. & Fairhaven Av.

45(108) ↳	1854(844) ↓	266(287) ↳ ↱ 411(213)
		← 312(257)
63(96) ↳		↰ 242(138)
280(176) →	87(260) ↱	504(1257) → 105(147) ↱
343(169) ↲		

3 Tustin Av. & Driveway 2

21(25) ↳	2471(1049) ↓	3(1) ↳ ↱ 3(5)
		↰ 2(0)
0(1) ↳		↑ 716(1768) ↱ 8(10)
17(58) ↲		

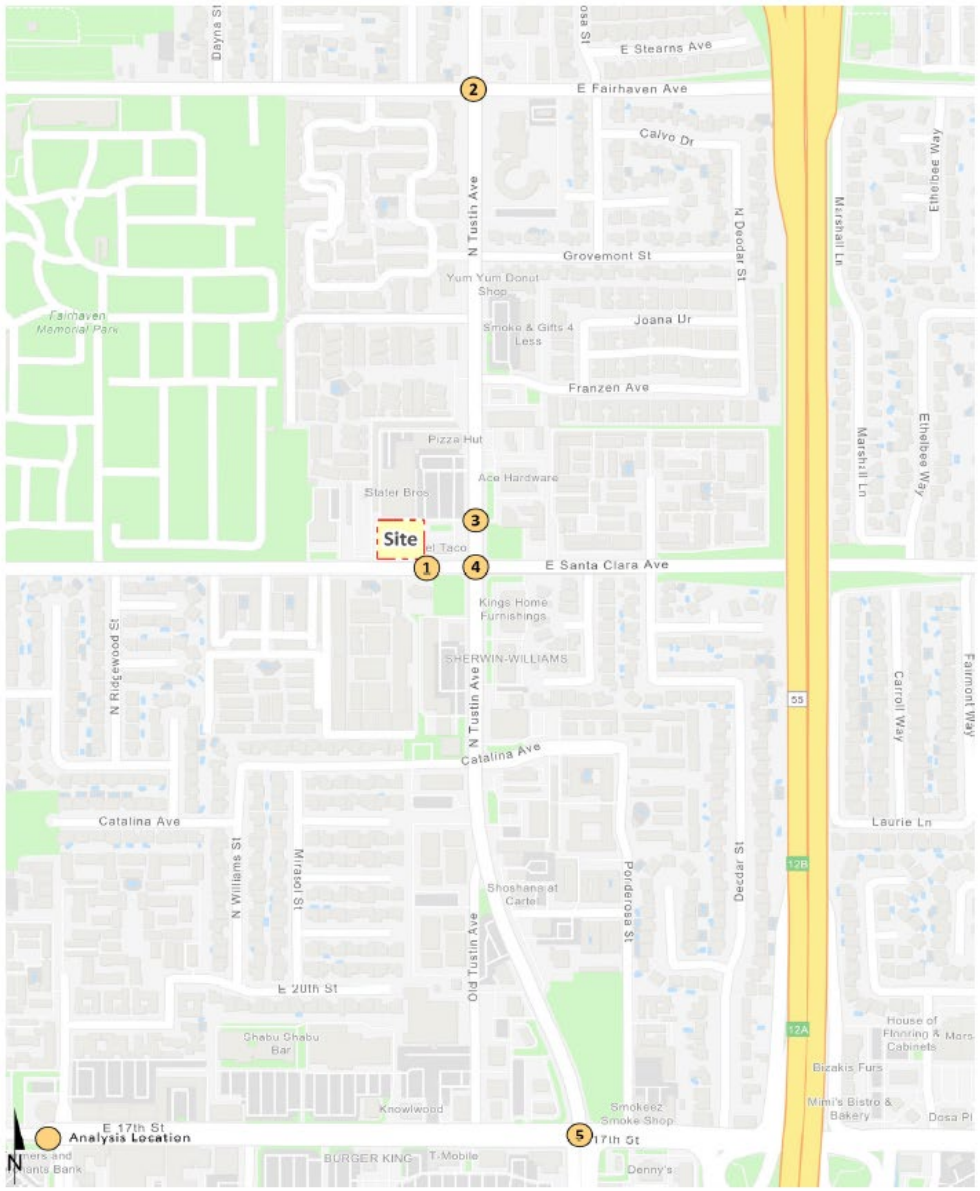
4 Tustin Av. & Santa Clara Av.

89(118) ↳	2293(814) ↓	109(176) ↳ ↱ 132(136)
		← 194(208)
111(110) ↳		↰ 114(97)
224(155) →	70(186) ↱	475(1424) → 103(159) ↱
186(161) ↲		

5 Tustin Av. & 17th St.

23(47) ↳	1399(389) ↓	565(376) ↳ ↱ 232(422)
		← 655(865)
206(452) ↳		↰ 459(223)
690(812) →	139(202) ↱	210(958) → 231(400) ↱
155(114) ↲		

EXHIBIT 6-2: OPENING YEAR CUMULATIVE (2023) WITH PROJECT TRAFFIC VOLUMES



##(##) AM(PM) Peak Hour Intersection Volumes

1 Driveway 1 & Santa Clara Av.

59(100) ↲	71(65) ↳	↱ 59(93)
		← 306(437)
		↰ 11(0)
62(81) ↳		↰ 2(2)
448(366) →		→
6(4) ↲		↱ 13(2)

2 Tustin Av. & Fairhaven Av.

45(108) ↲	266(287) ↳	↱ 411(213)
1861(849) ↓		← 312(257)
		↰ 244(140)
63(96) ↳		↰ 89(262)
280(176) →		→ 510(1262)
345(171) ↲		↱ 107(149)

