

REVISED TRAFFIC IMPACT ANALYSIS REPORT
THE MADISON MIXED-USE DEVELOPMENT

Santa Ana, California
August 4, 2017
(Update of Report dated May 31, 2017)

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1.0 INTRODUCTION

This Traffic Impact Analysis report addresses the potential traffic impacts and circulation needs associated with the Madison Mixed-Use Development Project (hereinafter referred to as Project). The project proponents, Bisno Development Company, LLC proposes to construct a podium style apartment project consisting of up to 260 multi-family residential units and 6,561 square-foot (SF) of retail/commercial space in the Metro East Mixed-Use Overlay Zone of the City of Santa Ana. The project site is a 2.79-acre vacant parcel of land that is located at 200 N. Cabrillo Park Drive.

1.1 Scope of Work

This traffic report documents the findings and recommendations of a traffic impact analysis conducted by Linscott, Law & Greenspan, Engineers (LLG) to determine the potential impacts associated with the proposed Project. The traffic analysis evaluates the existing operating conditions at fifteen (15) key study intersections eight (8) key roadway segments within the project vicinity, estimates the trip generation potential of the proposed Project, and forecasts future near-term (Year 2019) and long-term (Buildout) operating conditions without and with the proposed Project. Where necessary, intersection improvements/mitigation measures are identified.

This traffic report satisfies the traffic impact requirements of the City of Santa Ana and is consistent with the current *Congestion Management Program (CMP) for Orange County*. The Scope of Work for this traffic study, which is included in **Appendix A**, was developed in conjunction with City of Santa Ana Public Works Department staff.

The project site has been visited and an inventory of adjacent area roadways and intersections was performed. Existing weekday peak hour traffic count information has been collected at fifteen (15) key study intersections and eight (8) key roadway segments for use in the preparation of intersection level of service calculations. Information concerning cumulative projects (planned and/or approved) in the vicinity of the proposed Project has been researched at the City of Santa Ana and City of Tustin. Based on our research, there are eleven (11) related projects located in the City of Santa Ana and eight (8) related projects located in the City of Tustin. The nineteen (19) related projects were considered in the cumulative traffic analysis for this project.

This traffic report analyzes existing and future weekday daily, AM peak hour and PM peak hour traffic conditions for a near-term (Year 2019) and long-term (Buildout) traffic setting upon completion of the proposed Project. Near-term (Year 2019) cumulative daily and peak hour traffic forecasts were projected by incorporating a one percent (1.0%) annual growth rate and the trip generation potential of nineteen (19) related projects. Long-term (Buildout) daily and peak hour

traffic forecasts were projected based on modeled traffic projections prepared by OCTA utilizing the OCTAM 3.4.2 Year 2035 Model.

1.2 Study Area

Fifteen (15) key study intersections and eight (8) key roadway segments have been identified for evaluation. Of the fifteen (15) identified intersections, thirteen (13) are located within the City of Santa Ana and two (2) are located in the City of Tustin (i.e. Tustin Avenue at First Street and SR-55 NB Ramps at Fourth Street). All 8 key roadway segments are located in the City of Santa Ana. The fifteen (15) intersections/eight (8) roadway segments listed below provide regional and local access to the study area and define the extent of the boundaries for this traffic impact investigation.

Key Study Intersections

1. I-5 SB On-Ramp at First Street (Santa Ana/Caltrans)
2. Cabrillo Park Drive at First Street (Santa Ana)
3. Golden Circle Drive at First Street (Santa Ana)
4. Tustin Avenue at First Street (Tustin)
5. Cabrillo Park Drive at Xerox Centre (Santa Ana)
6. Cabrillo Park Drive at State Fund (Santa Ana)
7. I-5 SB Off-Ramp/Mabury Street at Fourth Street (Santa Ana/Caltrans)
8. I-5 NB Ramps at Fourth Street (Santa Ana /Caltrans)
9. Cabrillo Park Drive at Fourth Street (Santa Ana)
10. Golden Circle Drive at Fourth Street (Santa Ana)
11. Park Center Drive at Fourth Street (Santa Ana)
12. Tustin Avenue at Fourth Street (Santa Ana)
13. SR-55 SB Ramps at Fourth Street (Santa Ana/Caltrans)
14. SR-55 NB Ramps at Fourth Street/Irvine Boulevard (Tustin/Caltrans)
15. Tustin Avenue at Sixth Street (Santa Ana)

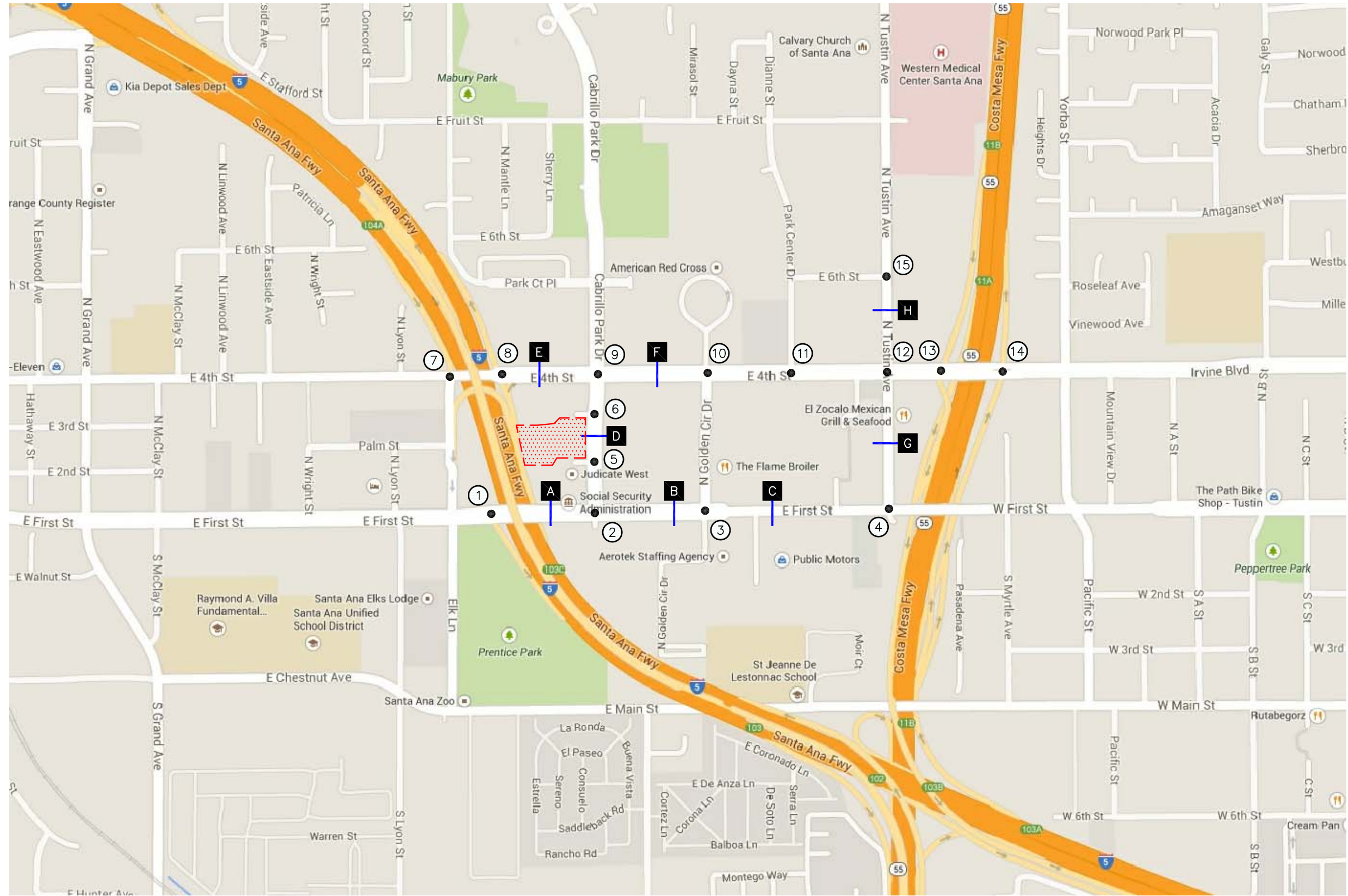
Key Roadway Segments

- A. First Street, between I-5 SB On-Ramp/Mabury Street and Cabrillo Park Drive
- B. First Street, between Cabrillo Park Drive and Golden Circle Drive
- C. First Street, between Golden Circle Drive and Tustin Avenue
- D. Cabrillo Park Drive, between Xerox Centre and State Fund
- E. Fourth Street, between I-5 NB Ramps and Cabrillo Park Drive
- F. Fourth Street, between Cabrillo Park Drive and Golden Circle Drive
- G. Tustin Avenue, between First Street and Fourth Street
- H. Tustin Avenue, between Fourth Street and Sixth Street

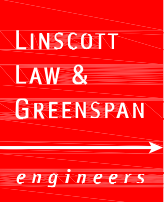
Figure 1-1 presents a Vicinity Map, which illustrates the general location of the Project and depicts the study locations and surrounding street system. The Level of Service (LOS) investigations at these key locations were used to evaluate the potential traffic-related impacts associated with area growth, cumulative projects and the proposed Project. When necessary, this report recommends intersection and/or roadway improvements that may be required to accommodate future traffic

volumes and restore/maintain an acceptable Level of Service, and/or mitigates the impact of the project. Included in this Traffic Impact Analysis are:

- Existing traffic counts,
- Estimated project traffic generation/distribution/assignment,
- Estimated cumulative project traffic generation/distribution/assignment,
- AM and PM peak hour capacity analyses for existing conditions,
- AM and PM peak hour capacity analyses for existing plus project conditions,
- AM and PM peak hour capacity analyses for future near-term (Year 2019) traffic conditions without and with the proposed Project,
- AM and PM peak hour capacity analyses for future long-term (Buildout) traffic conditions without and with the proposed Project,
- Site Access Evaluation,
- Congestion Management Program Compliance Assessment,
- Caltrans Evaluation and
- Roadway Segment Evaluation.



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SOURCE: GOOGLE

KEY

- = STUDY INTERSECTION
- = STUDY ROADWAY SEGMENT
- = PROJECT SITE

FIGURE 1-1

VICINITY MAP
THE MADISON, SANTA ANA

2.0 PROJECT DESCRIPTION

The Project site, located at 200 N. Cabrillo Park Drive, is a 2.79-acre vacant parcel of land within the Metro East Mixed Use Overlay Zone that is generally located north of First Street, south of Fourth Street, east of the Santa Ana (I-5) Freeway and west of Cabrillo Park Drive. The subject property is currently entitled for development of a 210,000 SF office building (Xerox Tower II). Access to the subject property is now provided at the Xerox Centre/Cabrillo Park Drive signalized intersection. *Figure 2-1* is an existing aerial photograph of the Project site.

The proposed Project includes seven-stories of multi-family apartment dwelling units over a two-level parking structure. *Table 2-1* summarizes the proposed Project development totals for the site. Review of *Table 2-1* shows that the proposed Project will include a total of 260 apartment homes consisting of 54 studio units, 143 one-bedroom units, 11 one-bedroom with loft units, 44 two-bedroom units, 4 three-bedroom units and 4 live/work units, each with 626.75 square-feet (SF) of dedicated retail/commercial space, and approximately 6,561 of ground floor retail space within two (2) suites over a two-level parking garage (plus subterranean level) with a total of 445 parking spaces. On-site facilities/amenities of the proposed Project include a leasing office, a lounge/lobby, business center, pool/spa, a fitness center for residents, and two roof top decks.

The Project is expected to be constructed over the next two years or so and completed by 2018, but is dependent on several factors, including the project funding and market conditions. Hence, to provide a conservative assessment, Year 2019 has been utilized to assess the Project's potential traffic impacts at full occupancy of the apartment homes project within an opening year traffic setting. *Figures 2-2 and 2-3* the site plan for the proposed Project prepared by MVE+Partners, for the ground floor and 2nd Floor, respectively.

2.1 Site Access

Vehicular access to the Project's parking garage will be provided from a proposed driveway on Xerox Centre Drive at N. Cabrillo Park Drive; no vehicular access from State Fund Drive is proposed.

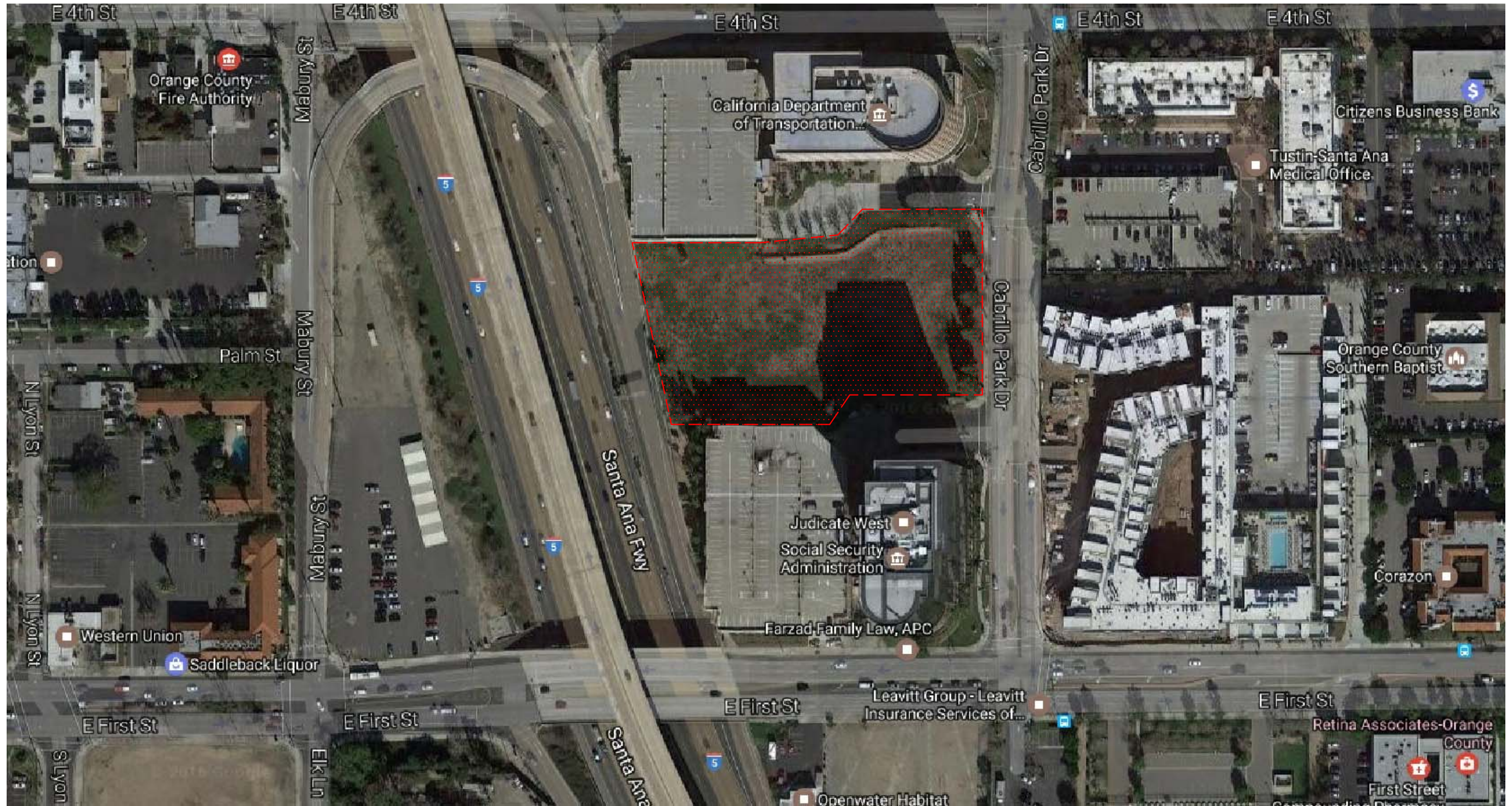
2.2 Pedestrian Circulation

Pedestrian circulation would be provided via existing public sidewalks along Cabrillo Park Drive, First Street and Fourth Street within the vicinity of the Project. The proposed Project will protect the existing sidewalk along Project frontage on Cabrillo Park Drive. The existing sidewalk system within the Project vicinity provides direct connectivity to the existing development located along major thoroughfares.

**TABLE 2-1
PROJECT DEVELOPMENT SUMMARY¹**

Land Use / Project Description	Project Development Totals
<i><u>The Madison Mixed-Use Development</u></i>	
<input type="checkbox"/> Studio Units (603 SF Average)	54 Units
<input type="checkbox"/> 1 Bedroom Units (803 SF Average)	143 Units
<input type="checkbox"/> 1 Bedroom + Loft Units (803 SF Average)	11 Units
<input type="checkbox"/> 2 Bedroom Units (928 SF Average)	44 Units
<input type="checkbox"/> 3 Bedroom Units (1,600 SF Average)	4 Units
<input type="checkbox"/> 1 Live/Work Units (1,459 SF Average)	<u>4 Units</u>
○ 2,507 SF commercial space	
<i>Total Residential Units:</i>	<i>260 Units</i>
<input type="checkbox"/> Retail Suite North	2,202 SF
<input type="checkbox"/> Retail Suite South	<u>4,359 SF</u>
<i>Total Retail Space:</i>	<i>6,561 SF</i>
<i><u>Parking Supply</u></i>	
<input type="checkbox"/> Resident Parking – 1 st Access (includes 10 H/C)	329 spaces
<input type="checkbox"/> Resident Parking – 2 nd Access/Tandem	63 spaces
<input type="checkbox"/> Guest Parking (includes 1 H/C spaces)	<u>53 spaces</u>
<i>Total Parking Supply:</i>	<i>445 spaces</i>

¹ Source: MVE+Partners, 7/28/17.



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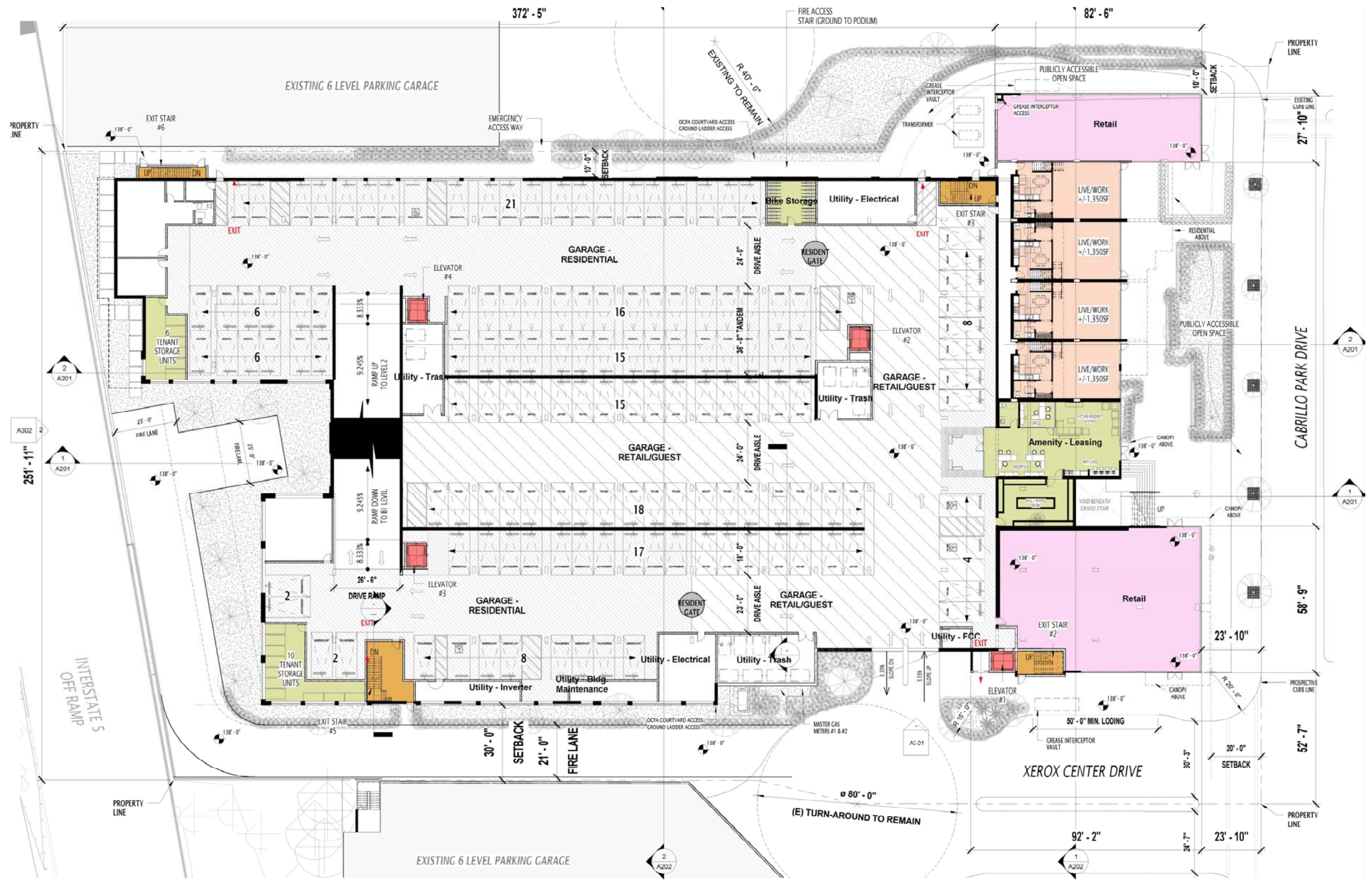
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KEY

 = PROJECT SITE

FIGURE 2-1

EXISTING AERIAL SITE PHOTOGRAPH
THE MADISON, SANTA ANA



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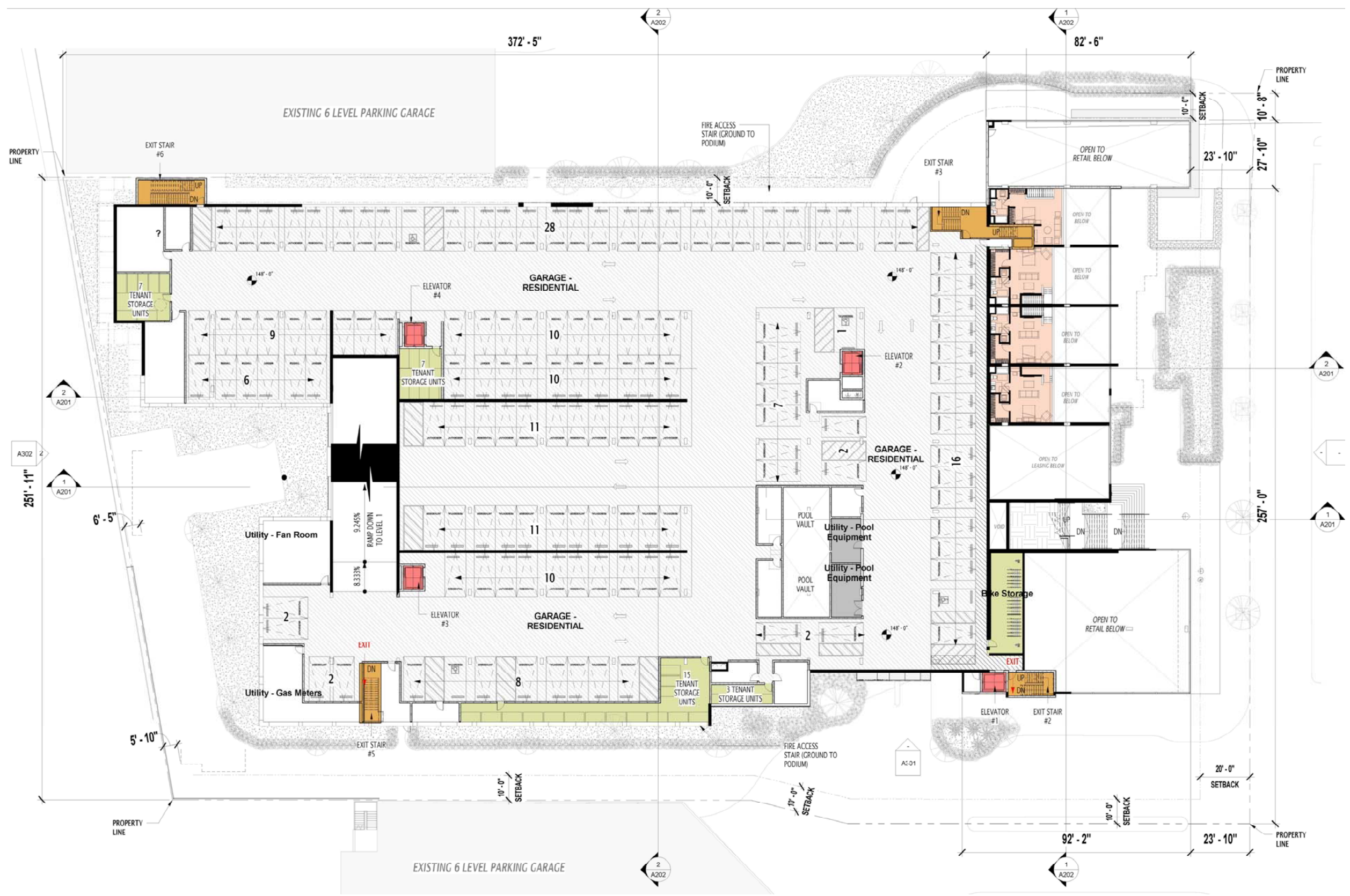
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LAW &
GREENSPAN**
engineers

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FIGURE 2-2
PROPOSED SITE PLAN - GROUND FLOOR
THE MADISON, SANTA ANA

UNIT TYPE LEGEND	
	STAIRS
	ELEVATOR CORES
	BUILDING AMENITIES
	RETAIL
	STUDIOS - 53 TOTAL UNITS
	1 BEDROOM - 176 TOTAL UNITS
	2 BEDROOM - 43 TOTAL UNITS
	3 BEDROOM - 4 TOTAL UNITS
	LIVE/WORK - 4 TOTAL UNITS



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SOURCE: MVE+PARTNERS

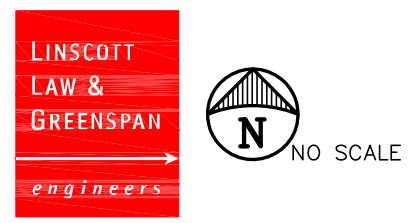


FIGURE 2-3

PROPOSED SITE PLAN - SECOND FLOOR
THE MADISON, SANTA ANA

3.0 EXISTING CONDITIONS

3.1 Existing Street System

The principal local network of streets serving the project site are Fourth Street, First Street, Cabrillo Park Drive, Golden Center Drive, and Tustin Avenue. The following discussion provides a brief synopsis of these key area streets. The descriptions are based on an inventory of existing roadway conditions.

Fourth Street is a six-lane, divided roadway oriented in the east-west direction that provides three eastbound and three westbound travel lanes separated by a raised median island. The posted speed limit on Fourth Street is 40 miles per hour (mph). On-street parking is not permitted along this roadway in the vicinity of the project. Traffic signals control the study intersections of Fourth Street at I-5 SB Off-Ramp, I-5 NB On-Ramp, Cabrillo Park Drive, Golden Circle Drive, Park Center Drive, Tustin Avenue, SR-55 SB Ramps, and SR-55 NB Ramps. East of the SR-55 Freeway, Fourth Street is known as Irvine Boulevard within the City of Tustin

First Street is a four to six-lane, divided roadway in the vicinity of the project, oriented in the east-west direction that provides two or three lanes in each direction separated by a raised median island. The posted speed limit on First Street is 35 mph. On-street parking is not permitted along this roadway. A traffic signal controls the study intersections of First Street at I-5 SB On Ramp, Cabrillo Park Drive, Golden Center Drive, and Tustin Avenue.

Cabrillo Park Drive is a four-lane, divided roadway that borders the project site to the east, oriented in the north-south direction. Cabrillo Park Drive will provide access to the site via a signalized driveway with Xerox Centre. The posted speed limit on Cabrillo Park Drive is 35 mph. On-street parking is not permitted along this roadway in the vicinity of the project. Traffic signals control the study intersections of Fourth Street, State Fund, Xerox Centre, and First Street.

Golden Center Drive is generally a two-lane, undivided roadway, oriented in the north-south direction. The posted speed limit on Golden Center Drive is 30 mph. On-street parking is permitted along this roadway in the vicinity of the project. A traffic signal controls the study intersection of Golden Center Drive at Fourth Street and First Street.

Tustin Avenue is a six-lane, divided roadway, oriented in the north-south direction. On-street parking is not permitted along this roadway in the vicinity of the project. The posted speed limit on Tustin Avenue is 40 mph. Traffic signals control the study intersections of Tustin Avenue at Sixth Street, Fourth Street, and First Street.

Figure 3-1 presents an inventory of the existing roadway conditions for the arterials and intersections evaluated in this report. This figure identifies the number of travel lanes for key arterials, as well as intersection configurations and controls for the key area study intersections.

3.1.1 *Public Transit*

Public transit bus service is provided in the project area by the Orange County Transportation Authority (OCTA). Three (3) OCTA bus routes operate within the vicinity of the Project site on First Street, Fourth Street and Tustin Avenue, which consist of the following:

- OCTA Route 64 (Huntington Beach to Tustin): Route 64 is a community bus route serving the Cities of Huntington Beach, Westminster, Garden Grove, Santa Ana and Tustin. The major routes of travel include Bolsa Avenue, First Street and Newport Boulevard. Nearest to the project site are bus stops on First Street - eastbound on the southeast corner of the intersection with Cabrillo Park Drive and westbound on the northwest corner of the intersection with Golden Circle Drive. Route 64 operates on approximate 30-minute headways during weekdays and 20-minute headways on weekends. Residents of the proposed Project would be within walking distance of existing bus stops, which currently serve and would continue to serve the project site.
- OCTA Route 71 (Newport Beach to Placentia): Route 71 is a community bus route serving the Cities of Newport Beach, Costa Mesa, Irvine, Tustin, Santa Ana, Orange, Anaheim and Placentia. The major routes of travel include Newport Boulevard, Red Hill Avenue, Newport Avenue, First Street, Tustin Avenue and Rose Avenue. Nearest to the project site are bus stops on First Street and Fourth Street at the intersections with Tustin Avenue. Route 71 operates on approximate 30-minute headways during weekdays and 45-minute headways on weekends.
- OCTA Route 463 (Santa Ana to Costa Mesa). Route 463 is a limited-stop community bus route serving the Cities of Santa Ana and Costa Mesa. The major routes of travel include Sunflower Avenue, Anton Avenue, Dyer Road, Grand Avenue, Edinger Avenue, and Fourth Street. Route 463 travels between the Santa Ana Regional Transportation Center, Hutton Centre, South Coast Metro Area, and Harbor at Sunflower. Nearest to the project site are bus stops on Fourth Street at the intersections with Cabrillo Park Drive. Route 71 operates on approximate 25-minute headways during weekdays; no bus service is provided on the weekends. Residents of the proposed Project would be within walking distance of existing bus stops, which currently serve and would continue to serve the project site.

3.2 Existing Traffic Volumes

Fifteen (15) key study intersections and eight (8) key roadway segments have been identified as the locations at which to evaluate existing and future traffic operating conditions. Some portion of potential project-related traffic will pass through each of these intersections, and their analysis will reveal the expected relative impacts of the project. These key locations were selected for evaluation based on discussions with City of Santa Ana staff and in consideration of Orange County CMP requirements.

Existing daily, AM peak hour and PM peak hour traffic volumes for the 15 key study intersections and 8 key roadway segments evaluated in this report were obtained from manual turning movement counts conducted by Transportation Studies, Inc. in October 2016.

Figures 3-2 and **3-3** illustrate the existing AM and PM peak hour traffic volumes at the fifteen (15) key study intersections evaluated in this report, respectively. **Figure 3-3** also presents the existing average daily traffic volumes for the 8 key roadway segments in the vicinity of the proposed Project. **Appendix B** contains the detailed peak hour and daily traffic count sheets for the key intersections and roadway segments evaluated in this report.

3.3 Existing Intersection Conditions

Existing AM and PM peak hour operating conditions for the fifteen (15) key study intersections were evaluated using the *Intersection Capacity Utilization (ICU)* methodology for signalized intersections and the methodology outlined in the *Highway Capacity Manual 2010 (HCM 2010)* for unsignalized intersections.

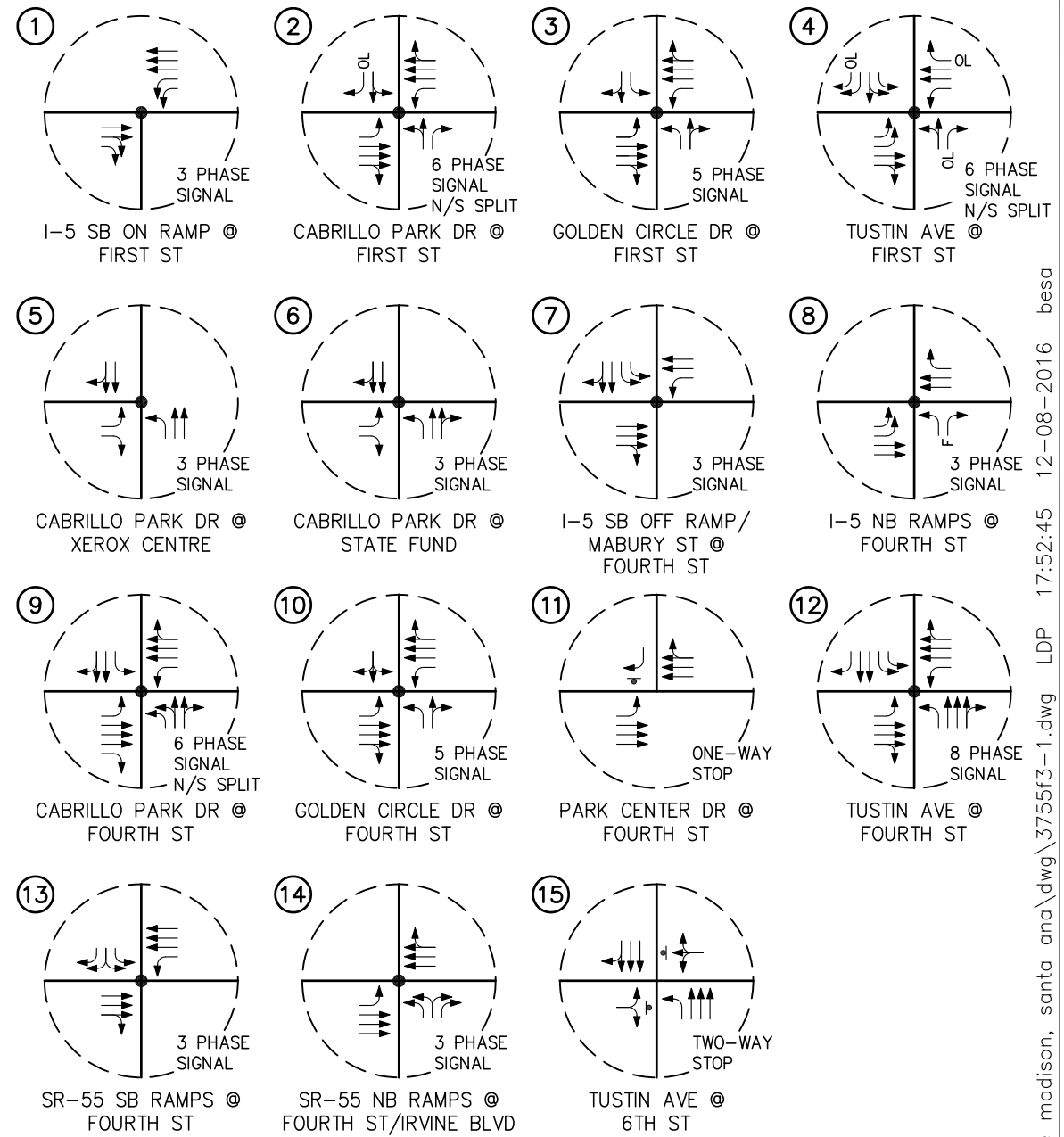
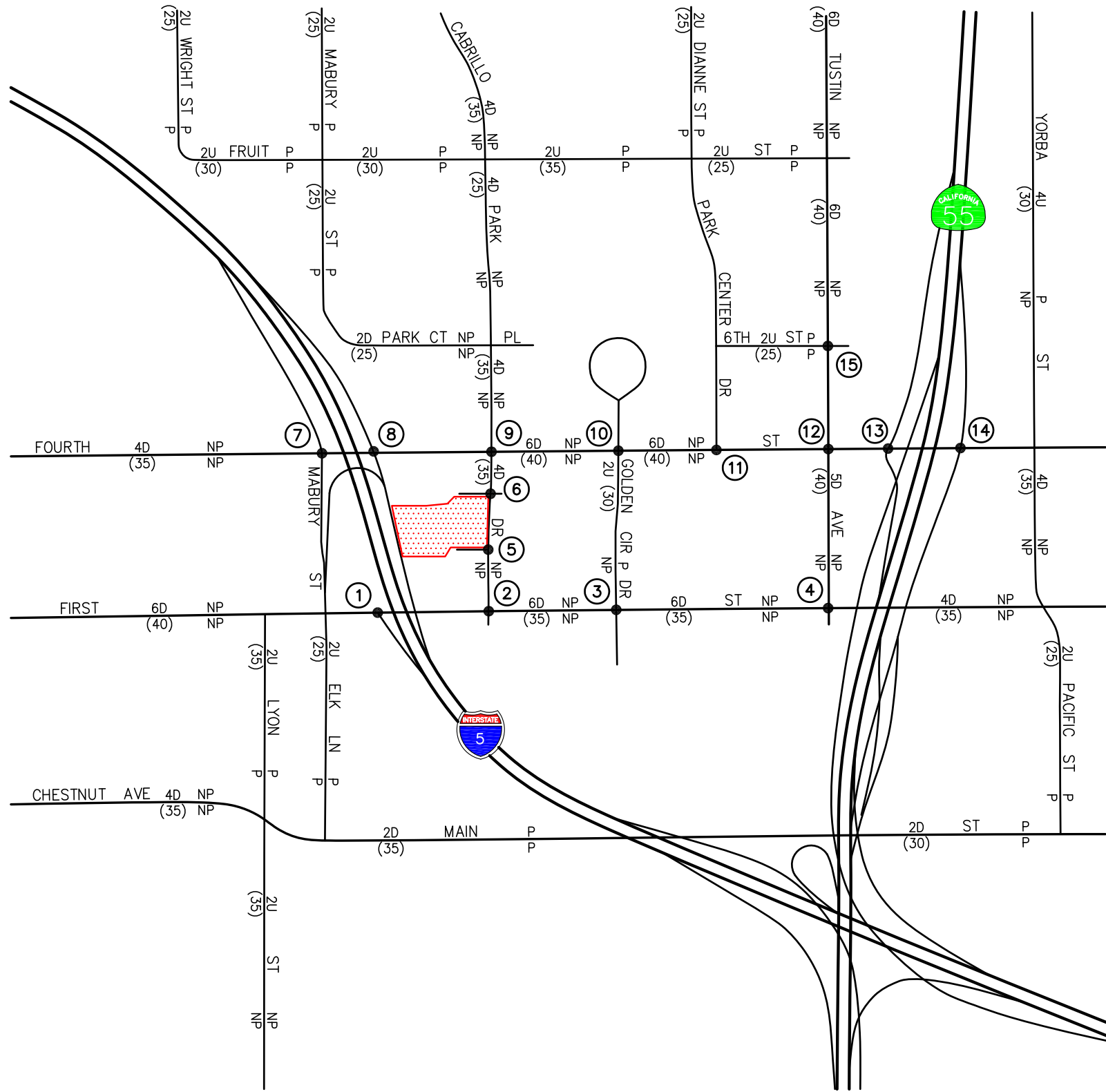
3.3.1 Intersection Capacity Utilization (ICU) Method of Analysis

In conformance with City of Santa Ana and Orange County CMP requirements, existing AM and PM peak hour operating conditions for the key signalized study intersections were evaluated using the Intersection Capacity Utilization (ICU) method. The ICU technique is intended for signalized intersection analysis and estimates the volume to capacity (V/C) relationship for an intersection based on the individual V/C ratios for key conflicting traffic movements. The ICU numerical value represents the percent signal (green) time, and thus capacity, required by existing and/or future traffic. It should be noted that the ICU methodology assumes uniform traffic distribution per intersection approach lane and optimal signal timing.

