Orange Show Road Logistics Center

TRAFFIC IMPACT ANALYSIS

CITY OF SAN BERNARDINO

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LIST OF ABBREVIATED TERMS

(1)	Reference
ADT	Average Daily Traffic
Caltrans	California Department of Transportation
CEQA	California Environmental Quality Act
CCI	Construction Cost Index
CMP	Congestion Management Program
DIF	Development Impact Fee
EA	Existing Plus Ambient Growth
EAC	Existing Plus Ambient Growth Plus Cumulative
EAP	Existing Plus Ambient Growth Plus Project
EAPC	Existing Plus Ambient Growth Plus Project Plus Cumulative
E+P	Existing Plus Project
FHWA	Federal Highway Administration
HCM	Highway Capacity Manual
ITE	Institute of Transportation Engineers
LOS	Level of Service
MUTCD	Manual on Uniform Traffic Control Devices
NCHRP	National Cooperative Highway Research Program
NP	No Project (or Without Project)
PCE	Passenger Car Equivalents
PHF	Peak Hour Factor
Project	Orange Show Road Logistics Center
RIRO	Right-in/Right-Out
RTP	Regional Transportation Plan
SANBAG	San Bernardino Association of Governments
SBTAM	San Bernardino Transportation Analysis Model
SCAG	Southern California Association of Governments
SCAQMD	South Coast Air Quality Management District
SHS	State Highway System
sf	Square Feet
TIA	Traffic Impact Analysis
Vphgph	Vehicles Per Hour Green Per Lane
v/c	Volume to Capacity
WP	With Project

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1 INTRODUCTION

This report presents the results of the traffic impact analysis (TIA) for the proposed Orange Show Road Logistics Center ("Project") located on the northwest corner of S. Lena Road and Orange Show Road in the City of San Bernardino as shown on Exhibit 1-1.

The purpose of this traffic impact analysis is to evaluate the potential circulation system deficiencies that may result from the development of the proposed Project, and to recommend improvements to achieve acceptable circulation system operational conditions. As directed by City of San Bernardino staff, this traffic study has been prepared in accordance with the City of San Bernardino Traffic Impact Study Guidelines (June 2015), and also where appropriate addresses requirements as identified by the San Bernardino County Congestion Management Program (CMP) *Guidelines for CMP Traffic Impact Analysis Reports* (Appendix C, 2005 Update), the California Department of Transportation (Caltrans) *Guide for the Preparation of Traffic Impact Studies* (December 2002), and consultation with City staff during the scoping process. (1) (2) (3) The approved Project Traffic Study Scoping agreement is provided in Appendix 1.1 of this TIA.

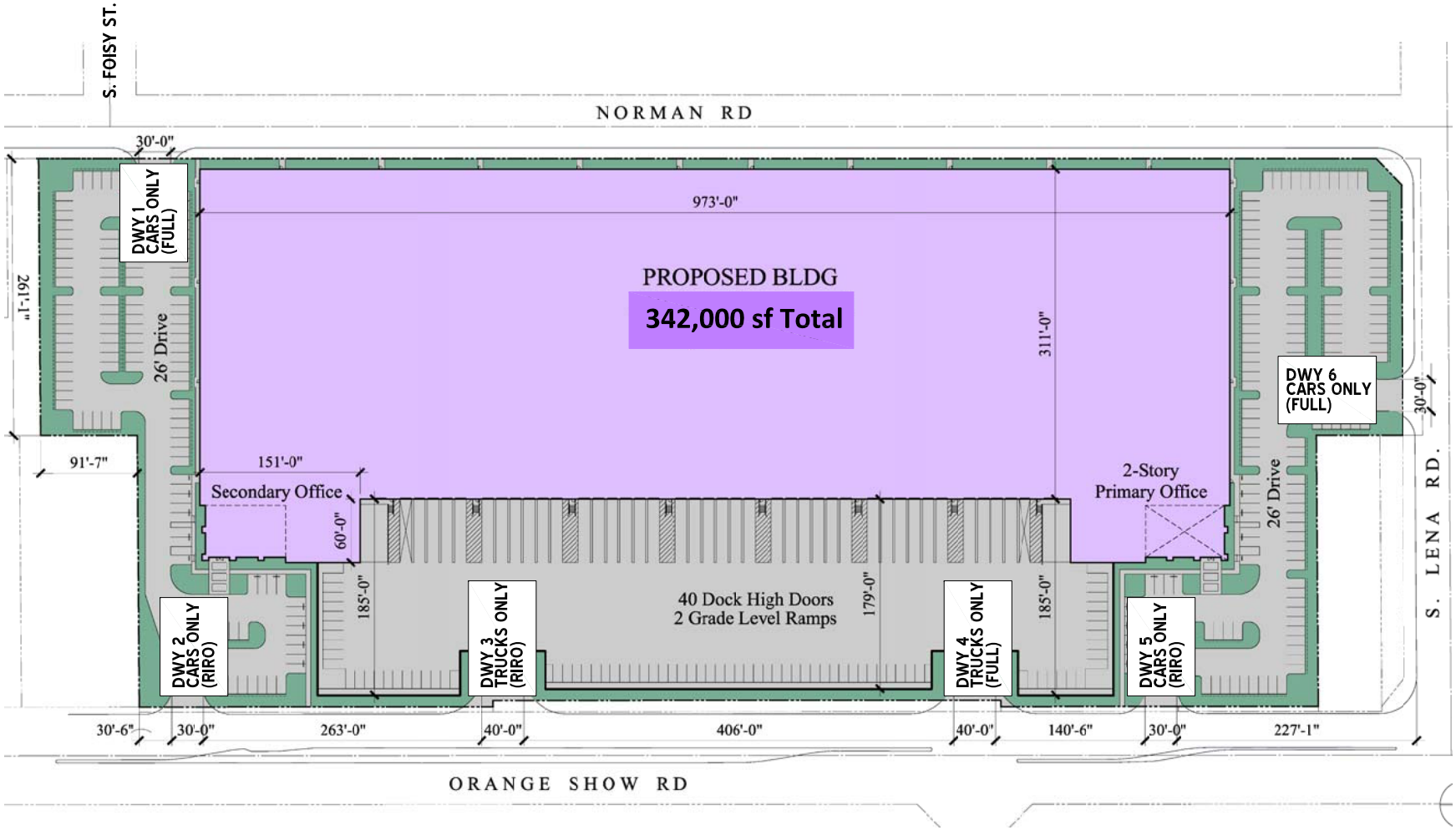
1.1 PROJECT OVERVIEW

The Project is proposed to consist of a total of 342,000 square feet (sf) of high-cube warehouse/distribution center use. For the purposes of this traffic study, the Project anticipated to be developed in a single phase with an anticipated opening year of 2017.

The Project is proposed to have access on E. Norman Road, Orange Show Road, and S. Lena Road. All Project access points are assumed to allow for full-access with the exception of Driveways 2, 3, and 5 on Orange Show Road which are proposed for right-in/right-out access only. Regional access to the Project site will be provided by the I-215 Freeway via Orange Show Road, I-10 Freeway via Waterman Road, and I-10 Freeway via Tippecanoe Avenue.

Trips generated by the Project's proposed land uses have been estimated based on trip generation rates collected by the Institute of Transportation Engineers (ITE) *Trip Generation Manual*, 9th Edition, 2012. (4) The Project is estimated to generate a net total of 945 passenger-car-equivalent (PCE) trip-ends per day on a typical weekday with approximately 54 net AM PCE peak hour trips and 64 net PM PCE peak hour trips. The assumptions and methods used to estimate the Project's trip generation characteristics are discussed in greater detail in Section 4.1 *Project Trip Generation* of this report.

EXHIBIT 1-1: PRELIMINARY SITE PLAN



LEGEND:

FULL = FULL ACCESS

RIRO = RIGHT-IN, RIGHT-OUT

N

1.2 ANALYSIS SCENARIOS

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

- Existing (2015)
- Existing plus Project (E+P)
- Existing plus Ambient Growth (EA) (2017)
- Existing plus Ambient Growth plus Project (EAP) (2017)
- Existing plus Ambient Growth plus Cumulative (EAC) (2017)
- Existing plus Ambient Growth plus Project plus Cumulative (EAPC) (2017)
- Horizon Year (2040) Without Project
- Horizon Year (2040) With Project

1.2.1 EXISTING (2015) CONDITIONS

Information for Existing (2015) conditions is disclosed to represent the baseline traffic conditions as they existed at the time this report was prepared.

1.2.2 EXISTING PLUS PROJECT CONDITIONS

The Existing Plus Project (E+P) analysis determines circulation system deficiencies that would occur on the existing roadway system in the scenario of the Project being placed upon Existing conditions. The E+P analysis is intended to identify the project-specific traffic impacts associated solely with the development of the proposed Project based on a comparison of the E+P traffic conditions to Existing (2015) conditions.

1.2.3 EXISTING PLUS AMBIENT GROWTH (EA) AND EXISTING PLUS AMBIENT GROWTH PLUS PROJECT (EAP) CONDITIONS

The EA (2017) and EAP (2017) traffic conditions analyses determine potential traffic impacts based on a comparison of the EAP traffic conditions to EA conditions. To account for background traffic growth, an ambient growth factor from Existing conditions of 6.09% (3 percent per year over 2 years, compounded annually) has been included for 2017 conditions.

1.2.4 EXISTING PLUS AMBIENT GROWTH PLUS CUMULATIVE (EAC) AND EXISTING PLUS AMBIENT GROWTH PLUS PROJECT PLUS CUMULATIVE (EAP) CONDITIONS

The EAC (2017) and EAPC (2017) conditions analysis determines the potential near-term cumulative circulation system deficiencies. To account for background traffic growth, traffic associated with other known cumulative development projects in conjunction with an ambient growth factor from Existing conditions of 6.09% (3 percent per year over 2 years, compounded annually) has been included for 2017 conditions. This comprehensive list was compiled from information from a recent traffic study in the City of San Bernardino.

1.2.5 HORIZON YEAR (2040) CONDITIONS

The Horizon Year (2040) conditions analysis will be utilized to determine if improvements funded through local and regional transportation mitigation fee programs, such as the City of San Bernardino Development Impact Fee (DIF) program, or other approved funding mechanism can accommodate the cumulative traffic at the target Level of Service (LOS) identified by the City of San Bernardino. If the planned and funded improvements can provide the necessary improvements in delay, then the Project's payment into these established fee programs will be considered as long-range cumulative mitigation. Other improvements needed beyond the "funded" improvements (such as localized improvements to non-funded facilities) are identified as such and would be subject to fair share or as identified by City staff. Traffic projections for Horizon Year conditions were derived from the San Bernardino County Transportation Analysis Model (SBTAM) using accepted procedures for model forecast refinement and smoothing.

The initial estimate of the future Horizon Year (2040) With Project peak hour turning movements were then reviewed by Urban Crossroads for reasonableness, and in some cases, were adjusted to achieve flow conservation, reasonable growth, and reasonable diversion between parallel routes. Post-processing worksheets Horizon Year (2040) Without and With Project traffic conditions are provided in Appendix 4.1.

The currently adopted Southern California Association of Governments (SCAG) 2012 Regional Transportation Plan (RTP) (April 2012) growth forecasts for the City of San Bernardino identifies projected growth in population of 209,900 in 2008 to 261,400 in 2035, or a 24.54 percent increase over the 27 year period. (5) The change in population equates to roughly a 0.82 percent annual growth rate, compounded annually. Similarly, growth over the same 27 year period in households is projected to increase by 29.51 percent, or 0.96 percent annual growth rate. Finally, growth in employment over the same 27 year period is projected to increase by 43.44 percent, or a 1.34 percent annual growth rate.

Based on a comparison of Existing traffic volumes to the Horizon Year (2040) forecasts, the average growth rate is estimated at approximately 1.24 percent compounded annually between Existing and Horizon Year (2040) traffic conditions. The annual growth rate at each individual intersection is not lower than 0.87 percent to as high as 1.90 percent compounded annually over the same time period. Therefore, the annual growth rate utilized for the purposes of this analysis would appear to conservatively approximate the anticipated regional growth in traffic volumes in the City of San Bernardino for near term and long range traffic conditions, especially when considered along with the addition of cumulative development project traffic and project-related traffic. As such, the growth in traffic volumes assumed in this traffic impact analysis would tend to overstate, as opposed to understate, the potential impacts to traffic and circulation.

1.3 STUDY AREA

To ensure that this TIA satisfies the City of San Bernardino's traffic study requirements, Urban Crossroads, Inc. prepared a project traffic study scoping package for review by City staff prior to the preparation of this report. The Agreement provides an outline of the Project study area, trip

generation, trip distribution, and analysis methodology. The Agreement approved by the City is included in Appendix 1.1.

1.3.1 INTERSECTIONS

The following 14 study area intersections listed in Table 1-1 and shown on Exhibit 1-2 were selected for this TIA based on consultation with City of San Bernardino staff. In general, the study area includes intersections where the Project is anticipated to contribute 50 or more peak hour trips, with the exception of the I-215 Southbound Ramps at Auto Center Road, I-215 Northbound Ramps at Auto Center Road, E Street at Orange Show Road, and Arrowhead Avenue at Orange Show Road, which were included at the request of the City of San Bernardino.

TABLE 1-1: INTERSECTION ANALYSIS LOCATIONS

ID	Intersection Location	Jurisdiction	CMP?
1	I-215 SB Ramps / Auto Center Rd.	Caltrans	Yes
2	I-215 NB Ramps / Auto Center Rd.	Caltrans	Yes
3	E St. / Auto Center Rd. / Orange Show Rd.	City of San Bernardino	No
4	Arrowhead Av. / Orange Show Rd.	City of San Bernardino	No
5	S. Waterman Av. / Orange Show Rd.	City of San Bernardino	No
6	S. Foisy St. / E. Norman Rd.	City of San Bernardino	No
7	Driveway 1 / E. Norman Rd. – Future Intersection	City of San Bernardino	No
8	Driveway 2 / Orange Show Rd. – Future Intersection	City of San Bernardino	No
9	Driveway 3 / Orange Show Rd. – Future Intersection	City of San Bernardino	No
10	Driveway 4 / Orange Show Rd – Future Intersection	City of San Bernardino	No
11	Driveway 5 / Orange Show Rd – Future Intersection	City of San Bernardino	No
12	S. Lena Rd. / E. Norman Rd.	City of San Bernardino	No
13	S. Lena Rd. /Driveway 6 – Future Intersection	City of San Bernardino	No
14	S. Lena Rd. / Orange Show Rd.	City of San Bernardino	No

The "50 peak hour trip" criterion utilized by the City of San Bernardino is consistent with the methodology employed by the County of San Bernardino, and generally represents a minimum number of trips at which a typical intersection would have the potential to be substantively impacted by a given development proposal. Although each intersection may have unique operating characteristics, this traffic engineering rule of thumb is a widely utilized tool for estimating a potential area of impact (i.e., study area).