3 Tustin Av. & Driveway 2

55(50) ↲	3(1) ↳	↱ 3(5)
2449(1033) ↓		
		↰ 2(0)
0(1) ↳		→ 727(1776)
60(89) ↲		↱ 8(10)

4 Tustin Av. & Santa Clara Av.

89(118) ↲	124(187) ↳	↱ 132(136)
2299(819) ↓		← 206(217)
		↰ 114(97)
113(112) ↳		↰ 82(195)
228(158) →		→ 475(1424)
190(164) ↲		↱ 103(159)

5 Tustin Av. & 17th St.

25(49) ↲	567(378) ↳	↱ 234(424)
1405(394) ↓		← 655(865)
		↰ 459(223)
208(454) ↳		↰ 139(202)
690(812) →		→ 217(963)
155(114) ↲		↱ 231(400)

6.4 INTERSECTION OPERATIONS ANALYSIS

6.4.1 OPENING YEAR CUMULATIVE (2023) WITHOUT PROJECT TRAFFIC CONDITIONS

LOS calculations were conducted for the study intersections to evaluate their operations under Opening Year Cumulative (2023) Without Project conditions with roadway and intersection geometrics consistent with Section 6.1 *Roadway Improvements*. As shown on Table 6-1, the following intersections are anticipated to operate at an unacceptable LOS under Opening Year Cumulative (2023) Without Project traffic conditions:

- Tustin Av. & Driveway 2 (#3) – LOS E AM peak hour only

The intersection operations analysis worksheets for Opening Year Cumulative (2023) Without Project traffic conditions are included in Appendix 6.1 of this TA.

TABLE 6-1: INTERSECTION ANALYSIS FOR OPENING YEAR CUMULATIVE (2023) CONDITIONS

#	Intersection	Traffic Control[1]	2023 Without Project Delay (secs.)[2] ICU (v/c) AM	2023 Without Project Delay (secs.)[2] ICU (v/c) PM	2023 Without Project Level of Service AM	2023 Without Project Level of Service PM	2023 With Project Delay (secs.)[2] ICU (v/c) AM	2023 With Project Delay (secs.)[2] ICU (v/c) PM	2023 With Project Level of Service AM	2023 With Project Level of Service PM	Change in v/c AM	Change in v/c PM	Project-Related Deficiency?[3]
1	Driveway 1 & Santa Clara Av.	CSS	11.8	13.2	B	B	13.9	15.2	B	C	--	--	No
2	Tustin Av. & Fairhaven Av.	TS	0.858	0.671	D	B	0.863	0.672	D	B	0.005	0.001	No
3	Tustin Av. & Driveway 2	CSS	**36.1**	29.3	**E**	D	**54.3**	29.7	**F**	D	--	--	No
4	Tustin Av. & Santa Clara Av.	TS	0.791	0.621	C	B	0.803	0.629	D	B	0.012	0.008	No
5	Tustin Av. & 17th St.	TS	0.671	0.800	B	C	0.672	0.803	B	D	0.001	0.003	No

* **BOLD** = LOS does not meet the applicable jurisdictional requirements (i.e., unacceptable LOS).

[1] CSS = Cross-Street Stop; TS = Traffic Signal

[2] All signalized intersections will be evaluated utilizing Intersection Capacity Utilization (ICU) methodology. For intersections with all way or cross street stop control, the delay and level of service for the worst individual movement (or movements sharing a single lane) are shown. HCM delay reported in seconds and ICU reported as a volume-to-capacity ratio.

[3] City of Santa Ana
A transportation impact on an intersection shall be deemed "significant" in accordance with the following table:
• The peak hour Level of Service (LOS) exceeds the maximum City threshold. The City of Santa Ana considers LOS D to be the minimum acceptable LOS for all intersections, except for those locations located within the City's defined major development areas, where LOS E is considered acceptable.
• The project increases traffic demand at the study intersection by 1% of capacity (ICU increase ≥ 0.010).
• At unsignalized intersections, an impact is considered to be significant if the project causes an intersection at LOS D or better to degrade to LOS E or F and the traffic signal warrant analysis determines that a signal is justified.
City of Orange
An intersection will be deemed deficient and require improvements to achieve an acceptable LOS when the LOS is E or F (Final V/C Ratio>0.90) and the project-related increase in V/C is equal to or greater than 0.010.

6.4.2 OPENING YEAR CUMULATIVE (2023) WITH PROJECT TRAFFIC CONDITIONS

As shown on Table 6-1, there are no additional study area intersections anticipated to operate at a deficient LOS during any of the peak hours for Opening Year Cumulative (2023) With Project traffic conditions with the addition of Project traffic. **The addition of Project traffic would not trigger the City of Santa Ana's significance criteria.** The intersection operations analysis worksheets for Opening Year Cumulative (2023) With Project traffic conditions are included in Appendix 6.2 of this TA.

6.5 TRAFFIC SIGNAL WARRANTS ANALYSIS

The traffic signal warrant analysis for Opening Year Cumulative (2023) traffic conditions are based on the peak hour volume-based traffic signal warrants. No study area intersections are anticipated to meet peak hour volume-based warrants for Opening Year Cumulative (2023) Without Project (see Appendix 6.3). With the addition of Project traffic, there are no study area intersections anticipated to meet traffic signal warrants under Opening Year Cumulative (2023) With Project traffic conditions (see Appendix 6.4).