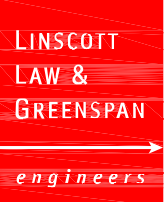
Per City of Santa Ana requirements, the ICU calculations use a lane capacity of 1,700 vehicles per hour (vph) for through lanes and 1,600 vph for left-turn lanes and right-turn lanes. A clearance adjustment factor of 0.05 was added to each Level of Service calculation.

Per City of Tustin requirements, the ICU calculations use a lane capacity of 1,700 for through and all turn lanes. A clearance adjustment factor of 0.05 was added to each Level of Service calculation.

The ICU value translates to a Level of Service (LOS) estimate, which is a relative measure of the intersection performance. The ICU value is the sum of the critical volume to capacity ratios at an

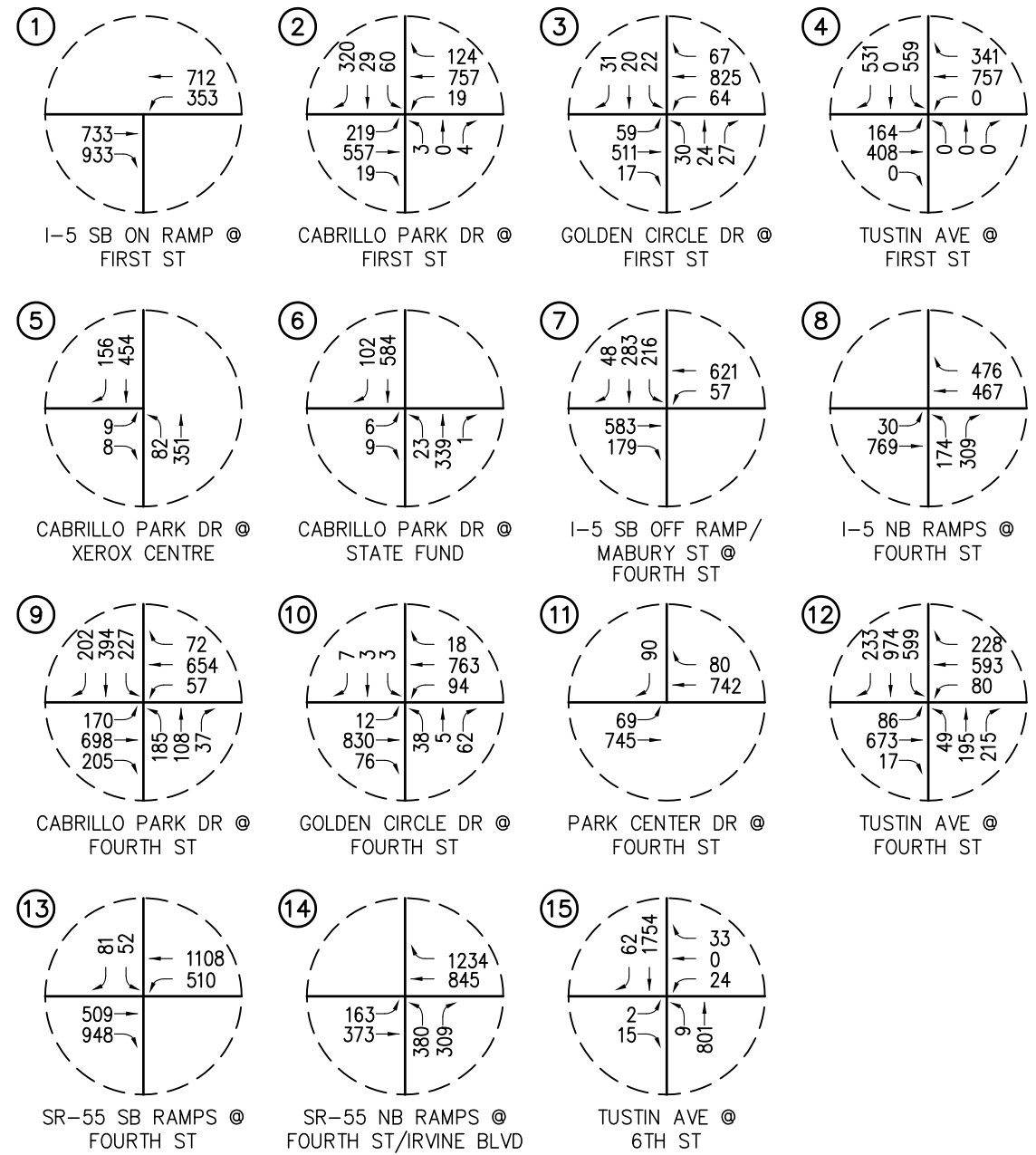
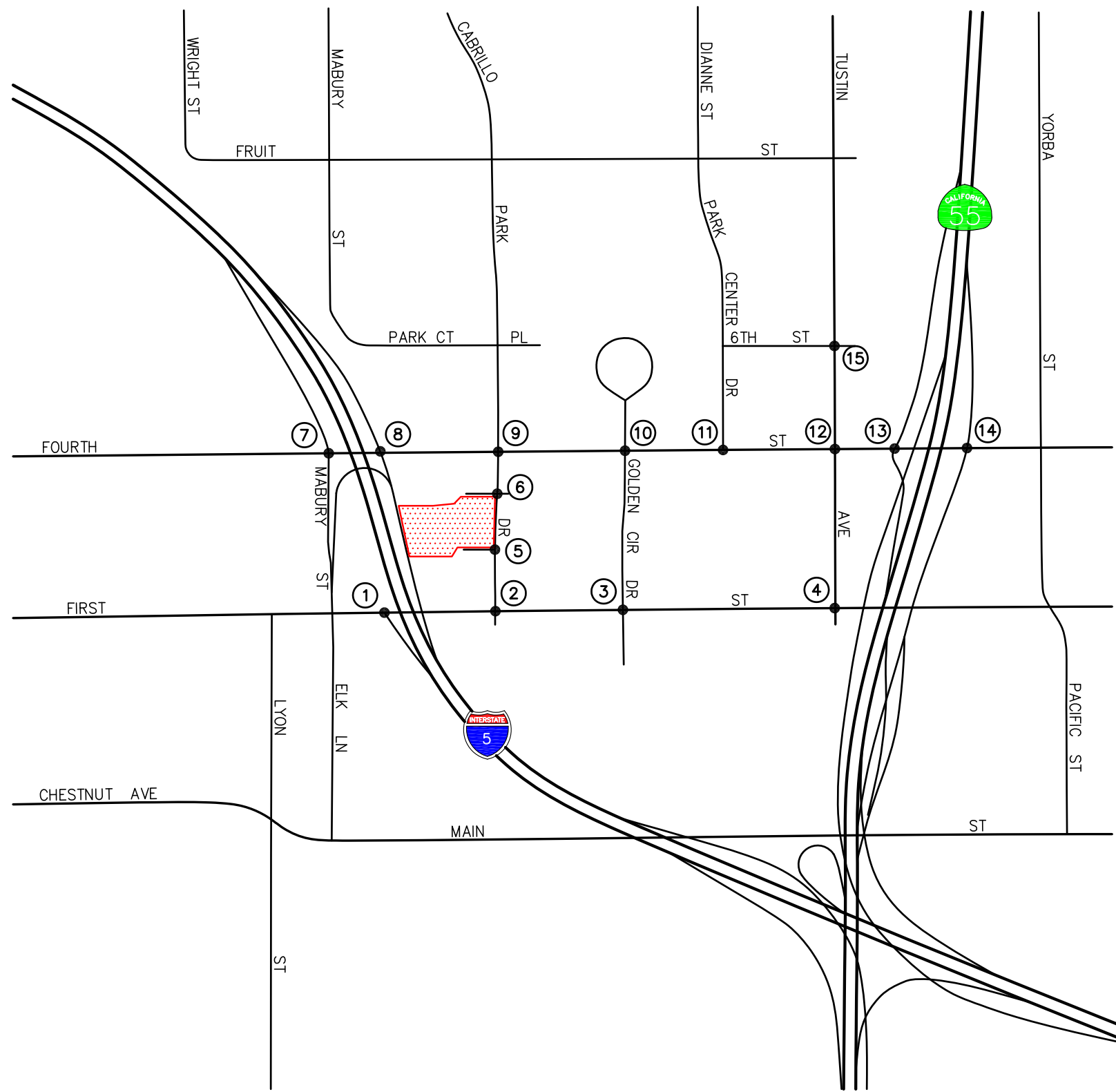


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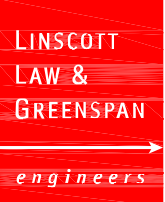


- KEY**
- ← = APPROACH LANE ASSIGNMENT
 - = TRAFFIC SIGNAL, ▼ = STOP SIGN
 - P = PARKING, NP = NO PARKING
 - U = UNDIVIDED, D = DIVIDED
 - OL = OVERLAP
 - 2 = NUMBER OF TRAVEL LANES
 - (XX) = POSTED SPEED LIMIT (MPH)
 - F = FREE-RIGHT
 - [Red Hatched Box] = PROJECT SITE

FIGURE 3-1
EXISTING ROADWAY CONDITIONS
AND INTERSECTION CONTROLS
 THE MADISON, SANTA ANA



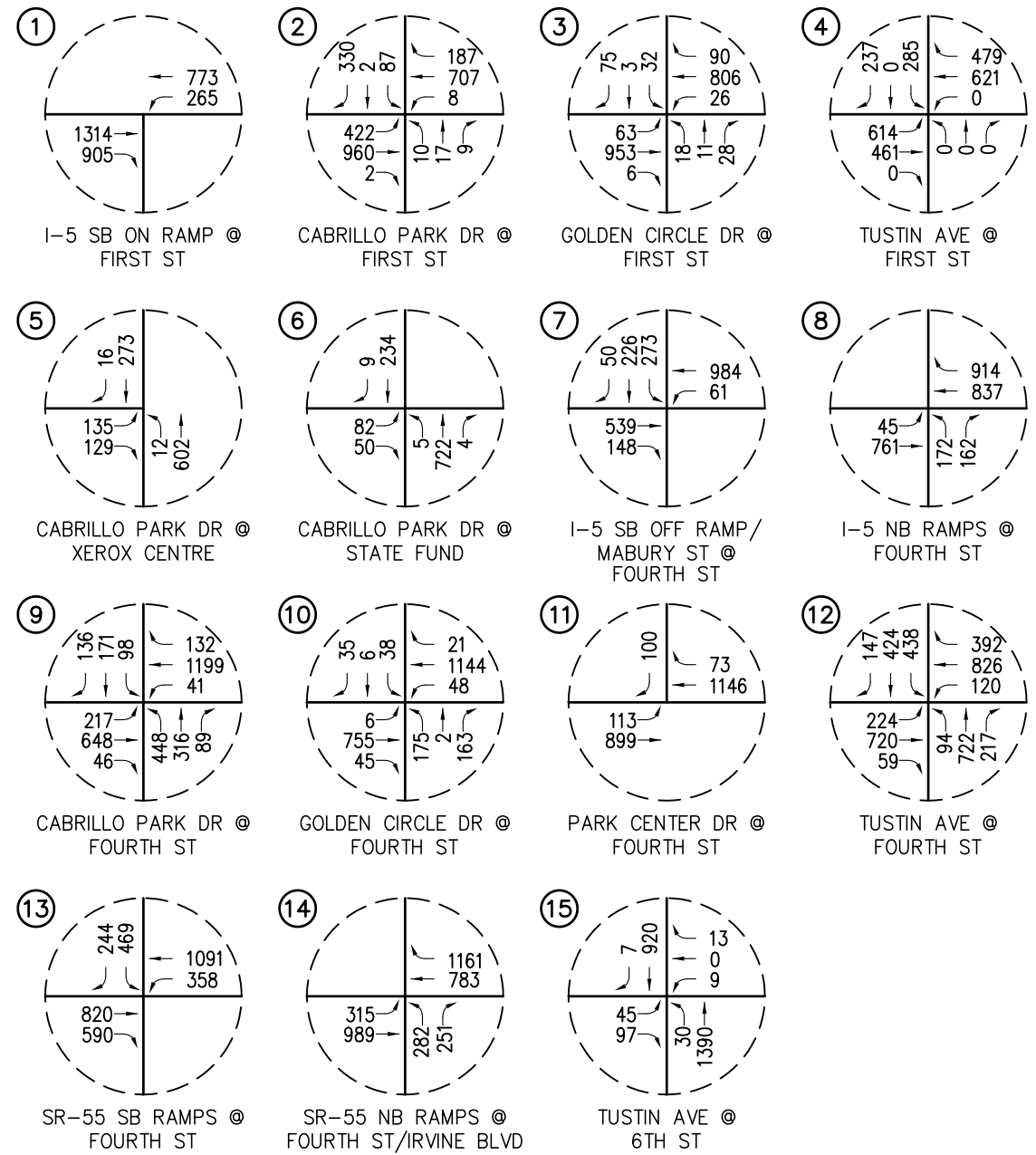
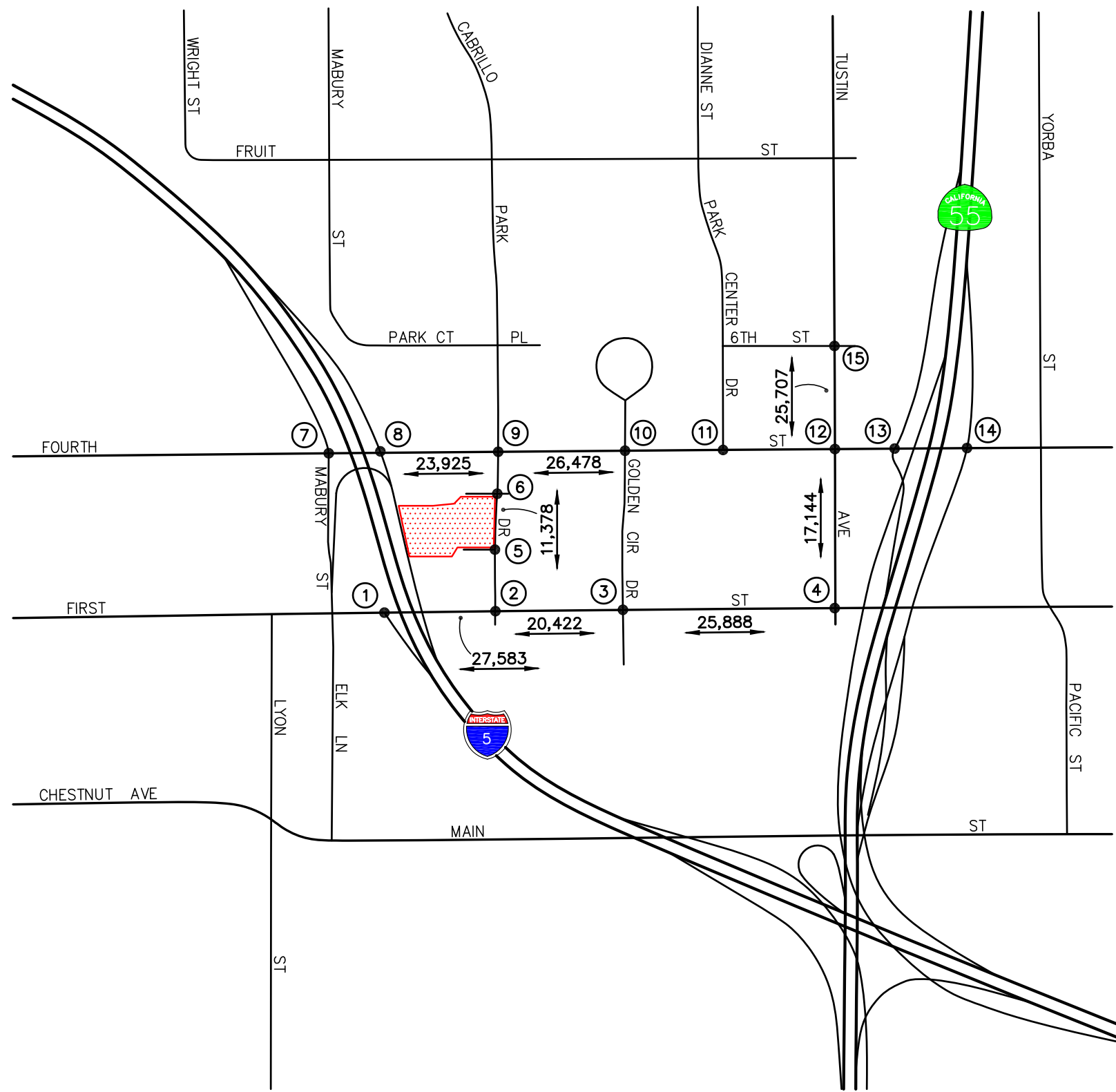
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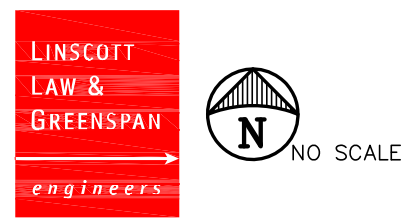
KEY
 = PROJECT SITE

FIGURE 3-2

EXISTING AM PEAK HOUR TRAFFIC VOLUMES
 THE MADISON, SANTA ANA



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KEY
 XX,XXX = DAILY TRAFFIC VOLUMES
 = PROJECT SITE

FIGURE 3-3
EXISTING PM PEAK HOUR AND DAILY TRAFFIC VOLUMES
 THE MADISON, SANTA ANA

intersection; it is not intended to be indicative of the LOS of each of the individual turning movements. The six qualitative categories of Level of Service have been defined along with the corresponding ICU value range and are shown in *Table 3-1*.

3.3.2 Highway Capacity Manual (HCM) Method of Analysis (Unsignalized Intersections)

Two-way stop-controlled intersections are comprised of a major street, which is uncontrolled, and a minor street, which is controlled by stop signs. Level of service for a two-way stop-controlled intersection is determined by the computed or measured control delay. The control delay by movement, by approach, and for the intersection as a whole is estimated by the computed capacity for each movement. LOS is determined for each minor-street movement (or shared movement) as well as major-street left turns. The worst side street approach delay is reported. LOS is not defined for the intersection as a whole or for major-street approaches, as it is assumed that major-street through vehicles experience zero delay. The HCM control delay value range for two-way stop-controlled intersections is shown in *Table 3-2*.

3.3.3 Level of Service Criteria

According to the Cities of Santa Ana and Tustin, LOS D is the minimum acceptable condition that should be maintained during the peak commute hours. However, the City of Santa Ana has defined exceptions to this criterion at specific locations within the study area. The City of Santa Ana has defined major development areas where LOS “E” is considered acceptable.

Caltrans “endeavors to maintain a target LOS at the transition between LOS “C” and LOS “D” on State highway facilities”; it does not require that LOS “D” (shall) be maintained. However, Caltrans acknowledges that this may not always be feasible and recommends that the lead agency consult with Caltrans to determine the appropriate target LOS. Caltrans has determined that all state owned facilities that operate below LOS D should be identified and improved to an acceptable LOS. The *Caltrans Traffic Impact Study Guidelines dated December 2002* does state that if an existing state owned facility operates at less than LOS D, the existing service level should be maintained. Based on the above, the following summarizes the LOS required for each key study intersection:

<u>LOS “D” Requirements</u>	
1. I-5 SB On-Ramp at First Street	8. I-5 NB Ramps at Fourth Street
4. Tustin Avenue at First Street	13. SR- 55 Ramps at Fourth Street
7. I-5 SB Off-Ramp/Mabury St at Fourth Street	14. SR-55 NB Ramps at Fourth St/Irvine Blvd
<u>LOS “E” Requirements</u>	
2. Cabrillo Park Drive at First Street	10. Golden Circle Drive at Fourth Street
3. Golden Circle Drive at First Street	11. Park Center Drive at Fourth Street
5. Cabrillo Park Drive at Xerox Centre	12. Tustin Avenue at Fourth Street
6. Cabrillo Park Drive at State Fund	15. Tustin Avenue at Sixth Street
9. Cabrillo Park Drive at Fourth Street	

**TABLE 3-1
LEVEL OF SERVICE CRITERIA FOR SIGNALIZED INTERSECTIONS**

Level of Service (LOS)	Intersection Capacity Utilization Value (V/C)	Level of Service Description
A	≤ 0.600	EXCELLENT. No vehicle waits longer than one red light, and no approach phase is fully used.
B	0.601 – 0.700	VERY GOOD. An occasional approach phase is fully utilized; many drivers begin to feel somewhat restricted within groups of vehicles.
C	0.701 – 0.800	GOOD. Occasionally drivers may have to wait through more than one red light; backups may develop behind turning vehicles.
D	0.801 – 0.900	FAIR. Delays may be substantial during portions of the rush hours, but enough lower volume periods occur to permit clearing of developing lines, preventing excessive backups.
E	0.901 – 1.000	POOR. Represents the most vehicles intersection approaches can accommodate; may be long lines of waiting vehicles through several signal cycles.
F	> 1.000	FAILURE. Backups from nearby locations or on cross streets may restrict or prevent movement of vehicles out of the intersection approaches. Potentially very long delays with continuously increasing queue lengths.

TABLE 3-2
LEVEL OF SERVICE CRITERIA FOR UNSIGNALIZED INTERSECTIONS²

Control Delay (sec/veh)	Level of Service (LOS)	Level of Service Description
0-10	A	Little or no delay
> 10-15	B	Short traffic delays
> 15-20	C	Average traffic delays
> 25-35	D	Long traffic delays
> 35-50	E	Very long traffic delays
> 50	F	Severe congestion

² Source: *Highway Capacity Manual*, Chapter 19: Two-Way Stop-Controlled Intersections. The LOS criteria apply to each lane on a given approach and to each approach on the minor street. LOS is not calculated for major-street approaches or for the intersection as a whole.

3.4 Existing Level of Service Results

Table 3-3 summarizes the existing peak hour service level calculations for the fifteen (15) key study intersections based on existing traffic volumes and current street geometrics. Review of *Table 3-3* indicates that fourteen (14) of the fifteen (15) key study intersections currently operate at an acceptable level of service during the AM and PM peak hours. The one exception is SR-55 SB Ramps at Fourth Street, which currently operates at unacceptable LOS E during the AM peak hour.

Appendix D presents the ICU/LOS and HCM/LOS calculation worksheets for the fifteen (15) key study intersections for the AM peak hour and PM peak hour.

**TABLE 3-3
EXISTING PEAK HOUR INTERSECTION CAPACITY ANALYSIS**

	Key Intersection	Time Period	Jurisdiction	Minimum Acceptable LOS	Control Type	ICU/HCM	LOS
1.	I-5 SB On-Ramp at First Street	AM PM	Santa Ana/ Caltrans	D	3Ø Traffic Signal	0.507 0.595	A A
2.	Cabrillo Park Drive at First Street	AM PM	Santa Ana	E	6Ø Traffic Signal	0.428 0.572	A A
3.	Golden Circle Drive at First Street	AM PM	Santa Ana	E	5Ø Traffic Signal	0.323 0.336	A A
4.	Tustin Avenue at First Street	AM PM	Tustin	D	6Ø Traffic Signal	0.485 0.512	A A
5.	Cabrillo Park Drive at Xerox Centre	AM PM	Santa Ana	E	3Ø Traffic Signal	0.297 0.311	A A
6.	Cabrillo Park Drive at State Fund	AM PM	Santa Ana	E	3Ø Traffic Signal	0.277 0.321	A A
7.	I-5 SB Off-Ramp/Mabury Street at Fourth Street	AM PM	Santa Ana/ Caltrans	D	3Ø Traffic Signal	0.348 0.426	A A
8.	I-5 NB Ramps at Fourth Street	AM PM	Santa Ana/ Caltrans	D	3Ø Traffic Signal	0.466 0.743	A C
9.	Cabrillo Park Drive at Fourth Street	AM PM	Santa Ana	E	6Ø Traffic Signal	0.563 0.737	A C
10.	Golden Circle Drive at Fourth Street	AM PM	Santa Ana	E	5Ø Traffic Signal	0.341 0.455	A A
11.	Park Center Drive at Fourth Street	AM PM	Santa Ana	E	One Way Stop	13.7 s/v 18.1 s/v	B C
12.	Tustin Avenue at Fourth Street	AM PM	Santa Ana	E	8Ø Traffic Signal	0.596 0.776	A C
13.	SR-55 SB Ramps at Fourth Street	AM PM	Santa Ana/ Caltrans	D	3Ø Traffic Signal	0.989 0.791	E C
14.	SR-55 NB Ramps at Fourth Street/Irvine Boulevard	AM PM	Tustin / Caltrans	D	3Ø Traffic Signal	0.778 0.800	C D
15.	Tustin Avenue at Sixth Street	AM PM	Santa Ana	E	Two Way Stop	30.0 s/v 38.7 s/v	D E

4.0 TRAFFIC FORECASTING METHODOLOGY

In order to estimate the traffic impact characteristics of the proposed Project, a multi-step process has been utilized. The first step is traffic generation, which estimates the total arriving and departing traffic on a peak hour and daily basis. The traffic generation potential is forecast by applying the appropriate vehicle trip generation equations or rates to the project development tabulation.

The second step of the forecasting process is traffic distribution, which identifies the origins and destinations of inbound and outbound project traffic. These origins and destinations are typically based on demographics and existing/expected future travel patterns in the study area.

The third step is traffic assignment, which involves the allocation of project traffic to study area streets and intersections. Traffic assignment is typically based on minimization of travel time, which may or may not involve the shortest route, depending on prevailing operating conditions and travel speeds. Traffic distribution patterns are indicated by general percentage orientation, while traffic assignment allocates specific volume forecasts to individual roadway links and intersection turning movements throughout the study area.

With the forecasting process complete and project traffic assignments developed, the impact of the proposed project is isolated by comparing operational (LOS) conditions at selected key intersections using expected future traffic volumes with and without forecast project traffic. The need for site-specific and/or cumulative local area traffic improvements can then be evaluated and the significance of the project's impacts identified.

5.0 PROJECT TRAFFIC CHARACTERISTICS

5.1 Project Traffic Generation

Traffic generation is expressed in vehicle trip ends, defined as one-way vehicular movements, either entering or exiting the generating land use. Generation equations and/or rates used in the traffic forecasting procedure are found in the 9th Edition of *Trip Generation*, published by the Institute of Transportation Engineers (ITE) [Washington D.C., 2012].

Table 5-1 summarizes the trip generation rates used in forecasting the vehicular trips generated by the proposed Project and also presents the project's forecast peak hour and daily traffic volumes. As shown in the upper portion of *Table 5-1*, ITE Land Use 220: Apartments trip rates was be used to forecast the trip generation potential of the residential component of the Project. For the retail/commercial component of the Project, ITE Land Use 820: Shopping Center averages trips were used. For the Entitled Land Use, ITE Land Use 710: General Office averages trip rates were used.

A review of the middle portion of this table indicates that the proposed Project is forecast to generate approximately 2,010 "net" daily trips, with 134 "net" trips (30 inbound, 104 outbound) produced in the AM peak hour and 184 "net" trips (115 inbound, 69 outbound) produced in the PM peak hour on a "typical" weekday.

The trip generation potential of the Entitled Land Use totals 2,316 daily trips, with 328 trips (288 inbound, 40 outbound) during the AM peak hour and 313 trips (53 inbound, 260 outbound) during the PM peak hour.

Please note that based on common traffic engineering practices, the traffic generated by the entitled land uses may be considered to represent a "trip credit" for the project site, against which the impact of the proposed Project might be compared. Comparison of the trips generated by the proposed Project to the trips generated by the entitled development of 210,000 SF of office space shows that the proposed Project will generate 306 fewer daily trips, 194 fewer AM peak hour trips and 129 fewer PM peak hour trips. Based on this comparison, we conclude that the traffic impact potential associated with the proposed Project would likely be less than that of the entitled land use.

5.2 Project Traffic Distribution and Assignment

Figures 5-1 present the traffic distribution pattern for the proposed Project. A tabular summary of the general directional Project trip distribution pattern is presented *Table 5-2*. Project traffic volumes both entering and exiting the project site have been distributed and assigned to the adjacent street system based on the following considerations:

- location of site access points in relation to the surrounding street system,
- the site's proximity to major traffic carriers and regional access routes (i.e. First Street, Fourth Street, I-5 Freeway, SR-55 Freeway, etc.),
- physical characteristics of the circulation system such as lane channelization and presence of traffic signals that affect travel patterns,
- presence of traffic congestion in the surrounding vicinity,
- ingress/egress availability at the project site,
- distribution patterns contained within the *Traffic Impact Study for the Metro East Overlay Zone in the City of Santa Ana*, and
- input from City staff.

The anticipated near-term AM and PM peak hour project traffic volumes associated with the proposed Project are presented in *Figures 5-2* and *5-3*, respectively. *Figure 5-3* also presents the daily Project traffic volumes. The traffic volume assignments presented in *Figures 5-2* and *5-3* reflect the traffic distribution characteristics shown in *Figure 5-1* and the traffic generation forecast presented in *Table 5-1*.

5.3 Existing Plus Project Traffic Conditions

The Existing Plus Project traffic conditions have been generated based upon existing conditions and the estimated project traffic. These forecast traffic conditions have been prepared pursuant to the California Environmental Quality Act (CEQA) guidelines, which require that the potential impacts of a Project be evaluated upon the circulation system as it currently exists. This traffic volume scenario and the related intersection capacity analyses will identify the roadway improvements necessary to mitigate the direct traffic impacts of the Project, if any.

Figures 5-4 and *5-5* present projected AM and PM peak hour traffic volumes at the fifteen (15) key study intersections with the addition of the trips generated by the proposed Project to existing traffic volumes, respectively. *Figure 5-5* also presents the Existing Plus Project daily traffic volumes.

TABLE 5-1
PROJECT TRAFFIC GENERATION RATES AND FORECAST³

Description	Daily 2-Way	AM Peak Hour			PM Peak Hour		
		Enter	Exit	Total	Enter	Exit	Total
<i>Trip Rates:</i>							
▪ 220: Apartments (TE/ DU)	6.65	20%	80%	0.51	65%	35%	0.62
▪ 710: General Office (TE/1000 SF)	11.03	88%	12%	1.56	17%	83%	1.49
▪ 820: Shopping Center (TE/1000 SF)	42.70	62%	38%	0.96	48%	52%	3.71
<i>Project Trip Generation:</i>							
▪ The Madison Apartments (260 DU)	1,729	27	106	133	105	56	161
▪ The Madison Retail/Commercial Component of Live/Work (2,507 SF)	107	1	1	2	4	5	9
▪ The Madison Retail (6,561 SF)	280	4	2	6	12	12	24
Total Project Trip Generation:	2,116	32	109	141	121	73	194
Internal Trip Capture (5%)	-106	-2	-5	-7	-6	-4	-10
Total Net Project Trip Generation	2,010	30	104	134	115	69	184
<i>Entitled Land Use Trip Generation:</i>							
▪ Xerox Centre Phase II Office Tower (210,000 SF)	2,316	288	40	328	53	260	313
Trip Generation Comparison – Proposed Project vs. Entitled Land Use	-306	-258	64	-194	62	-191	-129

Notes:

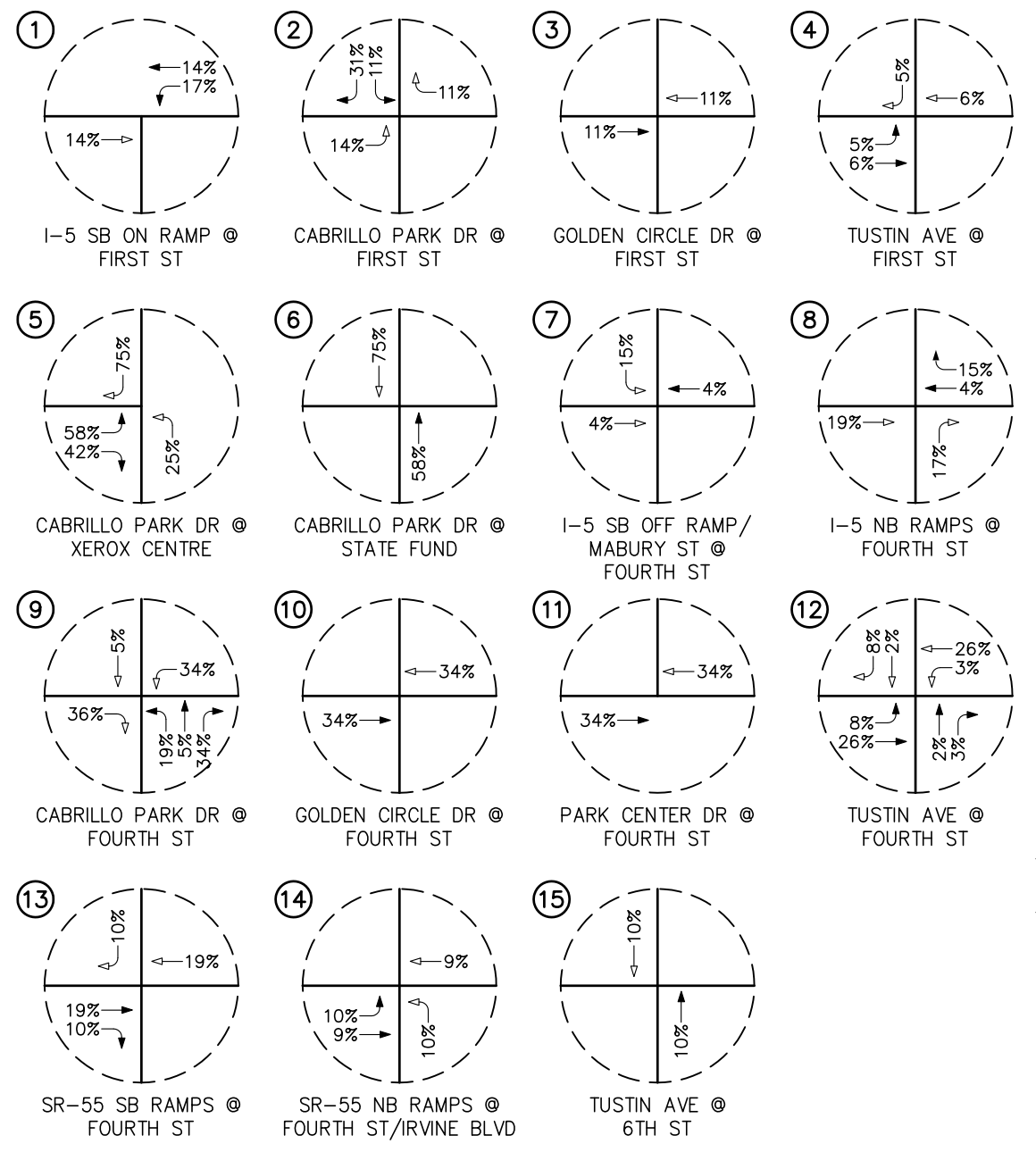
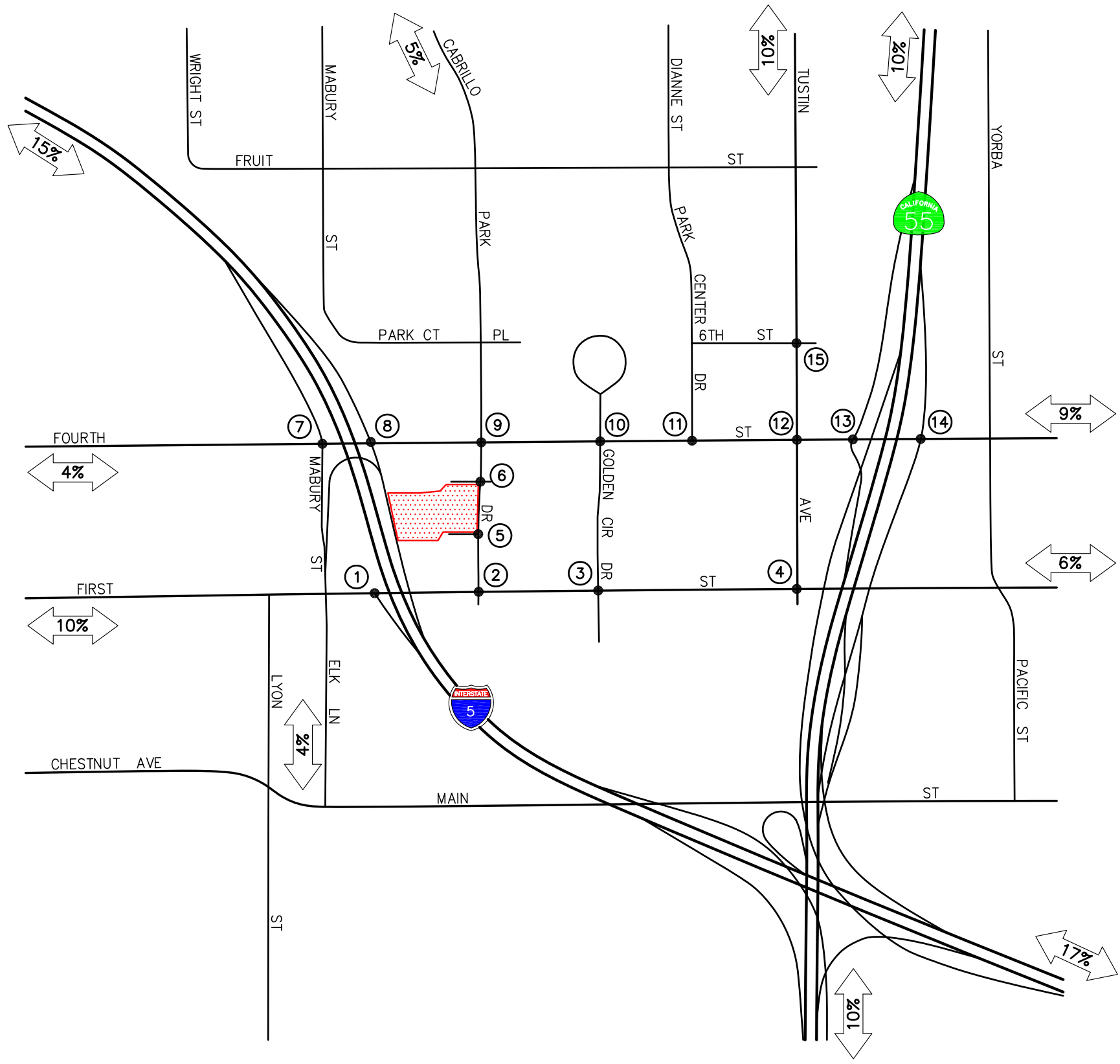
TE/1000 SF = Trip End per 1,000 Square Feet of Gross Floor Area

TE/DU = Trip End per Dwelling Unit

³ Source: *Trip Generation*, 9th Edition, Institute of Transportation Engineers (ITE), Washington, D.C. (2012).