EXHIBIT 1-2: LOCATION MAP

LEGEND:

- 0 = EXISTING INTERSECTION ANALYSIS LOCATION
- 0 = FUTURE INTERSECTION ANALYSIS LOCATION

N

1.4 ANALYSIS FINDINGS

This section provides a summary of the analysis results for Existing (2015), E+P, EA (2017) EAP (2017), EAC (2017), EAPC (2017), and Horizon Year (2040).

1.4.1 INTERSECTIONS

Existing (2015) Conditions

There are no study area intersections that are anticipated to operate at an unacceptable LOS during the peak hours under Existing (2015) conditions.

E+P Conditions

The intersection analysis results indicate that the addition of Project traffic is not anticipated to result in any additional LOS deficiencies.

As shown below, volume to capacity (v/c) ratios were calculated at intersections anticipated to operate at an LOS C or worse, consistent with the City of San Bernardino TIA guidelines:

		Existing (2015)				E+P				Δ v/c Difference		
		LOS		Average v/c		LOS		Average v/c				Significant
#	Intersection	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	Impact?
1	I-215 SB Ramps / Auto Center Rd.	C	B	0.61	--	C	B	0.65	--	0.04	--	No
3	E St. / Auto Center Rd. / Orange Show Rd.	C	D	0.63	0.81	C	D	0.64	0.82	0.01	0.01	No
4	Arrowhead Av. / Orange Show Rd.	C	C	0.40	0.53	C	C	0.42	0.54	0.02	0.01	No
5	S. Waterman Av. / Orange Show Rd.	C	D	0.64	0.79	C	D	0.64	0.81	0.00	0.02	No
14	S. Lena Rd. / Orange Show Rd.	B	C	--	0.35	B	C	--	0.35	--	0.00	No

The addition of Project traffic is not anticipated to result in a significant impact based on the City's significance threshold. Section 2.8 *Thresholds of Significance* includes the detailed methodology used in this analysis related to the significance thresholds for the City of San Bernardino.

EA (2017) Conditions

There are no study area intersections that are anticipated to operate at an unacceptable LOS during the peak hours under EA (2017) conditions.

EAP (2017) Conditions

The intersection analysis results indicate that the addition of Project traffic is not anticipated to result in any LOS deficiencies EAP (2017) conditions.

As shown below, volume to capacity (v/c) ratios were calculated at intersections anticipated to operate at an LOS C or worse, consistent with the City of San Bernardino TIA guidelines:

#	Intersection	EA (2017) LOS AM	EA (2017) LOS PM	EA (2017) Average v/c AM	EA (2017) Average v/c PM	EAP (2017) LOS AM	EAP (2017) LOS PM	EAP (2017) Average v/c AM	EAP (2017) Average v/c PM	Δ v/c Difference AM	Δ v/c Difference PM	Significant Impact?
1	I-215 SB Ramps / Auto Center Rd.	C	B	0.65	--	C	B	0.69	--	0.04	--	No
3	E St. / Auto Center Rd. / Orange Show Rd.	C	D	0.66	0.86	C	D	0.67	0.87	0.01	0.01	No
4	Arrowhead Av. / Orange Show Rd.	C	C	0.42	0.56	C	C	0.44	0.57	0.02	0.01	No
5	S. Waterman Av. / Orange Show Rd.	C	D	0.67	0.84	C	D	0.67	0.86	0.00	0.02	No
14	S. Lena Rd. / Orange Show Rd.	B	C	--	0.37	B	C	--	0.37	--	0.00	No

The addition of Project traffic is not anticipated to result in a significant impact based on the City's significance threshold. Section 2.8 *Thresholds of Significance* includes the detailed methodology used in this analysis related to the significance thresholds for the City of San Bernardino.

EAC (2017) Conditions

There are no study area intersections that are anticipated to operate at an unacceptable LOS during the peak hours under EAC (2017) conditions.

EAPC (2017) Conditions

The intersection analysis results indicate that the addition of Project traffic is not anticipated to result in any LOS deficiencies EAPC (2017) conditions.

As shown below, volume to capacity (v/c) ratios were calculated at intersections anticipated to operate at an LOS C or worse, consistent with the City of San Bernardino TIA guidelines:

#	Intersection	EAC (2017) LOS AM	EAC (2017) LOS PM	EAC (2017) Average v/c AM	EAC (2017) Average v/c PM	EAPC (2017) LOS AM	EAPC (2017) LOS PM	EAPC (2017) Average v/c AM	EAPC (2017) Average v/c PM	Δ v/c Difference AM	Δ v/c Difference PM	Significant Impact?
1	I-215 SB Ramps / Auto Center Rd.	C	B	0.69	--	C	B	0.70	--	0.01	--	No
2	I-215 NB Ramps / Auto Center Rd.	C	B	0.92	0.77	C	C	0.93	0.78	0.01	0.01	No
3	E St. / Auto Center Rd. / Orange Show Rd.	C	D	0.74	0.91	C	D	0.75	0.92	0.01	0.01	No
4	Arrowhead Av. / Orange Show Rd.	C	D	0.53	0.60	C	D	0.53	0.61	0.00	0.01	No
5	S. Waterman Av. / Orange Show Rd.	D	D	0.70	0.90	D	D	0.71	0.91	0.01	0.01	No
14	S. Lena Rd. / Orange Show Rd.	B	C	--	0.39	B	C	--	0.39	--	0.00	No

The addition of Project traffic is not anticipated to result in a significant impact based on the City's significance threshold. Section 2.8 *Thresholds of Significance* includes the detailed methodology used in this analysis related to the significance thresholds for the City of San Bernardino.

Horizon Year (2040) Without Project Conditions

There are no study area intersections that are anticipated to operate at an unacceptable LOS during the peak hours under Horizon Year (2040) Without Project conditions.

Horizon Year (2040) With Project Conditions

The intersection analysis results indicate that the addition of Project traffic is not anticipated to result in any additional LOS deficiencies under Horizon Year (2040) With Project traffic conditions.

As shown below, volume to capacity (v/c) ratios were calculated at intersections anticipated to operate at an LOS C or worse, consistent with the City of San Bernardino TIA guidelines:

		2040 Without Project				2040 With Project				Δ v/c Difference		
		LOS		Average v/c		LOS		Average v/c				Significant
#	Intersection	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	Impact?
1	I-215 SB Ramps / Auto Center Rd.	D	C	0.94	0.52	D	C	0.95	0.52	0.01	0.00	No
2	I-215 NB Ramps / Auto Center Rd.	D	C	0.91	0.84	D	C	0.92	0.88	0.01	0.04	No
3	E St. / Auto Center Rd. / Orange Show Rd.	D	D	0.75	0.84	D	D	0.75	0.84	0.00	0.00	No
4	Arrowhead Av. / Orange Show Rd.	D	D	0.55	0.65	D	D	0.57	0.66	0.02	0.01	No
5	S. Waterman Av. / Orange Show Rd.	D	D	0.78	0.91	D	D	0.79	0.93	0.01	0.02	No
14	S. Lena Rd. / Orange Show Rd.	C	D	0.33	0.41	C	D	0.34	0.41	0.01	0.00	No

The addition of Project traffic is not anticipated to result in a significant impact based on the City's significance threshold. Section 2.8 *Thresholds of Significance* includes the detailed methodology used in this analysis related to the significance thresholds for the City of San Bernardino.

1.5 LOCAL AND REGIONAL FUNDING MECHANISMS

Transportation improvements within the City of San Bernardino are funded through a combination of direct project mitigation, development impact fee programs or fair share contributions, such as the City of San Bernardino Development Impact Fee (DIF) program. Identification and timing of needed improvements is generally determined through local jurisdictions based upon a variety of factors.

1.5.1 MEASURE "I" FUNDS

In 2004, the voters of San Bernardino County approved the 30-year extension of Measure "I", a one-half of one percent sales tax on retail transactions, through the year 2040, for transportation projects including, but not limited to, infrastructure improvements, commuter rail, public transit, and other identified improvements. The Measure "I" extension requires that a regional traffic impact fee be created to ensure development is paying its fair share. A regional Nexus study was prepared by San Bernardino Association of Governments (SANBAG) and concluded that each jurisdiction should include a regional fee component in their local programs in order to meet the Measure "I" requirement. The regional component assigns specific facilities and cost sharing formulas to each jurisdiction and was most recently updated in November 2013. Revenues collected through these programs are used in tandem with Measure "I" funds to deliver projects identified in the Nexus Study.

While Measure "I" is a self-executing sales tax administered by SANBAG, it bears discussion here because the funds raised through Measure "I" have funded in the past and will continue to fund new transportation facilities in San Bernardino County, including within the City of San Bernardino.

1.5.2 CITY OF SAN BERNARDINO DEVELOPMENT IMPACT FEE (DIF) PROGRAM

The City of San Bernardino has created its own local Development Impact Fee (DIF) program to impose and collect fees from new residential, commercial and industrial development for the purpose of funding roadways and intersections necessary to accommodate City growth as identified in the City's General Plan Circulation Element. The City's DIF includes a Regional Circulation System Fee to comply with Measure "I" and a Local Circulation System Fee to address transportation improvements which are locally significant. The fee schedule was recently updated in June 2014 and is adjusted annually based upon changes in the construction cost index (CCI). Under the City's DIF program, the City may grant to developers a credit against specific components of fees when those developers construct certain facilities and landscaped medians identified in the list of improvements funded by the DIF program. The City may grant to developers a credit against specific components of fees when those developers construct certain facilities and landscaped medians identified in the list of improvements funded by the DIF program.

The timing to use the DIF fees is established through periodic capital improvement programs which are overseen by the City's Public Works Department. Periodic traffic counts, review of traffic accidents, and a review of traffic trends throughout the City are also periodically performed by City staff and consultants. The City uses this data to determine the timing of implementing the improvements listed in its facilities list. The City also uses this data to ensure that the improvements listed on the facilities list are constructed before the LOS falls below the LOS performance standards adopted by the City. In this way, the improvements are constructed before the LOS falls below the City's LOS performance thresholds.

The Project applicant will be subject to the City's DIF fee program, and will pay the requisite City DIF fees at the rates then in effect. The Project Applicant's payment of the requisite DIF fees at the rates then in effect pursuant to the DIF Program will mitigate its impacts to DIF-funded facilities. After the City's DIF fees are collected, they are placed in a separate interest bearing account pursuant to the requirements of Government Code § 66000 *et seq*. The timing to use the DIF fees is established through periodic capital improvement programs which are overseen by the City's Public Works Department.

1.6 ON-SITE ROADWAY AND SITE ACCESS IMPROVEMENTS

This section summarizes Project site access and on-site circulation recommendations.

The Project is proposed to have access on E. Norman Road, Orange Show Road, and S. Lena Road. All Project access points are assumed to allow for full-access with the exception of Driveways 2, 3, and 5 on Orange Show Road which are proposed for right-in/right-out access only. Regional access to the Project site will be provided by the I-215 Freeway via Orange Show Road, I-10 Freeway via Waterman Road, and I-10 Freeway via Tippecanoe Avenue. Roadway improvements necessary to provide site access and on-site circulation are assumed to be constructed in conjunction with site development and are described below. These improvements are required to be in place prior to occupancy.

1.6.1 SITE ADJACENT ROADWAY AND SITE ACCESS IMPROVEMENTS

The recommended site-adjacent roadway improvements for the Project are described below. These improvements need to be incorporated into the project description prior to Project approval or imposed as conditions of approval as part of the Project approval. Exhibit 1-3 illustrates the site-adjacent roadway improvement recommendations.

Exhibit 1-3 also illustrates the on-site and site adjacent recommended roadway lane improvements for Phase 1. Construction of on-site and site adjacent improvements are recommended to occur in conjunction with adjacent Project development activity or as needed for Project access purposes.

Norman Road – Norman Road is an east-west oriented roadway located along the Project's northern boundary. Norman Road from the Project's eastern to western boundaries is currently constructed to its ultimate half-section width as a local street (60-feet right-of-way) in compliance with the applicable City of San Bernardino standards. No roadway widening is necessary.

Orange Show Road – Orange Show Road is an east-west oriented roadway located along the Project's southern boundary. Norman Road from the Project's eastern to western boundaries is currently constructed to its ultimate half-section width as a major arterial (100-feet right-of-way) in compliance with the applicable City of San Bernardino standards. No roadway widening is necessary.

Lena Road – Lena Road is a north-south oriented roadway located along the Project's eastern boundary. Lena Road from the Projects northern to southern boundaries is currently constructed to its ultimate half section width as a major arterial (100-feet right-of-way) in compliance with applicable City of San Bernardino standards. No roadway widening is necessary.

Wherever necessary, roadways adjacent to the Project, site access points and site-adjacent intersections will be constructed to be consistent with the identified roadway classifications and respective cross-sections in the City of San Bernardino General Plan Circulation Element.