6.6 QUEUING ANALYSIS

Pursuant to the City approved scoping agreement, a queuing analysis was performed for the left turning movements at the intersection of Tustin Avenue & Santa Clara Avenue (#4) to assess vehicle queues along the roadways. Queuing analysis findings are presented in Table 6-2. It is important to note that the available stacking distances are consistent with the measured turn pocket lengths. As shown in Table 6-2, the intersection left turning movements are anticipated to experience acceptable queuing during the peak hours based on the 95th percentile peak hour traffic flows. Worksheets for Opening Year Cumulative (2023) Without Project and With Project traffic conditions queuing analysis are provided in Appendices 6.5 and 6.6, respectively.

TABLE 6-2: QUEUING SUMMARY FOR OPENING YEAR CUMULATIVE (2023) CONDITIONS

#	Intersection	Movement	Available Stacking Distance (Feet)	2023 Without Project 95th Percentile Queue (Feet) AM Peak Hour	2023 Without Project 95th Percentile Queue (Feet) PM Peak Hour	2023 Without Project Acceptable? [1] AM	2023 Without Project Acceptable? [1] PM	2023 With Project 95th Percentile Queue (Feet) AM Peak Hour	2023 With Project 95th Percentile Queue (Feet) PM Peak Hour	2023 With Project Acceptable? [1] AM	2023 With Project Acceptable? [1] PM
4	Tustin Av. & Santa Clara Av.	NBL	230	107	268 [2]	Yes	Yes[3]	120	284 [2]	Yes	Yes[3]
		SBL	150	75	112	Yes	Yes	83	118	Yes	Yes
		EBL	105	189 [2]	188 [2]	Yes[3]	Yes[3]	192 [2]	191 [2]	Yes[3]	Yes[3]
		WBL	70	195 [2]	168 [2]	Yes[3]	Yes[3]	195 [2]	168 [2]	Yes[3]	Yes[3]

[1] Stacking Distance is acceptable if the required stacking distance is less than or equal to the stacking distance provided. An additional 15 feet of stacking which is assumed to be provided in the transition for turn pockets is reflected in the stacking distance shown in this table, where applicable.

[2] 95th percentile volume exceeds capacity, queue may be longer. Queue shown is maximum after two cycles.

[3] Additional stacking distance is available in the two-way left turn lane.

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7 HORIZON YEAR (2040) TRAFFIC CONDITIONS

This section discusses the methods used to develop Horizon Year (2040) Without and With Project traffic forecasts, and the resulting intersection operations and traffic signal warrant analyses.

7.1 ROADWAY IMPROVEMENTS

The lane configurations and traffic controls assumed to be in place for Horizon Year (2040) conditions are consistent with those shown previously on Exhibit 3-1, with the exception of the following:

- Project driveways and those facilities assumed to be constructed by the Project to provide site access are also assumed to be in place for Horizon Year conditions only (e.g., intersection and roadway improvements along the Project's frontage and driveways).
- If applicable, driveways and those facilities assumed to be constructed by cumulative developments to provide site access are also assumed to be in place for Horizon Year conditions only.

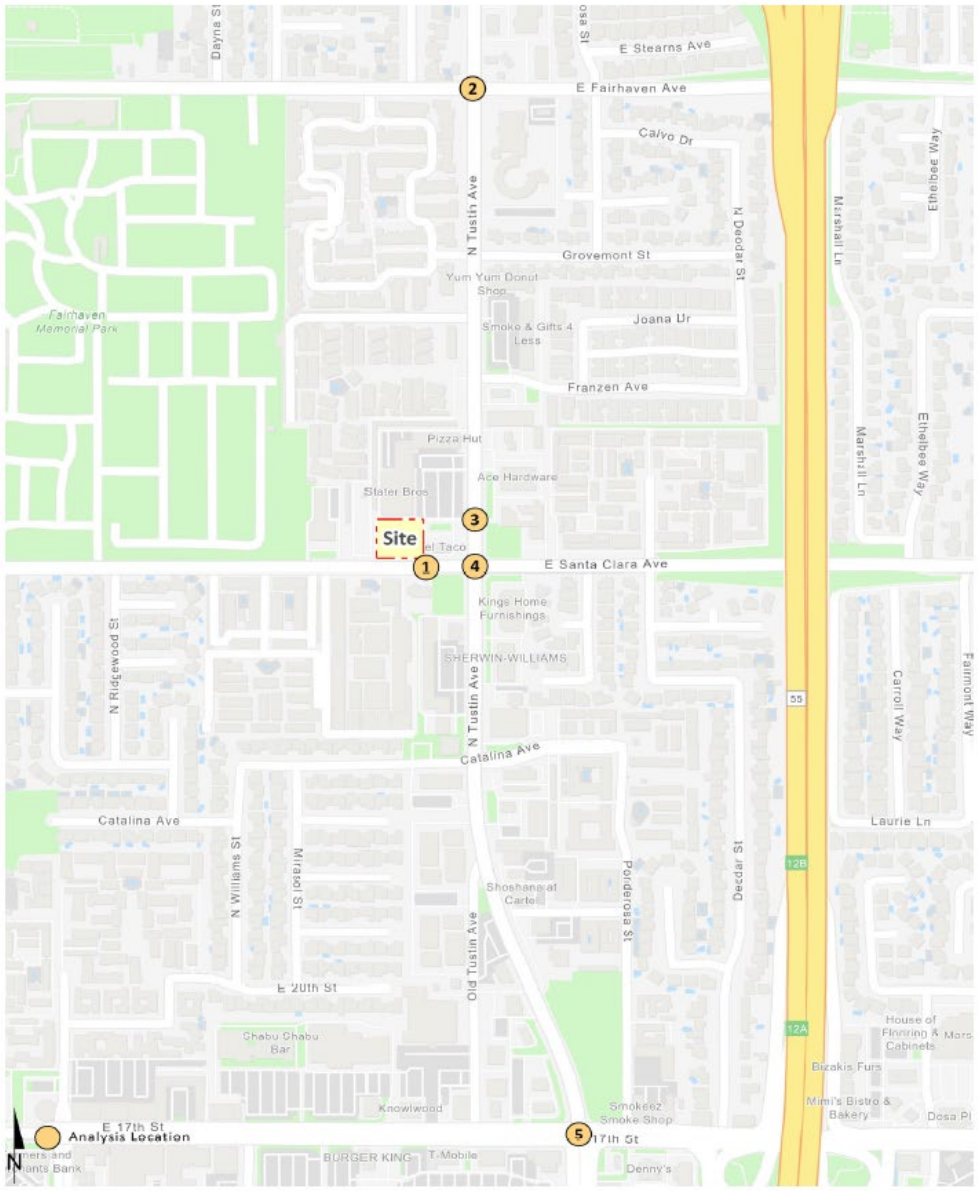
7.2 WITHOUT PROJECT TRAFFIC VOLUME FORECASTS