TABLE 5-2
PROJECT DIRECTIONAL DISTRIBUTION PATTERN

Distribution Percentage	Orientation/Direction
15%	To/from the north via I-5 Freeway
17%	To/from the south via I-5 Freeway
10%	To/from the north via SR-55 Freeway
10%	To/from the south via SR-55 Freeway
5%	To/from the north via Cabrillo Park Drive
10%	To/from the north via Tustin Avenue
4%	To/from the south via Elk Avenue
9%	To/from the east via Fourth Street/Irvine Boulevard
4%	To/from the west via Fourth Street
6%	To/from the east via First Street
10%	To/from the west via First Street
100%	Total



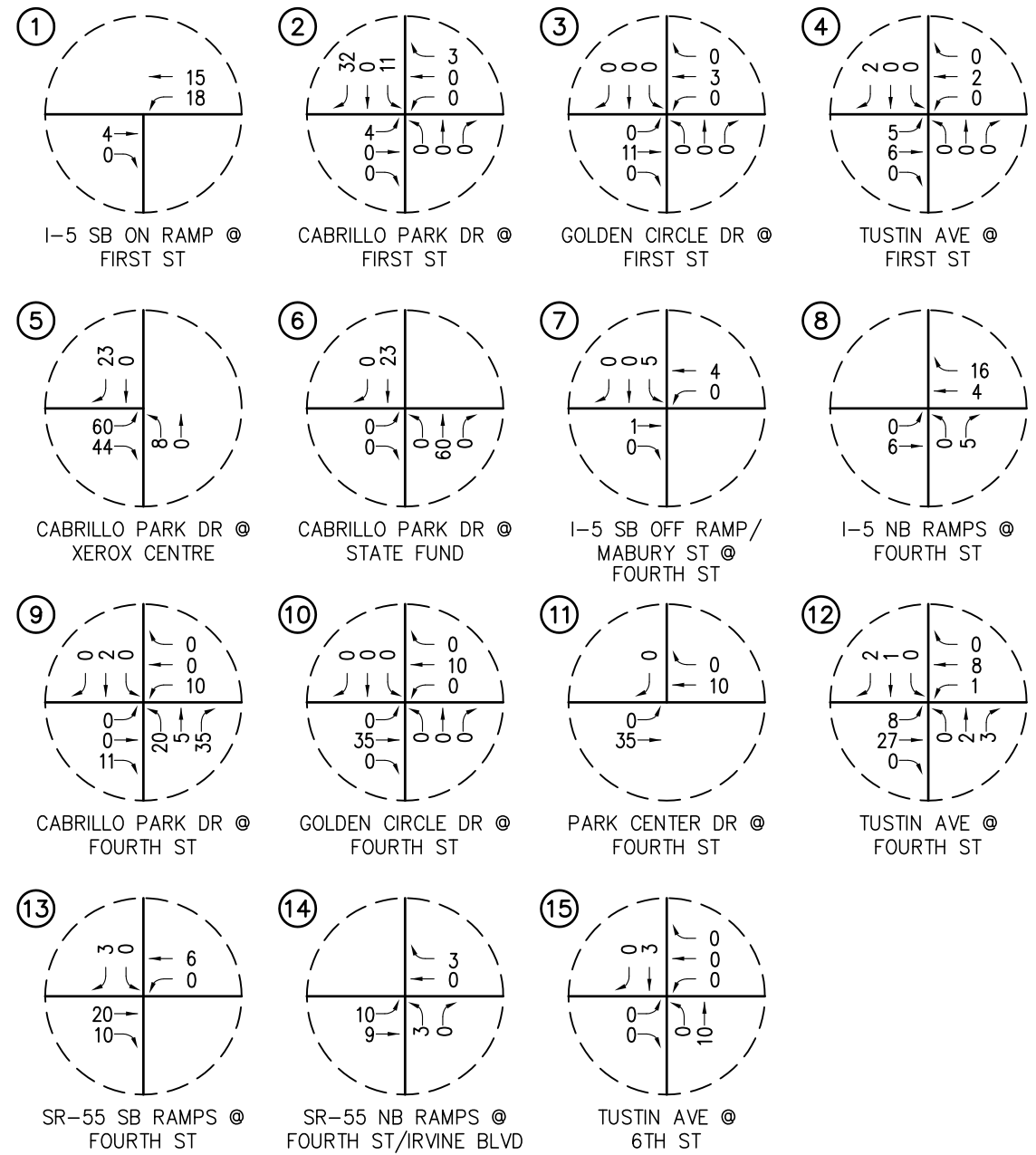
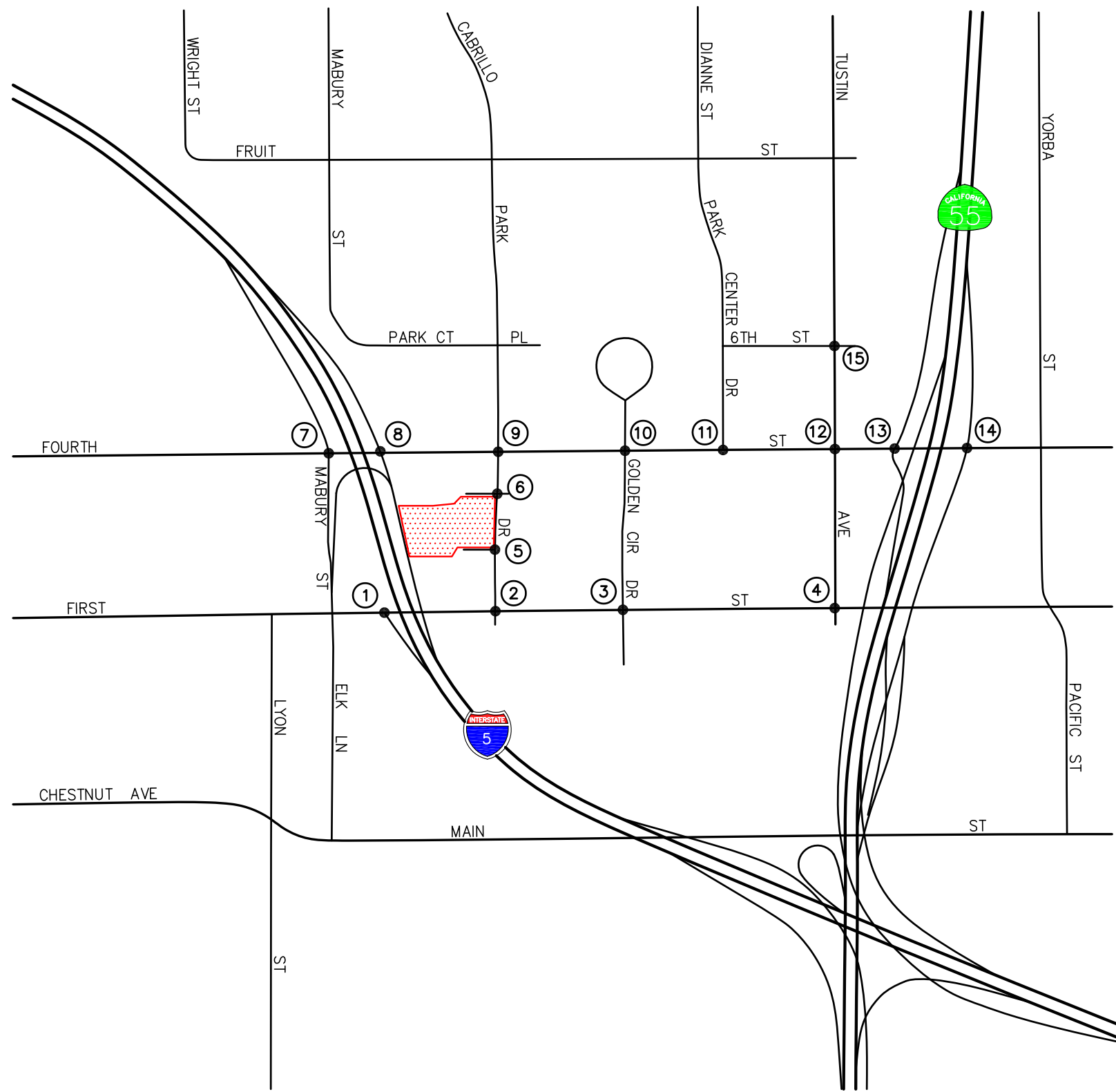
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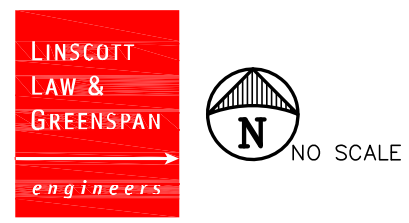
KEY
 ← = INBOUND PERCENTAGE
 → = OUTBOUND PERCENTAGE
 [Red Hatched Box] = PROJECT SITE

FIGURE 5-1

PROJECT TRAFFIC DISTRIBUTION PATTERN
 THE MADISON, SANTA ANA



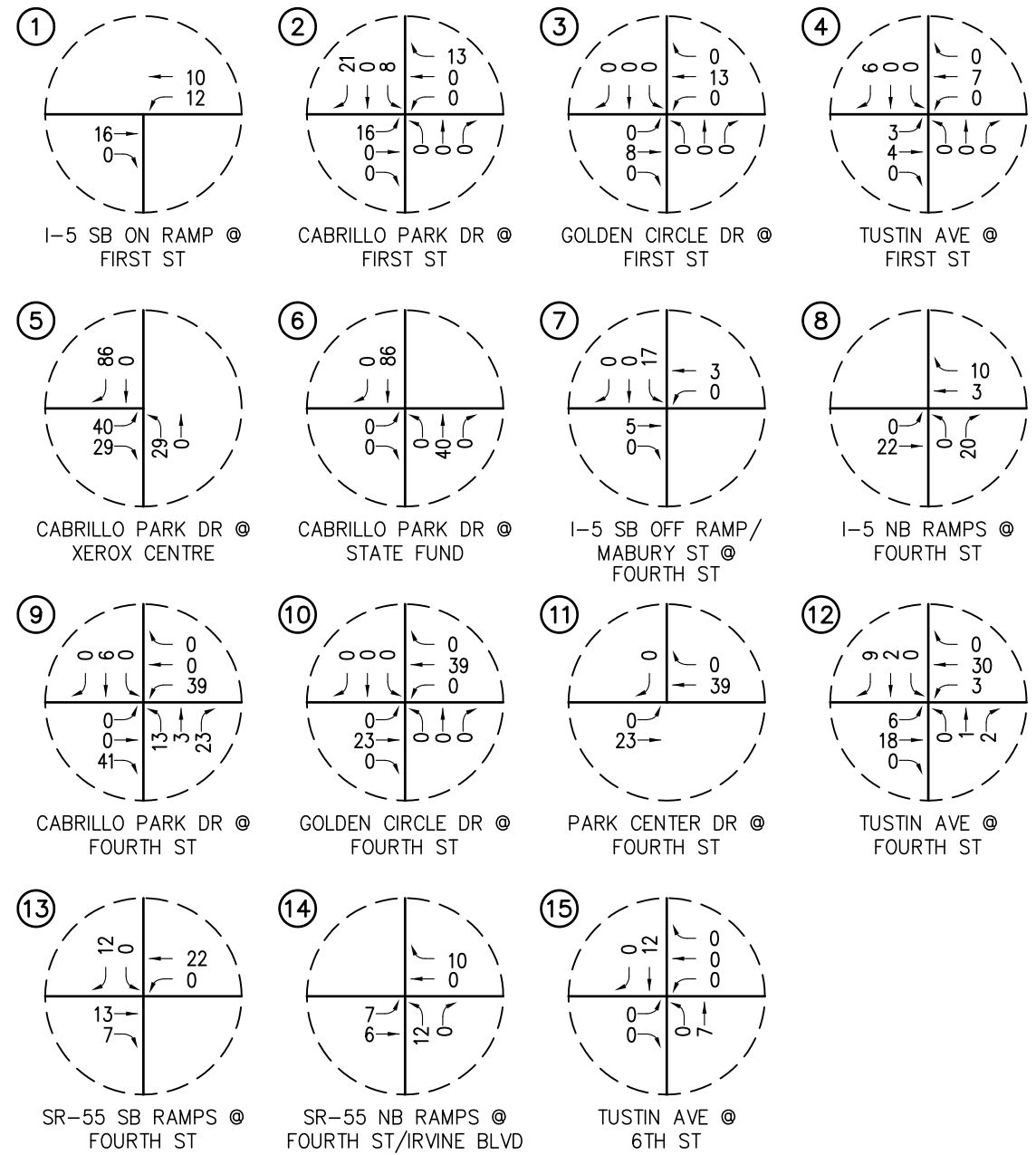
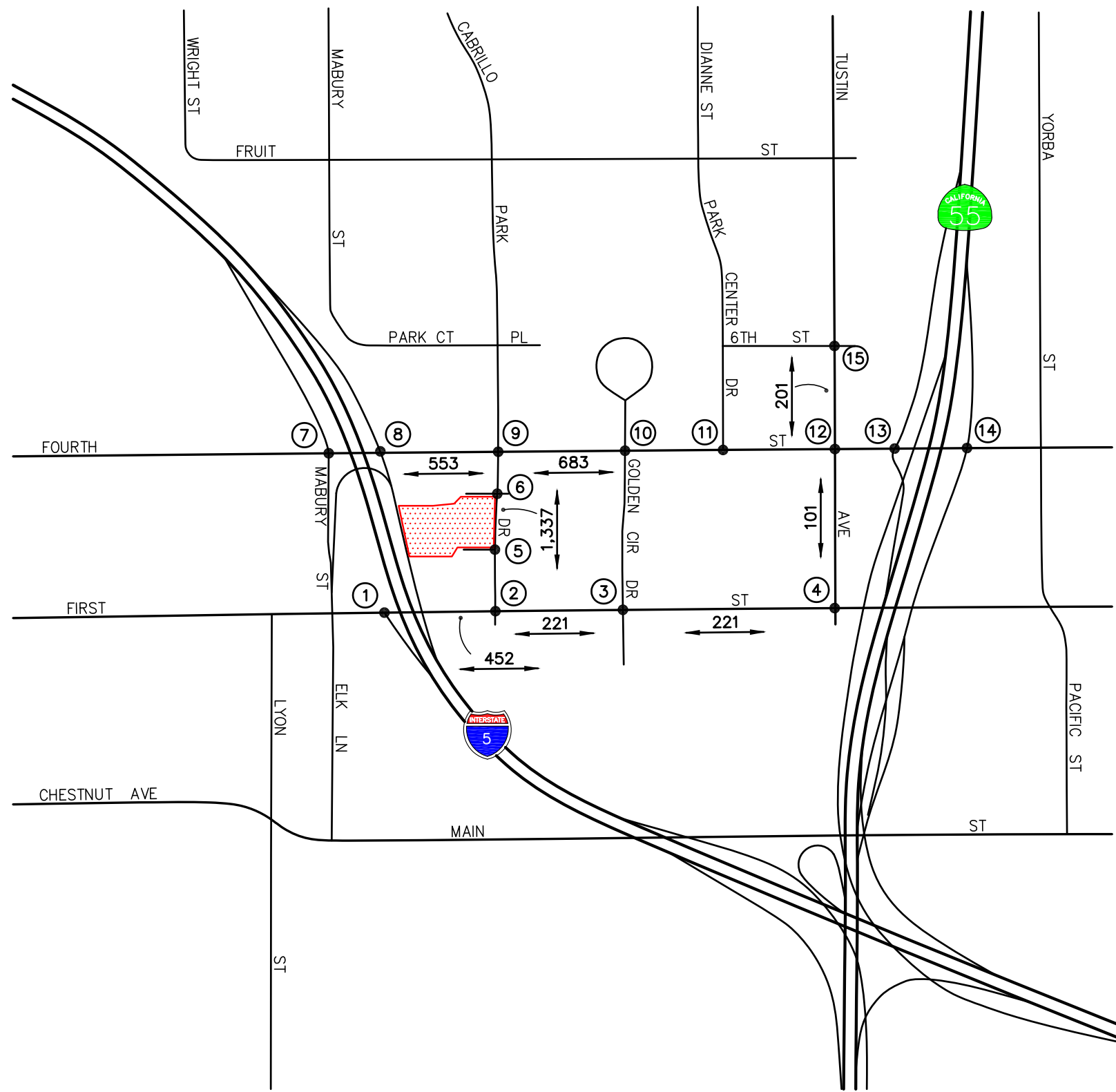
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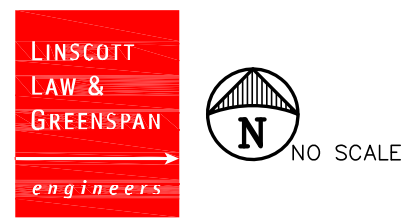
KEY
 = PROJECT SITE

FIGURE 5-2

AM PEAK HOUR PROJECT TRAFFIC VOLUMES
 THE MADISON, SANTA ANA

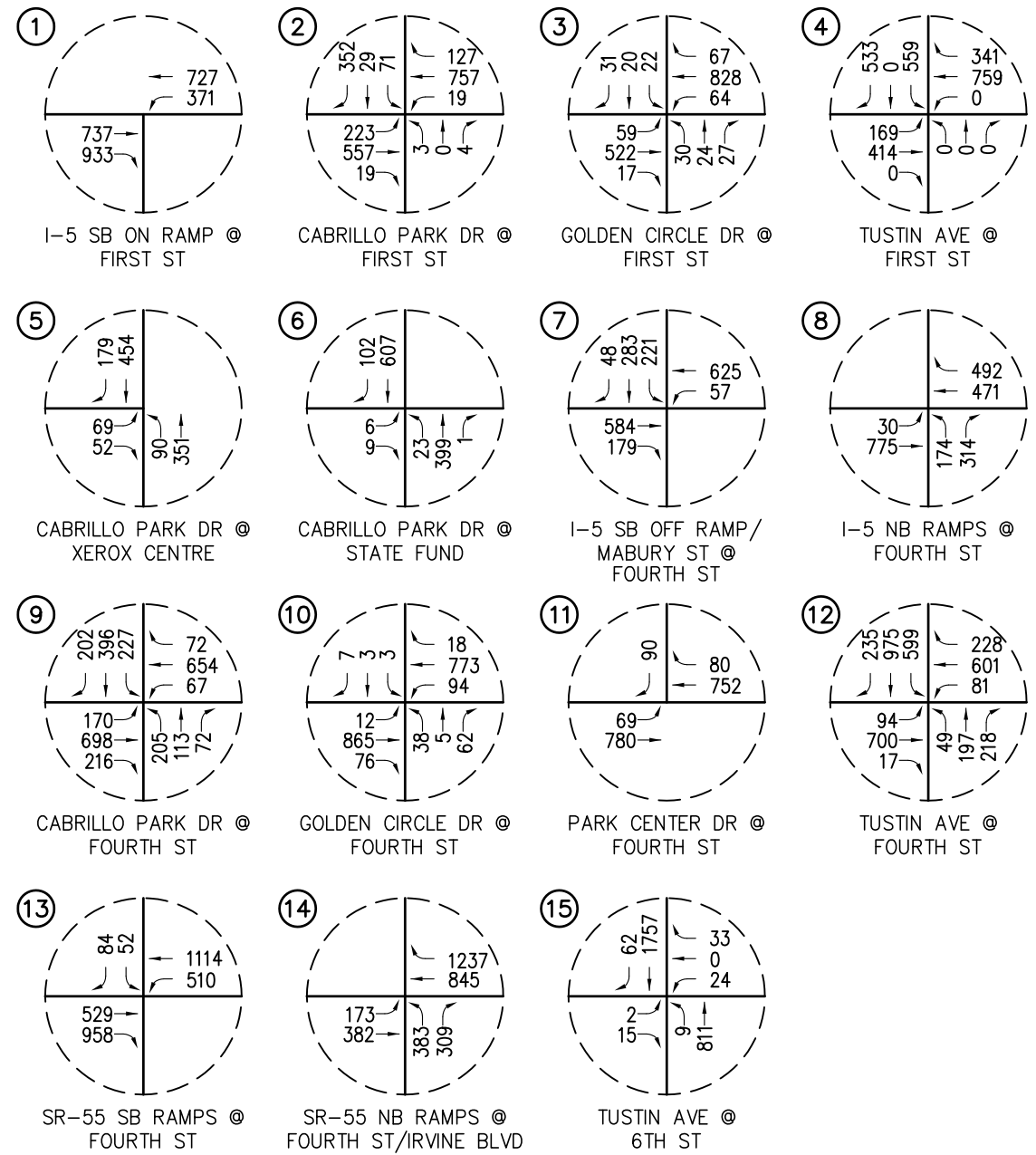
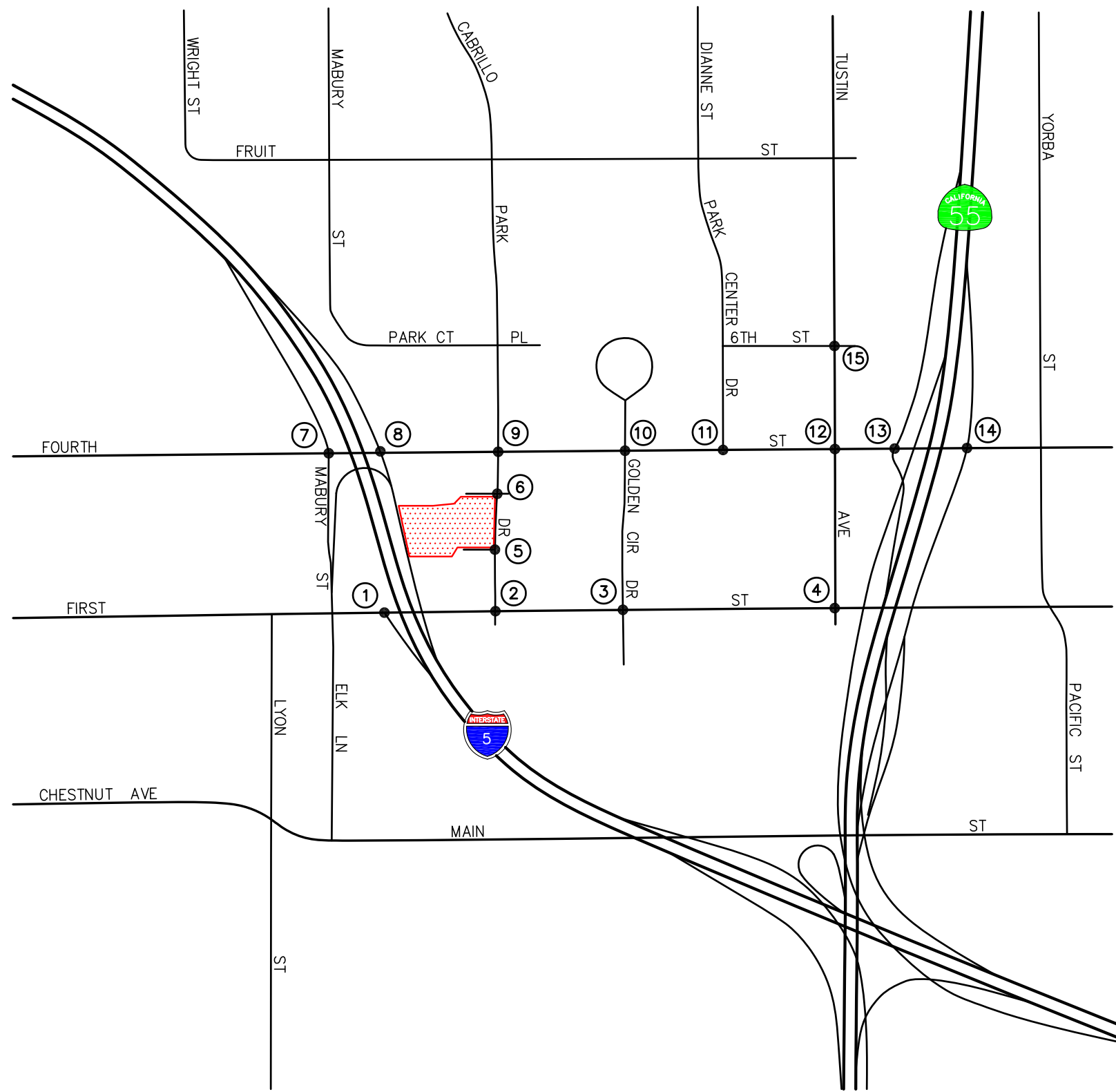


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KEY
 XX,XXX = DAILY TRAFFIC VOLUMES
 = PROJECT SITE

FIGURE 5-3
PM PEAK HOUR AND DAILY PROJECT TRAFFIC VOLUMES
 THE MADISON, SANTA ANA



KEY
 = PROJECT SITE

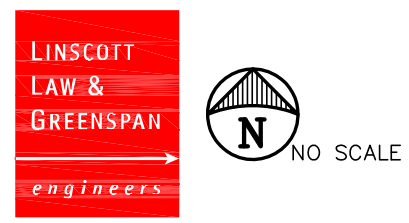
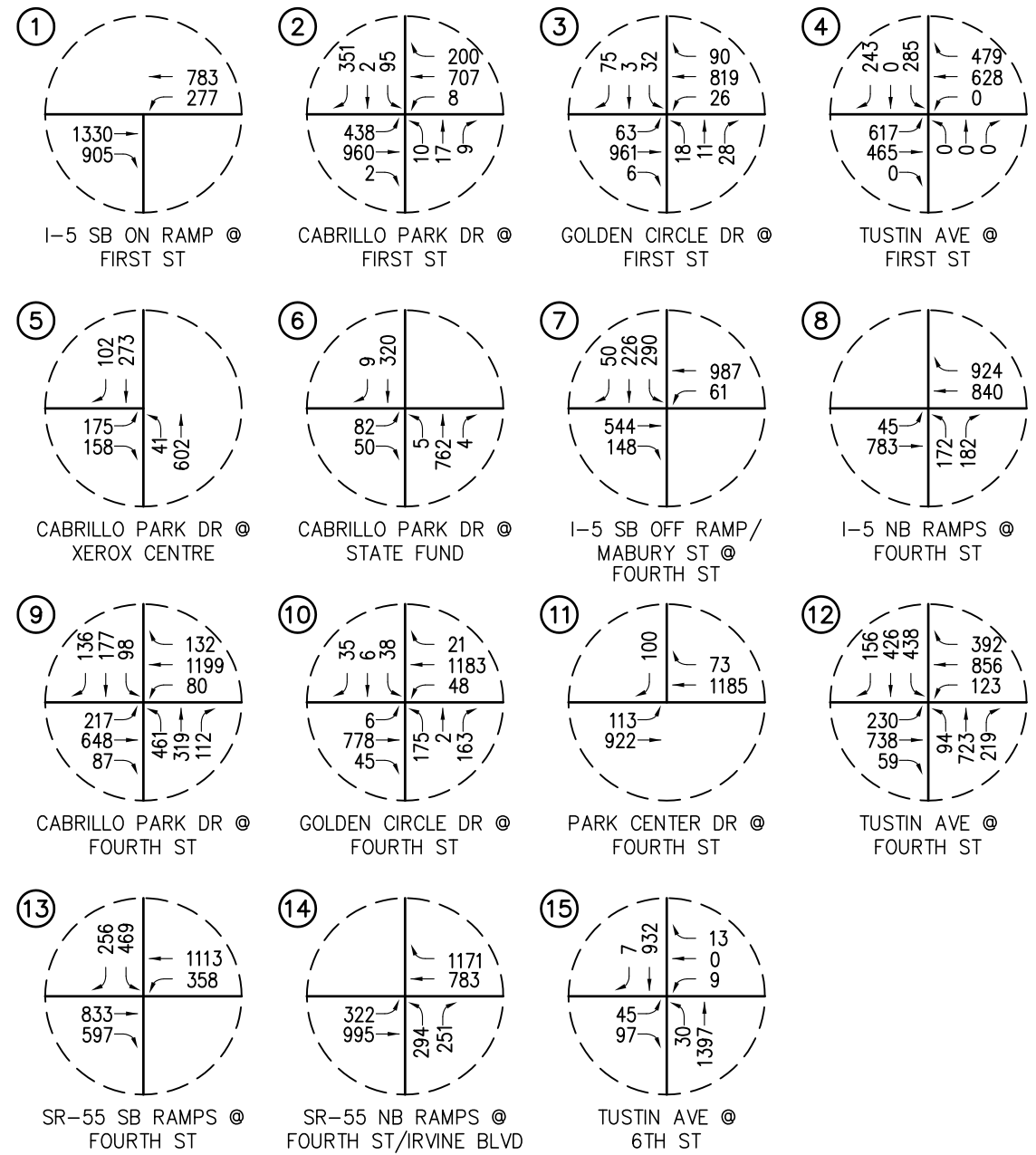
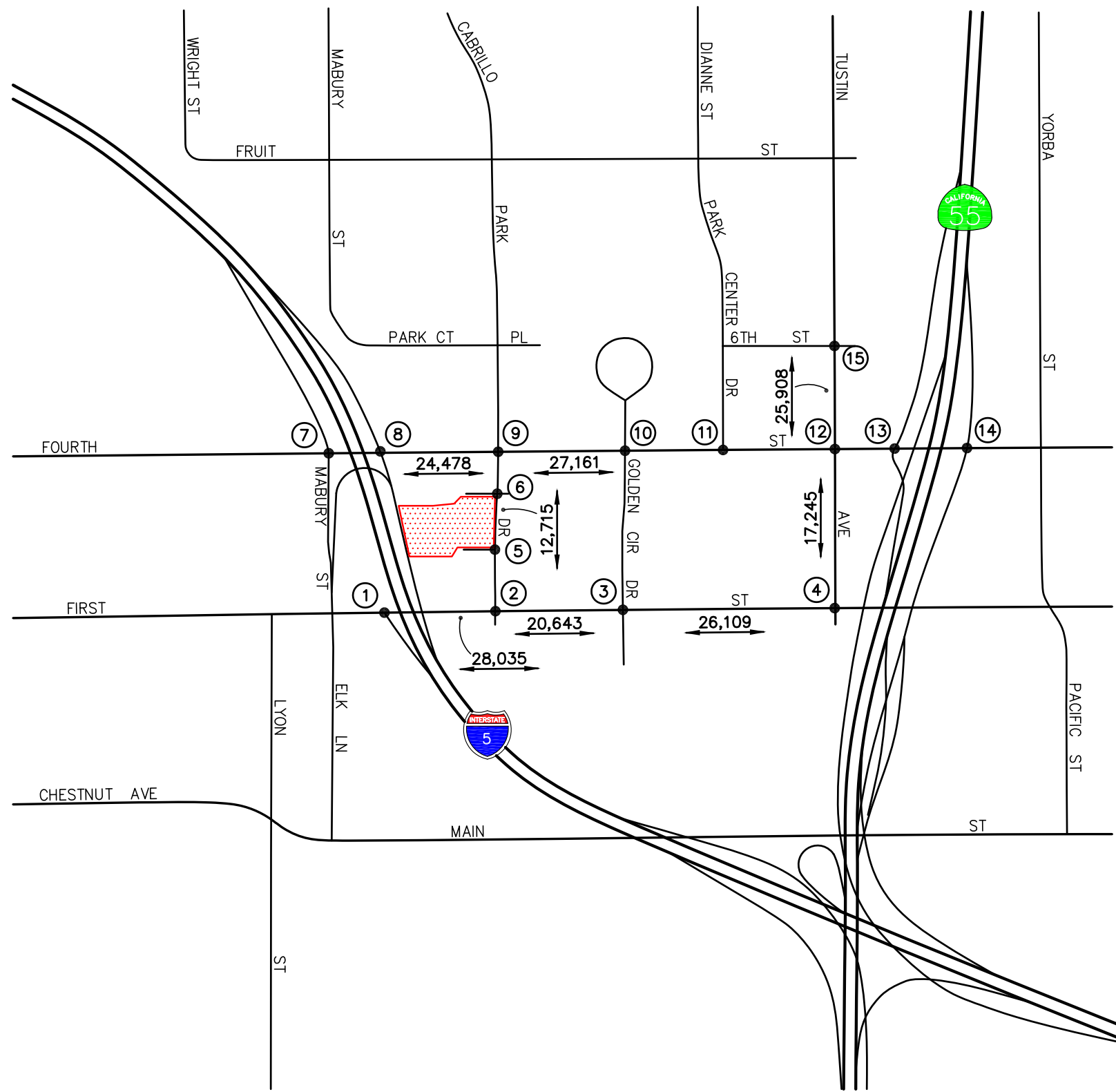


FIGURE 5-4
EXISTING PLUS PROJECT
AM PEAK HOUR TRAFFIC VOLUMES
 THE MADISON, SANTA ANA

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KEY
 XX,XXX = DAILY TRAFFIC VOLUMES
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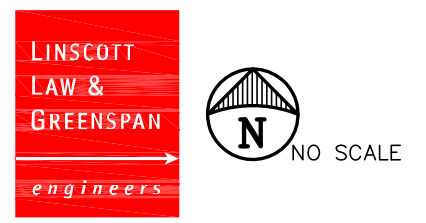


FIGURE 5-5
EXISTING PLUS PROJECT PM PEAK HOUR AND DAILY TRAFFIC VOLUMES
 THE MADISON, SANTA ANA

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6.0 FUTURE TRAFFIC CONDITIONS

6.1 Ambient Traffic Growth

Horizon year, background traffic growth estimates have been calculated using an ambient traffic growth factor. The ambient traffic growth factor is intended to include unknown and future related projects in the study area, as well as account for regular growth in traffic volumes due to the development of projects outside the study area. The future growth in traffic volumes has been calculated at one percent (1.0%) per year. Applied to the Year 2016 existing traffic volumes, this factor results in a 3.0% growth in existing volumes to the near-term horizon year 2019.