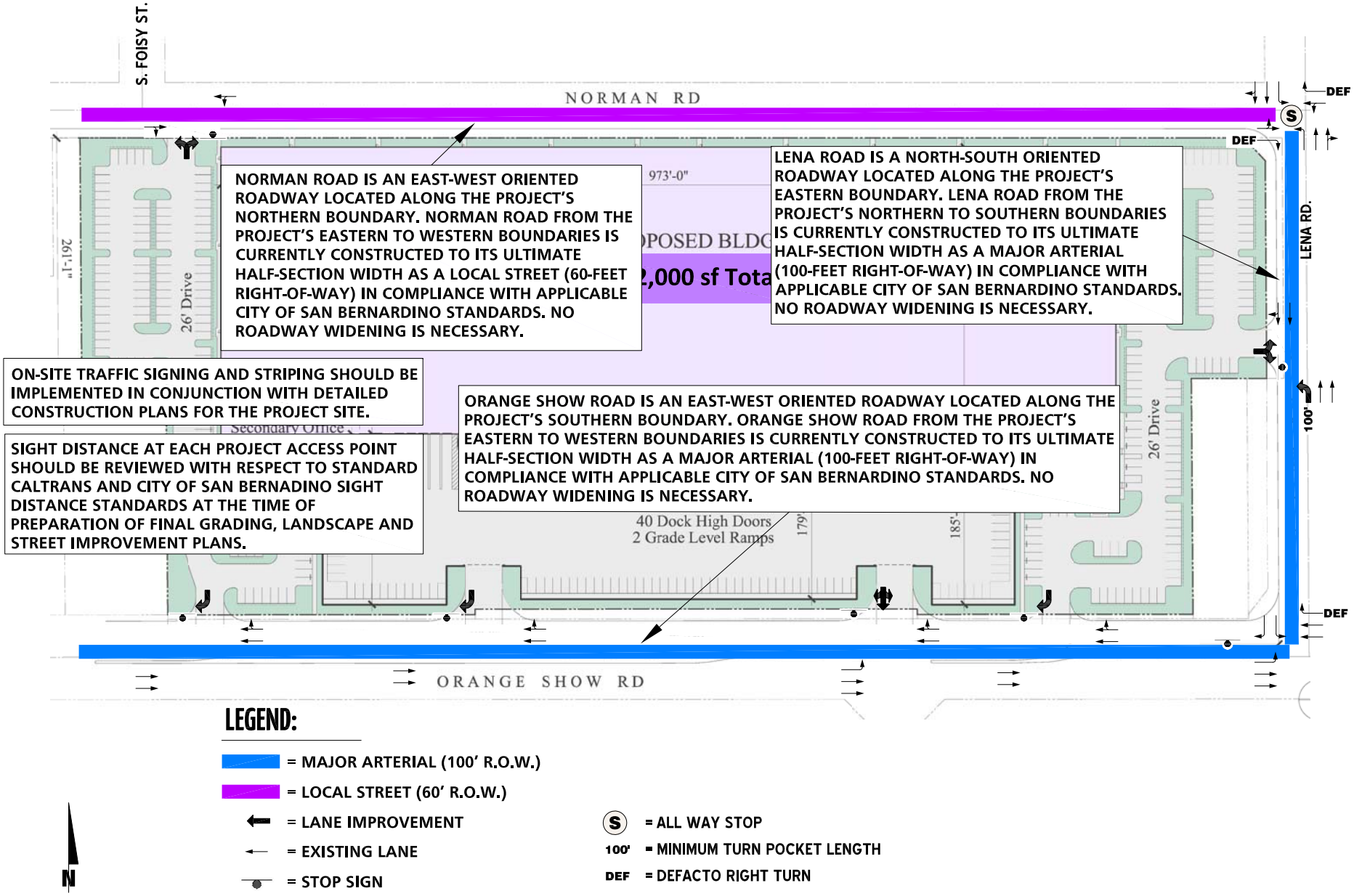
On-site traffic signing and striping should be implemented in conjunction with detailed construction plans for the Project site.

Sight distance at each project access point should be reviewed with respect to standard Caltrans and City of San Bernardino sight distance standards at the time of preparation of final grading, landscape and street improvement plans.

1.6.2 QUEUING ANALYSIS AT THE PROJECT DRIVEWAYS

A queuing analysis was conducted along the site adjacent roadway of Lena Road Horizon Year (2040) traffic conditions to determine the turn pocket lengths necessary to accommodate long-range 95th percentile queues. The analysis was conducted for the weekday AM and weekday PM peak hours. The results have been provided in Appendix 1.2.

EXHIBIT 1-3: SITE ACCESS AND SITE ADJACENT ROADWAY RECOMMENDATIONS



SimTraffic is designed to model networks of signalized and unsignalized intersections, with the primary purpose of checking and fine tuning signal operations. SimTraffic uses the input parameters from Synchro to generate random simulations. The 95th percentile queue is not necessarily ever observed, it is simply based on statistical calculations (or Average Queue plus 1.65 standard deviations). However, the average queue is the average of all the two-minute maximum queues observed by SimTraffic. The maximum back of queue observed for every two-minute period is recorded by SimTraffic.

SimTraffic has been utilized to assess peak hour queuing at the site access driveways for Horizon Year With Project traffic conditions. The random simulations generated by SimTraffic have been utilized to determine the 50th and 95th percentile queue lengths observed for each turn lane. A SimTraffic simulation has been recorded five (5) times, during the weekday AM and weekday PM peak hours, and has been seeded for 15-minute periods with 60-minute recording intervals.

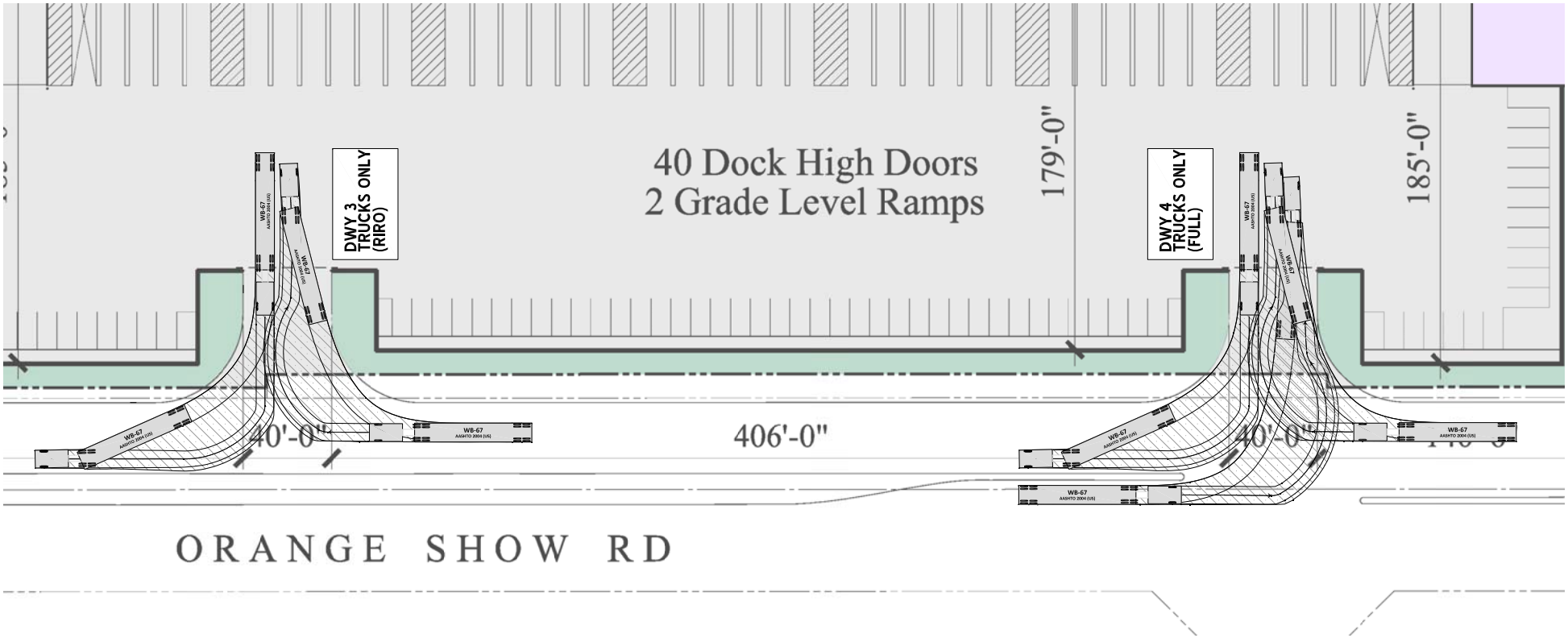
A vehicle is considered queued whenever it is traveling at less than 10 feet/second. A vehicle will only become queued when it is either at the stop bar or behind another queued vehicle. Although only the 95th percentile queue has been utilized for purposes of determining the necessary turn pocket storage lengths, the 50th percentile queues are also reported and can be found in Appendix 1.2. The 50th percentile queue is the maximum back of queue on a typical cycle during the peak hour, while the 95th percentile queue is the maximum back of queue with 95th percentile traffic volumes during the peak hour. In other words, if traffic were observed for 100 cycles, the 95th percentile queue would be the queue experienced with the 95th busiest cycle (or 5% of the time). The 50th percentile, or average, queue represents the typical queue length for peak hour traffic conditions, while the 95th percentile queue is derived from the average queue plus 1.65 standard deviations. The 95th percentile queue is not necessarily ever observed, it is simply based on statistical calculations. However, many jurisdictions utilize the 95th percentile queues for design purposes.

The storage length recommendations for the turning movement at the Project was shown previously on Exhibits 1-3.

1.7 TRUCK ACCESS AND CIRCULATION

Due to the typical wide turning radius of large trucks, a truck turning template has been overlaid on the site plan at each applicable Project driveway anticipated to be utilized by heavy trucks in order to determine appropriate curb radii and to verify that trucks will have sufficient space to execute turning maneuvers. The truck turning templates prepared for the Project are shown on Exhibit 1-4.

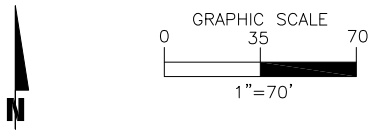
EXHIBIT 1-4: TRUCK ACCESS

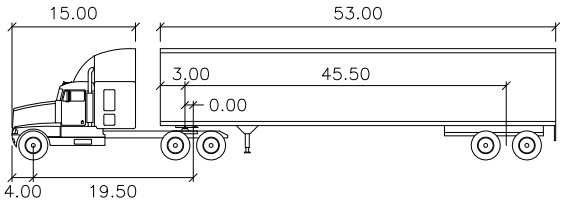


LEGEND:

FULL = FULL ACCESS

RIRO = RIGHT-IN, RIGHT-OUT





WB−67 feet

Tractor Width	: 8.00	Lock to Lock Time	: 6.00
Trailer Width	: 8.50	Steering Angle	: 28.40
Tractor Track	: 8.00	Articulating Angle	: 75.00
Trailer Track	: 8.50		

NOT TO SCALE

2 METHODOLOGIES

This section of the report presents the methodologies used to perform the traffic analyses summarized in this report. The methodologies described are generally consistent with City of San Bernardino traffic study guidelines.

2.1 LEVEL OF SERVICE

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

2.2 INTERSECTION CAPACITY ANALYSIS

The definitions of LOS for interrupted traffic flow (flow restrained by the existence of traffic signals and other traffic control devices) differ slightly depending on the type of traffic control. The LOS is typically dependent on the quality of traffic flow at the intersections along a roadway. The *Highway Capacity Manual* (HCM) 2010 methodology expresses the LOS at an intersection in terms of delay time for the various intersection approaches. (6) The HCM uses different procedures depending on the type of intersection control.

2.2.1 SIGNALIZED INTERSECTIONS

The City of San Bernardino requires signalized intersection operations analysis based on the methodology described in the HCM 2010. Intersection LOS operations are based on an intersection's average control delay. Control delay includes initial deceleration delay, queue move-up time, stopped delay, and final acceleration delay. For signalized intersections LOS is directly related to the average control delay per vehicle and is correlated to a LOS designation as described in Table 2-1. Study area intersections have been evaluated using the Synchro (Version 9 Build 904) analysis software package.

TABLE 2-1: SIGNALIZED INTERSECTION LOS THRESHOLDS

Description	Average Control Delay (Seconds), V/C ≤ 1.0	Level of Service, V/C ≤ 1.0	Level of Service, V/C > 1.0
Operations with very low delay occurring with favorable progression and/or short cycle length.	0 to 10.00	A	F
Operations with low delay occurring with good progression and/or short cycle lengths.	10.01 to 20.00	B	F

Description	Average Control Delay (Seconds), V/C ≤ 1.0	Level of Service, V/C ≤ 1.0	Level of Service, V/C > 1.0
Operations with average delays resulting from fair progression and/or longer cycle lengths. Individual cycle failures begin to appear.	20.01 to 35.00	C	F
Operations with longer delays due to a combination of unfavorable progression, long cycle lengths, or high V/C ratios. Many vehicles stop and individual cycle failures are noticeable.	35.01 to 55.00	D	F
Operations with high delay values indicating poor progression, long cycle lengths, and high V/C ratios. Individual cycle failures are frequent occurrences. This is considered to be the limit of acceptable delay.	55.01 to 80.00	E	F
Operation with delays unacceptable to most drivers occurring due to over saturation, poor progression, or very long cycle lengths.	80.01 and up	F	F

Source: HCM 2010

Consistent with Appendix C, Page C-13 of the San Bernardino County CMP, the following saturation flow rates, in vehicles per hour green per lane (vphgpl), will be utilized in the traffic analysis for signalized intersections:

Existing and Near-Term Traffic Conditions:

- Exclusive through: 1800 vphgpl
- Exclusive left: 1700 vphgpl
- Exclusive right: 1800 vphgpl
- Exclusive dual left: 1600 vphgpl
- Exclusive triple left: 1500 vphgpl

Synchro is a macroscopic traffic software program that is based on the signalized intersection capacity analysis as specified in the HCM. Macroscopic level models represent traffic in terms of aggregate measures for each movement at the study intersections. Equations are used to determine measures of effectiveness such as delay and queue length. The level of service and capacity analysis performed by Synchro takes into consideration optimization and coordination of signalized intersections within a network.