This scenario includes the refined post-process volumes obtained from the OCTAM (see Section 4.7 *Horizon Year (2040) Volume Development* of this TA for a detailed discussion on the post-processing methodology). The weekday peak hour volumes, in actual vehicles, which can be expected for Horizon Year (2040) Without Project traffic conditions are shown on Exhibit 7-1.

7.3 WITH PROJECT TRAFFIC VOLUME FORECASTS

This scenario includes the refined post-process volumes obtained from the OCTAM, plus the traffic generated by the proposed Project. The weekday peak hour volumes, in actual vehicles, which can be expected for Horizon Year (2040) With Project traffic conditions are shown on Exhibit 7-2.

EXHIBIT 7-1: HORIZON YEAR (2040) WITHOUT PROJECT TRAFFIC VOLUMES



##(##) AM(PM) Peak Hour Intersection Volumes

1 Driveway 1 & Santa Clara Av.

51(97) ↲	40(43) ↳	↱ 38(78)
		← 466(459)
30(58) →		↰ 12(0)
1498(421) ↓	2(2) ↓	14(2) ↱
6(4) ↳		

2 Tustin Av. & Fairhaven Av.

47(113) ↲	2284(918) ↓	277(340) ↳ ↱ 558(224)
		← 426(269)
79(101) →		↰ 377(145)
309(194) ↓	98(275) ↓	567(1439) ↑ 110(155) ↱
500(177) ↳		

3 Tustin Av. & Driveway 2

22(27) ↲	3145(1693) ↓	3(1) ↳ ↱ 3(5)
		↰ 2(0)
0(1) →		900(1857) ↑ 8(11) ↱
18(60) ↲		

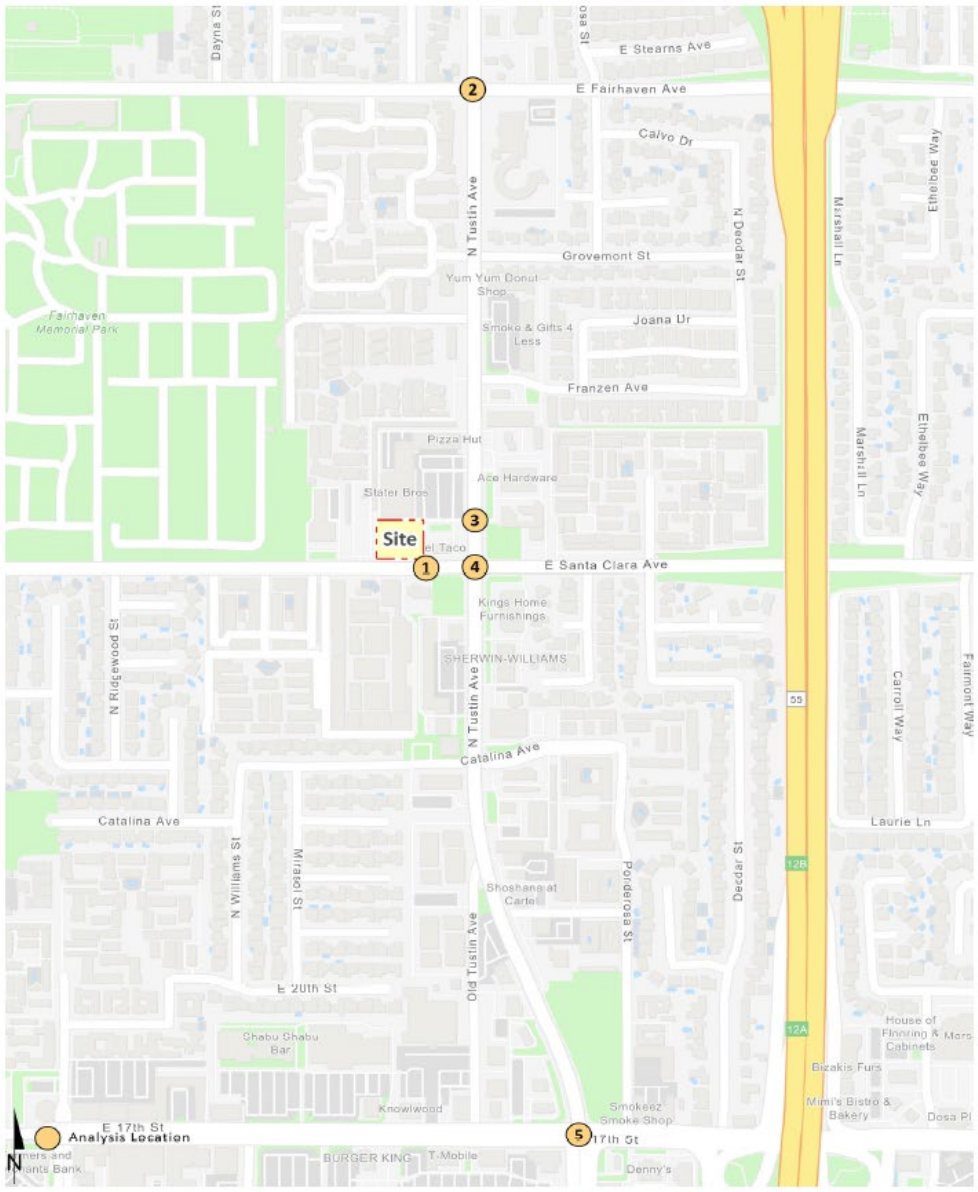
4 Tustin Av. & Santa Clara Av.