6.2 Related Projects Traffic Characteristics

In order to make a realistic estimate of future on-street conditions prior to implementation of the proposed Project, the status of other known development projects (related projects) within a two-mile radius of the proposed project has been researched at the City of Santa Ana and City of Tustin. With this information, the potential impact of the proposed Project can be evaluated within the context of the cumulative impact of all ongoing development.

Based on our research during the scoping process, there are eleven (11) related projects in the City of Santa Ana and eight (8) related projects in the City of Tustin that have either been built, but not yet fully occupied, or are being processed for approval. These nineteen (19) related projects have been included as part of the cumulative background setting.

Table 6-1 provides a brief description for each of the nineteen (19) related projects. *Figure 6-1* graphically illustrates the location of the nineteen (19) related projects. These related projects are expected to generate vehicular traffic, which may affect the operating conditions of the key study intersections.

Table 6-2 summarizes the trip generation potential for all nineteen (19) related projects on a daily and peak hour basis for a typical weekday. As shown, the related projects are expected to generate 17,529 daily trips, with 1,599 trips (914 inbound, 685 outbound) anticipated during the AM peak hour and 1,794 trips (795 inbound, 999 outbound) produced during the PM peak hour.

The AM and PM peak hour traffic volumes associated with the nineteen (19) related projects in the Year 2019 are presented in *Figures 6-2* and *6-3*, respectively. *Figure 6-3* also presents the daily related project traffic volumes.

TABLE 6-1
LOCATION AND DESCRIPTION OF CUMULATIVE PROJECTS⁴

No.	Cumulative Project	Location/Address	Description
<u>City of Santa Ana Development</u>			
1.	Artist Gateway	117 South Sycamore Street	14 DU Live/Work
2.	Depot at Santiago	923 North Santiago Street	70 DU Apartments, 9.000 TSF Retail/Office
3.	Lotus Townhomes	627 East Washington Avenue	8 DU Townhomes
4.	Lyon Communities ⁴	1901-1907 East First Street	2,424 TSF Commercial, 254 DU Apartments
5.	Rocket Express Car Wash	1703 East Seventeenth Street	4,995 TSF Car Wash, 20,146 TSF Existing Commercial Demolition
6.	Sexlinger Homes and Orchard	1584 East Santa Clara Avenue	24 DU Single Family Detached
7.	First Street Family Apartments	1440 East First Street	69 DU Apartments, 47.04 TSF Existing Office Demolition
8.	One Broadway Plaza	1109 North Broadway	518,000 SF Office Tower with 16,000 TSF of Restaurant Floor Area
9.	East First Street Apartments	2222 East First Street	443 DU Senior Residential Apartments
10.	First Street Care Home	2151 East First Street	Convert 75 Room Motel to 72 DU Supportive Housing Apartments
11.	Tom's Trucks Residential Development	1008 East Fourth Street	170 DU Single Family Detached
<u>City of Tustin Development</u>			
12.	Tustin Red Hill Mixed-Use	13751-13841 Red Hill Avenue	201 DU Apartments, 3,000 TSF Health Club, 10,000 TSF General Office, 4,000 TSF Shopping Center, 3,000 TSF High-Turnover Restaurant
13.	4 Unit Condominium Complex	1051 Bonita Street	4 DU Condominiums
14.	5 Detached Residential Condos	1381-1391 San Juan Street	5 DU Condominiums
15.	New Office Building	721 West First Street	7,200 TSF Office
16.	Restaurant	14232 Newport Avenue	1,800 TSF Fast-Food Restaurant w/ Drive-Thru
17.	Grace Harbor Church	12881 Newport Avenue	10,015 TSF 2-story Classroom
18.	Habitat for Humanity	140 South A Street	2 DU Condominiums
19.	Intracorp So Cal-1	420 West 6 th Street	140 DU Single Family Attached

⁴ Source: City of Santa Ana and City of Tustin Planning Department staff. To provide a conservative assessment, the Lyon Communities development (Nineteen01 Luxury Apartment), which is now completed, is included as a related project given the occupancy of the apartment development in October 2016 was unknown at the time when existing traffic counts were collected.

TABLE 6-2
CUMULATIVE PROJECTS TRAFFIC GENERATION FORECAST⁵

Cumulative Project Description		Daily 2-Way	AM Peak Hour			PM Peak Hour		
			Enter	Exit	Total	Enter	Exit	Total
1.	Artist Gateway	93	1	6	7	6	3	9
2.	Depot at Santiago	658	15	32	47	31	24	55
3.	Lotus Townhomes	46	1	3	4	3	1	4
4.	Lyon Communities	1,793	27	105	132	106	60	166
5.	Rocket Express Car Wash	529	15	15	30	21	20	41
6.	Sexlinger Homes and Orchard	229	5	13	18	15	9	24
7.	First Street Family Apartments	459	7	28	35	28	15	43
8.	One Broadway Plaza	6,175	641	94	735	198	596	794
9.	East First Street Apartments	1,524	30	59	89	60	51	111
10.	First Street Care Home	479	7	30	37	29	16	45
11.	Tom's Trucks Residential Development	1,618	32	96	128	107	63	170
12.	Tustin Red Hill Mixed-Use	2,098	57	102	159	115	81	196
13.	4 Unit Apartment Complex	27	0	2	2	1	1	2
14.	5 Detached Residential Condos	29	0	2	2	2	1	3
15.	New Office Building	122	15	2	17	3	13	16
16.	Restaurant	670	21	21	42	15	14	29
17.	Grace Harbor Church	155	29	23	52	5	7	12
18.	Habitat for Humanity	12	0	1	1	1	0	1
19.	Intracorp So Cal-1	813	11	51	62	49	24	73
Cumulative Projects Total Trip Generation Potential		17,529	914	685	1,599	795	999	1,794

⁵ Source: *Trip Generation*, 9th Edition, Institute of Transportation Engineers (ITE), Washington, D.C. (2012).

6.3 Buildout Traffic Conditions

As coordinated with City staff, the buildout background traffic volume forecasts for this traffic study were developed via the utilization of the OCTAM3.4.2 Year 2035 traffic model provided by OCTA. Specifically, daily, AM peak period and PM peak period link traffic volumes were provided by OCTA for the existing base year (i.e. Year 2010) and for the buildout year (i.e. Year 2035). The AM peak period corresponds to a three-hour morning commute period while the PM peak period corresponds to a four-hour afternoon commute period. Using the peak period model runs and the OCTA approved peak hour factors (i.e. AM = 0.3566 and PM = 0.2662), the one-hour peak hour link traffic volumes were determined. These future year 2035 link traffic volumes were post-processed based on the relationship of the base year validation model run output to the base year ground traffic counts resulting in Year 2035 buildout without project daily traffic volumes for the key roadway segments and AM peak hour/PM peak hour turning movements for the key study intersections. Copies of the model post-processing worksheets are contained in *Appendix C*.

It is noted that for the subject property, the site is entitled for up to 210,000 square-feet of office space. To forecast “no project” buildout traffic volumes, trips associated with 210,000 SF of office space were forecast at key study intersections and subtracted.

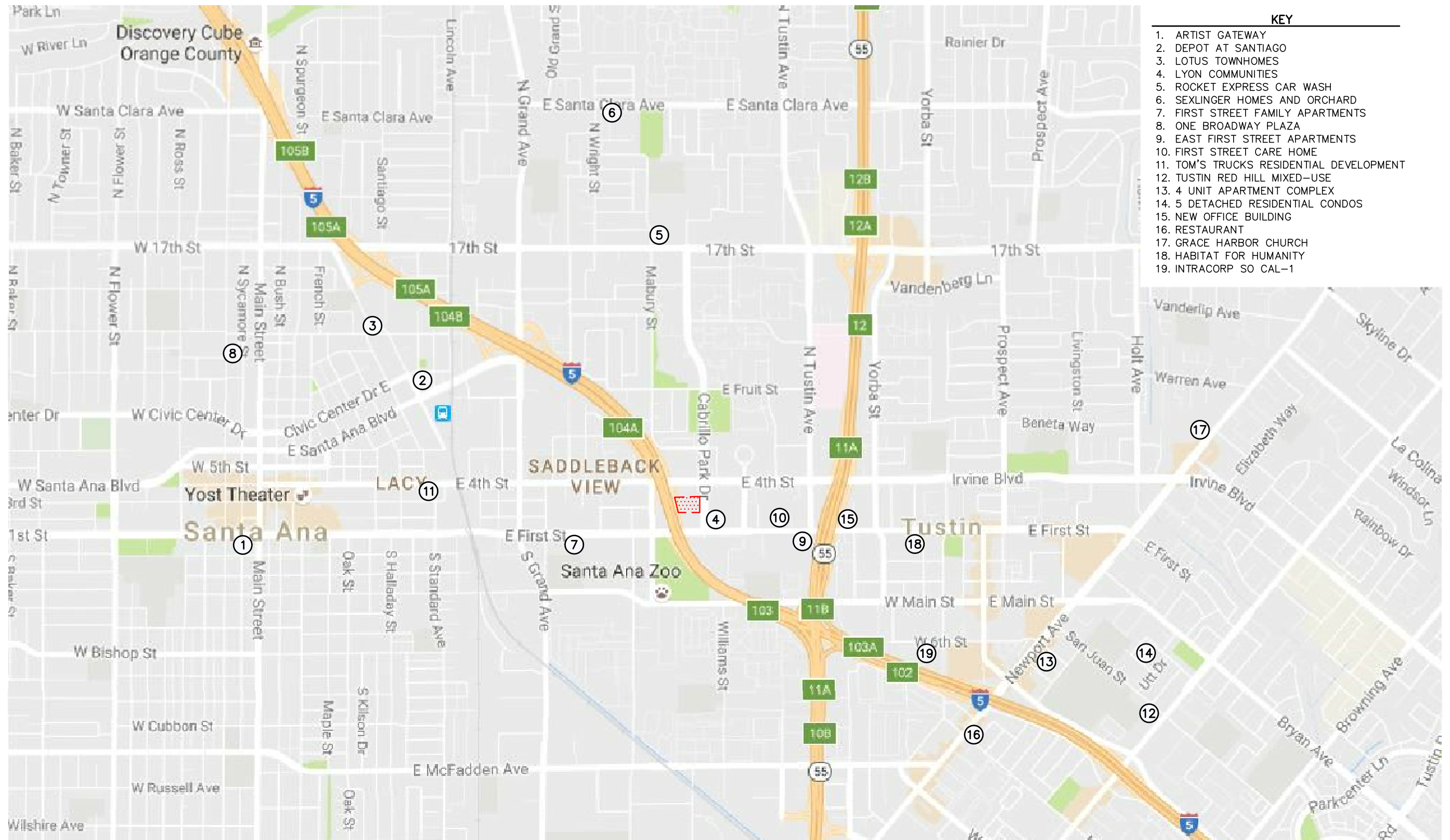
6.4 Year 2019 and Buildout Traffic Volumes

6.4.1 Year 2019 Traffic Volumes

Figures 6-4 and *6-5* present the AM and PM peak hour cumulative traffic volumes (existing traffic + ambient growth + related projects) at the fifteen (15) key study intersections for the Year 2019, respectively. *Figure 6-5* also presents the Year 2019 daily cumulative traffic volumes. *Figures 6-6* and *6-7* illustrate the Year 2019 forecast AM and PM peak hour traffic volumes, with the inclusion of the trips generated by the proposed Project, respectively. *Figure 6-7* also presents the Year 2019 daily cumulative plus project traffic volumes.

6.4.2 Buildout Traffic Volumes

Figures 6-8 and *6-9* present the Buildout AM and PM peak hour cumulative traffic volumes at the fifteen (15) key study intersections, respectively. *Figure 6-9* also presents the Buildout daily cumulative traffic volumes. *Figures 6-10* and *6-11* illustrate the Buildout forecast AM and PM peak hour traffic volumes, with the inclusion of the trips generated by the proposed Project, respectively. *Figure 6-11* also presents the Buildout daily cumulative plus project traffic volumes.



- KEY**
1. ARTIST GATEWAY
 2. DEPOT AT SANTIAGO
 3. LOTUS TOWNHOMES
 4. LYON COMMUNITIES
 5. ROCKET EXPRESS CAR WASH
 6. SEXLINGER HOMES AND ORCHARD
 7. FIRST STREET FAMILY APARTMENTS
 8. ONE BROADWAY PLAZA
 9. EAST FIRST STREET APARTMENTS
 10. FIRST STREET CARE HOME
 11. TOM'S TRUCKS RESIDENTIAL DEVELOPMENT
 12. TUSTIN RED HILL MIXED-USE
 13. 4 UNIT APARTMENT COMPLEX
 14. 5 DETACHED RESIDENTIAL CONDOS
 15. NEW OFFICE BUILDING
 16. RESTAURANT
 17. GRACE HARBOR CHURCH
 18. HABITAT FOR HUMANITY
 19. INTRACORP SO CAL-1

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SOURCE: GOOGLE

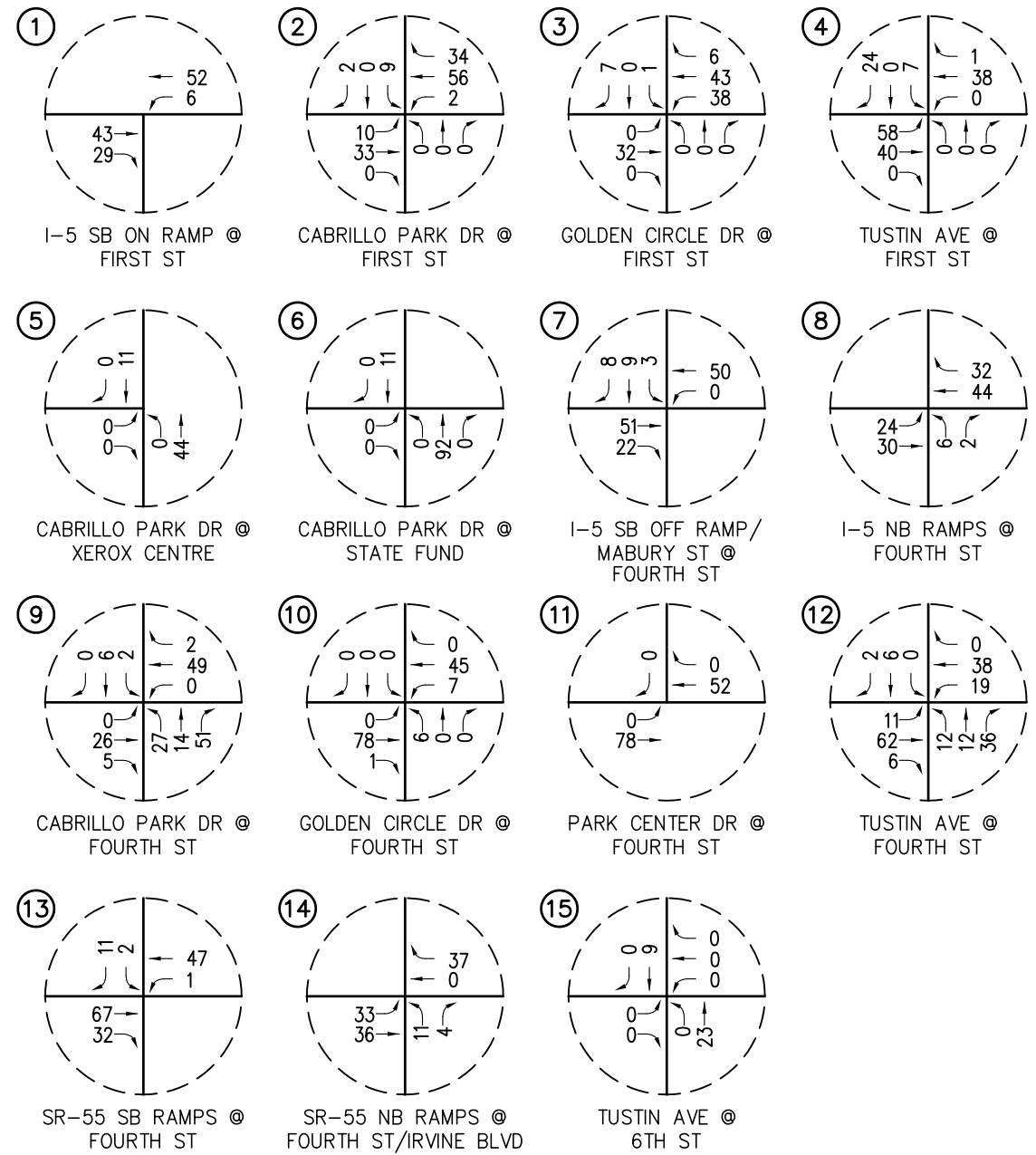
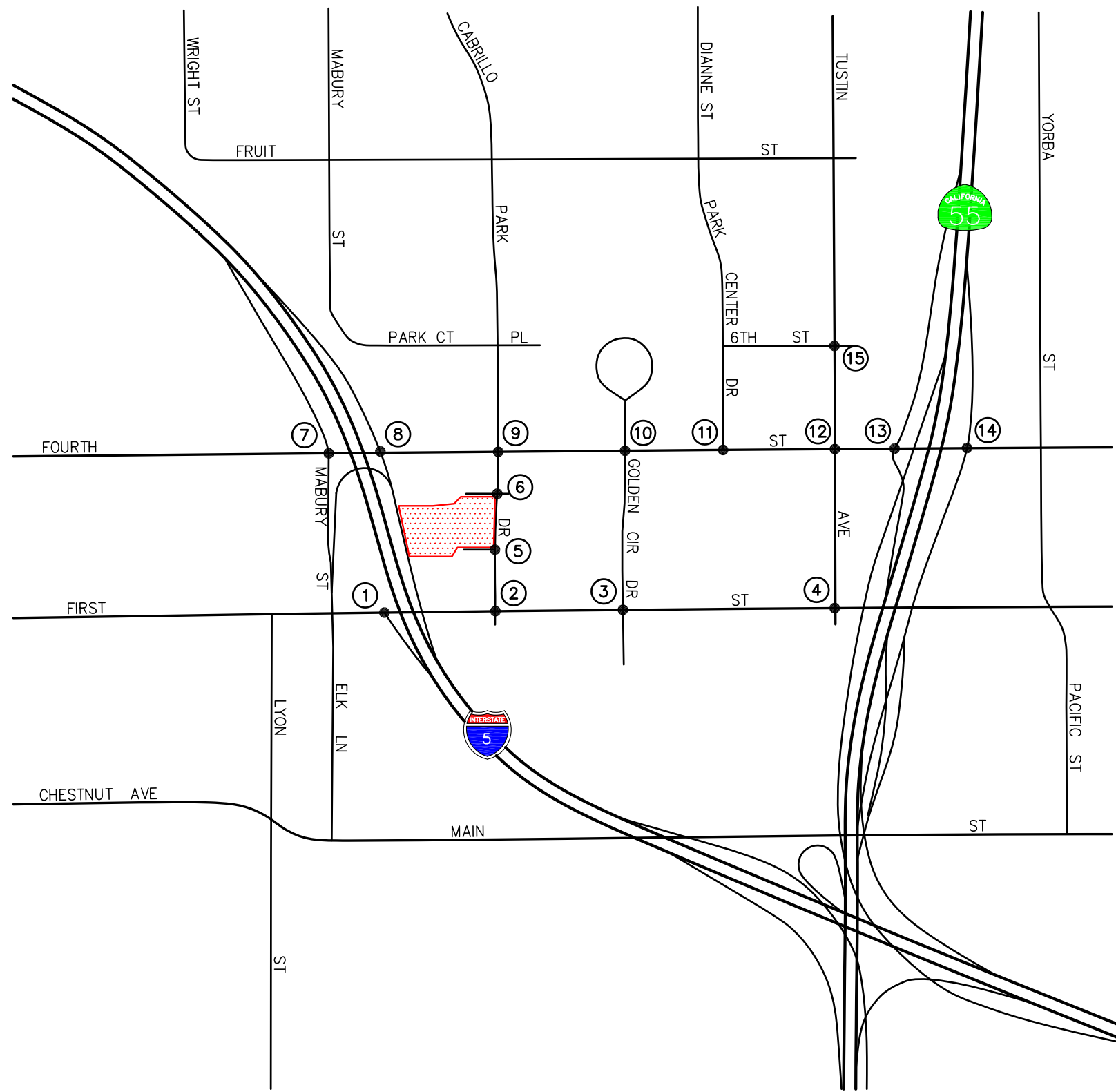
KEY

- = RELATED PROJECT LOCATION
- = PROJECT SITE

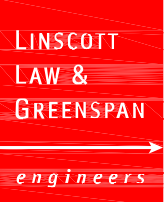


FIGURE 6-1

LOCATION OF CUMULATIVE PROJECTS
THE MADISON, SANTA ANA



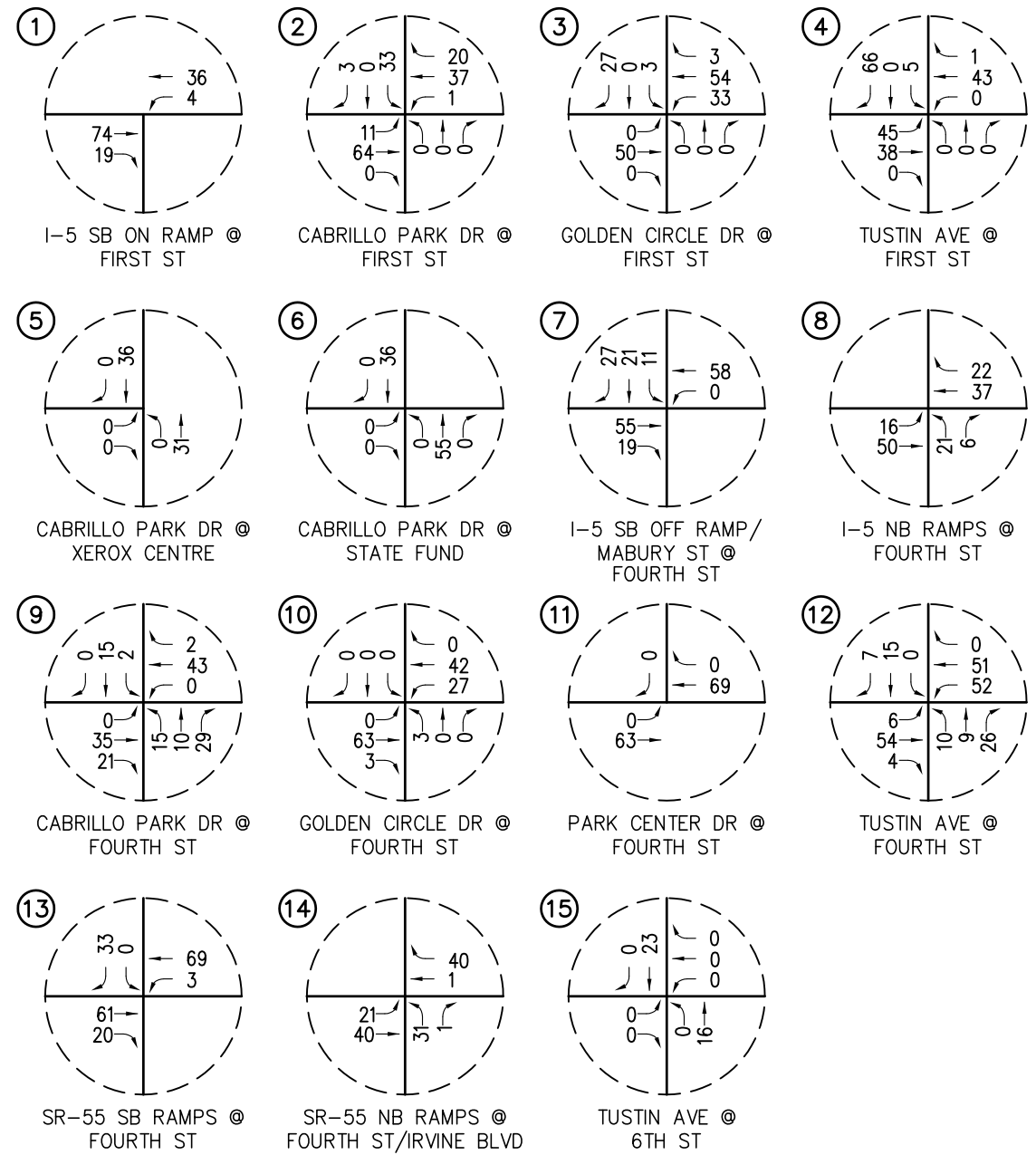
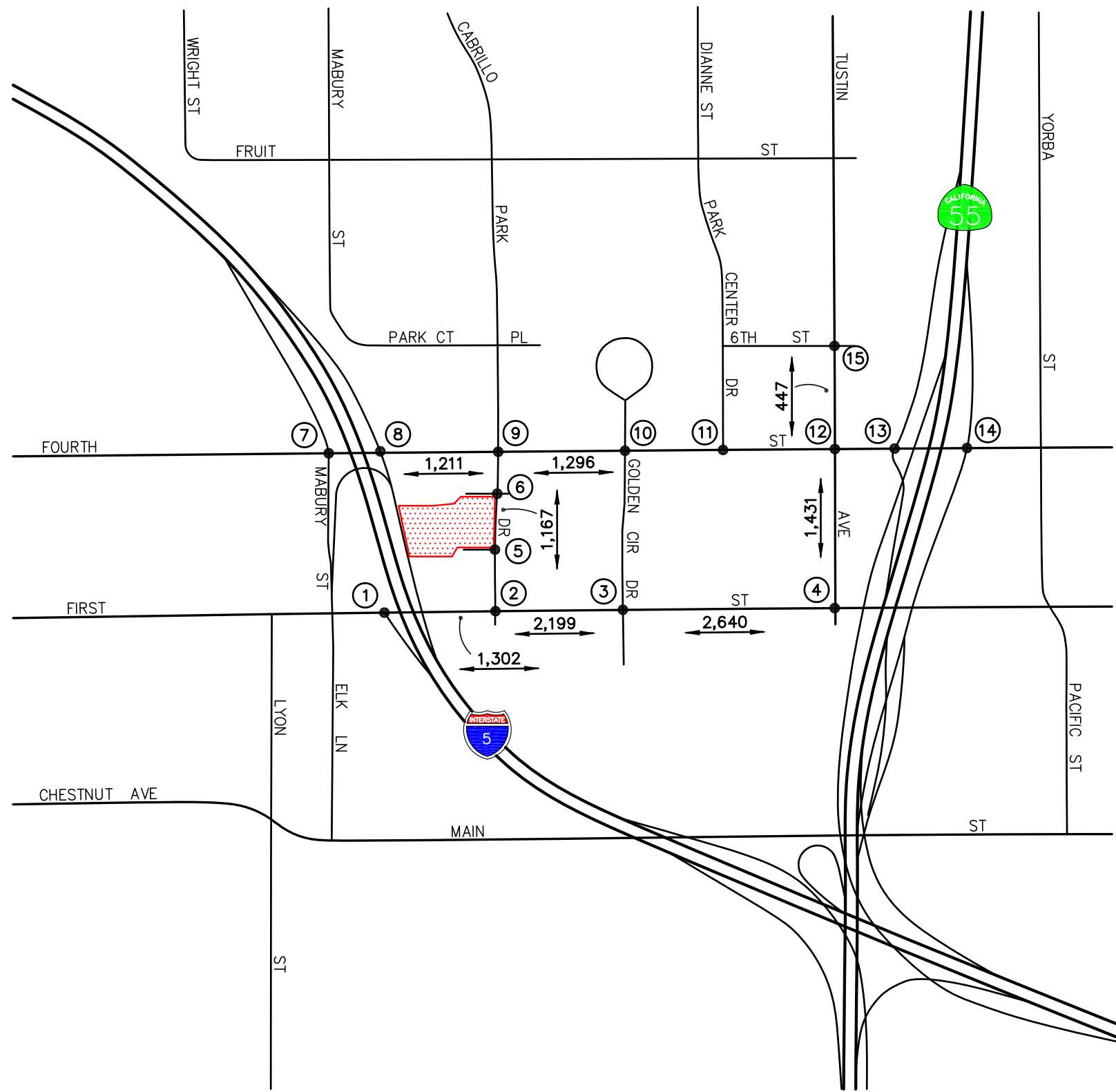
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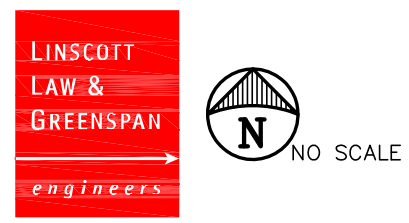
KEY
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FIGURE 6-2

AM PEAK HOUR RELATED PROJECTS TRAFFIC VOLUMES
 THE MADISON, SANTA ANA

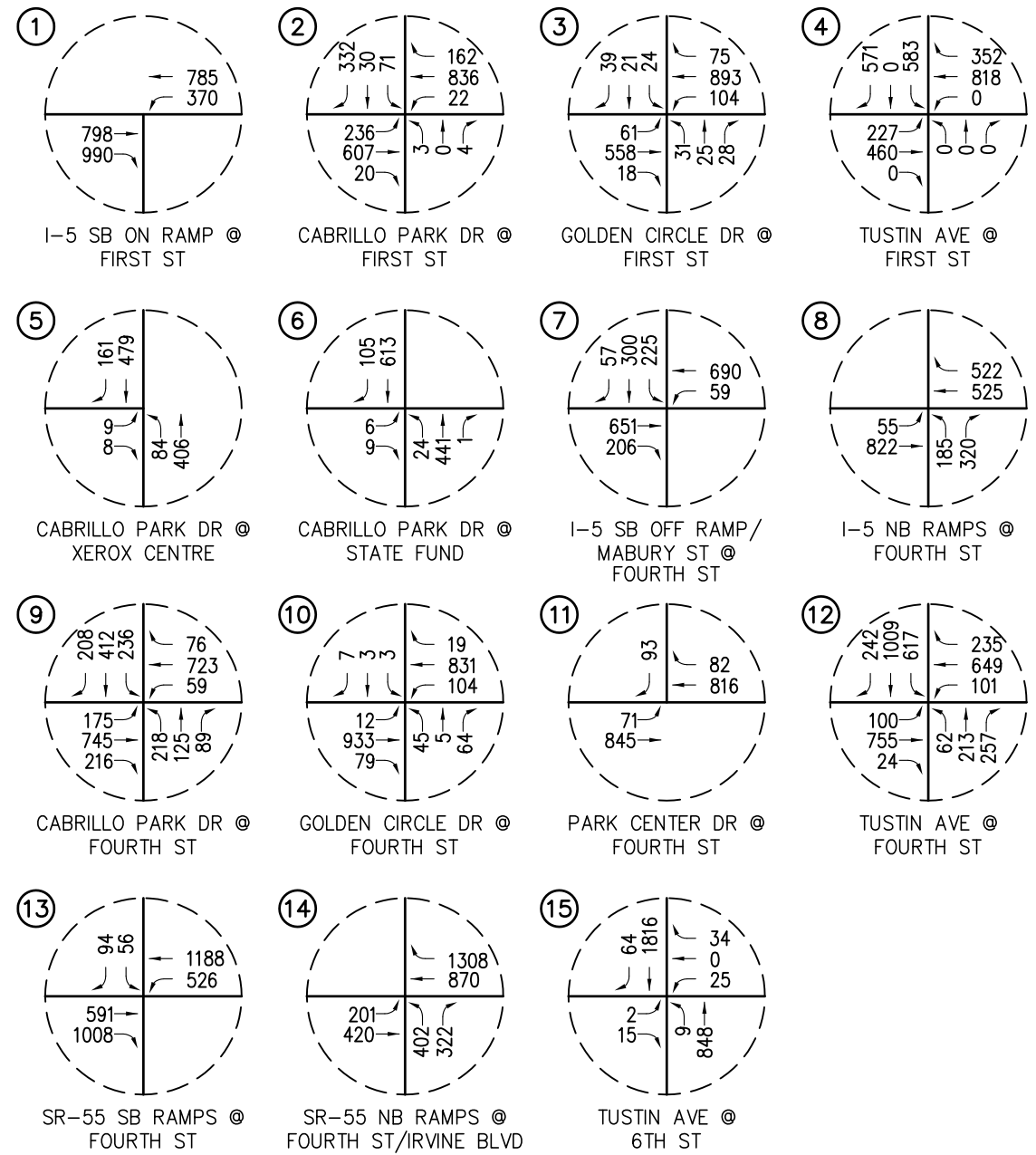
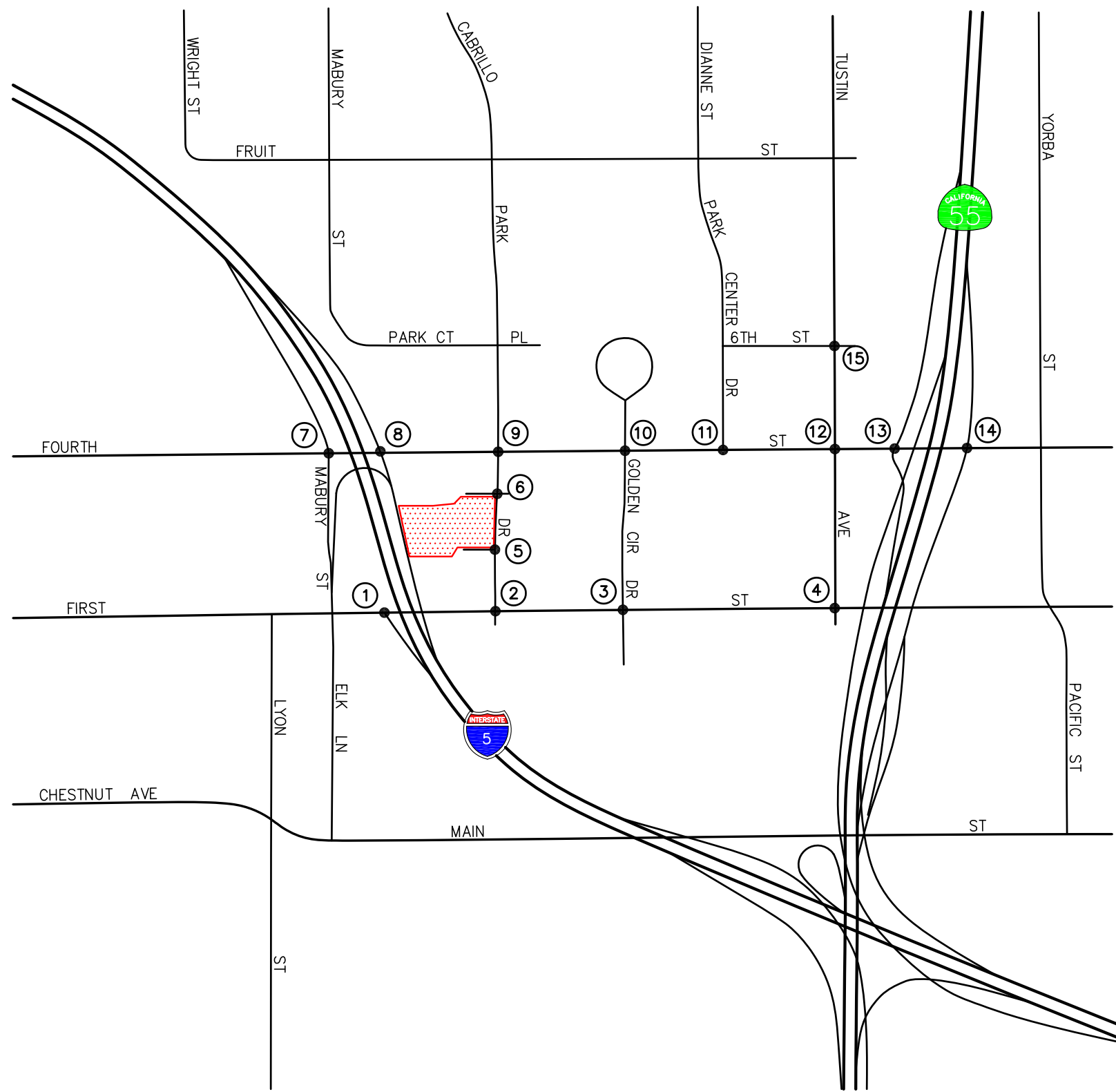