The peak hour traffic volumes have been adjusted using a peak hour factor (PHF) to reflect peak 15 minute volumes. Common practice for LOS analysis is to use a peak 15-minute rate of flow. However, flow rates are typically expressed in vehicles per hour. The PHF is the relationship between the peak 15-minute flow rate and the full hourly volume (e.g. PHF = [Hourly Volume] / [4 x Peak 15-minute Flow Rate]). The use of a 15-minute PHF produces a more detailed analysis as compared to analyzing vehicles per hour. Existing PHFs have been used for all analysis scenarios, with the exception of Long Range traffic conditions. Per the HCM, PHF values over 0.95 often are indicative of high traffic volumes with capacity constraints on peak hour flows while lower PHF values are indicative of greater variability of flow during the peak hour. (6)

California Department of Transportation (Caltrans)

Per the Caltrans *Guide for the Preparation of Traffic Impact Studies*, the traffic modeling and signal timing optimization software package Synchro (Version 9 Build 904) has been utilized to analyze signalized intersections under Caltrans' jurisdiction, which include interchange to arterial ramps (i.e. I-215 Freeway at Auto Center Drive). (3) Synchro is a macroscopic traffic software program that is based on the signalized intersection capacity analysis as specified in the Chapter 16 of the HCM. Macroscopic level models represent traffic in terms of aggregate measures for each movement at the study intersections. Equations are used to determine measures of effectiveness such as delay and queue length. The level of service and capacity analysis performed by Synchro takes into consideration optimization and coordination of signalized intersections within a network. Signal timing for the freeway arterial-to-ramp intersections have been obtained from Caltrans District 8 and were utilized for the purposes of this analysis.

2.2.2 UNSIGNALIZED INTERSECTIONS

The City of San Bernardino requires the operations of unsignalized intersections be evaluated using the methodology described the HCM 2010. (4) The LOS rating is based on the weighted average control delay expressed in seconds per vehicle (see Table 2-2).

TABLE 2-2: UNSIGNALIZED INTERSECTION LOS THRESHOLDS

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

Source: HCM 2010

At two-way or side-street stop-controlled intersections, LOS is calculated for each controlled movement and for the left turn movement from the major street, as well as for the intersection as a whole. For approaches composed of a single lane, the delay is computed as the average of all movements in that lane. For all-way stop controlled intersections, LOS is computed for the intersection as a whole.

2.3 FREEWAY OFF-RAMP QUEUING ANALYSIS

The study area for this TIA includes the freeway-to-arterial interchanges of the I-215 Freeway at Auto Center Road off-ramps. Consistent with Caltrans requirements, the 95th percentile queuing of vehicles has been assessed at the off-ramps to determine potential queuing impacts at the freeway ramp intersections on Auto Center Road. Specifically, the queuing analysis is utilized to identify any potential queuing and "spill back" onto the I-215 Freeway mainline from the off-ramps.

The traffic progression analysis tool and HCM intersection analysis program, Synchro, has been used to assess the potential impacts/needs of the intersections with traffic added from the proposed Project. Storage (turn-pocket) length recommendations at the ramps have been based upon the 95th percentile queue resulting from the Synchro progression analysis. The 95th percentile queue is the maximum back of queue with 95th percentile traffic volumes. The queue length reported is for the lane with the highest queue in the lane group.

There are two footnotes which appear on the Synchro outputs. One footnote indicates if the 95th percentile cycle exceeds capacity. Traffic is simulated for two complete cycles of the 95th percentile traffic in Synchro in order to account for the effects of spillover between cycles. In practice, the 95th percentile queue shown will rarely be exceeded and the queues shown with the footnote are acceptable for the design of storage bays. The other footnote indicates whether or not the volume for the 95th percentile queue is metered by an upstream signal. In many cases, the 95th percentile queue will not be experienced and may potentially be less than the 50th percentile queue due to upstream metering. If the upstream intersection is at or near capacity, the 50th percentile queue represents the maximum queue experienced.

A vehicle is considered queued whenever it is traveling at less than 10 feet/second. A vehicle will only become queued when it is either at the stop bar or behind another queued vehicle. Although only the 95th percentile queue has been reported in the tables, the 50th percentile queue can be found in the appendix alongside the 95th percentile queue for each ramp location. The 50th percentile maximum queue is the maximum back of queue on a typical cycle during the peak hour, while the 95th percentile queue is the maximum back of queue with 95th percentile traffic volumes during the peak hour. In other words, if traffic were observed for 100 cycles, the 95th percentile queue would be the queue experienced with the 95th busiest cycle (or 5% of the time). The 50th percentile or average queue represents the typical queue length for peak hour traffic conditions, while the 95th percentile queue is derived from the average queue plus 1.65 standard deviations. The 95th percentile queue is not necessarily ever observed, it is simply based on statistical calculations.

2.4 TRAFFIC SIGNAL WARRANT ANALYSIS METHODOLOGY

The term "signal warrants" refers to the list of established criteria used by Caltrans and other public agencies to quantitatively justify or ascertain the potential need for installation of a traffic signal at an otherwise unsignalized intersection. This TIA uses the signal warrant criteria presented in the latest edition of the Federal Highway Administration's (FHWA) *Manual on Uniform Traffic Control Devices (MUTCD)*, as amended by *the MUTCD 2014 California Supplement*, for all study area intersections. (7)

The signal warrant criteria for Existing study area intersections are based upon several factors, including volume of vehicular and pedestrian traffic, frequency of accidents, and location of school areas. Both the FHWA's *MUTCD* and the *MUTCD 2014 California Supplement* indicate that the installation of a traffic signal should be considered if one or more of the signal warrants are met. (7) Specifically, this TIA utilizes the Peak Hour Volume-based Warrant 3 as the appropriate representative traffic signal warrant analysis for existing traffic conditions. Warrant 3 criteria are basically identical for both the FHWA's *MUTCD* and the *MUTCD 2014 California Supplement*.

Warrant 3 is appropriate to use for this TIA because it provides specialized warrant criteria for intersections with rural characteristics (e.g. located in communities with populations of less than 10,000 persons or with adjacent major streets operating above 40 miles per hour). For the purposes of this study, the speed limit was the basis for determining whether Urban or Rural warrants were used for a given intersection.

Future unsignalized intersections, that currently do not exist, have been assessed regarding the potential need for new traffic signals based on future average daily traffic (ADT) volumes, using the Caltrans planning level ADT-based signal warrant analysis worksheets.

As shown on Table 2-3, traffic signal warrant analyses were performed for the following unsignalized study area intersections during the peak weekday conditions wherein the Project is anticipated to contribute the highest trips:

TABLE 2-3: TRAFFIC SIGNAL WARRANT ANALYSIS LOCATIONS

ID	Intersection Location	Jurisdiction
6	S. Foisy St. / E. Norman Rd.	City of San Bernardino
7	Driveway 1 / E. Norman Rd.	City of San Bernardino
10	Driveway 4 / Orange Show Rd.	City of San Bernardino
12	S. Lena Rd. / E. Norman Rd.	City of San Bernardino
13	S. Lena Rd. / Driveway 6	City of San Bernardino
14	S. Lena Rd. / Orange Show Rd.	City of San Bernardino

The Existing conditions traffic signal warrant analysis is presented in the subsequent section, Section 3 *Area Conditions* of this report. The traffic signal warrant analyses for future conditions are presented in Section 5 *Existing Plus Project Traffic Analysis,* Section 6 *EA (2017) and EAP (2017) Traffic Analysis,* Section 7 *EAC (2017) and EAPC (2017) Traffic Analysis,* and Section 8 *Horizon Year (2040) Traffic Analysis* of this report.

It is important to note that a signal warrant defines the minimum condition under which the installation of a traffic signal might be warranted. Meeting this threshold condition does not require that a traffic control signal be installed at a particular location, but rather, that other traffic factors and conditions be evaluated in order to determine whether the signal is truly justified. It should also be noted that signal warrants do not necessarily correlate with LOS. An intersection may satisfy a signal warrant condition and operate at or above acceptable LOS or operate below acceptable LOS and not meet a signal warrant.

2.5 MINIMUM LEVEL OF SERVICE (LOS)

The definition of an intersection deficiency has been obtained from each of the applicable surrounding jurisdictions.

2.5.1 CITY OF SAN BERNARDINO

The definition of an intersection deficiency in the City of San Bernardino is based on the City of San Bernardino General Plan Circulation Element. The City of San Bernardino General Plan states that target LOS D be maintained at City intersections wherever possible.

2.5.2 CMP

The CMP definition of deficiency is based on maintaining a level of service standard of LOS E or better, except where an existing LOS F condition is identified in the CMP document.

2.5.3 CALTRANS

Caltrans endeavors to maintain a target LOS at the transition between LOS C and LOS D on State Highway Facilities (SHS) facilities, 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. If an existing State highway facility is operating at less than this target LOS, the existing LOS should be maintained. In general, the region-wide goal for an acceptable LOS on all freeways, roadway segments, and intersections is LOS D. Consistent with the City of San Bernardino LOS threshold, LOS D will be used as the target LOS for freeway ramps, freeway segments, and freeway merge/diverge ramp junctions (see approved Caltrans scope included in Appendix 1.1.

2.6 THRESHOLDS OF SIGNIFICANCE

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

2.6.1 INTERSECTIONS

The City of San Bernardino TIA Guidelines identifies a “significant” traffic impact at an intersection when any of the following changes in the volume to capacity (v/c) ratios occur between the “without Project” and the “with Project” conditions:

LOS Without Project	V/C Difference
C	> 0.0400
D	> 0.0200
E, F	> 0.0100

Mitigation measures for direct Project impacts identified under Existing plus Project conditions would only mitigate the Project’s proportional change in delay or v/c ratio to pre-Project conditions or better. Mitigation measures will be identified for intersections that show a significant cumulative impact per the above changes in v/c, and operate at LOS D or worse under Existing plus Ambient Growth plus Project plus Cumulative (2017) and Horizon Year (2040) with Project traffic conditions. The LOS with mitigation must be improved to LOS D or better for intersections.

It should be noted that for the purposes of this analysis, HCM 2000 methodology has been utilized to report v/c as Synchro does not report the average v/c using the HCM 2010 methodology.

2.6.2 CALTRANS FACILITIES

To determine whether the addition of project traffic to the SHS freeway segments would result in a deficiency, the following will be utilized:

- The traffic study finds that the LOS of a segment will degrade from D or better to E or F.
- The traffic study finds that the project will exacerbate an already deficient condition by contributing 50 or more peak hour trips. A segment that is operating at or near capacity is deemed to be deficient.

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3 AREA CONDITIONS

This section provides a summary of the existing circulation network, the City of San Bernardino General Plan Circulation Network, and a review of existing peak hour intersection operations, freeway mainline operations, and traffic signal warrant analyses.

3.1 EXISTING CIRCULATION NETWORK

Pursuant to the agreement with City of San Bernardino staff (Appendix 1.1), the study area includes a total of 14 existing and future intersections as shown previously on Exhibit 1-2 where the Project is anticipated to contribute 50 or more peak hour trips, or at the request of the City staff. Exhibit 3-1 illustrates the study area intersections located near the proposed Project and identifies the number of through traffic lanes for existing roadways and intersection traffic controls.

3.2 CITY OF SAN BERNARDINO GENERAL PLAN CIRCULATION ELEMENT

As previously noted, the Project site is located within the City of San Bernardino. Exhibit 3-2 shows the City of San Bernardino General Plan Circulation Element, and Exhibit 3-3 illustrates the City of San Bernardino General Plan roadway cross-sections.

The roadway classifications and planned (ultimate) roadway cross-sections of the major roadways within the City of San Bernardino in the vicinity of the proposed Project as identified on the City's General Plan Circulation Element are described subsequently.

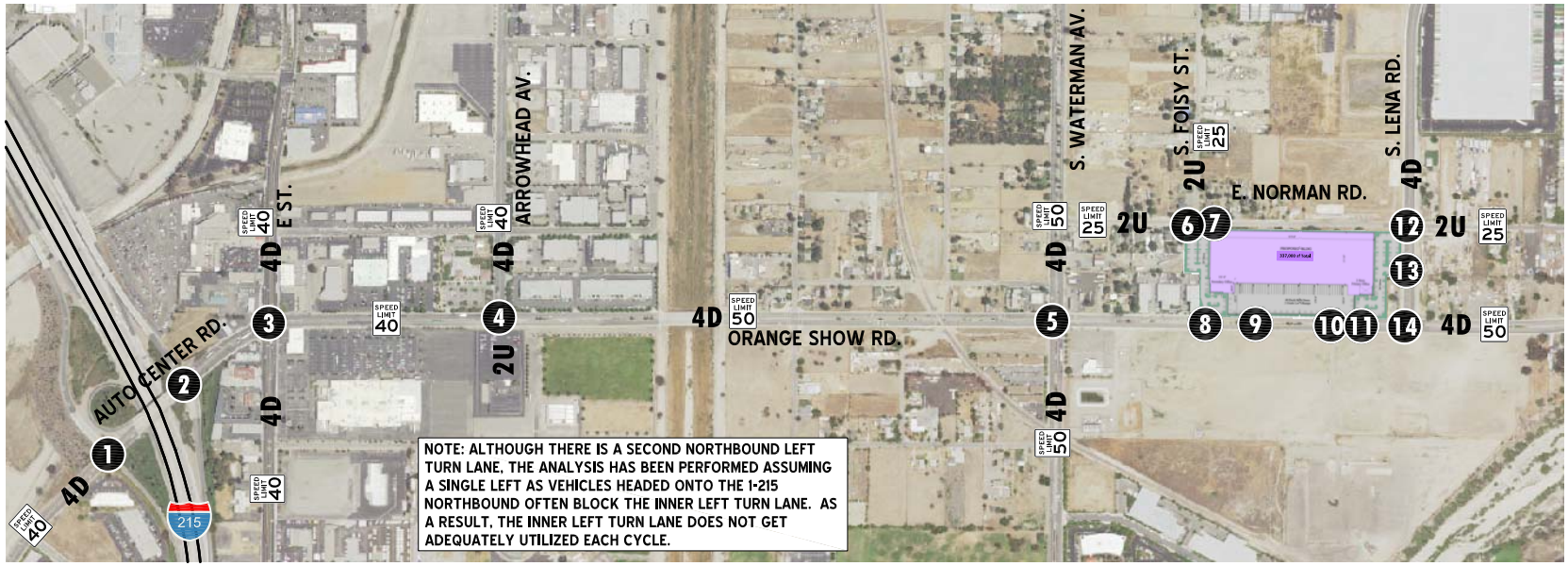
Major Arterials can accommodate six or eight travel lanes and may have raised medians. These facilities typically carry a high volume of traffic and are the primary thoroughfares linking San Bernardino with adjacent cities and the regional highway system. Driveway access to these roadways are typically limited in order to provide efficient high volume traffic flow. Examples of Major Arterials within the study area include:

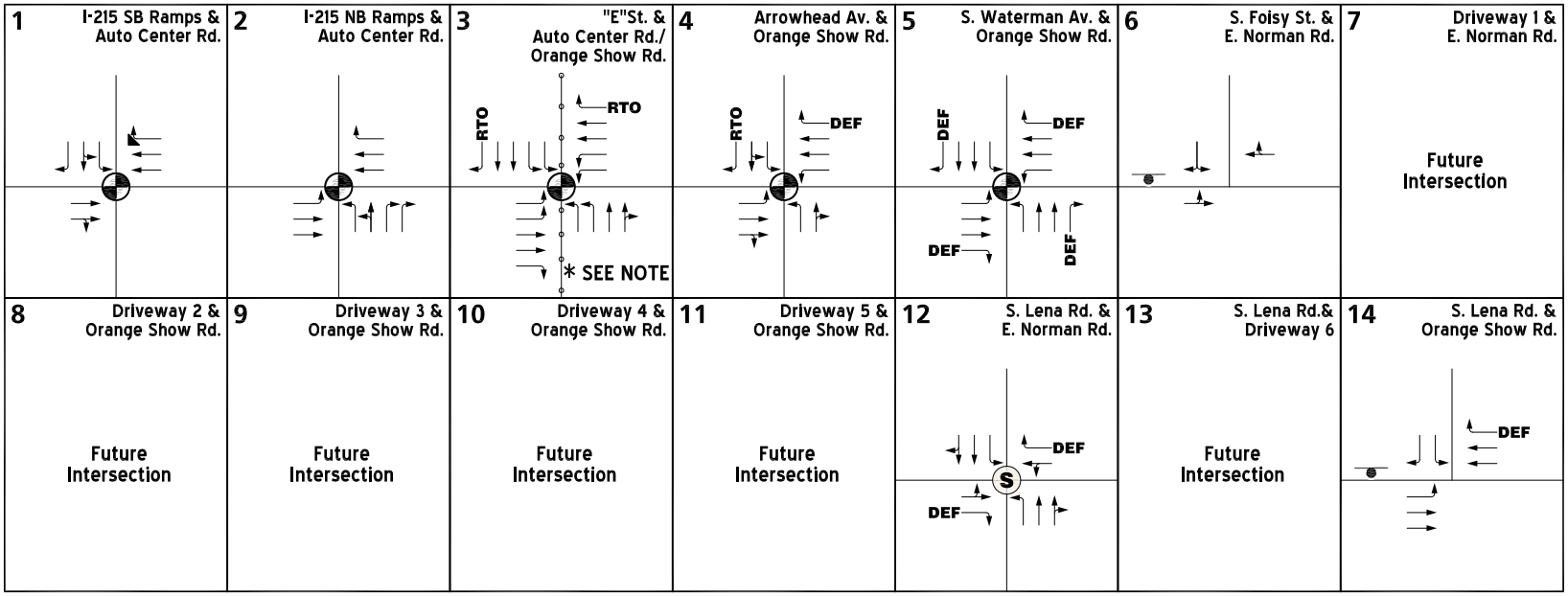
- Auto Center Road / Orange Show Road
- E Street
- Arrowhead Avenue
- Waterman Avenue
- S. Lena Road

Local Streets are typically two-lane streets that connect with secondary arterials allowing local traffic to access the regional transportation facilities. Examples of Local Streets within the study area include:

- Norman Road
- S. Foisy Street

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





LEGEND:

- = TRAFFIC SIGNAL
- = ALL WAY STOP
- = STOP SIGN
- 4 = NUMBER OF LANES
- D = DIVIDED
- U = UNDIVIDED
- RTO = RIGHT TURN OVERLAP
- DEF = DEFACTO RIGHT TURN
- = FREE RIGHT TURN
- = BUS LANE
- SPEED LIMIT 25 = SPEED LIMIT (MPH)

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URBAN CROSSROADS

EXHIBIT 3-2: CITY OF SAN BERNARDINO GENERAL PLAN CIRCULATION ELEMENT

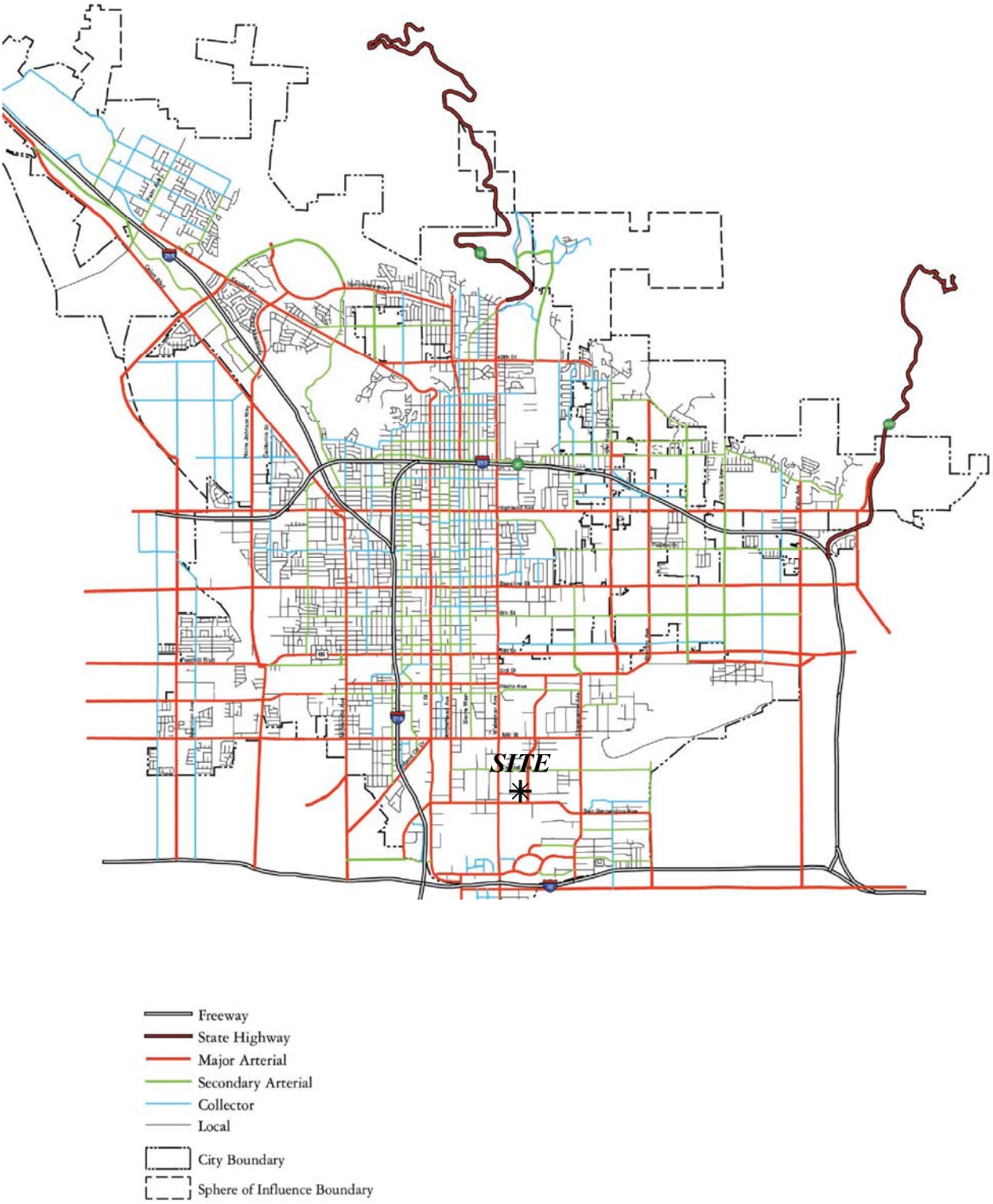
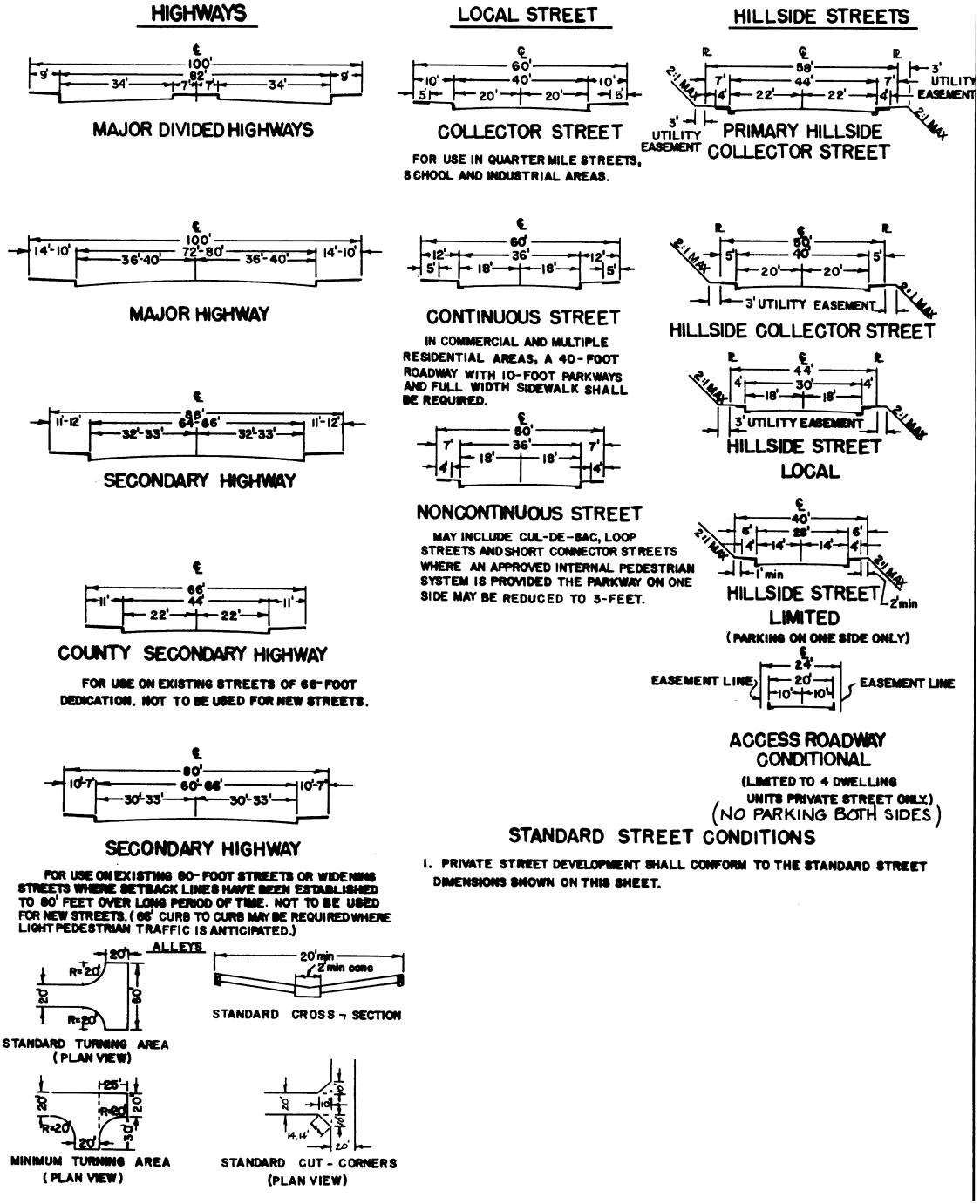


EXHIBIT 3-3: CITY OF SAN BERNARDINO GENERAL PLAN ROADWAY CROSS-SECTIONS



3.3 TRANSIT SERVICE

The study area is currently served by Omnitrans, a public transit agency serving various jurisdictions within San Bernardino County, with bus service along E Street via Route 2 and 5 and along S Waterman Avenue via the sbX Greenline. The existing bus routes provided within the area by Omnitrans are shown on Exhibit 3-4. The sbX Greenline is an existing transit line that currently serves the area in the immediate vicinity of the proposed Project. Transit service is reviewed and updated by Omnitrans periodically to address ridership, budget and community demand needs. Changes in land use can affect these periodic adjustments which may lead to either enhanced or reduced service where appropriate. As such, it is recommended that the applicant work in conjunction with Omnitrans to potentially provide bus service to the site.

3.4 BICYCLE & PEDESTRIAN FACILITIES

Field observations conducted in November 2015 indicate nominal pedestrian and bicycle activity within the study area. Exhibit 3-5 illustrates the City of San Bernardino conceptual trail system, which includes bicycle routes along Orange Show Road, Arrowhead Avenue, and Waterman Avenue near the vicinity of the site.

Existing pedestrian facilities within the study area are shown on Exhibit 3-6.