96(124) ↲	2912(1401) ↓	141(194) ↳ ↱ 158(152)
		← 301(218)
284(116) →		↰ 150(125)
705(211) ↓	80(190) ↓	498(1495) ↑ 108(166) ↱
520(169) ↳		

5 Tustin Av. & 17th St.

24(50) ↲	1915(401) ↓	682(377) ↳ ↱ 251(439)
		← 958(908)
527(508) →		↰ 617(238)
2050(980) ↓	146(241) ↓	222(1055) ↑ 260(521) ↱
358(133) ↳		

EXHIBIT 7-2: HORIZON YEAR (2040) WITH PROJECT TRAFFIC VOLUMES



##(##) AM(PM) Peak Hour Intersection Volumes

1 Driveway 1 & Santa Clara Av.

62(105) ↲	73(67) ↳	↰ 61(96)
		↑ 466(459)
		↱ 12(0)
64(83) ↳		↱ 14(2)
1476(405) →		2(2) →
6(4) ↲		

2 Tustin Av. & Fairhaven Av.

47(113) ↲	2291(923) ↓	277(340) ↳	↰ 558(224)
			↑ 426(269)
			↱ 379(147)
79(101) ↳			↱ 112(157)
309(194) →			573(1444) →
502(179) ↲			100(277) ↲

3 Tustin Av. & Driveway 2

56(52) ↲	3123(1677) ↓	3(1) ↳	↰ 3(5)
			↱ 2(0)
0(1) ↳			↱ 8(11)
			↑ 911(1865)
61(91) ↲			

4 Tustin Av. & Santa Clara Av.

96(124) ↲	2918(1406) ↓	156(205) ↳	↰ 158(152)
			↑ 313(227)
			↱ 150(125)
286(118) ↳			↱ 108(166)
709(214) →			498(1495) →
524(172) ↲			92(199) ↲

5 Tustin Av. & 17th St.

26(52) ↲	1921(406) ↓	684(379) ↳	↰ 253(441)
			↑ 958(908)
			↱ 617(238)
529(510) ↳			↱ 260(521)
2050(980) →			229(1060) →
358(133) ↲			146(241) ↲

7.4 INTERSECTION OPERATIONS ANALYSIS

7.4.1 HORIZON YEAR (2040) WITHOUT PROJECT TRAFFIC CONDITIONS

LOS calculations were conducted for the study intersections to evaluate their operations under Horizon Year (2040) Without Project conditions with roadway and intersection geometrics consistent with Section 7.1 *Roadway Improvements*. As shown on Table 7-1, the following intersections are anticipated to operate at an unacceptable LOS under Horizon Year (2040) Without Project traffic conditions:

- Tustin Av. & Fairhaven Av. (#2) – LOS F AM peak hour
- Tustin Av. & Driveway 2 (#3) – LOS F AM peak hour
- Tustin Av. & Santa Clara Av. (#4) – LOS F AM peak hour
- Tustin Av. & 17th St. (#5) – LOS F AM peak hour

The intersection operations analysis worksheets for Horizon Year (2040) Without Project traffic conditions are included in Appendix 7.1 of this TA.

TABLE 7-1: INTERSECTION ANALYSIS FOR HORIZON YEAR (2040) CONDITIONS

			2040 Without Project				2040 With Project						
			Delay (secs.)[2]		Level of		Delay (secs.)[2]		Level of		Change		Project-
		Traffic	ICU (v/c)		Service		ICU (v/c)		Service		in v/c		Related
#	Intersection	Control[1]	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	Deficiency?[3]
1	Driveway 1 & Santa Clara Av.	CSS	21.9	13.7	C	B	28.7	16.0	D	C	--	--	No
2	Tustin Av. & Fairhaven Av.	TS	**1.086**	0.690	**F**	B	**1.090**	0.692	**F**	B	0.004	0.002	No
3	Tustin Av. & Driveway 2	CSS	**66.0**	32.3	**F**	D	**>100.0**	33.0	**F**	D	--	--	No
4	Tustin Av. & Santa Clara Av.	TS	**1.144**	0.658	**F**	B	**1.155**	0.666	**F**	B	**0.011**	0.008	**Yes**
5	Tustin Av. & 17th St.	TS	**1.071**	0.815	**F**	D	**1.072**	0.818	**F**	D	0.001	0.003	No

* **BOLD** = LOS does not meet the applicable jurisdictional requirements (i.e., unacceptable LOS).

[1] CSS = Cross-Street Stop; TS = Traffic Signal

[2] All signalized intersections will be evaluated utilizing Intersection Capacity Utilization (ICU) methodology. For intersections with all way or cross street stop control, the delay and level of service for the worst individual movement (or movements sharing a single lane) are shown. HCM delay reported in seconds and ICU reported as a volume-to-capacity ratio.