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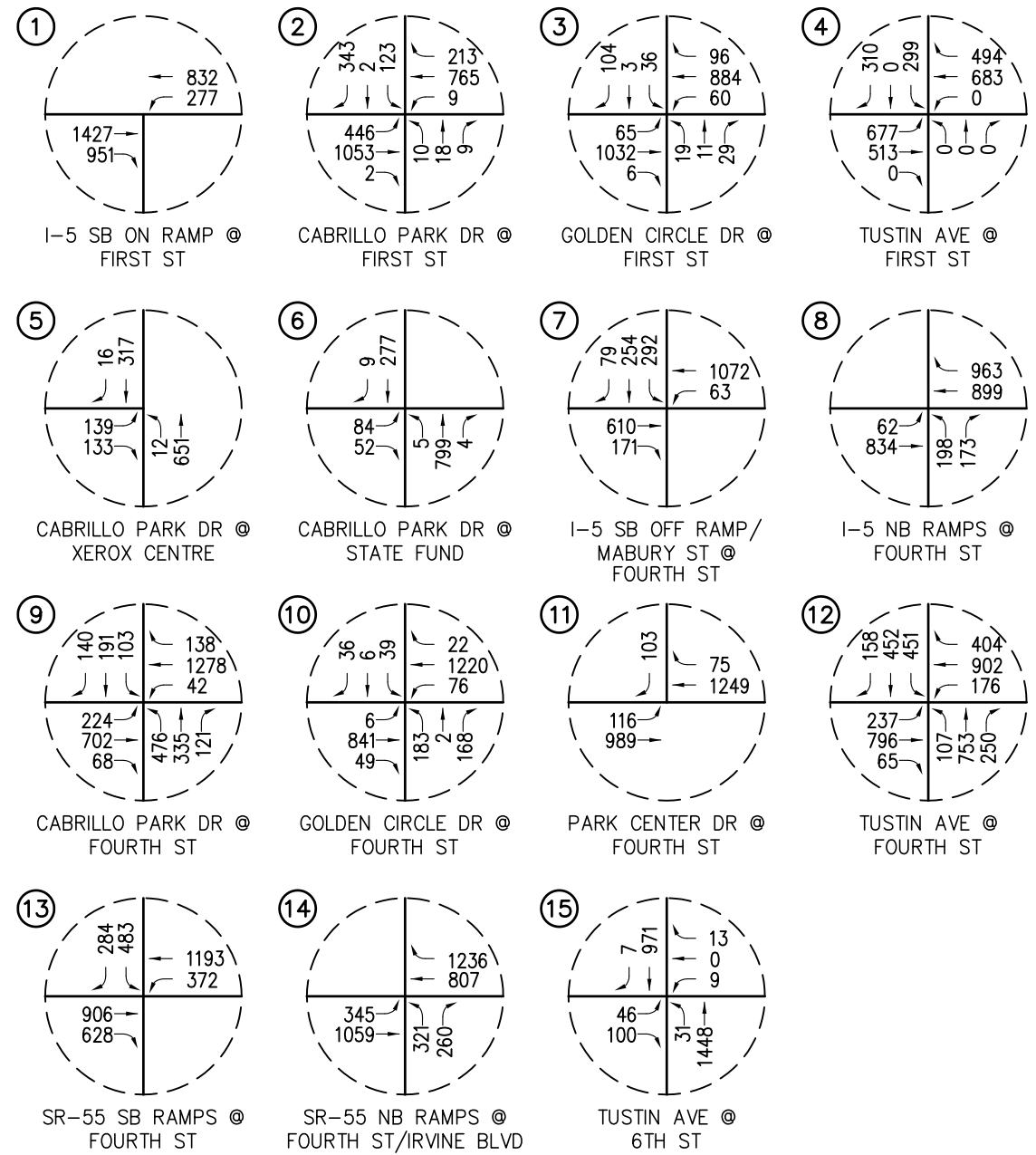
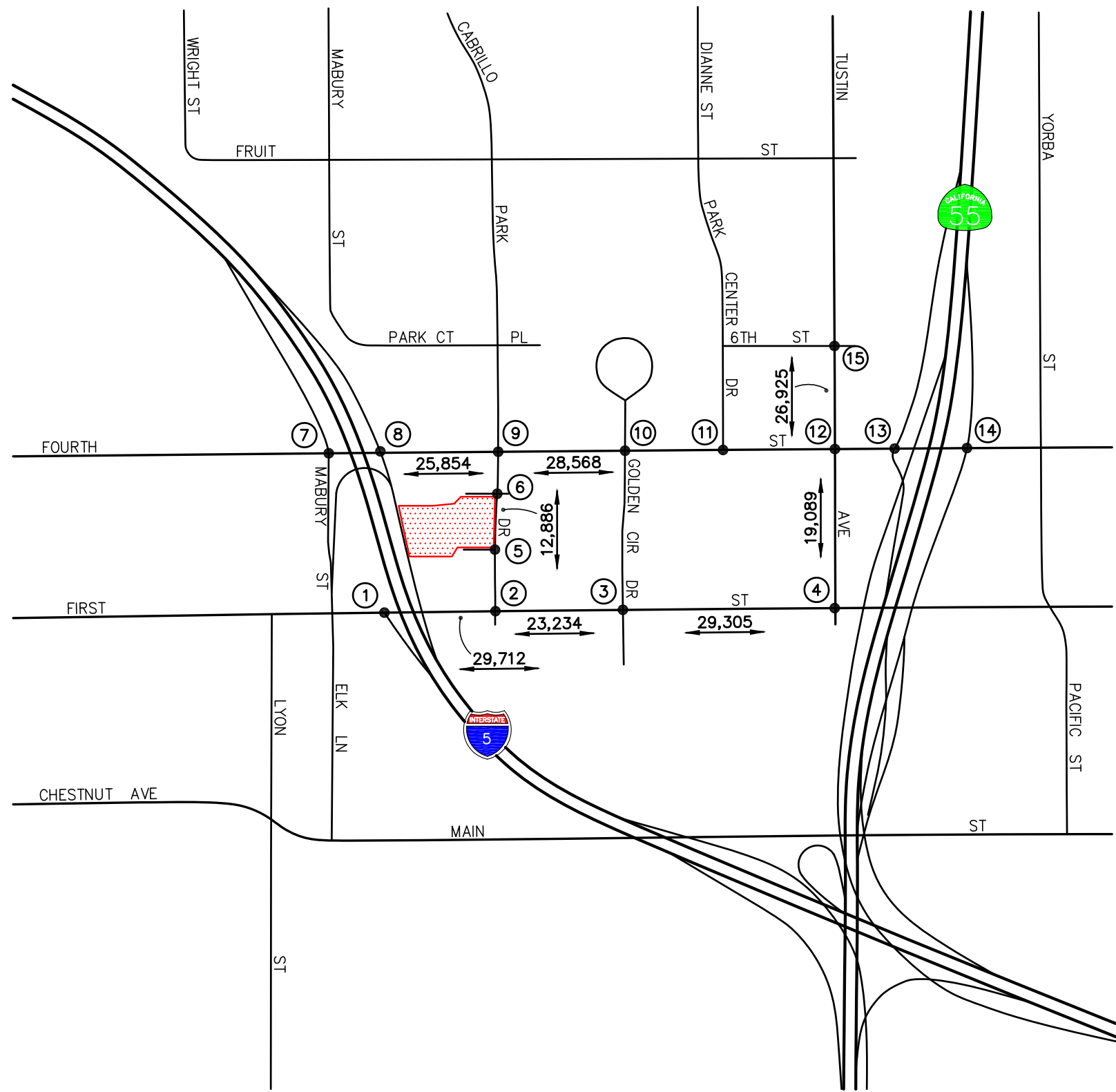
KEY
 XX,XXX = DAILY TRAFFIC VOLUMES
 = PROJECT SITE

FIGURE 6-3
 PM PEAK HOUR AND DAILY
 RELATED PROJECTS TRAFFIC VOLUMES
 THE MADISON, SANTA ANA

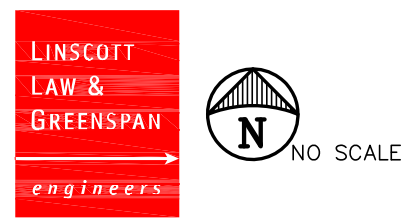


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FIGURE 6-4
 YEAR 2019 AM PEAK HOUR
 CUMULATIVE TRAFFIC VOLUMES
 THE MADISON, SANTA ANA

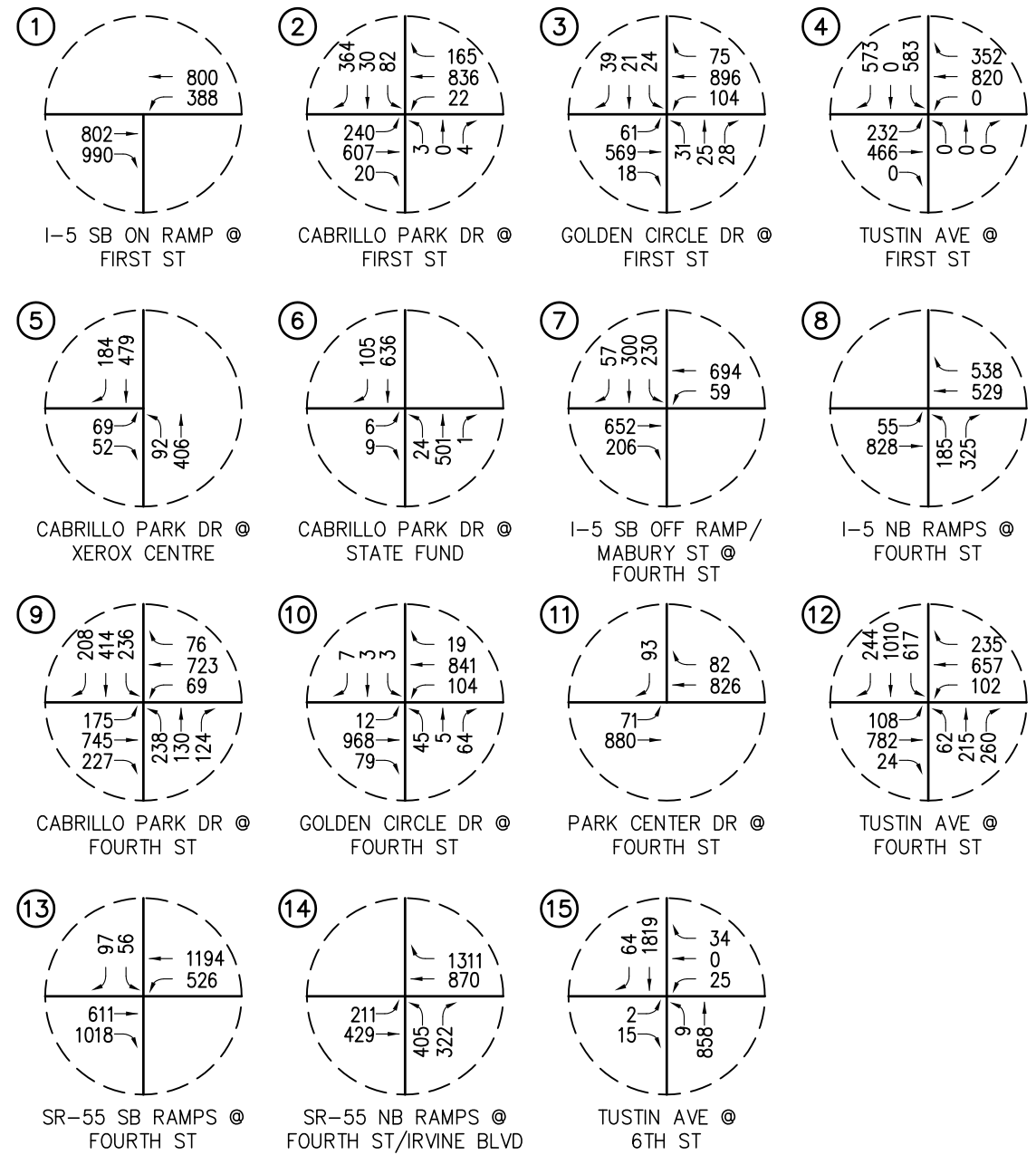
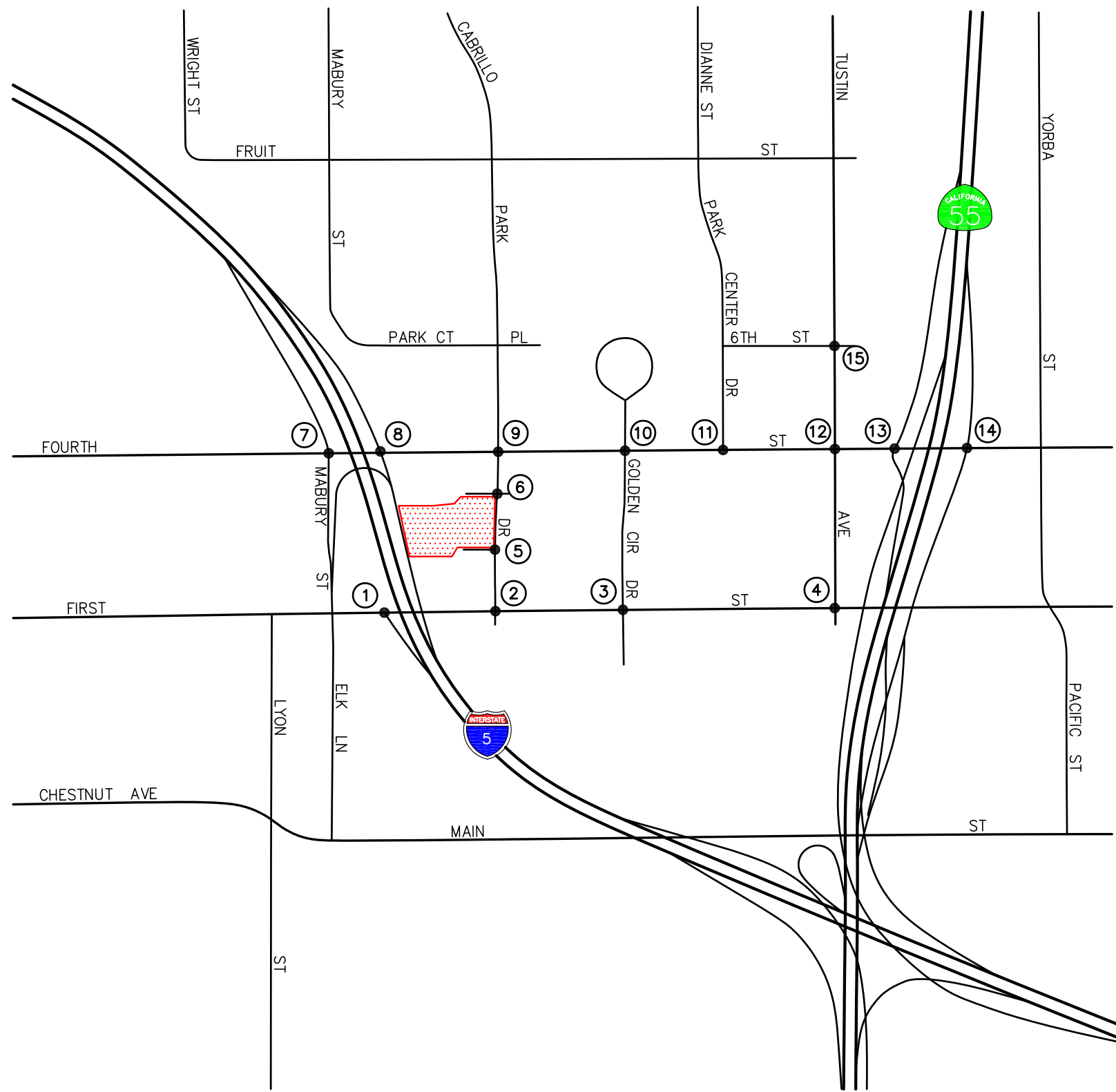


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KEY
 XX,XXX = DAILY TRAFFIC VOLUMES
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FIGURE 6-5
YEAR 2019 PM PEAK HOUR AND DAILY CUMULATIVE TRAFFIC VOLUMES
 THE MADISON, SANTA ANA



KEY
 = PROJECT SITE

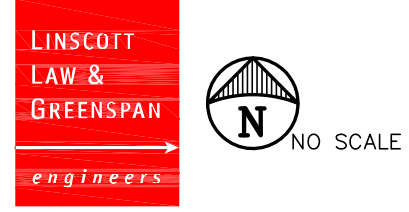
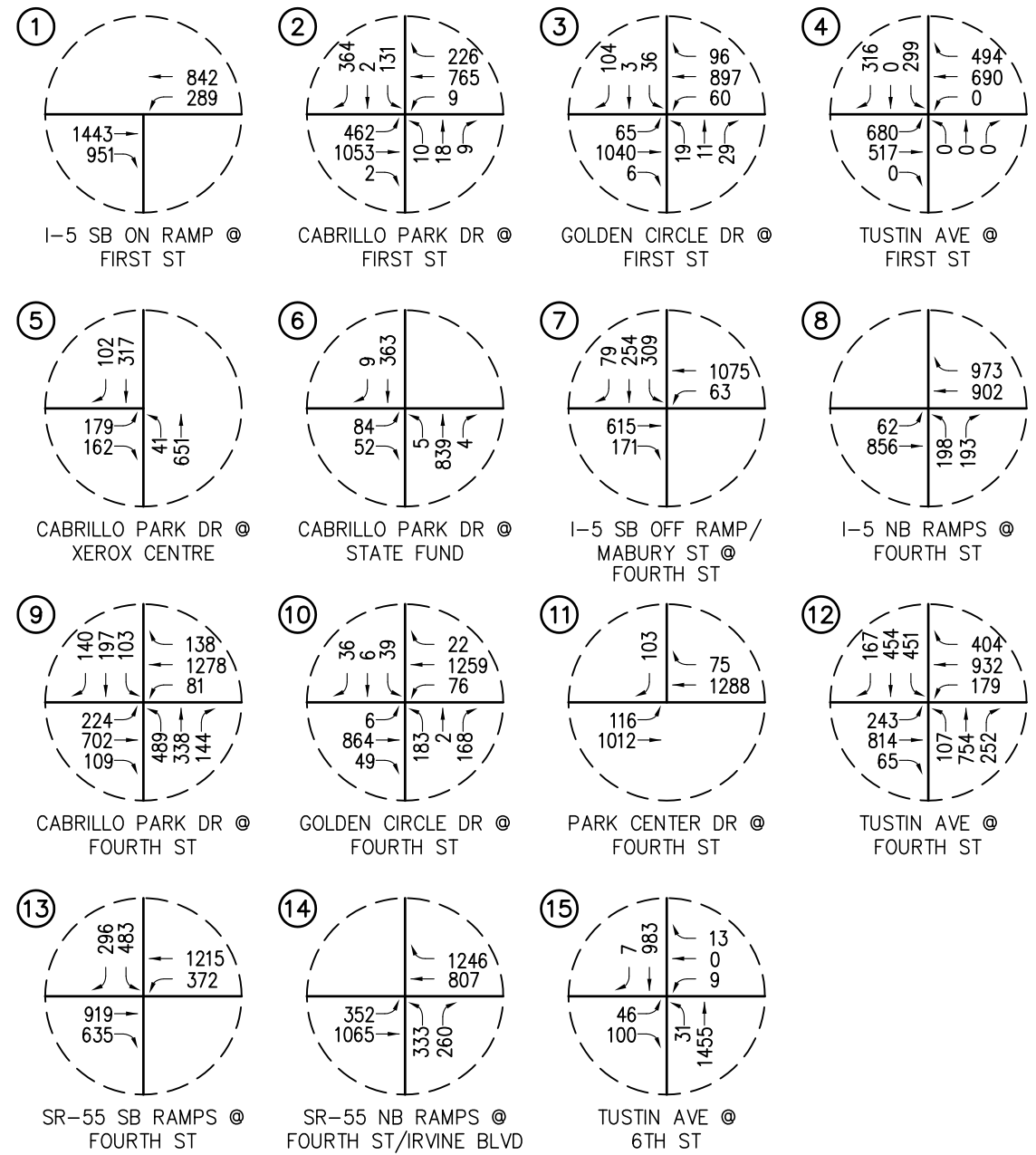
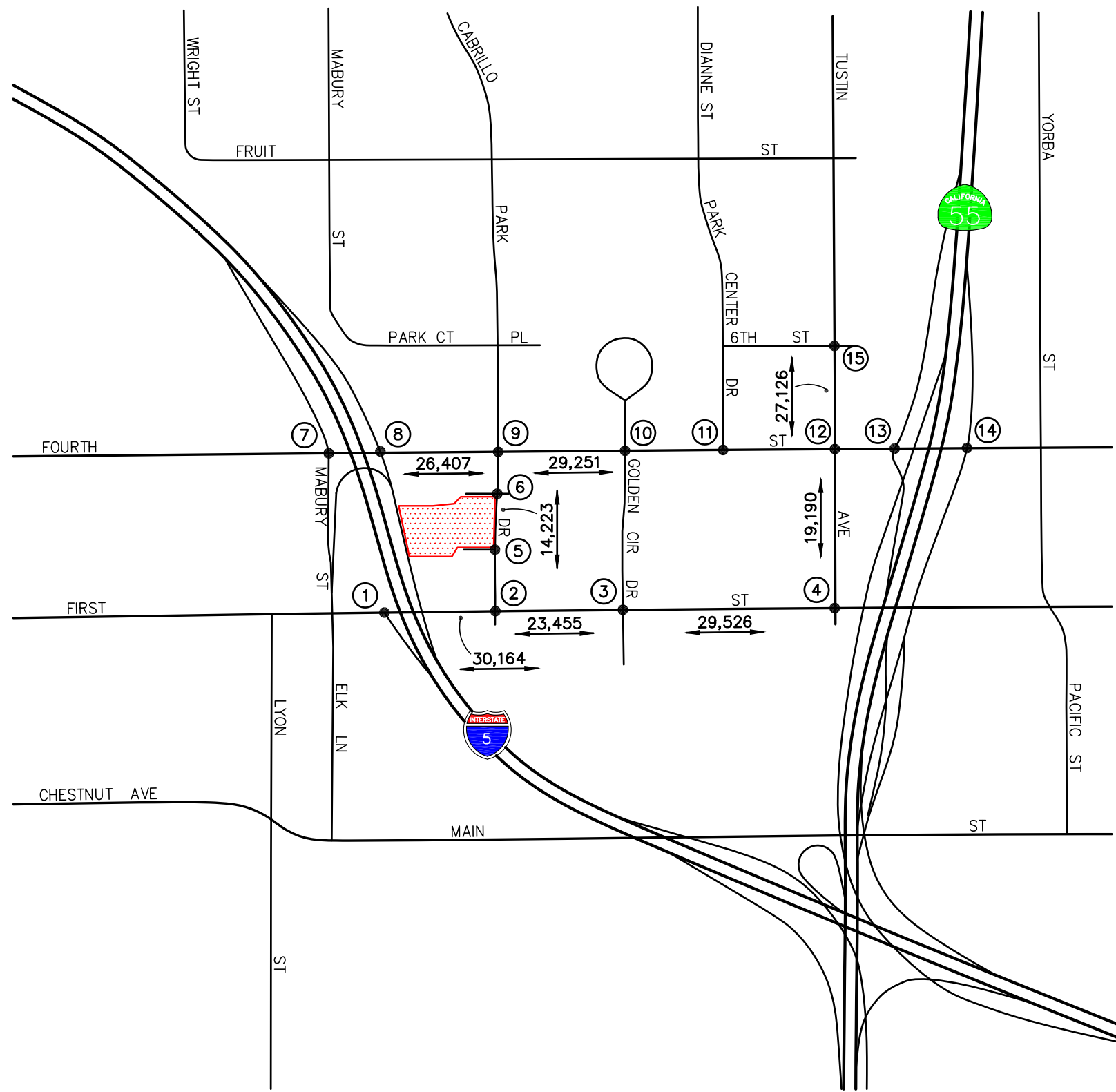
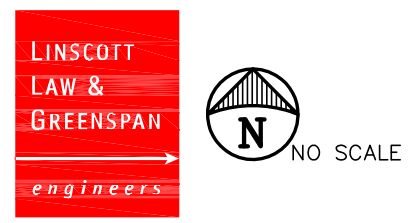


FIGURE 6-6
 YEAR 2019 AM PEAK HOUR CUMULATIVE TRAFFIC VOLUMES WITH PROJECT
 THE MADISON, SANTA ANA

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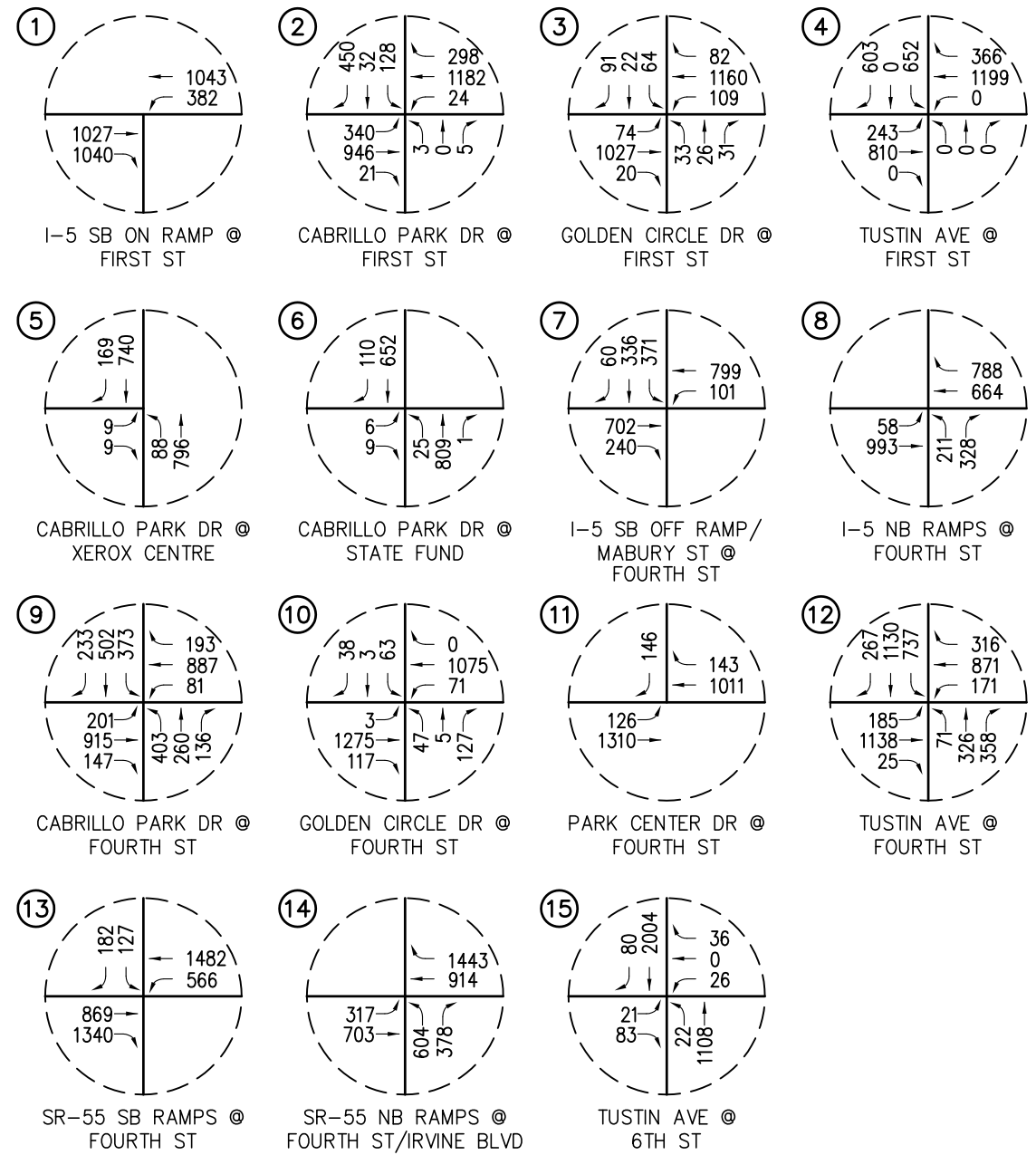
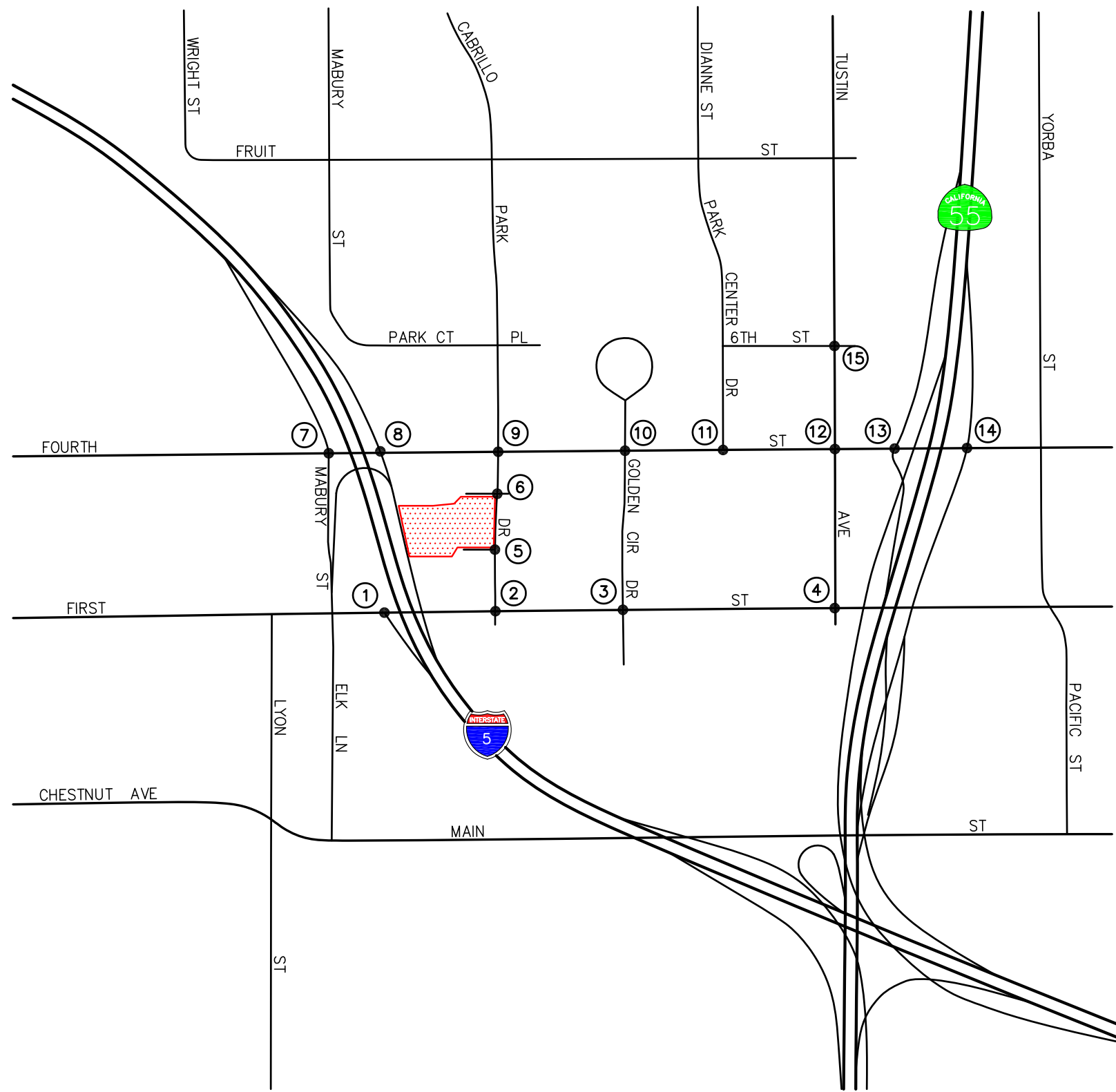


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KEY
 XX,XXX = DAILY TRAFFIC VOLUMES
 = PROJECT SITE

FIGURE 6-7
 YEAR 2019 PM PEAK HOUR AND DAILY CUMULATIVE TRAFFIC VOLUMES WITH PROJECT
 THE MADISON, SANTA ANA

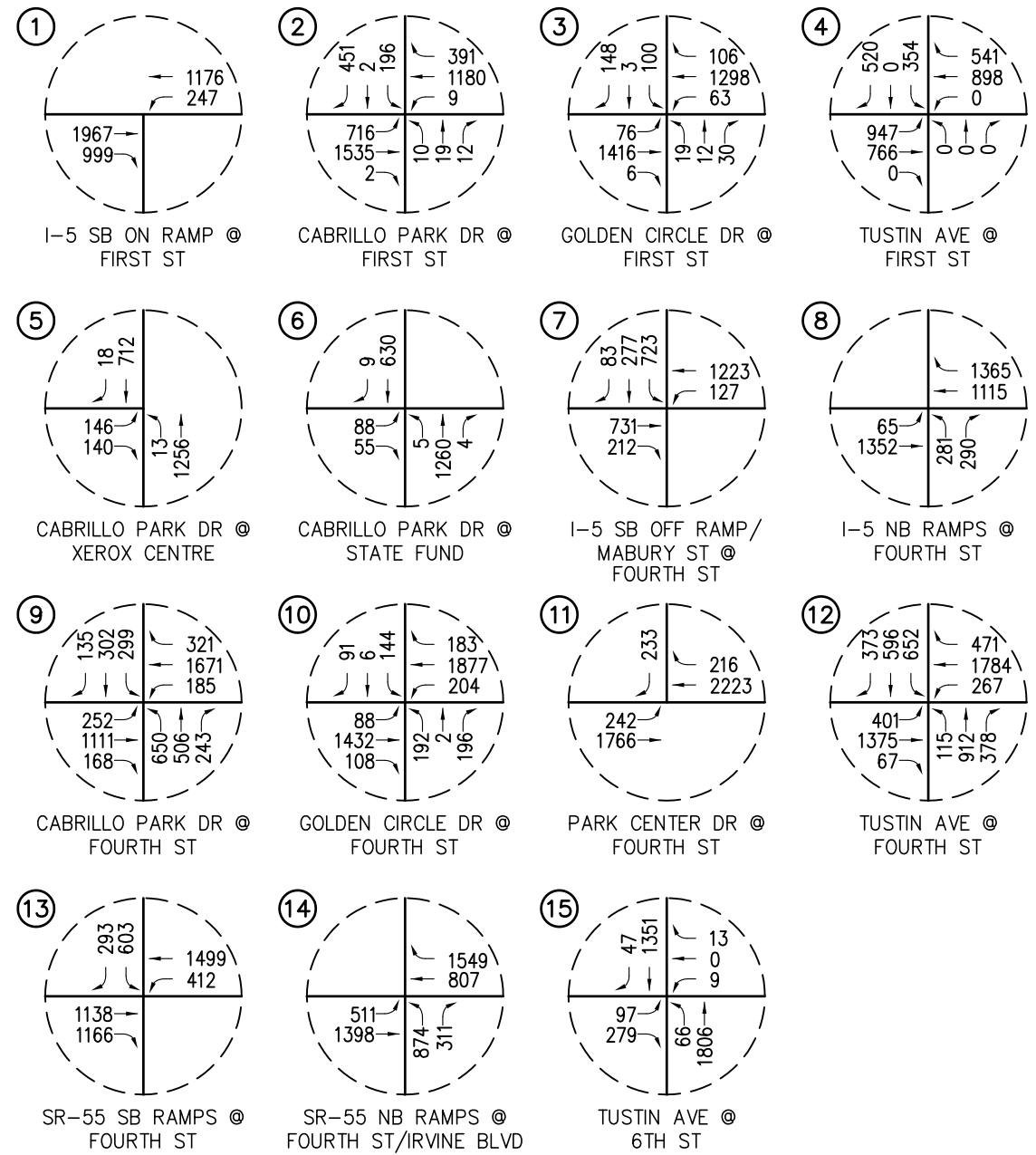
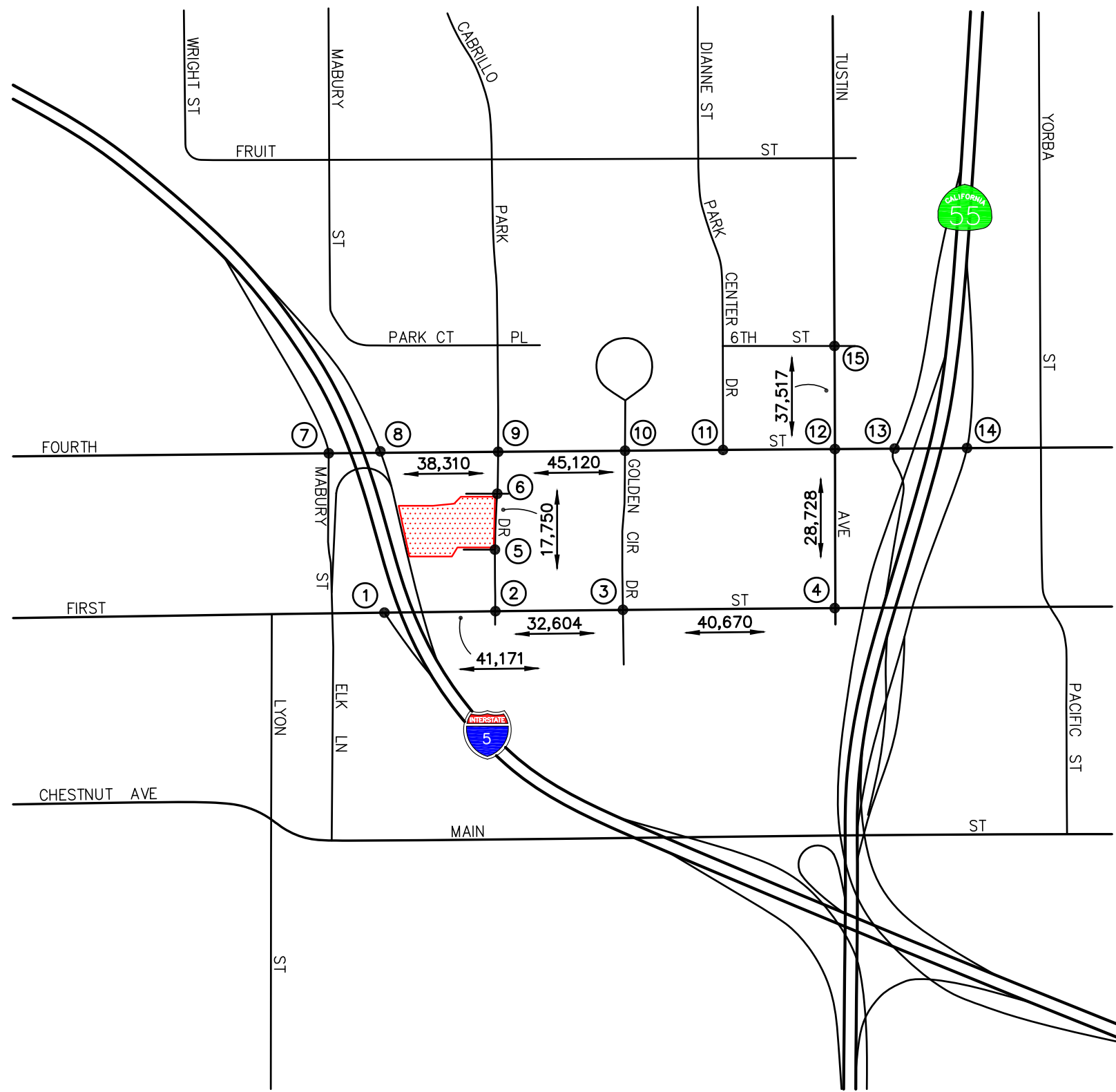