3.5 EXISTING (2015) TRAFFIC COUNTS

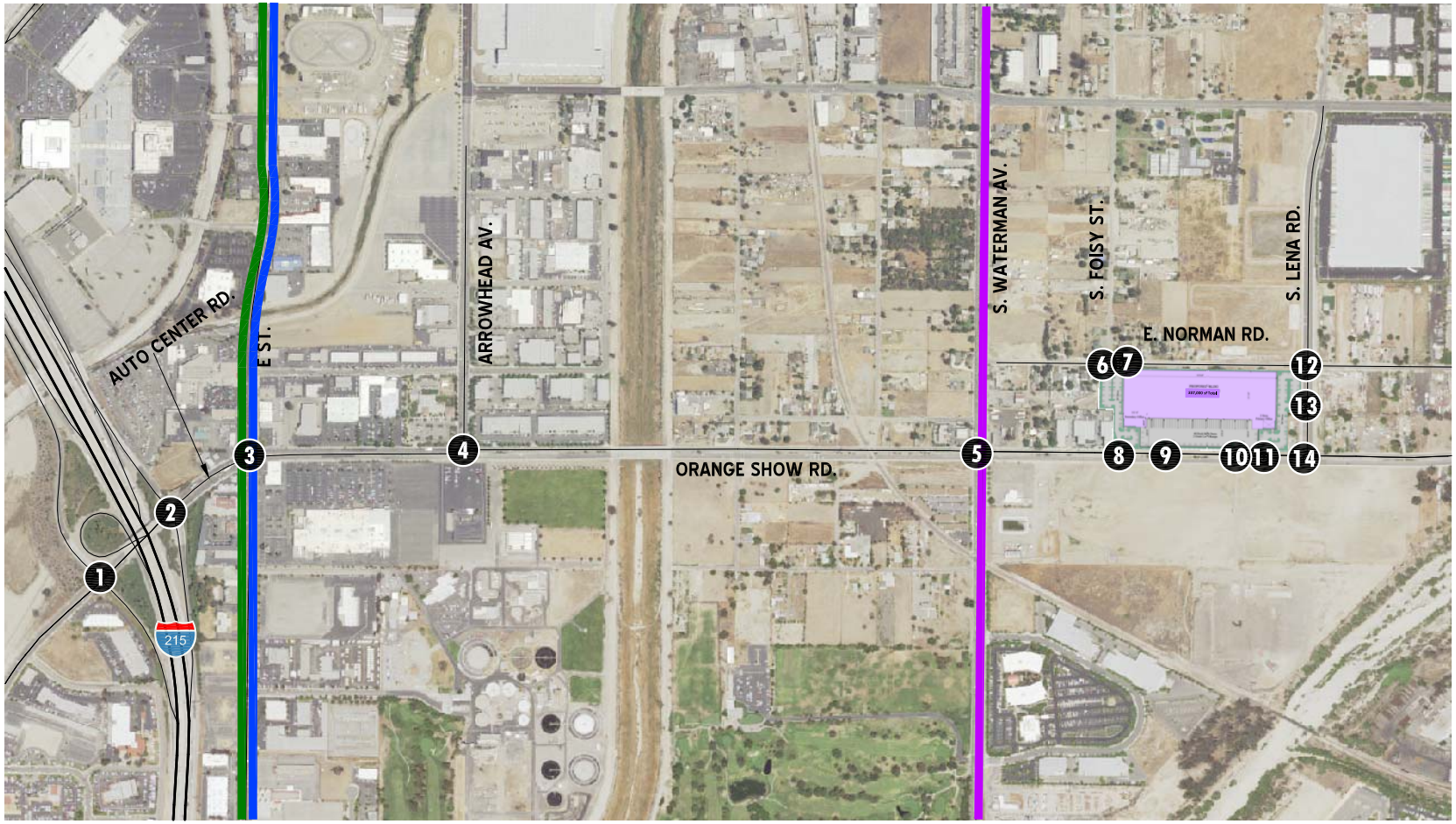
The intersection LOS analysis is based on the traffic volumes observed during the peak hour conditions using traffic count data collected in November 2015. The following peak hours were selected for analysis:

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

The weekday AM and weekday PM peak hour count data is representative of typical weekday peak hour traffic conditions in the study area. There were no observations made in the field that would indicate atypical traffic conditions on the count dates, such as construction activity or detour routes and near-by schools were in session and operating on normal schedules, with the exception of the intersection of E Street and Auto Center Road / Orange Show Road.

Field observations indicate that during the AM peak hour, one of the two eastbound left turn lanes at the intersection of E Street and Auto Center Road / Orange Show Road were coned off and not utilized. The cones were no longer present during the PM peak hour. As such, analysis was performed assuming a single eastbound left turn lane during the AM peak hour under Existing (2015) conditions. Although there is a second northbound left turn lane at the intersection of E Street and Auto Center Road / Orange Show Road, the analysis has been performed assuming a single left turn lane as vehicles headed onto the I-215 Northbound often block the inner left turn lane. As a result, the inner left turn lane does not get adequately utilized each cycle. As such, analysis was performed assuming a single northbound left turn lane during the AM and PM peak hours for all scenarios.

EXHIBIT 3-4: EXISTING TRANSIT SERVICES



SOURCE: OMNITRANS SYSTEM MAP

LEGEND:

- = OMNITRANS ROUTE 5
- = OMNITRANS ROUTE 2
- = SBX GREENLINE

N

EXHIBIT 3-5: CITY OF SAN BERNARDINO CONCEPTUAL TRAIL SYSTEM

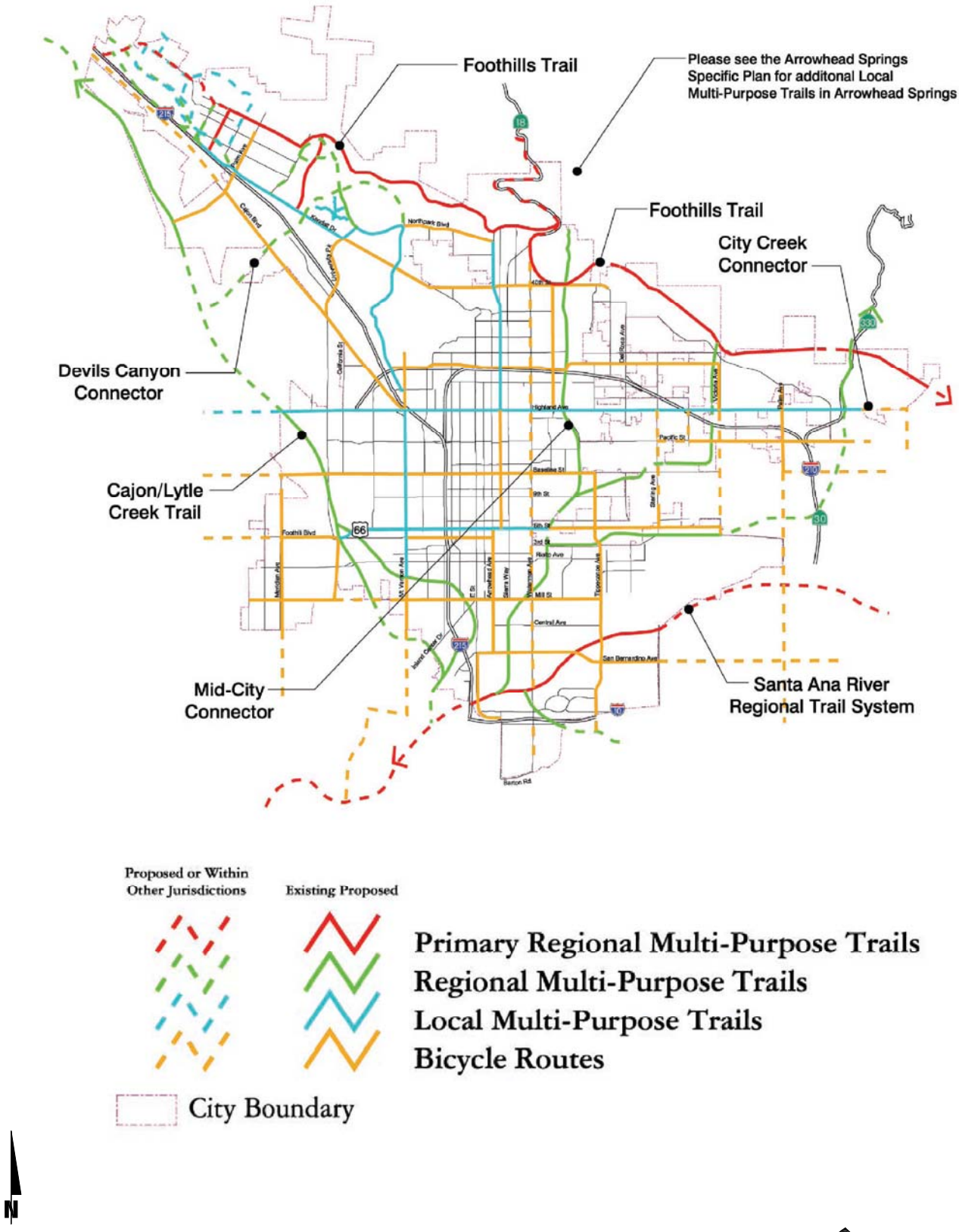
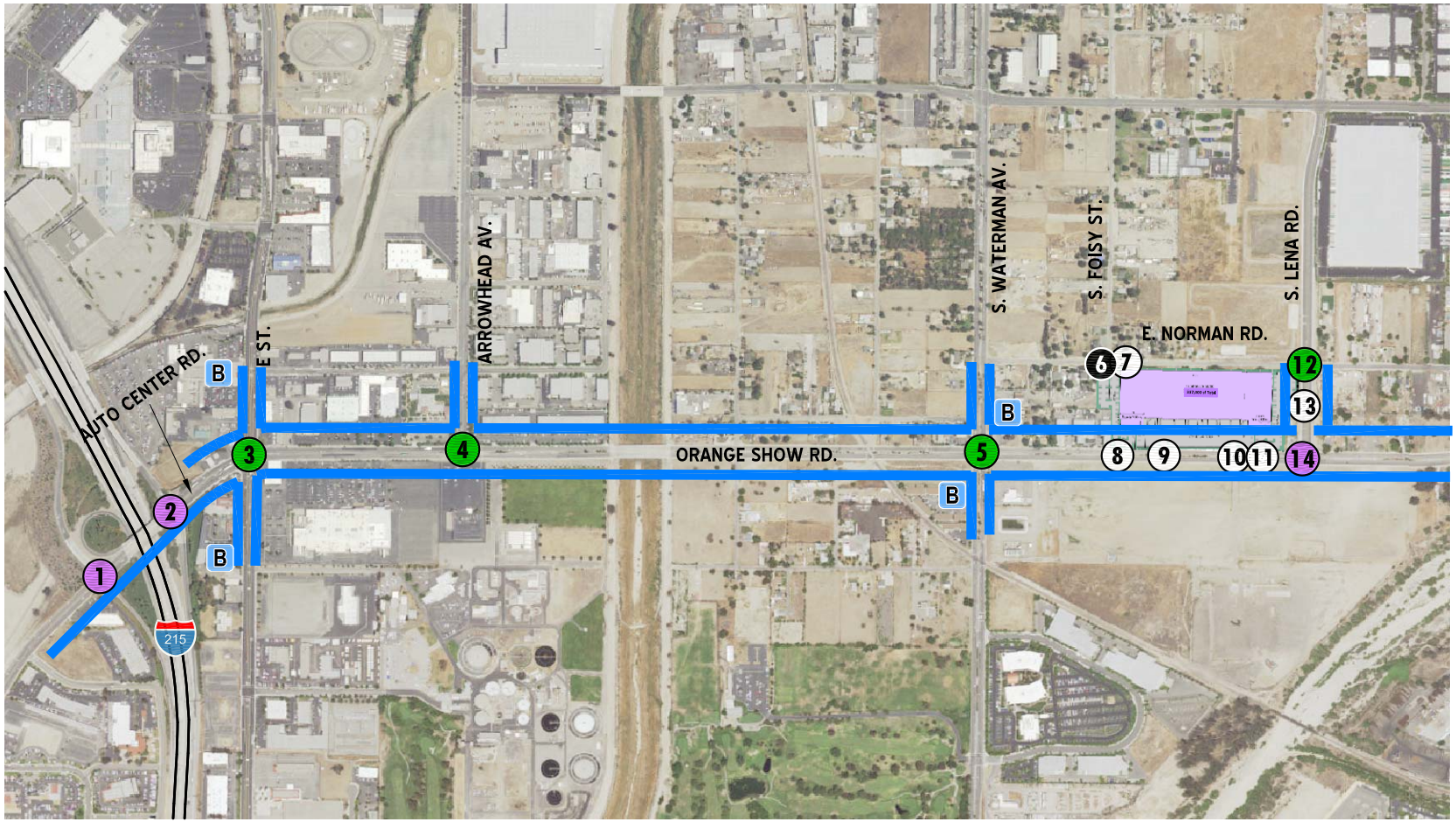


EXHIBIT 3-6: EXISTING PEDESTRIAN FACILITIES



LEGEND:

- SIDEWALK
- B = BUS STOP
- 0 = NO CROSSWALK
- 0 = FUTURE INTERSECTION
- 0 = CROSSWALK ON ALL APPROACHES
- 0 = CROSSWALK ON ONE APPROACH

N

The raw manual peak hour turning movement traffic count data sheets are included in Appendix 3.1. These raw turning volumes have been flow conserved between intersections with limited access, no access and where there are currently no uses generating traffic (e.g., between ramp-to-arterial intersections, etc.).