[3] City of Santa Ana
A transportation impact on an intersection shall be deemed "significant" in accordance with the following table:
• The peak hour Level of Service (LOS) exceeds the maximum City threshold. The City of Santa Ana considers LOS D to be the minimum acceptable LOS for all intersections, except for those locations located within the City's defined major development areas, where LOS E is considered acceptable.
• The project increases traffic demand at the study intersection by 1% of capacity (ICU increase ≥ 0.010).
• At unsignalized intersections, an impact is considered to be significant if the project causes an intersection at LOS D or better to degrade to LOS E or F and the traffic signal warrant analysis determines that a signal is justified.
City of Orange
An intersection will be deemed deficient and require improvements to achieve an acceptable LOS when the LOS is E or F (Final V/C Ratio>0.90) and the project-related increase in V/C is equal to or greater than 0.010.

7.4.2 HORIZON YEAR (2040) WITH PROJECT TRAFFIC CONDITIONS

With the addition of Project traffic, as shown on Table 7-1, are no additional study area intersections anticipated to operate at an unacceptable LOS during the peak hours for Horizon Year (2040) With Project traffic conditions. The addition of Project traffic would trigger the City of Santa Ana's significance criteria for the following intersection:

- Tustin Av. & Santa Clara Av. (#4) – the project increases traffic demand at the study intersection by 1% of capacity (ICU increase is greater than 0.010

The intersection operations analysis worksheets for Horizon Year (2040) With Project traffic conditions are included in Appendix 7.2 of this TA.

7.5 TRAFFIC SIGNAL WARRANTS ANALYSIS

The traffic signal warrant analysis for Horizon Year (2040) traffic conditions are based on the peak hour volume-based traffic signal warrants. No study area intersections are anticipated to meet peak hour volume-based warrants for Horizon Year (2040) Without Project (see Appendix 7.3). With the addition of Project traffic, there are no study area intersections anticipated to meet traffic signal warrants under Horizon Year (2040) With Project traffic conditions (see Appendix 7.4).

7.6 QUEUING ANALYSIS

Pursuant to the City approved scoping agreement, a queuing analysis was performed for the left turning movements at the intersection of Tustin Avenue & Santa Clara Avenue (#4) to assess vehicle queues along the roadways. Queuing analysis findings are presented in Table 7-2. It is important to note that the available stacking distances are consistent with the measured turn pocket lengths. As shown in Table 7-2, the intersection left turning movements are anticipated to experience acceptable queuing during the peak hours based on the 95th percentile peak hour traffic flows. Worksheets for Horizon Year (2040) Without Project and With Project traffic conditions queuing analysis are provided in Appendices 7.5 and 7.6, respectively.

TABLE 7-2: QUEUING SUMMARY FOR HORIZON YEAR (2040) CONDITIONS

			2040 Without Project				2040 With Project			
		Available Stacking	95th Percentile Queue (Feet)		Acceptable? [1]		95th Percentile Queue (Feet)		Acceptable? [1]	
# Intersection	Movement	Distance (Feet)	AM Peak Hour	PM Peak Hour	AM	PM	AM Peak Hour	PM Peak Hour	AM	PM
4 Tustin Av. & Santa Clara Av.	NBL	230	118	274 [2]	Yes	Yes[3]	146 [2]	320 [2]	Yes	Yes[3]
	SBL	150	92	124 [2]	Yes	Yes	100	156 [2]	Yes	Yes[1]
	EBL	105	538 [2]	200 [2]	Yes[3]	Yes[3]	539 [2]	215 [2]	Yes[3]	Yes[3]
	WBL	70	271 [2]	229 [2]	Yes[3]	Yes[3]	270 [2]	227 [2]	Yes[3]	Yes[3]

[1] Stacking Distance is acceptable if the required stacking distance is less than or equal to the stacking distance provided. An additional 15 feet of stacking which is assumed to be provided in the transition for turn pockets is reflected in the stacking distance shown in this table, where applicable.

[2] 95th percentile volume exceeds capacity, queue may be longer. Queue shown is maximum after two cycles.

[3] Additional stacking distance is available in the two-way left turn lane.

7.7 DEFICIENCIES AND IMPROVEMENTS

7.7.1 INTERSECTIONS

Improvements have been identified to improve Horizon Year (2040) traffic deficiencies back to acceptable levels. The effectiveness of the proposed recommended improvements is presented in Table 7-3, which summarizes the LOS results with the proposed traffic control improvements. The intersection operations analysis worksheets for Horizon Year (2040) With Project traffic conditions, with improvements, are included in Appendix 7.7.

TABLE 7-3: INTERSECTION ANALYSIS FOR HORIZON YEAR (2040) CONDITIONS WITH IMPROVEMENTS

#	Intersection	Traffic Control[1]	Intersection Approach Lanes[2] Northbound L	T	R	Southbound L	T	R	Eastbound L	T	R	Westbound L	T	R	ICU (v/c) AM	PM	Level of Service AM	PM
4	Tustin Av. & Santa Clara Av.																	
	-Without Improvements	TS	1	3	0	2	3	0	1	2	0	1	2	0	**1.155**	0.666	**F**	B
	- With Improvements	TS	2	3	0	2	3	0	1	2	0	1	2	0	**1.126**	0.631	**F**	B

[1] TS = Traffic Signal

[2] When a right turn is designated, the lane can either be striped or unstriped. To function as a right turn lane there must be sufficient width for right turning vehicles to travel outside the through lanes.

L = Left; T = Through; R = Right; **1** = Improvement

[3] Per the Highway Capacity Manual (6th Edition), overall average intersection delay and level of service are shown for intersections with a traffic signal or all way stop control. For intersections with cross street stop control, the delay and level of service for the worst individual movement (or movements sharing a single lane) are shown.