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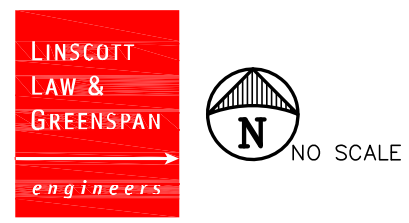


KEY
 = PROJECT SITE

FIGURE 6-8
BUILDOUT AM PEAK HOUR
CUMULATIVE TRAFFIC VOLUMES
 THE MADISON, SANTA ANA

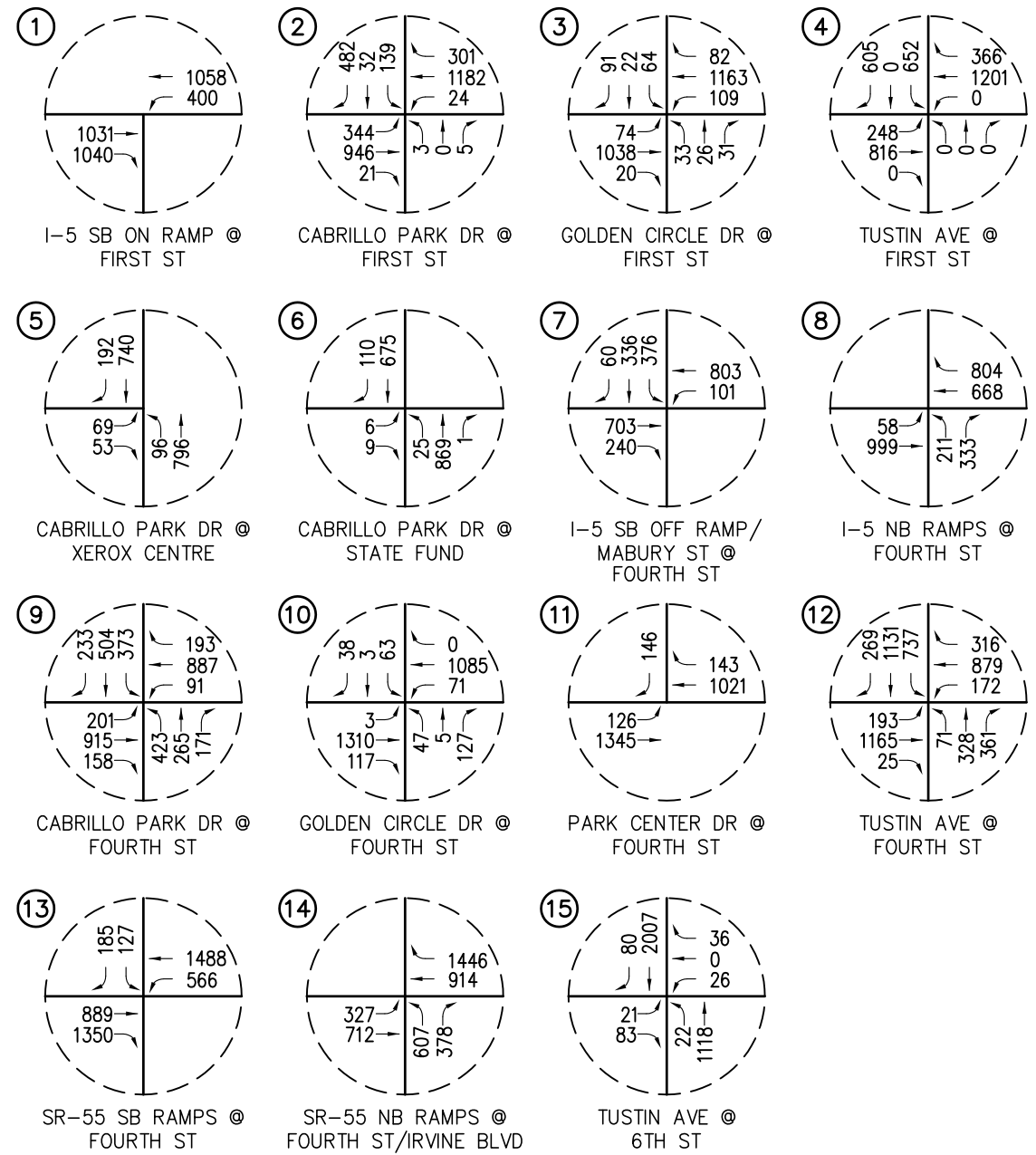
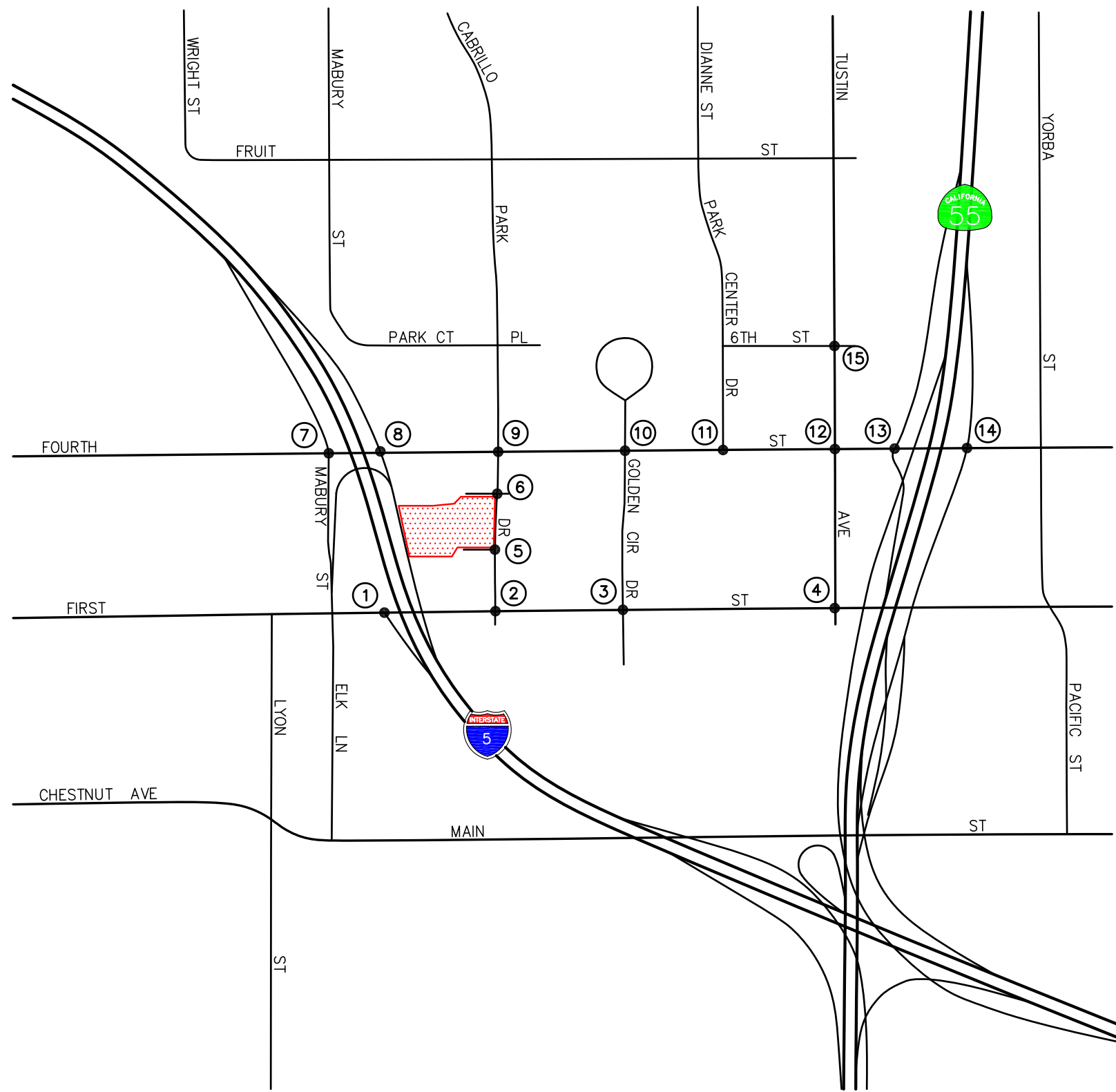


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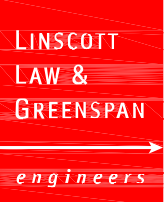


KEY
 XX,XXX = DAILY TRAFFIC VOLUMES
 = PROJECT SITE

FIGURE 6-9
BUILDOUT PM PEAK HOUR AND DAILY CUMULATIVE TRAFFIC VOLUMES
 THE MADISON, SANTA ANA



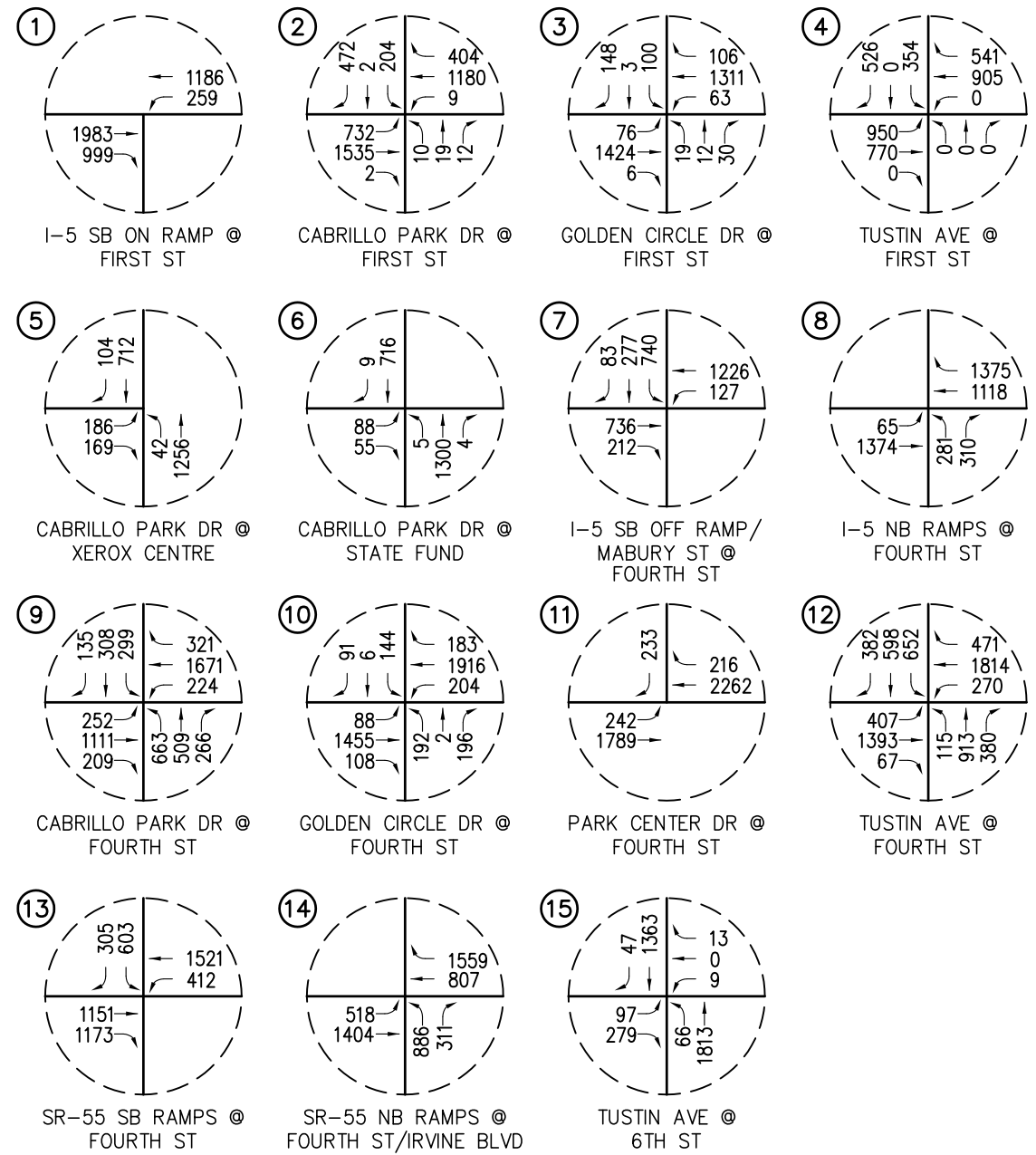
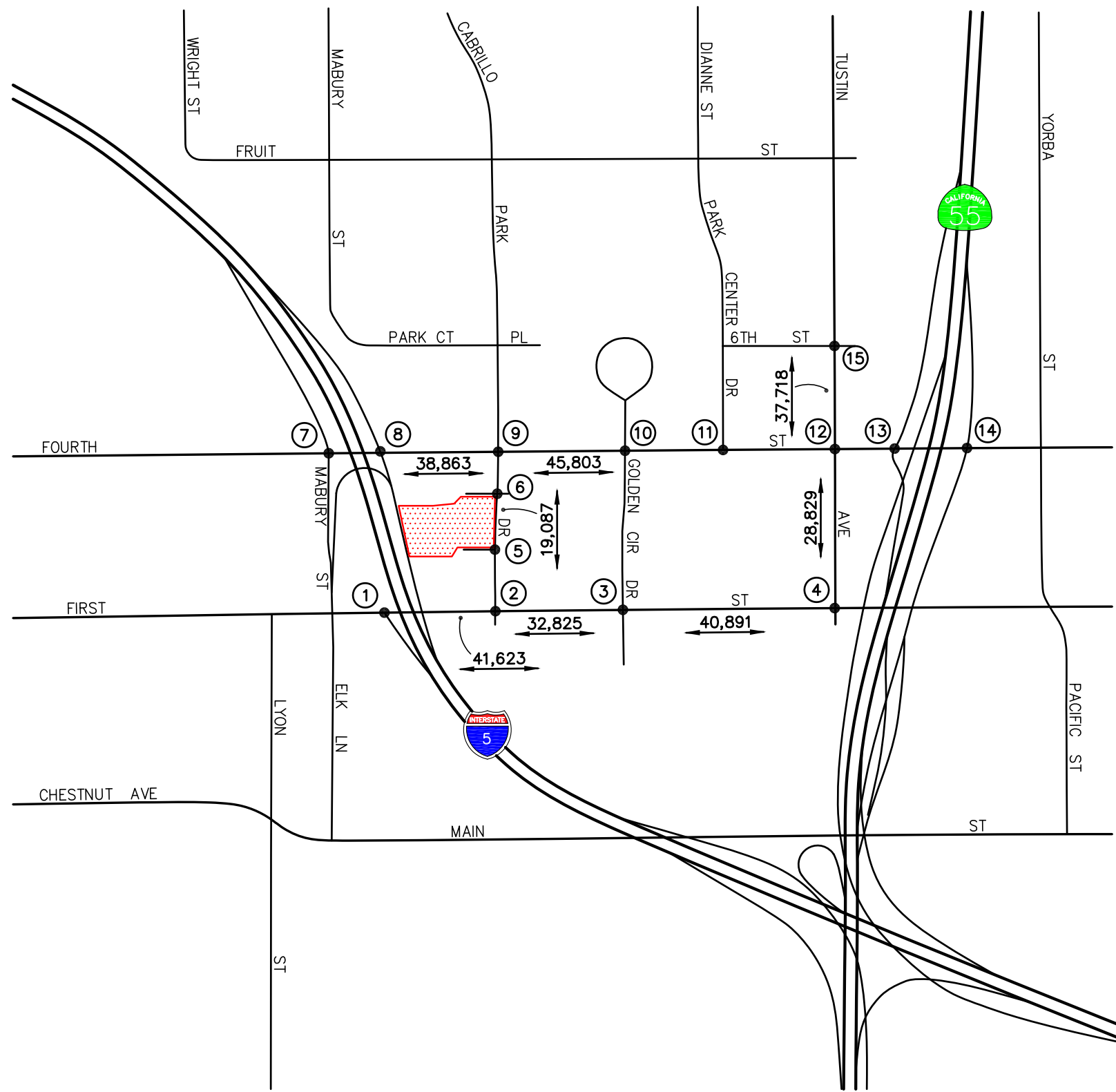
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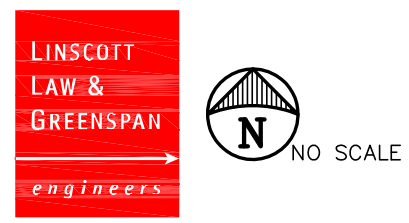
KEY
 = PROJECT SITE

FIGURE 6-10

BUILDOUT AM PEAK HOUR CUMULATIVE TRAFFIC VOLUMES WITH PROJECT
 THE MADISON, SANTA ANA



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KEY
 XX,XXX = DAILY TRAFFIC VOLUMES
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FIGURE 6-11
BUILDOUT PM PEAK HOUR AND DAILY CUMULATIVE TRAFFIC VOLUMES WITH PROJECT
 THE MADISON, SANTA ANA

7.0 TRAFFIC IMPACT ANALYSIS METHODOLOGY

The relative impact of the proposed Project during the AM peak hour and PM peak hour was evaluated based on analysis of future operating conditions at the fifteen (15) key study intersections, without, then with, the proposed Project. The previously discussed capacity analysis procedures were utilized to investigate the future volume-to-capacity relationships and service level characteristics at each study intersection. The significance of the potential impacts of the Project at each key intersection was then evaluated using the following traffic impact criteria.

7.1 Impact Criteria and Thresholds

7.1.1 City of Santa Ana

For those study intersections solely under the jurisdiction of the City of Santa Ana, impacts to local and regional transportation systems are considered significant if:

- An unacceptable peak hour Level of Service (LOS) at any of the key intersections is projected. The City of Santa Ana considers LOS D (ICU = 0.801 - 0.900) 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. Based on the above, the following summarizes the LOS required for each Santa Ana key study intersection:

<u>LOS "D" Requirements</u>	
1. I-5 SB On-Ramp at First Street	8. I-5 NB Ramps at Fourth Street
4. Tustin Avenue at First Street	13. SR- 55 Ramps at Fourth Street
7. I-5 SB Off-Ramp/Mabury St at Fourth Street	14. SR-55 NB Ramps at Fourth St/Irvine Blvd
<u>LOS "E" Requirements</u>	
2. Cabrillo Park Drive at First Street	10. Golden Circle Drive at Fourth Street
3. Golden Circle Drive at First Street	11. Park Center Drive at Fourth Street
5. Cabrillo Park Drive at Xerox Centre	12. Tustin Avenue at Fourth Street
6. Cabrillo Park Drive at State Fund	15. Tustin Avenue at Sixth Street
9. Cabrillo Park Drive at Fourth Street	

- The project increases traffic demand at the study intersection by 1% of capacity (ICU increase \geq 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.

7.1.2 City of Tustin

For those study intersections within the jurisdiction of the City of Tustin (i.e. Tustin Avenue at First Street and SR-55 NB Ramps at Fourth Street/Irvine Boulevard), impacts to local and regional transportation systems are considered significant if:

- An unacceptable peak hour Level of Service (LOS) at any of the key intersections is projected. The City of Tustin considers LOS D to be the minimum acceptable condition that should be maintained during the peak commute hours. For this analysis, if the project increases traffic demand at the study intersection by 1% of capacity (ICU increase ≥ 0.010), causing or worsening LOS E or F (ICU > 0.901), the impact is considered significant.

7.2 Traffic Impact Analysis Scenarios

The following scenarios are those for which volume/capacity calculations have been performed at the fifteen (15) key intersections for existing plus project, near-term (Year 2019) and long-term (Buildout) traffic conditions:

- A. Existing Traffic Conditions;
- B. Existing Plus Project Traffic Conditions;
- C. Scenario (B) with Improvements, if necessary;
- D. Near-Term (Year 2019) Cumulative Traffic Conditions,
- E. Near-Term (Year 2019) Cumulative plus Project Traffic Conditions;
- F. Scenario (E) with Improvements, if necessary;
- G. Long-Term (Buildout) Future Traffic Conditions;
- H. Long-Term (Buildout) Future Traffic Conditions plus Project Traffic; and
- I. Scenario (H) with Improvements, if necessary.

8.0 PEAK HOUR INTERSECTION CAPACITY ANALYSIS

8.1 Existing Plus Project Analysis

Table 8-1 summarizes the peak hour Level of Service results at the fifteen (15) key study intersections for existing plus project traffic conditions. The first column (1) of ICU/LOS values and HCM/LOS values in *Table 8-1* presents a summary of existing AM and PM peak hour traffic conditions (which were also presented in *Table 3-3*). The second column (2) lists existing plus project traffic conditions. The third column (3) shows the increase in ICU value and/or HCM value due to the added peak hour Project trips and indicates whether the traffic associated with the Project will have a significant impact based on the LOS standards and significant impact criteria defined in this report.

8.1.1 Existing Plus Project Traffic Conditions

Review of Columns 2 and 3 of *Table 8-1* indicates that traffic associated with the proposed Project ***will not*** significantly impact any of the fifteen (15) key study intersections, when compared to the LOS standards and significant impact criteria specified in this report. Although the intersection of SR-55 SB Ramps at Fourth Street is forecast to operate at LOS F during the AM peak hour, with the addition of Project traffic, the proposed Project is expected to add less than 0.010 to the ICU value. The remaining fourteen (14) key study intersections are forecast to continue to operate at an acceptable LOS with the addition of project generated traffic.

Appendix D presents the existing plus project ICU/LOS and HCM/LOS calculations for the fifteen (15) key study intersections.

**TABLE 8-1
EXISTING PLUS PROJECT PEAK HOUR INTERSECTION CAPACITY ANALYSIS**

Key Intersection	Time Period	Minimum Acceptable LOS	(1) Existing Traffic Conditions		(2) Existing Plus Project Traffic Conditions		(3) Significant Impact	
			ICU/HCM	LOS	ICU/HCM	LOS	Increase	Yes/No
1. I-5 SB On-Ramp at First Street	AM	D	0.507	A	0.514	A	0.007	No
	PM		0.595	A	0.602	B	0.007	No
2. Cabrillo Park Drive at First Street	AM	E	0.428	A	0.448	A	0.020	No
	PM		0.572	A	0.590	A	0.018	No
3. Golden Circle Drive at First Street	AM	E	0.323	A	0.324	A	0.001	No
	PM		0.336	A	0.339	A	0.003	No
4. Tustin Avenue at First Street	AM	D	0.485	A	0.487	A	0.002	No
	PM		0.512	A	0.513	A	0.001	No
5. Cabrillo Park Drive at Xerox Centre	AM	E	0.297	A	0.347	A	0.050	No
	PM		0.311	A	0.336	A	0.025	No
6. Cabrillo Park Drive at State Fund	AM	E	0.277	A	0.292	A	0.015	No
	PM		0.321	A	0.333	A	0.012	No
7. I-5 SB Off-Ramp/Mabury Street at Fourth Street	AM	D	0.348	A	0.348	A	0.000	No
	PM		0.426	A	0.431	A	0.005	No
8. I-5 NB Ramps at Fourth Street	AM	D	0.466	A	0.476	A	0.010	No
	PM		0.743	C	0.749	C	0.006	No
9. Cabrillo Park Drive at Fourth Street	AM	E	0.563	A	0.576	A	0.013	No
	PM		0.737	C	0.747	C	0.010	No
10. Golden Circle Drive at Fourth Street	AM	E	0.341	A	0.349	A	0.008	No
	PM		0.455	A	0.463	A	0.008	No
11. Park Center Drive at Fourth Street	AM	E	13.7 s/v	B	13.8 s/v	B	0.1 s/v	No
	PM		18.1 s/v	C	18.6 s/v	D	0.5 s/v	No
12. Tustin Avenue at Fourth Street	AM	E	0.596	A	0.605	B	0.009	No
	PM		0.776	C	0.787	C	0.011	No
13. SR-55 SB Ramps at Fourth Street	AM	D	0.989	E	0.996	E	0.007	No
	PM		0.791	C	0.798	C	0.007	No
14. SR-55 NB Ramps at Fourth Street/Irvine Blvd	AM	D	0.778	C	0.785	C	0.007	No
	PM		0.800	D	0.807	D	0.007	No
15. Tustin Avenue at Sixth Street	AM	E	30.0 s/v	D	30.1 s/v	D	0.1 s/v	No
	PM		38.7 s/v	E	39.2 s/v	E	0.5 s/v	No

Notes:

- **Bold ICU/LOS or HCM/LOS** values indicate adverse service levels based on the Cities LOS standards.
- s/v = seconds per vehicle

8.2 Year 2019 Traffic Conditions

Table 8-2 summarizes the peak hour Level of Service results at the fifteen (15) key study intersections for the Year 2019 horizon year. The first column (1) of ICU/LOS and HCM/LOS values in *Table 8-2* presents a summary of existing AM and PM peak hour traffic conditions. The second column (2) lists projected cumulative traffic conditions (existing plus ambient plus related projects traffic) based on existing intersection geometry, but without any traffic generated from the proposed Project. The third column (3) presents forecast Year 2019 near-term traffic conditions with the addition of Project traffic. The fourth column (4) shows the increase in ICU value and/or HCM value due to the added peak hour Project trips and indicates whether the traffic associated with the Project will have a significant impact based on the LOS standards and significant impact criteria defined in this report.

8.2.1 Year 2019 Cumulative Traffic Conditions

An analysis of future (Year 2019) background traffic conditions indicates that the addition of ambient traffic growth and related projects traffic will adversely impact one (1) of the fifteen (15) key study intersections. The location identified below is projected to degrade one service level for LOS E to LOS F in the Year 2019 during the PM peak hour:

<u>Key Intersection</u>	<u>AM Peak Hour</u>		<u>PM Peak Hour</u>	
	<u>ICU/HCM</u>	<u>LOS</u>	<u>ICU/HCM</u>	<u>LOS</u>
13. SR-55 SB Ramps at Fourth Street	---	---	1.040	F

The remaining fourteen (14) key study intersections are forecast to continue to operate at an acceptable LOS based on the LOS criteria identified in this report.

8.2.2 Year 2019 Cumulative Plus Project Conditions

Review of columns 3 and 4 of *Table 8-2* indicates that traffic associated with the proposed Project ***will not*** significantly impact any of the fifteen (15) key study intersections, when compared to the LOS standards and significant impact criteria specified in this report. Although the intersection of SR-55 SB Ramps at Fourth Street is forecast to operate at LOS F during the AM peak hour, with the addition of Project traffic, the proposed Project is expected to add less than 0.010 to the ICU value. The remaining fourteen (14) key study intersections are forecast to continue to operate at an acceptable LOS with the addition of project generated traffic in the Year 2019.

Appendix D also presents the near-term ICU/LOS and HCM/LOS calculations for the fifteen (15) key study intersections.

**TABLE 8-2
YEAR 2019 PEAK HOUR INTERSECTION CAPACITY ANALYSIS**

Key Intersection	Time Period	Minimum Acceptable LOS	(1) Existing Traffic Conditions		(2) Year 2019 Cumulative Traffic Conditions		(3) Year 2019 Cumulative Plus Project Traffic Conditions		(4) Significant Impact	
			ICU/HCM	LOS	ICU/HCM	LOS	ICU/HCM	LOS	Increase	Yes/No
1. I-5 SB On-Ramp at First Street	AM	D	0.507	A	0.538	A	0.545	A	0.007	No
	PM		0.595	A	0.632	B	0.639	B	0.007	No
2. Cabrillo Park Drive at First Street	AM	E	0.428	A	0.471	A	0.489	A	0.018	No
	PM		0.572	A	0.628	B	0.646	B	0.018	No
3. Golden Circle Drive at First Street	AM	E	0.323	A	0.347	A	0.347	A	0.000	No
	PM		0.336	A	0.383	A	0.384	A	0.001	No
4. Tustin Avenue at First Street	AM	D	0.485	A	0.529	A	0.531	A	0.002	No
	PM		0.512	A	0.538	A	0.541	A	0.003	No
5. Cabrillo Park Drive at Xerox Centre	AM	E	0.297	A	0.308	A	0.358	A	0.050	No
	PM		0.311	A	0.328	A	0.353	A	0.025	No
6. Cabrillo Park Drive at State Fund	AM	E	0.277	A	0.287	A	0.302	A	0.015	No
	PM		0.321	A	0.346	A	0.358	A	0.012	No
7. I-5 SB Off-Ramp/Mabury Street at Fourth Street	AM	D	0.348	A	0.377	A	0.377	A	0.000	No
	PM		0.426	A	0.469	A	0.470	A	0.001	No
8. I-5 NB Ramps at Fourth Street	AM	D	0.466	A	0.509	A	0.519	A	0.010	No
	PM		0.743	C	0.795	C	0.801	D	0.006	No

Note:

- **Bold ICU/LOS or HCM/LOS** values indicate adverse service levels based on the Cities LOS standards.

TABLE 8-2 (CONTINUED)
YEAR 2019 PEAK HOUR INTERSECTION CAPACITY ANALYSIS

Key Intersection	Time Period	Minimum Acceptable LOS	(1) Existing Traffic Conditions		(2) Year 2019 Cumulative Traffic Conditions		(3) Year 2019 Cumulative Plus Project Traffic Conditions		(4) Significant Impact	
			ICU/HCM	LOS	ICU/HCM	LOS	ICU/HCM	LOS	Increase	Yes/No
9. Cabrillo Park Drive at Fourth Street	AM	E	0.563	A	0.610	B	0.623	B	0.013	No
	PM		0.737	C	0.783	C	0.793	C	0.010	No
10. Golden Circle Drive at Fourth Street	AM	E	0.341	A	0.362	A	0.369	A	0.007	No
	PM		0.455	A	0.478	A	0.486	A	0.008	No
11. Park Center Drive at Fourth Street	AM	E	13.7 s/v	B	14.4 s/v	B	14.5 s/v	B	0.1 s/v	No
	PM		18.1 s/v	C	19.7 s/v	C	20.3 s/v	C	0.6 s/v	No
12. Tustin Avenue at Fourth Street	AM	E	0.596	A	0.650	B	0.659	B	0.009	No
	PM		0.776	C	0.820	D	0.831	D	0.011	No
13. SR-55 SB Ramps at Fourth Street	AM	D	0.989	E	1.040	F	1.047	F	0.007	No
	PM		0.791	C	0.835	D	0.842	D	0.007	No
14. SR-55 NB Ramps at Fourth Street/Irvine Blvd	AM	D	0.778	C	0.822	D	0.828	D	0.006	No
	PM		0.800	D	0.842	D	0.848	D	0.006	No
15. Tustin Avenue at Sixth Street	AM	E	30.0 s/v	D	32.2 s/v	D	32.3 s/v	D	0.1 s/v	No
	PM		38.7 s/v	E	43.3 s/v	E	43.9 s/v	E	0.6 s/v	No

Note:

- **Bold ICU/LOS or HCM/LOS** values indicate adverse service levels based on the Cities LOS standards.

8.3 Buildout Traffic Conditions

Table 8-3 summarizes the peak hour Level of Service results at the fifteen (15) key study intersections for the Buildout. The first column (1) of ICU/LOS and HCM/LOS values in *Table 8-3* presents a summary of existing AM and PM peak hour traffic conditions. The second column (2) lists projected Buildout long-term traffic conditions based on existing intersection geometry, but without any traffic generated from the proposed Project. The third column (3) presents forecast Buildout long-term traffic conditions with the addition of Project traffic. The fourth column (4) shows the increase in ICU value and/or HCM value due to the added peak hour Project trips and indicates whether the traffic associated with the Project will have a significant impact based on the LOS standards and significant impact criteria defined in this report. The fifth column (5) presents the resultant level of service with the inclusion of recommended traffic improvements, where needed, to achieve an acceptable level of service.

8.3.1 Buildout Cumulative Traffic Conditions

Review of column 2 of *Table 8-3* shows that projected long-term (Buildout) without project traffic will adversely impact seven (7) of the fifteen (15) key study intersections during the AM and PM peak hours when compared to the LOS standards and significant impact criteria specified in this report. The remaining eight (8) key study intersections are forecast to operate at an acceptable LOS for long-term (Buildout) traffic conditions. The locations projected to operate at an adverse LOS are as follows:

<u>Key Intersection</u>	<u>AM Peak Hour</u>		<u>PM Peak Hour</u>	
	<u>ICU/HCM</u>	<u>LOS</u>	<u>ICU/HCM</u>	<u>LOS</u>
8. I-5 NB Ramps at Fourth Street	--	--	1.099	F
9. Cabrillo Park Drive at Fourth Street	--	--	1.101	F
11. Park Center Drive at Fourth Street	--	--	344.0 s/v	F
12. Tustin Avenue at Fourth Street	--	--	1.243	F
13. SR-55 SB Ramps at Fourth Street	1.306	F	--	--
14. SR-55 NB Ramps at Fourth Street	1.024	F	1.147	F
15. Tustin Avenue at Sixth Street	259.0 s/v	F	1561.2 s/v	F

8.3.2 Buildout Plus Project Traffic Conditions

Review of columns 3 and 4 of *Table 8-3* indicates that traffic associated with the proposed Project will have a cumulative significant impact at three (3) of the fifteen (15) key study intersections during the AM and PM peak hours when compared to the LOS standards and significant impact criteria specified in this report. Although the intersections of I-5 NB Ramps/Fourth Street, Cabrillo Park Drive/Fourth Street, SR-55 SB Ramps/Fourth Street, and SR-55 NB Ramps/Fourth-Irvine Blvd are forecast to operate at LOS F during the AM and/or PM peak hours with the addition of project traffic, the proposed Project is expected to add less than 0.010 to the ICU value. The remaining eight (8) key study intersections are forecast to operate at an acceptable LOS during the AM and PM peak hours in the Buildout with the proposed Project.

<u>Key Intersection</u>	<u>AM Peak Hour</u>		<u>PM Peak Hour</u>	
	<u>ICU/HCM</u>	<u>LOS</u>	<u>ICU/HCM</u>	<u>LOS</u>
11. Park Center Drive at Fourth Street	--	--	366.3 s/v	F
12. Tustin Avenue at Fourth Street	--	--	1.254	F
15. Tustin Avenue at Sixth Street	261.8 s/v	F	1703.4 s/v	F

However, as shown in column (5) of *Table 8-3*, the implementation of recommended improvements at three (3) of the four (4) locations offsets the impact of the proposed Project and improves the service level to acceptable operating conditions. Please note that although the recommended improvement at the intersection of Tustin Avenue at Sixth Street, which includes construction of median diverter, does not improve the service level to acceptable operating conditions, the improvement significantly improves the overall intersection delay and offsets the Project impact; the reduction in overall intersection delay is equivalent to improving the service level by up to three or four letter grades. *Appendix D* presents the long-term ICU/LOS and HCM/LOS calculations for the fifteen (15) key study intersections.