The traffic counts collected in November 2015 include the following vehicle classifications: include the vehicle classifications as shown below:

- Passenger Cars
- 2-Axle Trucks
- 3-Axle Trucks
- 4 or More Axle Trucks

To represent the impact large trucks, buses and recreational vehicles have on traffic flow; all trucks were converted into passenger car equivalents (PCEs). By their size alone, these vehicles occupy the same space as two or more passenger cars. In addition, the time it takes for them to accelerate and slow down is also much longer than for passenger cars, and varies depending on the type of vehicle and number of axles. For the purpose of this analysis, a PCE factor of 2.0 has been applied to 2-axle trucks, 2.5 for 3-axle trucks and 3.0 for 4+-axle trucks to estimate each turning movement. These factors are consistent with the City of San Bernardino Traffic Impact Study Guidelines (1). Existing average daily traffic (ADT) volumes on arterial highways throughout the study area are shown on Exhibit 3-7. Existing ADT volumes are based upon factored intersection peak hour counts collected by Urban Crossroads, Inc. using the following formula for each intersection leg:

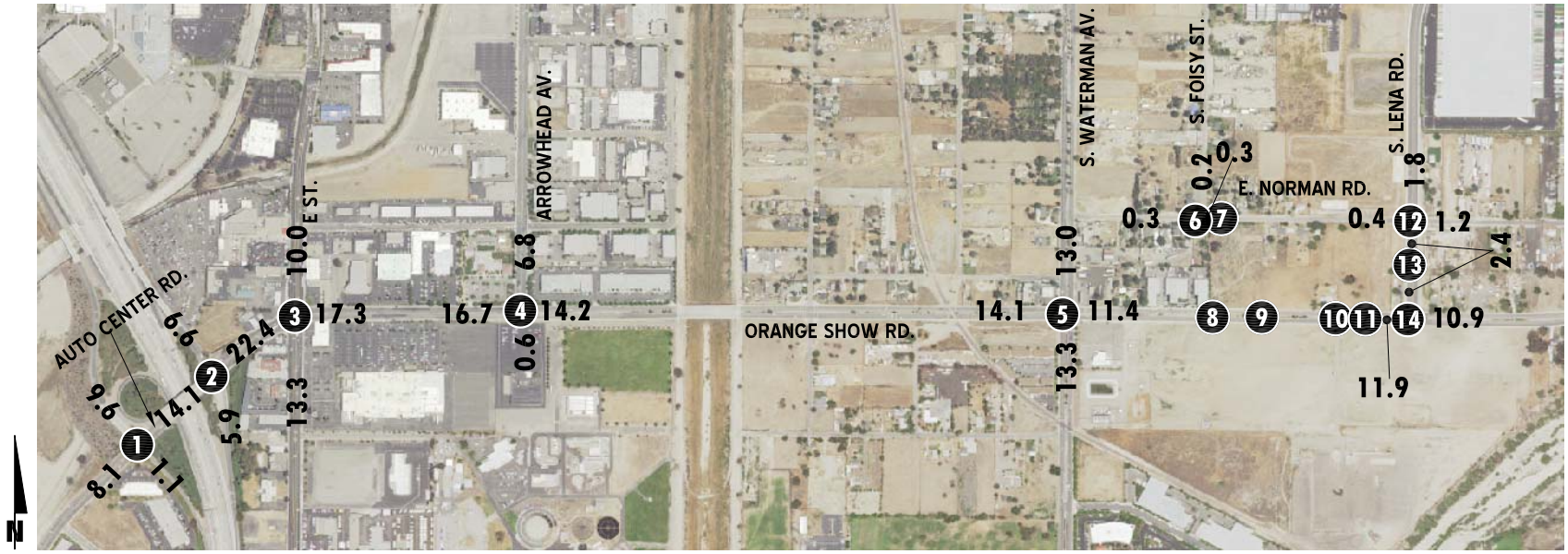
Weekday PM Peak Hour (Approach Volume + Exit Volume) x 13.5214 = Leg Volume

For those roadway segments which have 24-hour tube count data available in close proximity to the study area, a comparison between the PM peak hour and daily traffic volumes indicated that the peak-to-daily relationship of approximately 7.3957 percent would sufficiently estimate ADT volumes for planning-level analyses. As such, the above equation utilizing a factor of 13.5214 estimates the ADT volumes on the study area roadway segments assuming a peak-to-daily relationship of approximately 7.3957 percent (i.e., 1/0.135214 = 7.3957).

3.6 EXISTING (2015) CONDITIONS INTERSECTION OPERATIONS ANALYSIS

Existing peak hour traffic operations have been evaluated for the study area intersections based on the analysis methodologies presented in Section 2.2 *Intersection Capacity Analysis* of this report. The intersection operations analysis results are summarized in Table 3-1 which indicates that there are no existing study area intersections are currently operating at an unacceptable LOS during the peak hours.

EXHIBIT 3-7: EXISTING (2015) TRAFFIC VOLUMES (IN PCE)



1 I-215 SB Ramps & Auto Center Rd.	2 I-215 NB Ramps & Auto Center Rd.	3 "E"St. & Auto Center/ Orange Show Rd.	4 Arrowhead Av. & Orange Show Rd.	5 S. Waterman Av. & Orange Show Rd.	6 S. Foisy St. & E. Norman Rd.	7 Driveway 1 & E. Norman Rd.
258(170) 39(45) 1035(644) 245(437) 261(408) 131(412) 29(108)	233(695) 356(756) 49(188) 1116(868) 150(89) 3(8) 769(704)	59(267) 139(299) 57(140) 37(94) 388(765) 90(201) 196(196) 1122(979) 537(417) 100(368) 111(358) 66(159)	198(348) 9(7) 85(164) 100(120) 297(648) 5(11) 280(266) 850(959) 8(8) 0(23) 1(18) 1(19)	85(112) 525(717) 58(101) 48(60) 269(466) 87(67) 178(188) 419(775) 276(162) 72(199) 572(575) 57(78)	8(4) 8(7) 59(4) 8(12) 62(6) 6(24)	Future Intersection

8 Driveway 2 & Orange Show Rd.	9 Driveway 3 & Orange Show Rd.	10 Driveway 4 & Orange Show Rd.	11 Driveway 5 & Orange Show Rd.	12 S. Lena Rd. & E. Norman Rd.	13 S. Lena Rd.& Driveway 6	14 S. Lena Rd. & Orange Show Rd.
Future Intersection	Future Intersection	Future Intersection	Future Intersection	32(8) 116(102) 0(14) 3(9) 8(10) 14(28) 0(7) 7(21) 7(5) 24(2) 82(100) 13(91)	Future Intersection	118(116) 18(19) 29(79) 296(510) 92(114) 477(864)

LEGEND:

10(10) = AM(PM) PEAK HOUR INTERSECTION VOLUMES

10.0 = VEHICLES PER DAY (1000'S)

Table 3-1

Intersection Analysis for Existing (2015) Conditions

#	Intersection	Traffic Control[4]	Intersection Approach Lanes[1]												Delay[2] (secs.)		Level of Service	
			Northbound			Southbound			Eastbound			Westbound						
			L	T	R	L	T	R	L	T	R	L	T	R	AM	PM	AM	PM
1	I-215 SB Ramps / Auto Center Rd.	TS	0	0	0	1	1	1	0	2	0	0	2	1>>	29.3	13.3	C	B
2	I-215 NB Ramps / Auto Center Rd.	TS	1	1	2	0	0	0	1	2	0	0	2	1	15.1	13.0	B	B
3	E St. / Auto Center Rd. / Orange Show Rd.[4, 5]	TS	1	2	0	2	2	1>	2	2	1	2	2	1>	23.2	36.2	C	D
4	Arrowhead Av. / Orange Show Rd.	TS	1	1	0	1	1	1>	1	2	0	1	2	d	23.5	29.3	C	C
5	S. Waterman Av. / Orange Show Rd.	TS	1	2	d	1	2	d	1	2	d	1	2	d	33.2	39.9	C	D
6	S. Foisy St. / E. Norman Rd.	CSS	0	0	0	0	1	0	0	1	0	0	1	0	9.1	8.7	A	A
7	Driveway 1 / E. Norman Rd.		Intersection Does Not Exist															
8	Driveway 2 / Orange Show Rd.		Intersection Does Not Exist															
9	Driveway 3 / Orange Show Rd.		Intersection Does Not Exist															
10	Driveway 4 / Orange Show Rd.		Intersection Does Not Exist															
11	Driveway 5 / Orange Show Rd.		Intersection Does Not Exist															
12	S. Lena Rd. / E. Norman Rd.	AWS	1	2	0	1	2	0	0	1	d	0	1	d	8.4	8.6	A	A
13	S. Lena Rd. / Driveway 6		Intersection Does Not Exist															
14	S. Lena Rd. / Orange Show Rd.	CSS	0	0	0	1	0	1	1	2	0	0	2	d	13.8	19.5	B	C

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

L = Left; T = Through; R = Right; d = Defacto Right Turn Lane; > = Right Turn Overlap Phasing; >> = Free-Right Turn Lane

[2] Per the 2010 Highway Capacity Manual, overall average intersection delay and level of service are shown for intersections with a traffic signal or all-way stop control. For intersections with cross street stop control, the delay and level of service for the worst individual movement (or movements sharing a single lane) are shown.

[3] CSS = Cross-street Stop; AWS = All Way Stop; TS = Traffic Signal

[4] Although there is a second northbound left turn lane, the analysis has been performed assuming a single left as vehicles headed onto the I-215 Northbound often block the inner left turn lane. As a result, the inner left turn lane does not get adequately utilized each cycle.

[5] Field observations indicate that during the AM peak hour, one of the two eastbound left turn lanes were coned off and not utilized. The cones were no longer present during the PM peak hour. As such, analysis was performed assuming a single eastbound left turn lane during the AM peak hour under Existing (2015) conditions.

Consistent with Table 3-1, a summary of the peak hour intersection LOS for Existing conditions are shown on Exhibit 3-8. The intersection operations analysis worksheets are included in Appendix 3.2 of this TIA.

3.7 EXISTING (2015) CONDITIONS TRAFFIC SIGNAL WARRANTS ANALYSIS

Traffic signal warrants for Existing traffic conditions are based on existing peak hour intersection turning volumes. The intersections of S. Lena Road and Orange Show Road currently warrant a traffic signal for Existing traffic conditions.

As discussed previously, a signal warrant defines the minimum condition under which the installation of a traffic signal might be warranted. An intersection may satisfy a signal warrant condition and operate at or above acceptable LOS or operate below acceptable LOS and not meet a signal warrant.

Existing conditions traffic signal warrant analysis worksheets are provided in Appendix 3.3.

3.8 EXISTING (2015) CONDITIONS OFF-RAMP QUEUING ANALYSIS

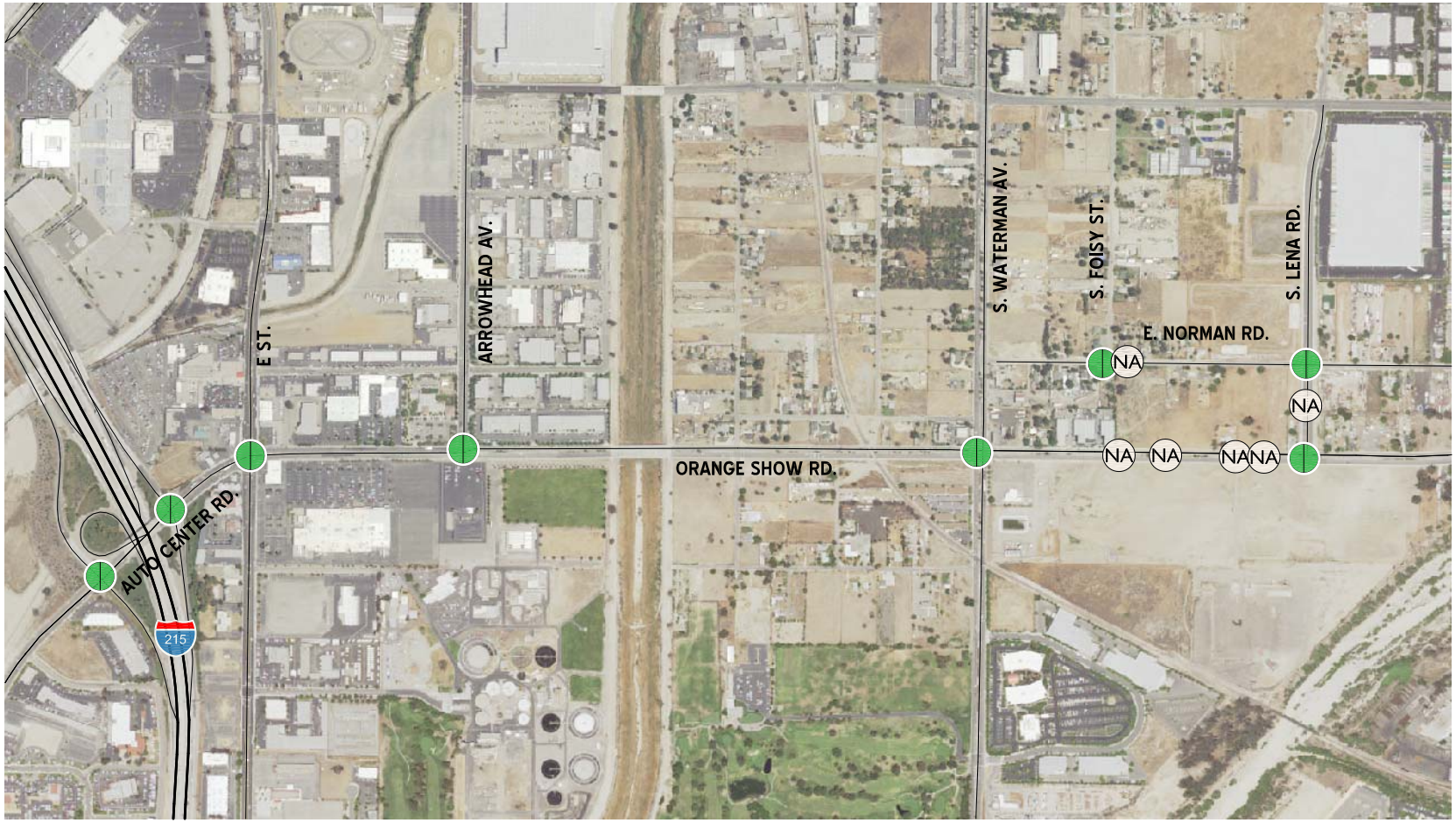
A queuing analysis was performed for the off-ramps at the I-215 Freeway at the Auto Center Road interchange to assess vehicle queues for the off ramps that may potentially result in deficient peak hour operations at the ramp-to-arterial intersections and may potentially "spill back" onto the I-215 Freeway mainline. Queuing analysis findings are presented in Table 3-2. It is important to note that off-ramp lengths are consistent with the measured distance between the intersection and the freeway mainline. As shown on Table 3-2, there are no movements that are currently experiencing queuing issues during the weekday AM or weekday PM peak 95th percentile traffic flows.

Worksheets for Existing traffic conditions off-ramp queuing analysis are provided in Appendix 3.4.

3.9 RECOMMENDED IMPROVEMENTS

No improvement strategies have been recommended as there are no intersections that are anticipated to operate at an unacceptable LOS under Existing (2015) conditions.