7.7.1 QUEUES

The recommended improvements to address intersection LOS deficiencies, as shown in Table 7-3, are also reflected in Table 7-4 for the queuing analysis. Horizon Year (2040) With Project traffic conditions, with improvements, queuing analysis worksheets are provided in Appendix 7.8.

TABLE 7-4: QUEUING SUMMARY FOR HORIZON YEAR (2040) CONDITIONS WITH IMPROVEMENTS

#	Intersection	Movement	Available Stacking Distance (Feet)	Without Improvements 95th Percentile Queue (Feet) AM Peak Hour	PM Peak Hour	Acceptable?[1] AM	PM	With Improvements 95th Percentile Queue (Feet) AM Peak Hour	PM Peak Hour	Acceptable?[1] AM	PM
4	Tustin Av. & Santa Clara Av.	NBL	230	146[2]	320[2]	Yes	Yes[3]	64	120	Yes	Yes

[1] Stacking Distance is acceptable if the required stacking distance is less than or equal to the stacking distance provided. An additional 15 feet of stacking which is assumed to be provided in the transition for turn pockets is reflected in the stacking distance shown in this table, where applicable.

[2] 95th percentile volume exceeds capacity, queue may be longer. Queue shown is maximum after two cycles.

[3] Additional stacking distance is available in the two-way left turn lane.

8 DRIVE-THRU EVALUATION

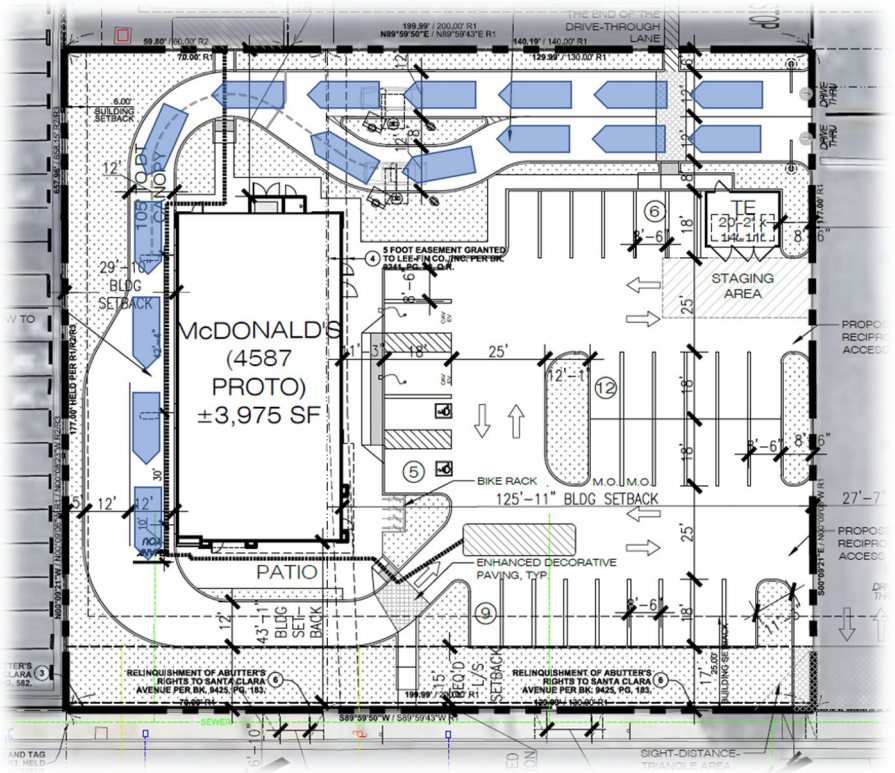
This Drive-Thru Evaluation is intended to determine if the proposed circulation plan provides adequate on-site drive-thru storage capacity to accommodate the peak on-site vehicle demands.

The proposed building will implement many of the current McDonald's restaurant design improvements. McDonald's restaurants are designed to optimize operations, drive-thru lane configurations, parking, and on-site circulation. McDonald's understands that the drive-thru wait time directly impacts the customer experience and sales. To reduce the vehicle drive-thru wait time, McDonald's has developed equipment and procedures to improve cook times and crew efficiency. These improvements include dual order boards (or a Side-By-Side drive-thru) that enables customers to place orders earlier. The Side-By-Side drive-thru allows two cars to stack next to each other. This allows the kitchen more cook time to prepare the food to have it ready by the time the customer gets to the pickup window. For a Side-By-Side drive-thru, approximately 180 seconds would elapse from the time the customer completes the order to the time the customer picks up the order from the window. Overall, the Side-By-Side drive-thru decreases total wait time and total stacking lengths during peak demands. Recognizing the benefits of the dual order boards, nearly all rebuilds and newly constructed McDonald's restaurants employ this more efficient design configuration.

8.1 DRIVE-THRU LANE

The proposed Circulation plan prepared on September 26, 2022 by Bickel Group Architecture as shown on Exhibit 8-1 indicates that the drive-thru lane will provide storage capacity for 16 vehicles.

EXHIBIT 8-1: QUEUING EVALUATION



It should be noted that approximately 20 to 25 feet per vehicle is an industry standard used to estimate the length needed for a queued vehicle. However, since the drive-thru operations involve relatively low speeds, a slightly shorter distance between vehicles is often observed. This can result in allowing more vehicles to queue in a given length. While a reduced queue length is appropriate, this analysis relies on a more conservative vehicle length of 25 feet per queued vehicle.