**TABLE 8-3
BUILDOUT PEAK HOUR INTERSECTION CAPACITY ANALYSIS**

Key Intersection	Time Period	Minimum Acceptable LOS	(1) Existing Traffic Conditions		(2) Buildout Background Traffic Conditions		(3) Buildout Background Plus Project Traffic Conditions		(4) Significant Impact		(5) Buildout Background Plus Project Plus Improvements Traffic Conditions	
			ICU/HCM	LOS	ICU/HCM	LOS	ICU/HCM	LOS	Increase	Yes/No	ICU/HCM	LOS
1. I-5 SB On-Ramp at First Street	AM	D	0.507	A	0.600	A	0.606	B	0.006	No	--	--
	PM		0.595	A	0.745	C	0.752	C	0.007	No	--	--
2. Cabrillo Park Drive at First Street	AM	E	0.428	A	0.674	B	0.684	B	0.010	No	--	--
	PM		0.572	A	0.967	E	0.984	E	0.017	No	--	--
3. Golden Circle Drive at First Street	AM	E	0.323	A	0.446	A	0.447	A	0.001	No	--	--
	PM		0.336	A	0.496	A	0.499	A	0.003	No	--	--
4. Tustin Avenue at First Street	AM	D	0.485	A	0.666	B	0.668	B	0.002	No	--	--
	PM		0.512	A	0.697	B	0.700	B	0.003	No	--	--
5. Cabrillo Park Drive at Xerox Centre	AM	E	0.297	A	0.395	A	0.444	A	0.049	No	--	--
	PM		0.311	A	0.511	A	0.536	A	0.025	No	--	--
6. Cabrillo Park Drive at State Fund	AM	E	0.277	A	0.309	A	0.317	A	0.008	No	--	--
	PM		0.321	A	0.488	A	0.500	A	0.012	No	--	--
7. I-5 SB Off-Ramp/Mabury Street at Fourth Street	AM	D	0.348	A	0.433	A	0.433	A	0.000	No	--	--
	PM		0.426	A	0.636	B	0.642	B	0.006	No	--	--
8. I-5 NB Ramps at Fourth Street	AM	D	0.466	A	0.693	B	0.703	C	0.010	No	--	--
	PM		0.743	C	1.099	F	1.105	F	0.006	No	--	--

Notes:

- **Bold ICU/LOS or HCM/LOS** values indicate adverse service levels based on the Cities LOS standards.
- s/v = seconds per vehicle

TABLE 8-3 (CONTINUED)
BUILDOUT PEAK HOUR INTERSECTION CAPACITY ANALYSIS

Key Intersection	Time Period	Minimum Acceptable LOS	(1) Existing Traffic Conditions		(2) Buildout Background Traffic Conditions		(3) Buildout Background Plus Project Traffic Conditions		(4) Significant Impact		(5) Buildout Background Plus Project Plus Improvements Traffic Conditions	
			ICU/HCM	LOS	ICU/HCM	LOS	ICU/HCM	LOS	Increase	Yes/No	ICU/HCM	LOS
9. Cabrillo Park Drive at Fourth Street	AM	E	0.563	A	0.800	D	0.813	D	0.013	No	--	--
	PM		0.737	C	1.101	F	1.109	F	0.008	No	--	--
10. Golden Circle Drive at Fourth Street	AM	E	0.341	A	0.506	A	0.514	A	0.008	No	--	--
	PM		0.455	A	0.805	D	0.813	D	0.008	No	--	--
11. Park Center Drive at Fourth Street	AM	E	13.7 s/v	B	19.4 s/v	C	19.6 s/v	C	0.2 s/v	No	0.463	A
	PM		18.1 s/v	C	344.0 s/v	F	366.3 s/v	F	22.3 s/v	Yes	0.863	D
12. Tustin Avenue at Fourth Street	AM	E	0.596	A	0.867	D	0.876	D	0.009	No	0.782	C
	PM		0.776	C	1.243	F	1.254	F	0.011	Yes	0.916	E
13. SR-55 SB Ramps at Fourth Street	AM	D	0.989	E	1.306	F	1.313	F	0.007	No	--	--
	PM		0.791	C	1.225	F	1.230	F	0.005	No	--	--
14. SR-55 NB Ramps at Fourth Street/Irvine Blvd	AM	D	0.778	C	0.967	E	0.973	E	0.006	No	--	--
	PM		0.800	D	1.082	F	1.090	F	0.008	No	--	--
15. Tustin Avenue at Sixth Street	AM	E	30.0 s/v	D	259.0 s/v	F	261.8 s/v	F	2.8 s/v	No	37.8 s/v	E
	PM		38.7 s/v	E	1561.2 s/v	F	1,703.4 s/v	F	142.2 s/v	Yes	58.2 s/v	F

Notes:

- **Bold ICU/LOS or HCM/LOS** values indicate adverse service levels based on the Cities LOS standards.
- s/v = seconds per vehicle

9.0 TRAFFIC SIGNAL WARRANT ANALYSIS

The level of service analysis at the unsignalized intersections of Park Center Drive at Fourth Street and Tustin Avenue at Sixth Street are supplemented with an assessment of the need for signalization of the intersection. This assessment is made on the basis of signal warrant criteria adopted by Caltrans. For this study, the need for signalization is assessed on the basis of the peak-hour traffic signal warrant as described in the *California Manual on Uniform Traffic Control Devices (MUTCD)*.

Warrant #3 has two parts:

- (1) *Part A* evaluates peak hour vehicle delay for traffic on the minor street approach with the highest delay, and
- (2) *Part B* evaluates peak-hour traffic volumes on the major and minor streets.

This method provides an indication of whether peak-hour traffic conditions or peak-hour traffic volume levels are, or would be, sufficient to justify installation of a traffic signal.

The decision to install a traffic signal should not be based purely on the warrants alone. Instead, the installation of a signal should be considered and further analysis performed when one or more of the warrants are met. Additionally, engineering judgment is exercised on a case-by-case basis to evaluate the effect a traffic signal will have on certain types of accidents and traffic conditions at the subject intersection as well as at adjacent intersections.

9.1 Traffic Signal Warrant Analysis Results and Conclusions

The results of the peak-hour traffic signal warrant analysis (Warrant #3) for Buildout and Buildout with Project traffic are summarized on **Table 9-1**. Review of **Table 9-1** indicates that a traffic signal is warranted at Park Center Drive at Fourth Street based on the volumes for Buildout Cumulative Traffic Conditions and Buildout Cumulative Plus Project Traffic Conditions. Therefore, the installation of a traffic signal is justified and recommended at this location.

Appendix E presents the signal warrant worksheets for the unsignalized study intersections.

**TABLE 9-1
TRAFFIC SIGNAL WARRANT ANALYSIS SUMMARY⁶**

Key Intersections	Peak Hour	Buildout Cumulative Traffic		Buildout Cumulative Plus Project Traffic	
		Part A of Warrant 3 Satisfied?	Part B of Warrant 3 Satisfied?	Part A of Warrant 3 Satisfied?	Part B of Warrant 3 Satisfied?
11. Park Center Drive at Fourth Street	AM	No	Yes	No	Yes
	PM	Yes	Yes	Yes	Yes

⁶ Signal warrant checks based on Warrant 3, Part A - Peak-Hour Delay Warrant and Part B - Peak-Hour Volume Warrant are contained in the California MUTCD.

10.0 SITE ACCESS EVALUATION AND QUEUING ANALYSIS

Access to the project site will be provided via the existing intersection of Cabrillo Park Drive at Xerox Centre. **Table 10-1** summarizes the intersection level of service results for Cabrillo Park Drive at Xerox Centre under near-term (Year 2019) and long-term (Buildout) traffic conditions at completion and full occupancy of the proposed Project. As shown, this key study intersection is forecast to operate at LOS A during the AM peak hour and PM peak hour. Please note the values presented in this table reflect the values presented in *Table 8-2* and *Table 8-3*.

To validate the adequacy of the existing stacking/storage lengths, a queuing evaluation was prepared for the northbound left-turn lane on Cabrillo Park Drive and eastbound left-turn lane and eastbound right-turn lane on Xerox Centre. The queuing evaluation was conducted based on projected Buildout plus project peak hour traffic volumes and the Average Queue methodology, which calculates the average queue value in terms of number of vehicles per lane. At signalized intersections, the storage length for left-turn and right-turn lanes may be based on one and one-half (1½) to two (2) times the average queue length per signal cycle⁷. For the purposes of this traffic analysis, the minimum storage requirement for left-turn lanes and right-turn lanes was calculated by taking 1½ times the average queue length (Minimum required storage = $Q_{av} \times 1.5$).

Currently, a northbound left-turn lane with approximately 125 feet of storage is provided on Cabrillo Park Drive at Xerox Centre. For the eastbound approach on Xerox Centre, a separate left-turn and separate right-turn lane with up to 120 feet of storage can be provided. **Table 10-2** summarizes the results of the queueing analysis during the AM peak hour and PM peak hour. **Figure 10-1** and **Figure 10-2** graphically illustrate the forecast vehicular queuing results for the AM peak hour and PM peak hour, respectively, with added Project-related vehicular queues shown. Review of **Figure 10-1** shows that during the AM peak hour, the existing northbound left-turn lane on Cabrillo Park Drive at Xerox Center can accommodate forecast vehicular traffic queues of 4-5 vehicles that are destined for the existing office building or the Project site. Relative to eastbound (outbound) vehicular queues, the forecast traffic amounts to no more than four (4) vehicles in the left-turn lane and three (3) vehicles in the right-turn lane, which can be accommodated by the existing storage of 120 feet.

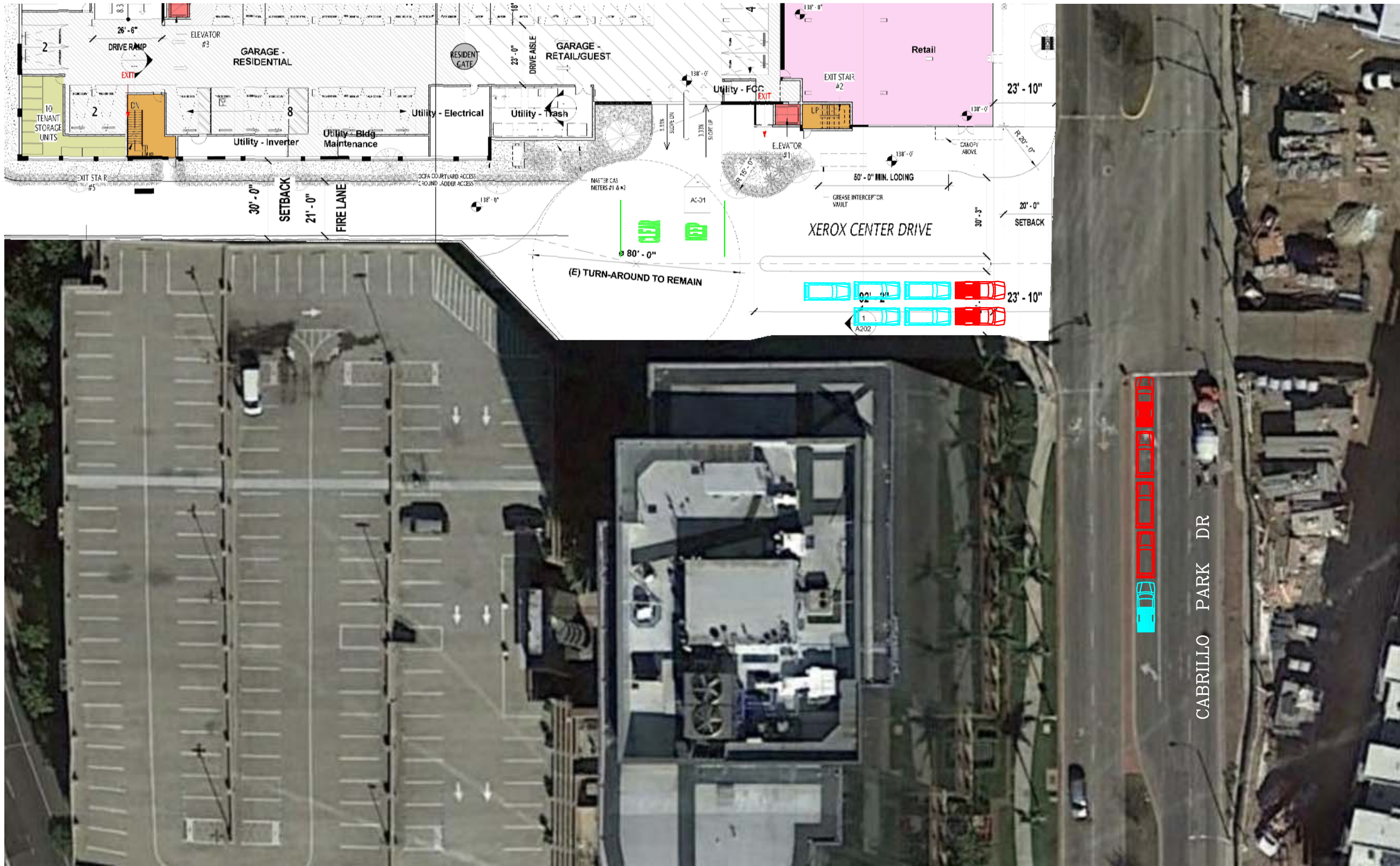
During the PM peak hour, as shown in **Figure 10-2**, the northbound (inbound) left-turn queue amounts to no more than two (2) vehicles, whereas the eastbound (outbound) vehicular queues totals no more than six (6) vehicles in the left-turn lane and six (6) vehicles in the right-turn lane, all of which can be accommodated by the existing storage provided in each of these lanes.

Nevertheless, to minimize conflicts between Project-related traffic and existing office traffic, it is recommended that “Keep Clear” pavement markings be installed on Xerox Centre drive at the project driveway to facilitate access to and from the Project and the existing office building. As such, Cabrillo Park Drive at Xerox is forecast to provide acceptable storage during the AM and PM peak hours and project access will be adequate. Motorists entering and exiting the Project site will

⁷ Source: Highway Design Manual, Intersections at Grade, page 400-9, CALTRANS.

be able to do so comfortably, safely, and without undue congestion. In addition, please note that the circulation pattern for the existing office building would have a dominant inbound movement in the AM period and a dominant outbound movement in the PM period. The circulation for the proposed Project is the opposite flow from the existing office building with dominant outbound movements in the AM period and dominant inbound movements in the PM period. Therefore, these uses complement each other to help minimize queues and conflicts.

Appendix F presents the queuing worksheets.



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SOURCE: MVE+PARTNERS



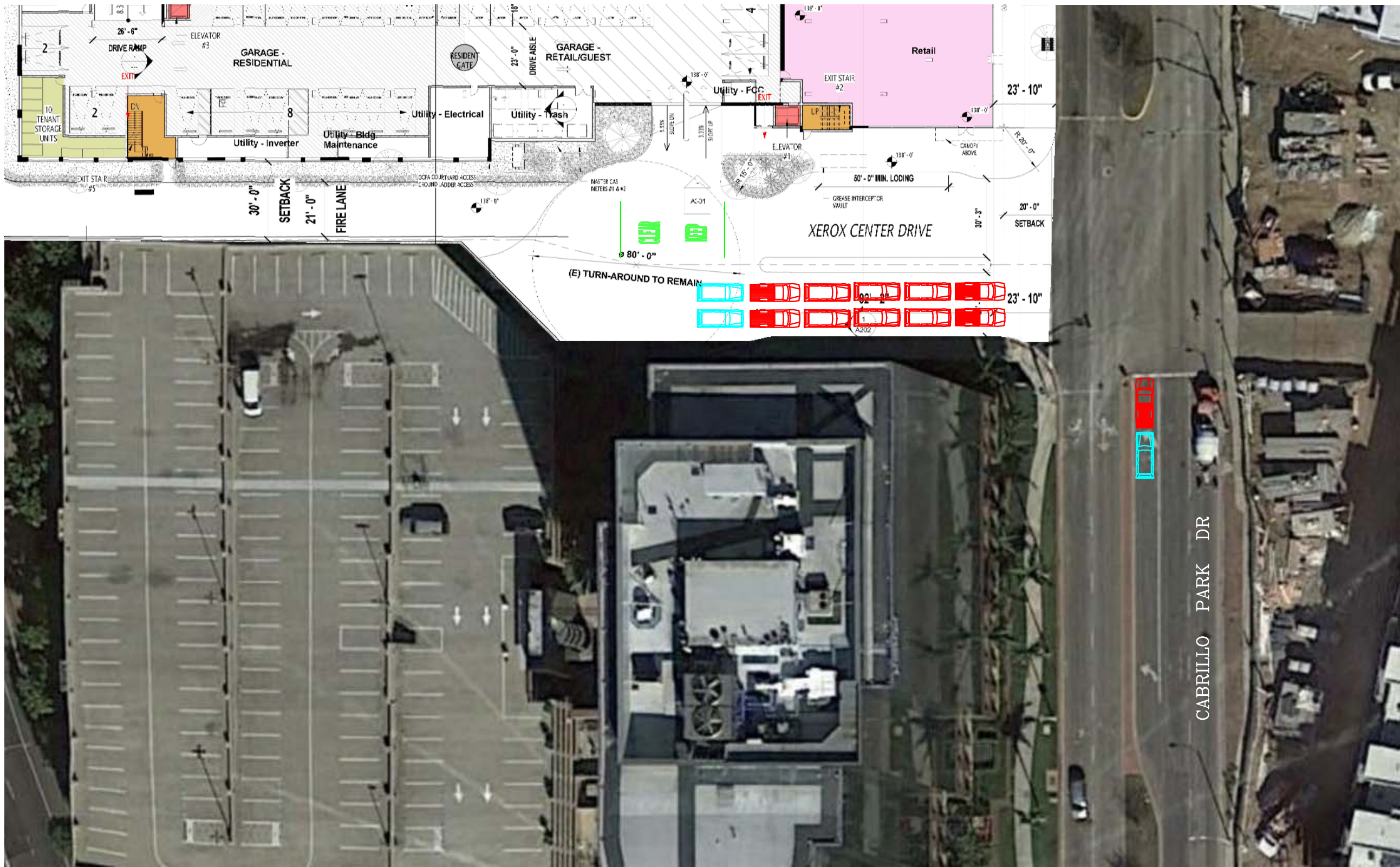
- KEY**
-  = EXISTING OFFICE BUILDING VEHICLE
 -  = PROJECT VEHICLE

FIGURE 10-1

AM PEAK HOUR QUEUEING ASSESSMENT FOR CABRILLO PARK DRIVE AT XEROX CENTER THE MADISON, SANTA ANA



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SOURCE: MVE+PARTNERS

KEY

- = EXISTING OFFICE BUILDING VEHICLE
- = PROJECT VEHICLE

FIGURE 10-2

PM PEAK HOUR QUEUEING ASSESSMENT FOR CABRILLO PARK DRIVE AT XEROX CENTER THE MADISON, SANTA ANA

TABLE 10-1
PROJECT DRIVEWAY PEAK HOUR INTERSECTION CAPACITY ANALYSIS

Key Intersection	Time Period	Intersection Control	(1) Year 2019 Plus Project Traffic Conditions		(2) Buildout Plus Project Traffic Conditions	
			ICU	LOS	ICU	LOS
5. Cabrillo Park Drive at Xerox Centre	AM	3Ø Traffic Signal	0.358	A	0.444	A
	PM		0.353	A	0.536	A

**TABLE 10-2
 BUILDOUT CUMULATIVE PLUS PROJECT QUEUING ANALYSIS**

Key Intersections	Storage Provided (ft.)	Buildout Cumulative Plus Project Traffic Conditions			
		AM Peak Hour		PM Peak Hour	
		Max. Queue (ft.)	Adequate Storage Yes / No	Max. Queue (ft.)	Adequate Storage Yes / No
5. Cabrillo Park Drive at Xerox Centre					
Northbound Left-Turn	125'	89'	Yes	30'	Yes
Eastbound Left-Turn	120'	62'	Yes	119'	Yes
Eastbound Right-Turn	120'	47'	Yes	110'	Yes

11.0 RECOMMENDED INTERSECTION IMPROVEMENTS

For those intersections where projected traffic volumes are expected to result in unacceptable operating conditions, this report recommends (identifies) improvement measures that change the intersection geometry to increase capacity. These capacity improvements involve roadway widening and/or re-striping to reconfigure (add lanes) to specific approaches of a key intersection. The identified improvements are expected to:

- mitigate the impact of existing traffic, Project traffic and future non-project (ambient traffic growth and cumulative project) traffic and
- improve Levels of Service to an acceptable range and/or to pre-project conditions.

11.1 Existing Plus Project Traffic Conditions

The results of the intersection capacity analysis presented previously in *Table 8-1* shows that the proposed Project will not significantly impact any of the fifteen (15) key study intersections under the “Existing Plus Project” traffic scenario. Given that there are no significant project impacts, no improvements are required under this traffic scenario.

11.2 Year 2019 Plus Project Traffic Conditions

The results of the intersection capacity analyses presented previously in *Table 8-2* shows that the proposed Project will not significantly impact any of the fifteen (15) key study intersections under the “Year 2019 Plus Project” traffic scenario. Given that there are no significant project impacts, no improvements are required under this traffic scenario.

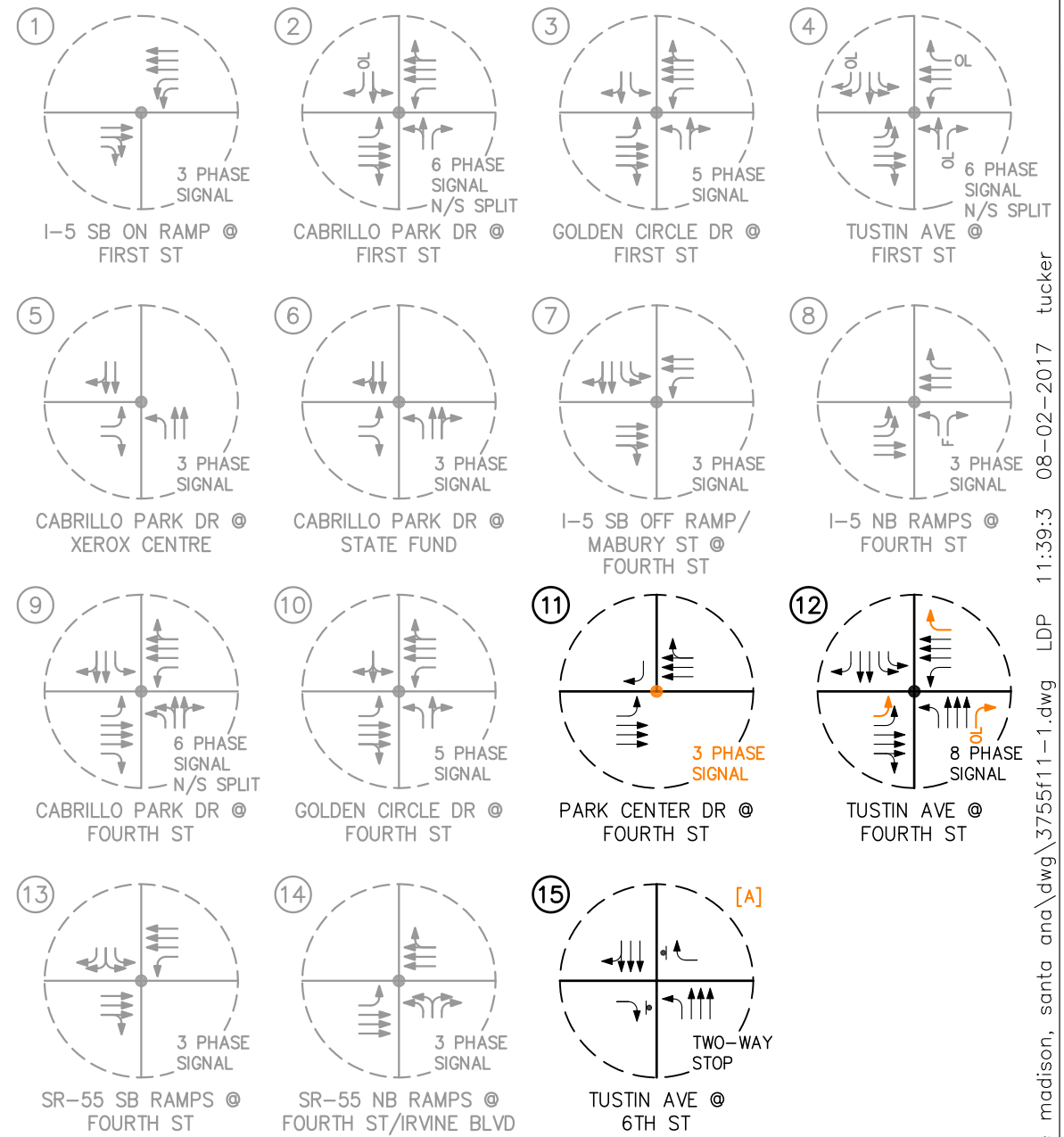
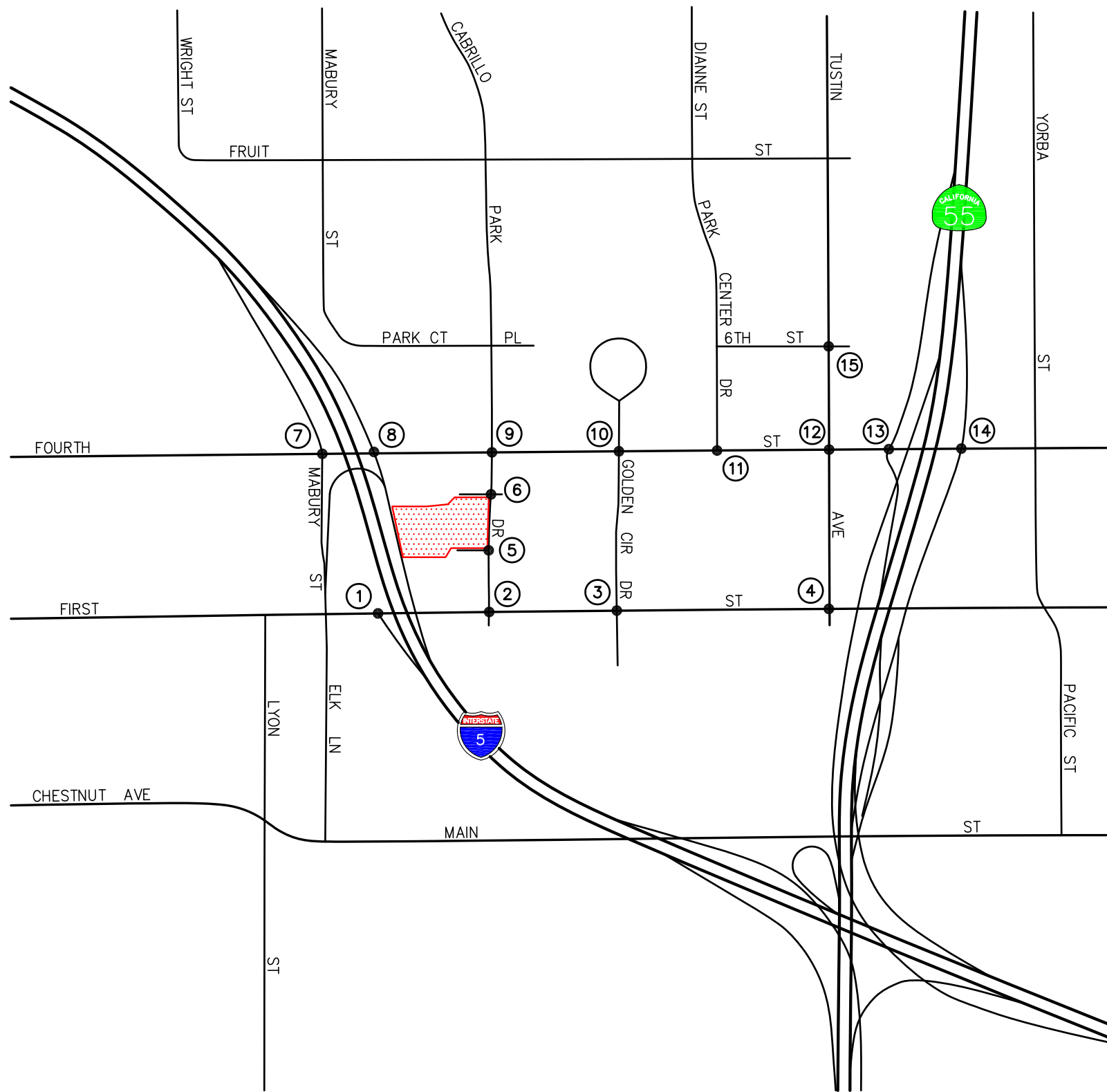
11.3 Buildout Plus Project Traffic Conditions

The results of the intersection capacity analyses presented previously in *Table 8-3* shows that the proposed Project is expected to have a significant impact at three (3) of the fifteen (15) key study intersections under Buildout Plus Project traffic conditions. As such, the following intersection improvements are recommended to mitigate the cumulative impacts of the proposed Project under these conditions. Per City requirements, the Project may be expected to pay a fair-share/local fee to cover the Project’s fair share of the full construction costs needed to implement these mitigation measures.

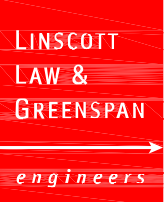
- **No. 11 – Park Center Drive at Fourth Street:** Install a traffic signal and design for three-phase operations. Modify existing signing and striping improvements. This improvement is subject to the review and approval of the City of Santa Ana.
- **No. 12 – Tustin Avenue at Fourth Street:** Widen and/or restripe Tustin Avenue to provide an exclusive northbound right-turn lane. Widen and/or restripe Fourth Street to provide a second exclusive eastbound left-turn lane and an exclusive westbound right-turn lane. Modify the existing traffic signal for northbound right-turn overlap phasing and existing signing and striping improvements accordingly. This improvement is subject to the review and approval of the City of Santa Ana.

- **No. 15 – Tustin Avenue at Sixth Street:** Install a median island to prohibit eastbound and westbound cross-traffic and left-turns. This improvement is subject to the review and approval of the City of Santa Ana.

Figure 11-1 graphically illustrates the recommended improvements for Buildout traffic conditions. It should be noted that the improvements identified herein are generally consistent with those recommended in the *Traffic Impact Study for the Metro East Overlay Zone in the City of Santa Ana*.



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- KEY**
- ← = APPROACH LANE ASSIGNMENT
 - = BUILDOUT RECOMMENDED IMPROVEMENTS
 - = TRAFFIC SIGNAL, ▽ = STOP SIGN
 - ▨ = PROJECT SITE

NOTE:
[A] INSTALL MEDIAN ISLAND. RESTRICT EASTBOUND/WESTBOUND CROSS TRAFFIC AND LEFT TURNS.

FIGURE 11-1
RECOMMENDED IMPROVEMENTS
THE MADISON, SANTA ANA

11.4 Project-Related Fair-Share Contribution

The transportation impacts associated with the development of the Project were determined based on the Existing Plus Project, Year 2019 and Buildout traffic analyses. As summarized in *Tables 8-1, 8-2 and 8-3*, the development of the Project is anticipated to have a cumulative impact at four (4) locations in the Buildout. As such, the Project can be expected to pay its fair share of the improvement costs of the impacted intersections to offset the Project's incremental traffic impact. *Table 11-1* presents the impacted intersections along with their recommend improvements. *Table 11-2* presents Project's fair-share contribution to construct the recommended improvements at the study intersections projected to operate at an unacceptable LOS in the Buildout. As presented in this *Table 11-2*, the first column (1) presents a total of all intersection peak hour movements for existing conditions. The second column (2) presents Project-related added traffic volumes during AM peak hour and PM peak hour. The third column (3) presents Buildout traffic conditions with Project traffic. The fourth column (4) represents what percentage of total added intersection peak hour traffic is Project-related traffic.

**TABLE 11-1
RECOMMENDED IMPROVEMENTS⁸**

Key Intersections	Jurisdiction	Improvement Description
11. Park Center Drive at Fourth Street	Santa Ana	<ul style="list-style-type: none"> ▪ Install three phase traffic signal.
12. Tustin Avenue at Fourth Street	Santa Ana	<ul style="list-style-type: none"> ▪ Widen to provide a NB right-turn lane. ▪ Widen to provide a 2nd EB left-turn lane. ▪ Widen to provide a WB right-turn lane. ▪ Modify existing traffic signal for NB overlap phasing.
15. Tustin Avenue at Sixth Street	Santa Ana	<ul style="list-style-type: none"> ▪ Install a median island to prohibit eastbound and westbound cross-traffic and left-turns.

⁸ Developer will be required to submit detailed cost estimates for the recommended intersection improvements. Cost Estimates shall be prepared by a licensed Civil Engineer. Cost Estimates will require review and approval by the City of Santa Ana

**TABLE 11-2
BUILDOUT PROJECT FAIR-SHARE COST CONTRIBUTION**

Key Intersection	City/ Jurisdiction	Time Period	(1) Existing Traffic	(2) Project Traffic	(3) Buildout Build out Plus Project Traffic	(4) Project Fair-Share Percent⁹
11. Park Center Drive at Fourth Street	Santa Ana	AM	--	--	--	--
		PM	2331	62	4742	2.57%
12. Tustin Avenue at Fourth Street	Santa Ana	AM	--	--	--	--
		PM	4383	71	7462	2.31%
15. Tustin Avenue at Sixth Street	Santa Ana	AM	2700	13	3393	1.88%
		PM	2511	19	3687	1.62%

⁹ Project fair-share percentage Column (4) = [Column (2)] / [Column (3) – Column (1)].

12.0 CONGESTION MANAGEMENT PROGRAM (CMP) COMPLIANCE ASSESSMENT

This analysis is consistent with the requirements and procedures outlined in the current *Orange County Congestion Management Program (CMP)*. The CMP requires that a traffic impact analysis be conducted for any project generating 2,400 or more daily trips, or 1,600 or more daily trips for projects that directly access the CMP Highway System (HS). Per the CMP guidelines, this number is based on the desire to analyze any impacts that will be 3.0% or more of the existing CMP highway system facilities' capacity.

However, as noted in this traffic study, the proposed Project is expected to generate 2,010 daily trips, and thus does not meet the criteria required for a CMP traffic analysis. Therefore, it is concluded that the proposed Project will not have any significant traffic impacts on the Congestion Management Program Highway System.

13.0 STATE OF CALIFORNIA (CALTRANS) METHODOLOGY

In conformance with the current Caltrans *Guide for the Preparation of Traffic Impact Studies*, existing and projected AM and PM peak hour operating conditions at the five (5) state-controlled study intersections within the study area have been evaluated using the *Highway Capacity Manual 2010* operations method of analysis. These state-controlled locations include the following intersections:

1. I-5 SB On-Ramp at First Street
7. I-5 SB Off-Ramp/Mabury St at Fourth Street
8. I-5 NB Ramps at Fourth Street
13. SR- 55 Ramps at Fourth Street
14. SR-55 NB Ramps at Fourth St/Irvine Blvd

Caltrans “endeavors to maintain a target LOS at the transition between LOS “C” and LOS “D” on State highway facilities”; it does not require that LOS “D” (shall) be maintained. However, Caltrans acknowledges that this may not always be feasible and recommends that the lead agency consult with Caltrans to determine the appropriate target LOS. For this analysis, LOS D is the target level of service standard and will be utilized to assess the project impacts at the state-controlled study intersections.

13.1 Highway Capacity Manual (HCM) Method of Analysis (Signalized Intersections)

AM and PM peak hour operating conditions for the key study intersections were evaluated using the methodology outlined in *Chapter 18 of the Highway Capacity Manual 2010 (HCM 2010)* for signalized intersections. Based on the HCM operations method of analysis, level of service for signalized intersections and approaches is defined in terms of control delay, which is a measure of the increase in travel time due to traffic signal control, driver discomfort, and fuel consumption. Control delay includes the delay associated with vehicles slowing in advance of an intersection, the time spent stopped on an intersection approach, the time spent as vehicles move up in the queue, and the time needed for vehicles to accelerate to their desired speed. LOS criteria for traffic signals are stated in terms of the control delay in seconds per vehicle. The LOS thresholds established for the automobile mode at a signalized intersection are shown in *Table 13-1*.

TABLE 13-1
LEVEL OF SERVICE CRITERIA FOR SIGNALIZED INTERSECTIONS (HCM METHODOLOGY)¹⁰

Control Delay (sec/veh)	Level of Service (LOS)	Level of Service Description
≤ 10	A	This level of service occurs when the v/c ratio is low and either progression is exceptionally favorable or the cycle length is very short.
> 10-20	B	This level generally occurs when the v/c ratio is low and either progression is highly favorable or the cycle length is short.
> 20-35	C	Average traffic delays. These higher delays may result when progression is favorable or the cycle length is moderate. Individual cycle failures may begin to appear at this level. The number of vehicles stopping is significant at this level, though many still pass through the intersection without stopping.
> 35-55	D	Long traffic delays. At level D, the influence of congestion becomes more noticeable. Longer delays may result from some combination of unfavorable progression, long cycle lengths, or high v/c ratios. Many vehicles stop and individual cycle failures are noticeable.
> 55-80	E	Very long traffic delays. This level is considered by many agencies (i.e. SANBAG) to be the limit of acceptable delay. These high delay values generally indicate poor progression, long cycle lengths, and high v/c ratios. Individual cycle failures are frequent.
> 80	F	Severe congestion. This level, considered to be unacceptable to most drivers, often occurs with over saturation, that is, when arrival flow rates exceed the capacity of the intersection. It may also occur at high v/c ratios below 1.0 with many individual cycle failures. Poor progression and long cycle lengths may also be major contributing factors to such delay levels.

¹⁰ Source: *Highway Capacity Manual*, Chapter 18: Signalized Intersections.

13.2 Existing Plus Project Traffic Conditions – Caltrans Methodology

Table 13-2 summarizes the existing plus project peak hour HCM level of service results at the five (5) state-controlled study intersections within the study area. The first column (1) of HCM/LOS values in *Table 13-2* presents a summary of existing traffic conditions. The second column (2) presents existing plus project traffic conditions. The third column (3) indicates whether the traffic associated with the Project will have an impact based on the LOS standards defined in this report. The fourth column (4) presents the resultant level of service with the inclusion of recommended traffic improvements, where needed, to achieve an acceptable level of service.

13.2.1 Existing Traffic Conditions

Review of column (1) of *Table 13-2* indicates that all five (5) state-controlled study intersections currently operate an acceptable LOS D or better during the AM and PM peak hours.

13.2.2 Existing Plus Project Traffic Conditions

Review of columns (2) and (3) of *Table 13-2* indicates that traffic associated with the proposed Project ***will not*** significantly impact any of the five (5) state-controlled study intersections, when compared to the LOS standards and significant impact criteria specified in this report.

13.3 Year 2019 Traffic Conditions – Caltrans Methodology

Table 13-3 summarizes the Year 2019 peak hour HCM level of service results at the five (5) state-controlled study intersections within the study area. The first column (1) of HCM/LOS values in *Table 13-3* presents a summary of existing traffic conditions. The second column (2) presents Year 2019 cumulative traffic conditions based on existing intersection geometry, but without any project generated traffic. The third column (3) presents future forecast traffic conditions with the addition of Project traffic. Column four (4) indicates whether the traffic associated with the Project will have an impact based on the LOS standards defined in this report. The fifth column (5) presents the resultant level of service with the inclusion of recommended traffic improvements, where needed, to achieve an acceptable level of service.