8.2 REFERENCE DRIVE-THRU LANE DATA COLLECTION

To evaluate the proposed dual drive-thru order board configuration, Urban Crossroads, Inc. collected drive-thru queuing data at three reference McDonald's restaurant locations in August 2022. The three reference queuing surveys shown on Table 8-1 were collected at similar McDonald's locations. Table 8-1 presents the existing weekday drive-thru queuing data for the breakfast and lunch conditions. The reference queueing data includes a count of each vehicle entering the drive-thru lane during peak breakfast and lunch activity. In addition, the counts describe the total number of vehicles queued in the drive-thru lane at any time. This includes vehicles queued at the pickup window, cashier window, and order board.

TABLE 8-1: REFERENCE DRIVE-THRU QUEUEING DATA SUMMARY

Location	Average Vehicle Queue		Peak Vehicle Queue	
	AM (7am-9am)	MD (11am-1pm)	AM (7am-9am)	MD (11am-1pm)
Brea[1]	7	8	11	12
La Palma[2]	8	10	13	15
South Gate[3]	11	5	13	10

[1] Based on counts collected at the McDonald's located at 825 Imperial Highway on Thursday, August 18,2022 (Appendix 8.1).
[2] Based on counts collected at the McDonald's located at 5062 Orangethrope Avenue on Thursday, August 18, 2022 (Appendix 8.2).
[3] Based on counts collected at the McDonald's located at 3309 Tweedy Boulevard on Thursday, August 18, 2022 (Appendix 8.3).

Table 8-1 shows that the peak observed vehicle queue lengths in the drive-thru lane ranged from 10 to 15 vehicles. The average vehicle queue at the three reference McDonald's locations ranged from 5 to 11 vehicles. The maximum number of total vehicles observed in the drive-thru never exceeded 15 vehicles at any of the three reference locations.

8.3 DRIVE-THRU QUEUING ANALYSIS

Since the proposed McDonald's – 2109 E Santa Clara Avenue Circulation Plan provides a drive-thru storage capacity of 16 vehicles, the proposed drive-thru lane will accommodate the reference average queue length of 5 to 11 vehicles. At no time does the existing or reference peak queue exceed a maximum of 15 vehicles.

The drive-thru queuing analysis demonstrates that the maximum vehicle queue of 16 vehicles can be accommodated within the drive-thru. The site plan provides adequate drive-thru storage capacity to serve the average queue length of 5 to 11 vehicles within the drive-thru lane. During peak drive-thru demands, the site plan can accommodate a total of 16 vehicles within the drive-thru, suggesting an overflow of on-site drive-thru lane capacity approaching 1 vehicle. Peak queuing can be accommodated within the drive-thru.

9 LOCAL AND REGIONAL FUNDING MECHANISMS

Transportation improvements within the City of Santa Ana are funded through a combination of direct project mitigation, payment of requisite fees, construction of planned/committed improvements covered by Measure M or M2, or fair share contributions. Identification and timing of needed improvements is generally determined through local jurisdictions based upon a variety of factors.

9.1 MEASURE M

One of the primary sources of grants funds for various County road projects is the Orange County Transportation Authority (OCTA) Measure M grants. The Measure M funds are an Orange County voter-approved, 20-year ½ cent sales tax, effective in 1990, to pay for various transportation improvements throughout the County. In November 2006, this 20-year sales tax was extended for another 30 years via a voter-approved "Renewed" Measure M (M2). OCTA is the governing administrator of these funds. Measure M and M2 improvements are outlined in the seven-year Capital Improvement Program (CIP).

9.2 PROPOSITION 1B

Proposition 1B, which was also passed by voters in November 2006, provide bond funds for road capital and maintenance projects. The County has allocated approximately $61.6 million Proposition 1B funds to apply towards transportation improvements within the County, as determined by the County's Board of Supervisors.

9.3 FAIR SHARE CONTRIBUTION

Project improvements may include a combination of fee payments to established programs (e.g., DIF), construction of specific improvements, payment of a fair share contribution toward future improvements or a combination of these approaches. Improvements constructed by development may be eligible for a fee credit or reimbursement through the program where appropriate (to be determined at the City of Santa Ana's discretion).

When off-site improvements are identified with a minor share of responsibility assigned to proposed development, the approving jurisdiction may elect to collect a fair share contribution or require the development to construct improvements. Detailed fair share calculations, for each peak hour, have been provided in Table 9-1 for the applicable deficient intersections shown previously in Table 1-3. Improvements included in a defined program and constructed by development may be eligible for a fee credit or reimbursement through the program where appropriate.

TABLE 9-1: PROJECT FAIR SHARE CALCULATIONS

#	Intersection		Existing	Project Only	2040 With Project Volume	Net New Traffic	Project % of New Traffic
4	Tustin Av. & Santa Clara Av.						
		AM:	4,040	55	6,009	1,969	2.8%
		PM:	3,675	42	4,603	928	**4.5%**

BOLD = Denotes highest fair share percentage.

10 REFERENCES

1. **City of Santa Ana.** *Traffic Impact Study Guidelines.* Santa Ana : s.n., 2019.
2. **Institute of Transportation Engineers.** *Trip Generation Manual.* 11th Edition. 2021.
3. **City of Orange.** *Traffic Impact Analysis Guidelines for Vehicle Miles Traveled and Level of Service Assessment.* Orange : s.n., July 2020.
4. **Transportation Research Board.** *Highway Capacity Manual (HCM).* 6th Edition. s.l. : National Academy of Sciences, 2016.
5. **Husch, David and Albeck, John.** *Intersection Capacity Utilization: Evaluation Procedures for Intersections and Interchanges.* Albany, California : Trafficware, 2003 Edition. 09742903-0-0.
6. **California Department of Transportation.** California Manual on Uniform Traffic Control Devices (CA MUTCD). [book auth.] California Department of Transportation. *California Manual on Uniform Traffic Control Devices (CA MUTCD).* 2014, Updated March 30, 2021 (Revision 6).

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