13.3.1 Year 2019 Cumulative Traffic Conditions

An analysis of future (Year 2019) cumulative traffic conditions indicates that with the addition of ambient traffic growth and related projects traffic, all five (5) state-controlled study intersections currently operate an acceptable LOS D or better during the AM and PM peak hours.

13.3.2 Year 2019 Cumulative Plus Project Traffic Conditions

Review of columns (3) and (4) of *Table 13-3* indicates that traffic associated with the proposed Project ***will not*** significantly impact any of the five (5) state-controlled study intersections, when compared to the LOS standards and significant impact criteria specified in this report.

TABLE 13-2
EXISTING PLUS PROJECT PEAK HOUR INTERSECTION CAPACITY ANALYSIS - CALTRANS

Key Intersection	Time Period	(1) Existing Traffic Conditions		(2) Existing Plus Project Traffic Conditions		(3) Impact	(4) Existing Plus Project Plus Improvements Traffic Conditions	
		HCM (s/v)	HCM (s/v)	HCM (s/v)	LOS	Yes/No	HCM (s/v)	LOS
1. I-5 SB On-Ramp at First Street	AM	7.9	A	8.2	A	No	--	--
	PM	6.6	A	6.8	A	No	--	--
7. I-5 SB Off-Ramp/Mabury at Fourth Street	AM	15.4	B	15.4	B	No	--	--
	PM	14.0	B	14.1	B	No	--	--
8. I-5 NB Ramps at Fourth Street	AM	8.7	A	8.7	A	No	--	--
	PM	11.6	B	11.7	B	No	--	--
13. SR-55 SB Ramps at Fourth Street	AM	39.3	D	40.8	D	No	--	--
	PM	22.4	C	22.6	C	No	--	--
14. SR-55 NB Ramps at Fourth Street/Irvine Blvd	AM	27.2	C	28.3	C	No	--	--
	PM	25.8	C	25.5	C	No	--	--

Notes:

- s/v = seconds per vehicle

**TABLE 13-3
YEAR 2019 PEAK HOUR INTERSECTION CAPACITY ANALYSIS - CALTRANS**

Key Intersection	Time Period	(1) Existing Traffic Conditions		(2) Year 2019 Cumulative Traffic Conditions		(3) Year 2019 Cumulative Plus Project Traffic Conditions		(4) Impact Yes/No	(5) Year 2019 Cumulative Plus Project Plus Improvements Traffic Conditions	
		HCM (s/v)	LOS	HCM (s/v)	LOS	HCM (s/v)	LOS		HCM	LOS
1. I-5 SB On-Ramp at First Street	AM	7.9	A	8.0	A	8.3	A	No	--	--
	PM	6.6	A	6.9	A	7.2	A	No	--	--
7. I-5 SB Off-Ramp/Mabury at Fourth Street	AM	15.4	B	15.2	B	15.2	B	No	--	--
	PM	14.0	B	14.3	B	14.5	B	No	--	--
8. I-5 NB Ramps at Fourth Street	AM	8.7	A	9.6	A	9.6	A	No	--	--
	PM	11.6	B	14.1	B	14.3	B	No	--	--
13. SR-55 SB Ramps at Fourth Street	AM	39.3	D	47.5	D	48.6	D	No	--	--
	PM	22.4	C	24.7	C	26.2	C	No	--	--
14. SR-55 NB Ramps at Fourth Street/Irvine Blvd	AM	27.2	C	33.1	C	33.8	C	No	--	--
	PM	25.8	C	30.7	C	31.5	C	No	--	--

Notes:

- s/v = seconds per vehicle

13.4 Buildout Traffic Conditions – Caltrans Methodology

Table 13-4 summarizes the peak hour Level of Service results at the five (5) state-controlled study intersections for the Buildout. The first column (1) of HCM/LOS values in *Table 13-4* presents a summary of existing traffic conditions. The second column (2) presents Buildout cumulative traffic conditions based on existing intersection geometry, but without any project generated traffic. The third column (3) presents future forecast traffic conditions with the addition of Project traffic. Column four (4) indicates whether the traffic associated with the Project will have an impact based on the LOS standards defined in this report. The fifth column (5) presents the resultant level of service with the inclusion of recommended traffic improvements, where needed, to achieve an acceptable level of service.

13.4.1 Buildout Cumulative Traffic Conditions

Review of column (2) of *Table 13-4* shows that projected long-term (Buildout) without project traffic will adversely impact two (2) of the five (5) state-controlled study intersections, when compared to the LOS standards specified in this report. The remaining three (3) key study intersections are forecast to operate at an acceptable LOS for long-term (Buildout) traffic conditions. The locations projected to operate at an adverse LOS are as follows:

<u>Key Intersection</u>	<u>AM Peak Hour</u>		<u>PM Peak Hour</u>	
	<u>HCM</u>	<u>LOS</u>	<u>HCM</u>	<u>LOS</u>
13. SR-55 SB Ramps at Fourth Street	104.0	F	101.3	F
14. SR-55 NB Ramps at Fourth St/Irvine Blvd	59.3	E	94.2	F

13.4.2 Buildout Plus Project Traffic Conditions

Review of columns (3) and (4) of *Table 13-4* indicates that traffic associated with the proposed Project will have a cumulative impact at two (2) of the five (5) state-controlled study intersections. The remaining three (3) state-controlled study intersections are forecast to continue to operate at LOS D or better with the addition of project generated traffic in the Buildout. The locations projected to operate at an adverse LOS are as follows:

<u>Key Intersection</u>	<u>AM Peak Hour</u>		<u>PM Peak Hour</u>	
	<u>HCM</u>	<u>LOS</u>	<u>HCM</u>	<u>LOS</u>
13. SR-55 SB Ramps at Fourth Street	105.5	F	103.4	F
14. SR-55 NB Ramps at Fourth St/Irvine Blvd	60.7	E	98.3	F

However, as shown in column (5) of *Table 13-4*, the implementation of recommended improvements at these three intersections results in acceptable levels of service. **Appendix G** presents the Caltrans level of service calculation worksheets for the five state-controlled study intersections.

TABLE 13-4
BUILDOUT PEAK HOUR INTERSECTION CAPACITY ANALYSIS - CALTRANS

Key Intersection	Time Period	(1) Existing Traffic Conditions		(2) Buildout Cumulative Traffic Conditions		(3) Buildout Cumulative Plus Project Traffic Conditions		(4) Impact Yes/No	(5) Buildout Cumulative Plus Project Plus Improvements Traffic Conditions	
		HCM	LOS	HCM	LOS	HCM	LOS		HCM	LOS
1. I-5 SB On-Ramp at First Street	AM	7.9	A	7.8	A	8.1	A	No	--	--
	PM	6.6	A	7.5	A	7.8	A	No	--	--
7. I-5 SB Off-Ramp/Mabury at Fourth Street	AM	15.4	B	17.4	B	17.4	B	No	--	--
	PM	14.0	B	19.0	B	19.2	B	No	--	--
8. I-5 NB Ramps at Fourth Street	AM	8.7	A	11.4	B	11.6	B	No	--	--
	PM	11.6	B	52.6	D	53.7	D	No	--	--
13. SR-55 SB Ramps at Fourth Street	AM	39.3	D	104.0	F	105.5	F	Yes	16.4	B
	PM	22.4	C	101.3	F	103.4	F	Yes	21.7	C
14. SR-55 NB Ramps at Fourth Street/Irvine Blvd	AM	27.2	C	59.3	E	60.7	E	Yes	25.0	C
	PM	25.8	C	94.2	F	98.3	F	Yes	41.9	D

Notes:

- s/v = seconds per vehicle

13.5 Recommended Improvements – Caltrans Methodology

13.5.1 Buildout Plus Project Traffic Conditions

The results of the Caltrans assessment for Buildout Plus Project Traffic Conditions as summarized in *Table 13-4* indicate that the proposed Project will cumulatively impact two (2) of the five (5) state-controlled study intersections. The Project may be expected to pay a fair-share/local fee to cover the Project's fair share of the full construction of the following recommended improvements:

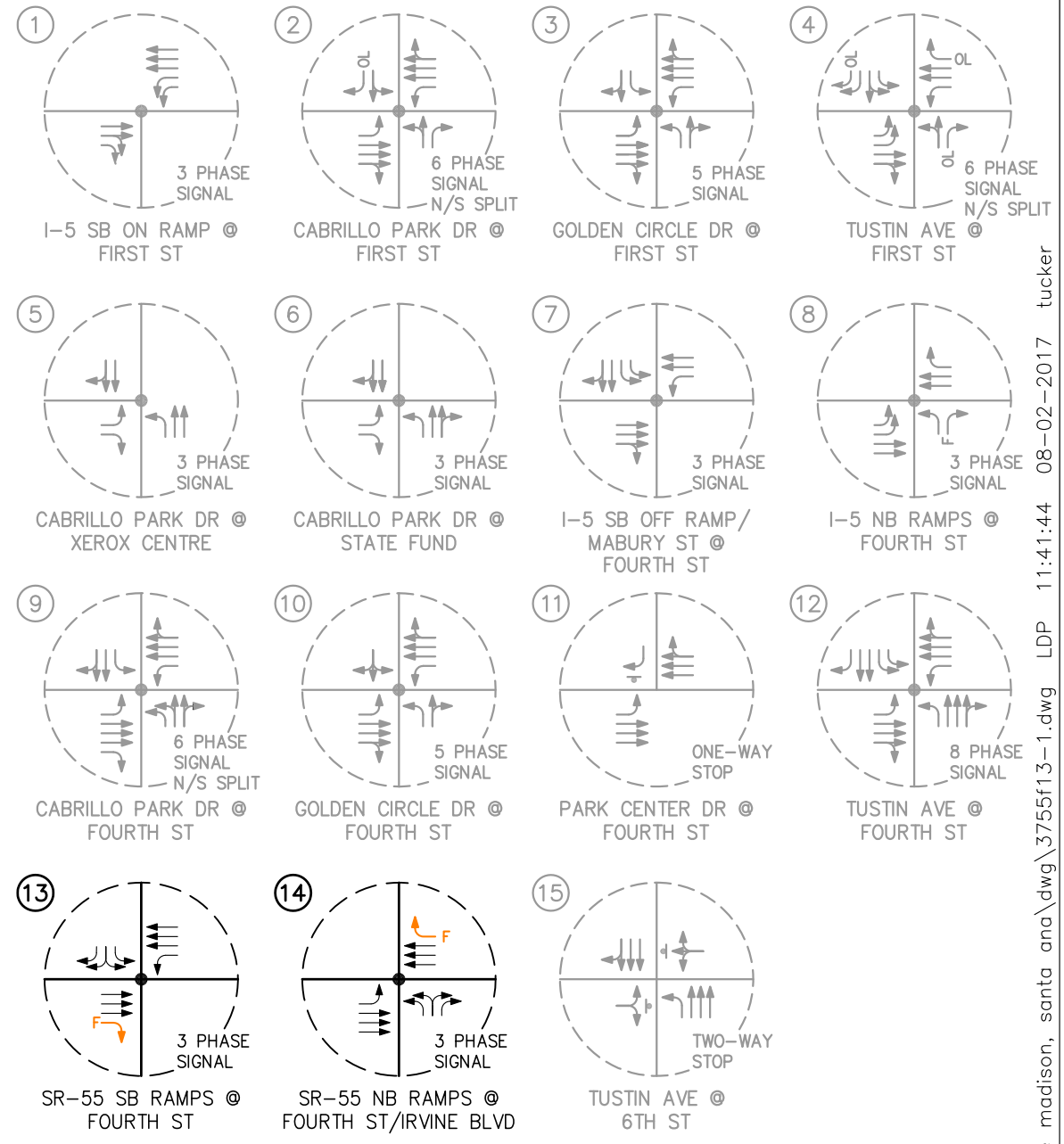
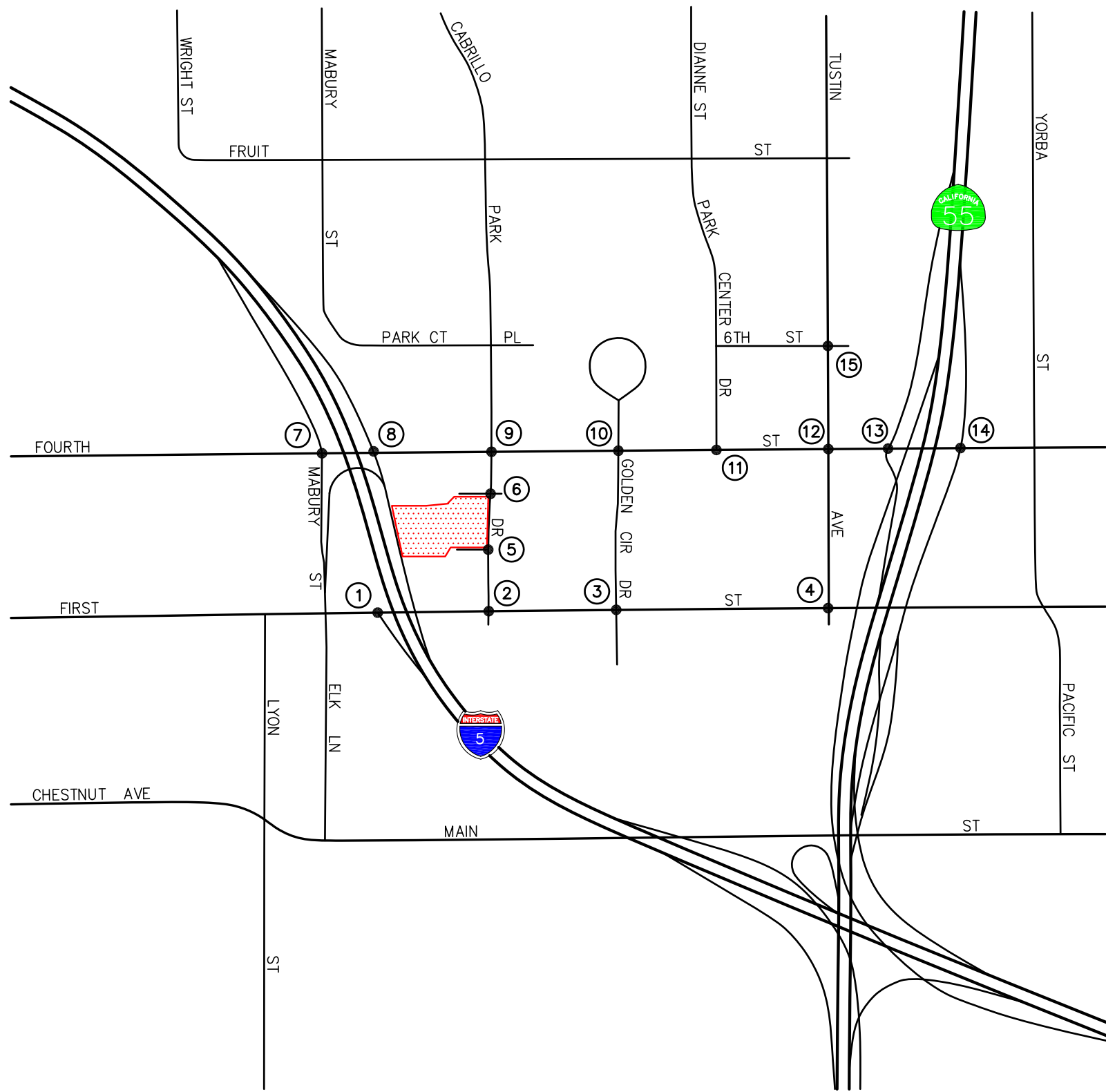
- **No. 13 – SR-55 SB Ramps at Fourth Street:** Widen and/or restripe the eastbound approach on Fourth Street to provide an exclusive (free) right-turn lane. Modify existing traffic signal as well as existing signing and striping improvements accordingly. This improvement is subject to the review and approval of the City of Santa Ana and/or Caltrans.
- **No. 14 – SR-55 NB Ramps at Fourth Street/Irvine Boulevard:** Widen and/or restripe the westbound approach on Irvine Boulevard to provide an exclusive (free) right-turn lane. Modify existing traffic signal as well as existing signing and striping improvements accordingly. This improvement is subject to the review and approval of the City of Tustin and/or Caltrans.

Figure 13-1 graphically illustrates the recommended improvements for Buildout traffic conditions. It should be noted that the improvements identified herein are generally consistent with those recommended in the *Traffic Impact Study for the Metro East Overlay Zone in the City of Santa Ana*.

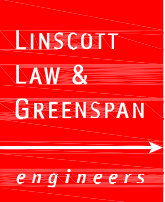
13.6 Project-Related Fair Share Contribution

Table 13-5 presents the impacted intersections along with their recommended improvements. *Table 13-6* presents Project's fair-share contribution of the cost to construct the recommended improvements at the study intersections projected to operate at an unacceptable LOS in the Buildout that are under the jurisdiction of Caltrans.

Similar to *Table 11-2*, the first column (1) of *Table 13-6* presents a total of all intersection peak hour movements for existing conditions. The second column (2) presents Project-related added traffic volumes during AM peak hour and PM peak hour. The third column (3) presents Buildout traffic conditions with Project traffic. The fourth column (4) represents what percentage of total added intersection peak hour traffic is Project-related traffic.



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- KEY**
- = APPROACH LANE ASSIGNMENT
 - = BUILDOUT RECOMMENDED IMPROVEMENTS
 - = TRAFFIC SIGNAL, ▼ = STOP SIGN
 - ▨ = PROJECT SITE

FIGURE 13-1
RECOMMENDED IMPROVEMENTS - CALTRANS
 THE MADISON, SANTA ANA

TABLE 13-5
RECOMMENDED IMPROVEMENTS– CALTRANS¹¹

Key Intersections	Jurisdiction	Improvement Description
13. SR-55 SB Ramps at Fourth Street	Caltrans / Santa Ana	<ul style="list-style-type: none"> ▪ Widen to provide a free EB right-turn lane. ▪ Modify existing traffic signal.
14. SR-55 NB Ramps at Fourth St/Irvine Blvd	Caltrans / Tustin	<ul style="list-style-type: none"> ▪ Widen to provide a free WB right-turn lane. ▪ Modify existing traffic signal.

¹¹ Developer will be required to submit detailed cost estimates for the recommended intersection improvements. Cost Estimates shall be prepared by a licensed Civil Engineer. Cost Estimates will require review and approval by the City of Santa Ana

**TABLE 13-6
BUILDOUT PROJECT FAIR-SHARE COST CONTRIBUTION – CALTRANS**

Key Intersection	City/ Jurisdiction	Time Period	(1) Existing Traffic	(2) Project Traffic	(3) Buildout Build out Plus Project Traffic	(4) Project Fair-Share Percent¹²
13. SR-55 SB Ramps at Fourth Street	Caltrans	AM	3208	39	4605	2.79%
		PM	3572	54	5165	3.39%
14. SR-55 NB Ramps at Fourth St/Irvine Blvd	Caltrans	AM	3304	25	4384	2.31%
		PM	3781	35	5485	2.05%

¹² Project fair-share percentage Column (4) = [Column (2)] / [Column (3) – Column (1)].

14.0 ROADWAY SEGMENT EVALUATION

Per City of Santa Ana requirements, this section of the report analyzes the daily operating conditions of key roadway segments within the vicinity of the proposed Project. A total of eight (8) key roadway segments within the City of Santa Ana have been selected for evaluation and consist of the following locations:

- A. First Street, between I-5 SB On-Ramp/Mabury Street and Cabrillo Park Drive
- B. First Street, between Cabrillo Park Drive and Golden Circle Drive
- C. First Street, between Golden Circle Drive and Tustin Avenue
- D. Cabrillo Park Drive, between Xerox Centre and State Fund
- E. Fourth Street, between I-5 NB Ramps and Cabrillo Park Drive
- F. Fourth Street, between Cabrillo Park Drive and Golden Circle Drive
- G. Tustin Avenue, between First Street and Fourth Street
- H. Tustin Avenue, between Fourth Street and Sixth Street

14.1 Roadway Link Capacities

Daily operating conditions for the eight (8) key roadway segments (links) identified above have been investigated according to the daily volume-to-capacity (V/C) of each link. The daily V/C relationship is used to estimate the LOS of the roadway segment with the volume based on 24-hour traffic count data and the capacity based on the Orange County Master Plan of Arterial Highways (MPAH) street classifications. The daily and peak hour roadway link capacity of each street classification according to the Orange County MPAH is presented in **Table 14-1**, along with the six corresponding service levels and associated V/C ratios.

14.2 Roadway Link Level of Service Criteria

According to the City of Santa Ana, LOS D is the minimum acceptable condition that should be maintained for roadway segments. However, the City of Santa Ana has defined exceptions to this criteria in major development areas where LOS “E” is considered acceptable.

**TABLE 14-1
ROADWAY LINK CAPACITIES¹³**

Facility Type	Number of Lanes	Level of Service Criteria With Associated Roadway Capacity							Peak Hour Capacity (VPH) ¹⁴
		Daily Values (VPD)							
		Level of Service (LOS)							
		A	B	C	D	E	F		
Principal	8-lanes divided	45,000	52,500	60,000	67,500	75,000	--	7,500	
Major	6-lanes divided	33,900	39,400	45,000	50,600	56,300	--	5,630	
Primary	4-lanes divided	22,500	26,300	30,000	33,800	37,500	--	3,750	
Secondary	4-lanes undivided	15,000	17,500	20,000	22,500	25,000	--	2,500	
Commuter	2-lanes undivided	7,500	8,800	10,000	11,300	12,500	--	1,250	
V/C Ratio		≤ 0.600	0.601-0.700	0.701-0.800	0.801-0.900	0.901-1.000	≥ 1.01		

Notes:

- VPD = vehicles per day
- VPH = vehicles per hour

¹³ Source: Most current Orange County Master Plan of Arterial Highways.

¹⁴ Peak hour capacity based on 10% of the daily LOS “E” capacity.

<u>LOS “D” Requirements</u>
G. Tustin Avenue, between First Street and Fourth Street
<u>LOS “E” Requirements</u>
A. First Street, between I-5 SB On-Ramp/Mabury Street and Cabrillo Park Drive
B. First Street, between Cabrillo Park Drive and Golden Circle Drive
C. First Street, between Golden Circle Drive and Tustin Avenue
D. Cabrillo Park Drive, between Xerox Centre and State Fund
E. Fourth Street, between I-5 NB Ramps and Cabrillo Park Drive
F. Fourth Street, between Cabrillo Park Drive and Golden Circle Drive
H. Tustin Avenue, between Fourth Street and Sixth Street

If the daily roadway V/C ratio results in unacceptable LOS conditions, a peak hour link analysis is conducted to determine if the roadway operates at a satisfactory service level during the peak hours.

14.3 Roadway Segment Analysis Results

14.3.1 Existing Plus Project Analysis

Table 14-2 summarizes the results of the Existing Plus Project daily analysis for the eight (8) key roadway segments. The first column (1) shows the number of lanes, the second column (2) shows the arterial classification and the third column (3) shows the existing LOS “E” capacity. The fourth column (4) shows the daily volume, V/C ratio and resulting level of service for “Existing” traffic conditions. The fifth column (5) shows the daily volume, V/C ratio and resulting level of service for “Existing Plus Project” traffic conditions and indicates whether the traffic associated with the Project will have a significant impact based on the LOS standards defined in this report.

Existing Traffic Conditions

Review of column (4) of *Table 14-2* indicates that all eight (8) key roadway segments currently operate at an acceptable service level on a daily basis.

Existing Plus Project Traffic Conditions

Review of column (5) of *Table 14-2* indicates that all eight (8) key roadway segments currently operate and are forecast to continue to operate at an acceptable service level on a daily basis with the addition of Project generated traffic to existing traffic.

14.3.2 Year 2019 Plus Project Analysis

Table 14-3 summarizes the results of the Year 2019 Plus Project daily analysis for the eight (8) key roadway segments. The first column (1) shows the number of lanes, the second column (2) shows the arterial classification and the third column (3) shows the existing LOS “E” capacity. The fourth column (4) shows the daily volume, V/C ratio and resulting level of service for “Year 2019

Cumulative” traffic conditions. The fifth column (5) shows the daily volume, V/C ratio and resulting level of service for “Year 2019 Cumulative Plus Project” traffic conditions and indicates whether the traffic associated with the Project will have a significant impact based on the LOS standards defined in this report.

Year 2019 Cumulative Traffic Conditions

An analysis of future (Year 2019) background traffic conditions indicates that the addition of ambient traffic growth and related projects traffic will not adversely impact any of the eight (8) key roadway segments. The eight (8) key roadway segments are forecast to continue to operate at acceptable levels of service on a daily basis with the addition of ambient traffic growth and related projects traffic.

Year 2019 Cumulative Plus Project Traffic Conditions

Review of column (5) of *Table 14-3* indicates that traffic associated with the proposed Project will not significantly impact any of the eight (8) key roadway segments, when compared to the LOS standards specified in this report. The eight (8) key roadway segments are forecast to continue to operate at an acceptable LOS with the addition of project generated traffic in the Year 2019.

14.3.3 Buildout Plus Project Analysis

Table 14-4 summarizes the results of the Buildout Plus Project daily analysis for the eight (8) key roadway segments. The structure of this table is similar to the Year 2019 daily capacity analysis summary presented in *Table 14-3*.

Buildout Cumulative Traffic Conditions

Review of column 4 of *Table 14-4* indicates that all eight (8) key roadway segments are forecast to operate at an acceptable LOS for long-term (Buildout) traffic conditions. The eight (8) key roadway segments are forecast to continue to operate at acceptable levels of service on a daily basis with the addition of ambient traffic growth and related projects traffic.

Buildout Cumulative Plus Project Traffic Conditions

Review of column 5 of *Table 14-4* indicates that traffic associated with the proposed Project will not significantly impact any of the eight (8) key roadway segments, when compared to the LOS standards specified in this report. The eight (8) key roadway segments are forecast to continue to operate at an acceptable LOS with the addition of project generated traffic in the Buildout.

**TABLE 14-2
EXISTING PLUS PROJECT ROADWAY SEGMENT LEVEL OF SERVICE SUMMARY**

Key Roadway Segment	(1) No. of Existing Lanes	(2) Arterial Classification	(3) Existing Capacity at LOS “E”	(4) Existing Traffic Conditions			(5) Existing Plus Project Traffic Conditions				
				Daily Volume	V/C Ratio	LOS	Daily Volume	V/C Ratio	LOS	Increase	Significant (Yes/No)
A. First St between I-5 SB On-Ramp and Cabrillo Park Dr	6D	Major	56,300	27,583	0.490	A	28,035	0.498	A	0.008	No
B. First St between Cabrillo Park Dr and Golden Circle Dr	6D	Major	56,300	20,422	0.363	A	20,643	0.367	A	0.004	No
C. First St between Golden Circle Dr and Tustin Ave	6D	Major	56,300	25,888	0.460	A	26,109	0.464	A	0.004	No
D. Cabrillo Park Dr between Xerox Centre and State Fund	4D	Primary	37,500	11,378	0.303	A	12,715	0.339	A	0.036	No
E. Fourth St between I-5 NB Ramps and Cabrillo Park Dr	6D	Major	56,300	23,925	0.425	A	24,478	0.435	A	0.010	No
F. Fourth St between Cabrillo Park Dr and Golden Circle Dr	6D	Major	56,300	26,478	0.470	A	27,161	0.482	A	0.012	No
G. Tustin Ave between First St and Fourth St	5D	Major	46,900	17,144	0.366	A	17,245	0.368	A	0.002	No
H. Tustin Ave between Fourth St and Sixth St	6D	Major	56,300	25,707	0.457	A	25,908	0.460	A	0.003	No

TABLE 14-3
YEAR 2019 CUMULATIVE PLUS PROJECT ROADWAY SEGMENT LEVEL OF SERVICE SUMMARY

Key Roadway Segment	(1) No. of Existing Lanes	(2) Arterial Classification	(3) Existing Capacity at LOS "E"	(4) Year 2019 Cumulative Traffic Conditions			(5) Year 2019 Cumulative Plus Project Traffic Conditions				
				Daily Volume	V/C Ratio	LOS	Daily Volume	V/C Ratio	LOS	Increase	Significant (Yes/No)
A. First St between I-5 SB On-Ramp and Cabrillo Park Dr	6D	Major	56,300	29,712	0.528	A	30,164	0.536	A	0.008	No
B. First St between Cabrillo Park Dr and Golden Circle Dr	6D	Major	56,300	23,234	0.413	A	23,455	0.417	A	0.004	No
C. First St between Golden Circle Dr and Tustin Ave	6D	Major	56,300	29,305	0.521	A	29,526	0.524	A	0.003	No
D. Cabrillo Park Dr between Xerox Centre and State Fund	4D	Primary	37,500	12,886	0.344	A	14,223	0.379	A	0.035	No
E. Fourth St between I-5 NB Ramps and Cabrillo Park Dr	6D	Major	56,300	25,854	0.459	A	26,407	0.469	A	0.010	No
F. Fourth St between Cabrillo Park Dr and Golden Circle Dr	6D	Major	56,300	28,568	0.507	A	29,251	0.520	A	0.013	No
G. Tustin Ave between First St and Fourth St	5D	Major	46,900	19,089	0.407	A	19,190	0.409	A	0.002	No
H. Tustin Ave between Fourth St and Sixth St	6D	Major	56,300	26,925	0.478	A	27,126	0.482	A	0.004	No

TABLE 14-4

BUILDOUT CUMULATIVE PLUS PROJECT ROADWAY SEGMENT LEVEL OF SERVICE SUMMARY

Key Roadway Segment	(1) No. of Existing Lanes	(2) Arterial Classification	(3) Existing Capacity at LOS "E"	(4) Buildout Cumulative Traffic Conditions			(5) Buildout Cumulative Plus Project Traffic Conditions				
				Daily Volume	V/C Ratio	LOS	Daily Volume	V/C Ratio	LOS	Increase	Significant (Yes/No)
A. First St between I-5 SB On-Ramp and Cabrillo Park Dr	6D	Major	56,300	41,171	0.731	C	41,623	0.739	C	0.008	No
B. First St between Cabrillo Park Dr and Golden Circle Dr	6D	Major	56,300	32,604	0.579	A	32,825	0.583	A	0.004	No
C. First St between Golden Circle Dr and Tustin Ave	6D	Major	56,300	40,670	0.722	C	40,891	0.726	C	0.004	No
D. Cabrillo Park Dr between Xerox Centre and State Fund	4D	Primary	37,500	17,750	0.473	A	19,087	0.509	A	0.036	No
E. Fourth St between I-5 NB Ramps and Cabrillo Park Dr	6D	Major	56,300	38,310	0.680	B	38,863	0.690	B	0.010	No
F. Fourth St between Cabrillo Park Dr and Golden Circle Dr	6D	Major	56,300	45,120	0.801	D	45,803	0.814	D	0.013	No
G. Tustin Ave between First St and Fourth St	5D	Major	46,900	28,728	0.613	B	28,829	0.615	B	0.002	No
H. Tustin Ave between Fourth St and Sixth St	6D	Major	56,300	37,517	0.666	B	37,718	0.670	B	0.004	No

15.0 SUMMARY OF FINDINGS AND CONCLUSIONS

- **Project Description** – The project proponents, Bisno Development Company, LLC proposes to construct a podium style apartment project consisting of up to 260 multi-family residential units and 6,561 square-feet (SF) of retail/commercial space in the Metro East Mixed-Use Overlay Zone of the City of Santa Ana. The project site is a 2.79-acre vacant parcel of land that is located at 200 N. Cabrillo Park Drive.

- **Study Scope** – The following fifteen (15) key study intersections and eight (8) key roadway segments were selected for detailed peak hour level of service analyses under Existing Traffic Conditions, Existing Plus Project Traffic Conditions, Year 2019 Cumulative Traffic Conditions, Year 2019 Cumulative plus Project, Buildout Cumulative Traffic Conditions, and Buildout Cumulative plus Project Traffic Conditions.

Key Study Intersections

1. I-5 SB On-Ramp at First Street (Santa Ana/Caltrans)
2. Cabrillo Park Drive at First Street (Santa Ana)
3. Golden Circle Drive at First Street (Santa Ana)
4. Tustin Avenue at First Street (Tustin)
5. Cabrillo Park Drive at Xerox Centre (Santa Ana)
6. Cabrillo Park Drive at State Fund (Santa Ana)
7. I-5 SB Off-Ramp/Mabury Street at Fourth Street (Santa Ana/Caltrans)
8. I-5 NB Ramps at Fourth Street (Santa Ana /Caltrans)
9. Cabrillo Park Drive at Fourth Street (Santa Ana)
10. Golden Circle Drive at Fourth Street (Santa Ana)
11. Park Center Drive at Fourth Street (Santa Ana)
12. Tustin Avenue at Fourth Street (Santa Ana)
13. SR-55 SB Ramps at Fourth Street (Santa Ana/Caltrans)
14. SR-55 NB Ramps at Fourth Street/Irvine Boulevard (Tustin/Caltrans)
15. Tustin Avenue at Sixth Street (Santa Ana)

Key Roadway Segments

- A. First Street, between I-5 SB On-Ramp/Mabury Street and Cabrillo Park Drive
 - B. First Street, between Cabrillo Park Drive and Golden Circle Drive
 - C. First Street, between Golden Circle Drive and Tustin Avenue
 - D. Cabrillo Park Drive, between Xerox Centre and State Fund
 - E. Fourth Street, between I-5 NB Ramps and Cabrillo Park Drive
 - F. Fourth Street, between Cabrillo Park Drive and Golden Circle Drive
 - G. Tustin Avenue, between First Street and Fourth Street
 - H. Tustin Avenue, between Fourth Street and Sixth Street
- **Existing Traffic Conditions** – Fourteen (14) of the fifteen (15) key study intersections currently operate at an acceptable service level during the AM and PM peak hours. The one exception is SR-55 SB Ramps at Fourth Street, which currently operates at unacceptable LOS E during the AM peak hour.

- ***Project Trip Generation*** – The proposed Project is forecast to generate approximately 2,010 “net” daily trips, with 134 “net” trips (30 inbound, 104 outbound) produced in the AM peak hour and 184 “net” trips (115 inbound, 69 outbound) produced in the PM peak hour on a “typical” weekday. Comparison of the trips generated by the proposed Project to the trips generated by the entitled development of 210,000 SF of office space shows that the proposed Project will generate 306 fewer daily trips, 194 fewer AM peak hour trips and 129 fewer PM peak hour trips.
- ***Related Projects Traffic Characteristics*** – Nineteen (19) related projects were considered as part of the cumulative background setting. The 19 related projects are forecast to generate a combined total of 17,529 daily trips, with 1,599 trips (914 inbound, 685 outbound) anticipated during the AM peak hour and 1,794 trips (795 inbound, 999 outbound) produced during the PM peak hour.
- ***Existing Plus Project Traffic Conditions*** – The proposed Project will not significantly impact any of the fifteen (15) key study intersections, when compared to the LOS standards and significant impact criteria specified in this report.
- ***Year 2019 Cumulative Traffic Conditions Plus Project*** – The proposed Project will not significantly impact any of the fifteen (15) key study intersections, when compared to the LOS standards and significant impact criteria specified in this report.
- ***Buildout Cumulative Traffic Conditions Plus Project*** – The proposed Project will have a cumulative impact at the following three (3) key study intersections, when compared to the LOS standards and significant impact criteria specified in this report.

Key Intersection

- 11. Park Center Drive at Fourth Street
- 12. Tustin Avenue at Fourth Street
- 15. Tustin Avenue at Sixth Street

However, implementation of recommended improvements will off-set the incremental impact of Project-related traffic.

- ***State of California (Caltrans) Analysis for Buildout Cumulative Traffic Conditions Plus Project*** – Based on the evaluation of five state-controlled study intersections using Caltrans criteria, the proposed Project will have a cumulative impact at the following two (2) key study intersections under the jurisdiction of Caltrans.

Key Intersection

- 13. SR-55 SB Ramps at Fourth Street
- 14. SR-55 NB Ramps at Fourth Street/Irvine Boulevard

However, implementation of recommended improvements will off-set the incremental impact of Project-related traffic.

- **Site Access and Queuing Assessment** – The proposed Project access on Xerox Centre at Cabrillo Park Drive is forecast to operate at acceptable LOS A during the AM and PM peak hours for near-term (Year 2019) and long-term (Buildout) traffic conditions. Further, adequate stacking/storage will be provided for forecast queues at this intersection. As such, project access will be adequate. Motorists entering and exiting the Project site will be able to do so comfortably, safely, and without undue congestion.
- **Project Fair-Share Contribution:** The implementation of recommended cumulative improvements at the five (5) intersections cumulative impacted by the proposed Project in the Buildout ensures acceptable operating conditions are achieved/maintained. The Project can be expected to pay a proportional “fair-share” of the improvement which is identified below.

<u>Key Intersection</u>	<u>City/ Jurisdiction</u>	<u>Project Fair- Share Contribution</u>
11. Park Center Drive at Fourth Street	Santa Ana	2.57%
12. Tustin Avenue at Fourth Street	Santa Ana	2.31%
15. Tustin Avenue at Sixth Street	Santa Ana	1.88%
13. SR-55 SB Ramps at Fourth Street	Santa Ana/ Caltrans	3.39%
14. SR-55 NB Ramps at Fourth St/Irvine Blvd	Tustin/ Caltrans	2.31%

- **CMP Compliance Assessment** – No significant impacts are expected to occur on the Orange County Congestion Management Program roadway network due to the development and full occupancy of the proposed Project.
- **Roadway Segment Evaluation** – The proposed Project **will not** significantly impact any of the eight (8) key study roadway segments, when compared to the LOS standards specified in this report.