EXHIBIT 3-8: SUMMARY OF PEAK HOUR INTERSECTION LOS FOR EXISTING (2015) CONDITIONS



LEGEND:

- = AM PEAK HOUR ACCEPTABLE LOS
- = AM PEAK HOUR DEFICIENT LOS
- = PM PEAK HOUR ACCEPTABLE LOS
- = PM PEAK HOUR DEFICIENT LOS
- (NA) = NOT AN ANALYSIS LOCATION FOR THIS SCENARIO

N

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URBAN CROSSROADS

Table 3-2

Peak Hour Freeway Off-Ramp Queuing Summary for Existing (2015) Conditions

Intersection	Movement	Available Stacking Distance (Feet)	Existing (2015) 95th Percentile Queue (Feet)		Acceptable? [1]	
			AM Peak	PM Peak	AM	PM
I-215 SB Off-Ramp / Auto Center Rd.	SBL	2,695	517 [2]	193	Yes	Yes
	SBL/T	2,230	432 [2]	181	Yes	Yes
	SBR	465	29	33	Yes	Yes
I-215 NB Off-Ramp / Auto Center Rd.	NBL	925	54	41	Yes	Yes
	NBL/T	1,050	51	39	Yes	Yes
	NBR	275	178	129	Yes	Yes

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

[2] 95th percentile volume exceeds capacity, queue may be longer

4 PROJECTED FUTURE TRAFFIC

This section presents the traffic volumes estimated to be generated by the Project, as well as the Project's trip assignment onto the study area roadway network. The Project is proposed to consist of a total of 342,000 square feet (sf) of high-cube warehouse / warehousing use. The Project is anticipated to be developed in a single phase with the opening year of 2017.

The Project is proposed to have access on E. Norman Road, Orange Show Road, and S. Lena Road. All Project access points are assumed to allow for full-access with the exception of Driveways 2, 3, and 5 on Orange Show Road which are proposed for right-in/right-out access only. Regional access to the Project site will be provided by the I-215 Freeway via Orange Show Road, I-10 Freeway via Waterman Road, and I-10 Freeway via Tippecanoe Avenue.

4.1 PROJECT TRIP GENERATION

Trip generation represents the amount of traffic which is both attracted to and produced by a development. Determining traffic generation for a specific project is therefore based upon forecasting the amount of traffic that is expected to be both attracted to and produced by the specific land uses being proposed for a given development.

Trip generation rates used to estimate Project traffic are shown in Table 4-1 for actual vehicles and Table 4-2 for PCE. The trip generation rates used for this analysis are based upon information collected by the Institute of Transportation Engineers (ITE) as provided in their *Trip Generation* manual, 9th Edition, 2012. (4) For purposes of this analysis, ITE land use code 152 (High-Cube Warehousing) has been used to derive site specific trip generation estimates. In order to accurately reflect the impact that heavy trucks would have on the street system, Project trips have been further broken down between passenger cars and trucks for each of the peak hours and weekday daily trip generation. As noted on Table 4-1 and 4-2, refinements to the raw trip generation estimates have been made to provide a more detailed breakdown of trips between passenger cars and trucks. The percentage of trucks has been determined from the table shown on page 267 of the ITE *Trip Generation* manual. As shown on page 267, the truck trip generation rate for weekday daily traffic is 0.64 or 38.1% of the total traffic. Similarly, the truck trip generation rate for the weekday AM peak hour is 0.03 (27.3% of the total traffic) and 0.04 (or 33.3% of the total traffic) for the weekday PM peak hour.

Trip generation for heavy trucks was further broken down by truck type (or axle type). The total truck percentage is comprised of 3 different truck types: 2-axle, 3-axle, and 4+-axle trucks. For the purposes of this analysis, the percentage of trucks, by axle type, were obtained from the South Coast Air Quality Management District's (SCAQMD) interim recommended truck mix. The SCAQMD has recently performed surveys of existing facilities and compiled the data to provide

Table 4-1

Project Trip Generation Summary (Actual Vehicles)

Land Use	Units[2]	ITE LU Code	AM Peak Hour In	AM Peak Hour Out	AM Peak Hour Total	PM Peak Hour In	PM Peak Hour Out	PM Peak Hour Total	Daily
Trip Generation Rates[1]									
High-Cube Warehouse[3]	TSF	152	0.076	0.034	0.110	0.037	0.083	0.120	1.680
Passenger Cars			0.055	0.025	0.080	0.025	0.055	0.080	1.040
2-Axle Trucks			0.005	0.002	0.007	0.003	0.006	0.009	0.141
3-Axle Trucks			0.004	0.002	0.005	0.002	0.005	0.007	0.113
4-Axle+ Trucks			0.012	0.006	0.018	0.007	0.017	0.024	0.386

Land Use	Quantity	Units[2]	AM Peak Hour In	AM Peak Hour Out	AM Peak Hour Total	PM Peak Hour In	PM Peak Hour Out	PM Peak Hour Total	Daily
Trip Generation Summary									
High-Cube Warehouse	342.000	TSF							
Passenger Cars:			19	8	27	8	19	27	356
Truck Trips:									
2-axle:			2	1	3	1	2	3	48
3-axle:			1	1	2	1	2	3	39
4+-axle:			4	2	6	3	6	9	132
- Net Truck Trips (Actual Trucks)[4]			*7*	*4*	*11*	*5*	*10*	*15*	*219*
TOTAL NET TRIPS (Actual Vehicles)[5]			***26***	***12***	***38***	***13***	***29***	***42***	***575***

[1] Trip Generation Source: Institute of Transportation Engineers (ITE), Trip Generation Manual, Ninth Edition (2012).

[2] TSF = thousand square feet

[3] Vehicle Mix Source: Total truck percentage source from ITE Trip Generation manual. Truck mix (by axle type) source from SCAQMD.

AM peak hour = 72.7% passenger cars, 6.01% 2-Axle trucks, 4.83% 3-Axle trucks, 16.46% 4-Axle trucks

PM peak hour = 66.7% passenger cars, 7.33% 2-Axle trucks, 5.89% 3-Axle trucks, 20.08% 4-Axle trucks

ADT = 61.9% passenger cars, 8.38% 2-Axle trucks, 6.74% 3-Axle trucks, 22.98% 4-Axle trucks

[4] Vehicle Mix Source: Total truck percentage source from ITE Trip Generation manual. Truck mix (by axle type) source from SCAQMD for high-cube warehouse use and from the City of Fontana Truck Trip Generation Study for warehousing and general light industrial uses.

[5] TOTAL NET TRIPS (Actual Vehicles) = Passenger Cars + Net Truck Trips (Actual Trucks).

Table 4-2

Project Trip Generation Summary (PCE)

Land Use	Units[2]	ITE LU Code	AM Peak Hour In	AM Peak Hour Out	AM Peak Hour Total	PM Peak Hour In	PM Peak Hour Out	PM Peak Hour Total	Daily
Trip Generation Rates[1]									
High-Cube Warehouse[3,4]	TSF	152	0.076	0.034	0.110	0.037	0.083	0.120	1.680
Passenger Cars			0.055	0.025	0.080	0.025	0.055	0.080	1.040
2-Axle Trucks (PCE = 2.0)			0.009	0.004	0.013	0.005	0.012	0.018	0.282
3-Axle Trucks (PCE = 2.5)			0.009	0.004	0.013	0.005	0.012	0.018	0.283
4-Axle+ Trucks (PCE = 3.0)			0.037	0.017	0.054	0.022	0.050	0.072	1.158

Land Use	Quantity	Units[2]	AM Peak Hour In	AM Peak Hour Out	AM Peak Hour Total	PM Peak Hour In	PM Peak Hour Out	PM Peak Hour Total	Daily
Trip Generation Summary									
High-Cube Warehouse	342.000	TSF							
Passenger Cars:			19	8	27	8	19	27	356
Truck Trips:									
2-axle:			3	1	4	2	4	6	96
3-axle:			3	1	4	2	4	6	97
4+-axle:			13	6	19	8	17	25	396
- Net Truck Trips (PCE)[5]			*19*	*8*	*27*	*12*	*25*	*37*	*589*
TOTAL NET TRIPS (PCE)[6]			***38***	***16***	***54***	***20***	***44***	***64***	***945***

[1] Trip Generation Source: Institute of Transportation Engineers (ITE), Trip Generation Manual, Ninth Edition (2012).

[2] TSF = thousand square feet

[3] Vehicle Mix Source: Total truck percentage source from ITE Trip Generation manual. Truck mix (by axle type) source from SCAQMD.

AM peak hour = 72.7% passenger cars, 6.01% 2-Axle trucks, 4.83% 3-Axle trucks, 16.46% 4-Axle trucks

PM peak hour = 66.7% passenger cars, 7.33% 2-Axle trucks, 5.89% 3-Axle trucks, 20.08% 4-Axle trucks

ADT = 61.9% passenger cars, 8.38% 2-Axle trucks, 6.74% 3-Axle trucks, 22.98% 4-Axle trucks

[4] PCE rates are per SANBAG.

interim guidance on the mix of heavy trucks for these types of high-cube warehousing / distribution facilities. Based on this interim guidance from the SCAQMD, the following truck fleet mix was utilized for the purposes of estimating the truck trip generation for the site: 22.0% of the total trucks as 2-axle trucks, 17.7% of the total trucks as 3-axle trucks, and 60.3% of the total trucks as 4+-axle trucks. Lastly, PCE factors were applied to the trip generation rates for heavy trucks (large 2-axles, 3-axles, 4+-axles). PCEs allow the typical "real-world" mix of vehicle types to be represented as a single, standardized unit, such as the passenger car, to be used for the purposes of capacity and level of service analyses. The PCE factors are consistent with the recommended PCE factors in the City of San Bernardino Traffic Impact Study Guidelines, 2015 Update. Trip generation rates for actual vehicles and with PCE factors are shown on Table 4-1 and Table 4-2.

As shown on Table 4-2, the proposed Project is anticipated to generate a net total of 945 PCE trip-ends per day with 54 net PCE AM peak hour trips and 64 net PCE PM peak hour trips.

4.2 PROJECT TRIP DISTRIBUTION

The Project trip distribution and assignment process represents the directional orientation of traffic to and from the Project site. The trip distribution pattern of passenger cars is heavily influenced by the geographical location of the site, the location of surrounding uses, and the proximity to the regional freeway system. Given these differences, separate trip distributions were generated for both passenger cars and truck trips.

Exhibits 4-1 illustrates the truck trip distribution patterns. Exhibit 4-2 illustrates the passenger car trip distribution patterns.

4.3 MODAL SPLIT

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

4.4 PROJECT TRIP ASSIGNMENT

The assignment of traffic from the Project area to the adjoining roadway system is based upon the Project trip generation, trip distribution, and the arterial highway and local street system improvements that would be in place by the time of initial occupancy of the Project. Based on the identified Project traffic generation and trip distribution patterns, Project ADT and peak hour intersection turning movement volumes are shown on Exhibits 4-3.

EXHIBIT 4-1: PROJECT (TRUCK) TRIP DISTRIBUTION

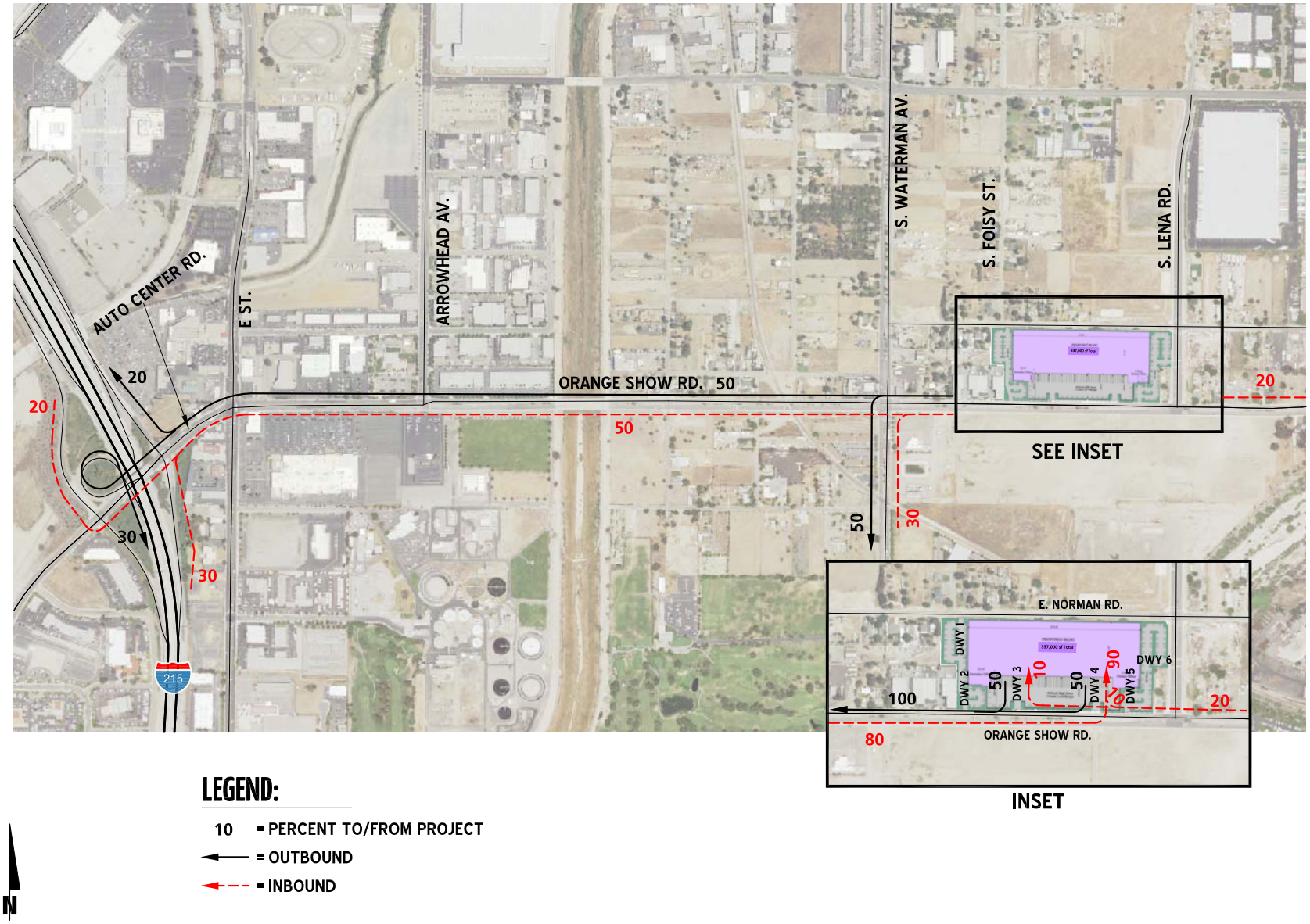
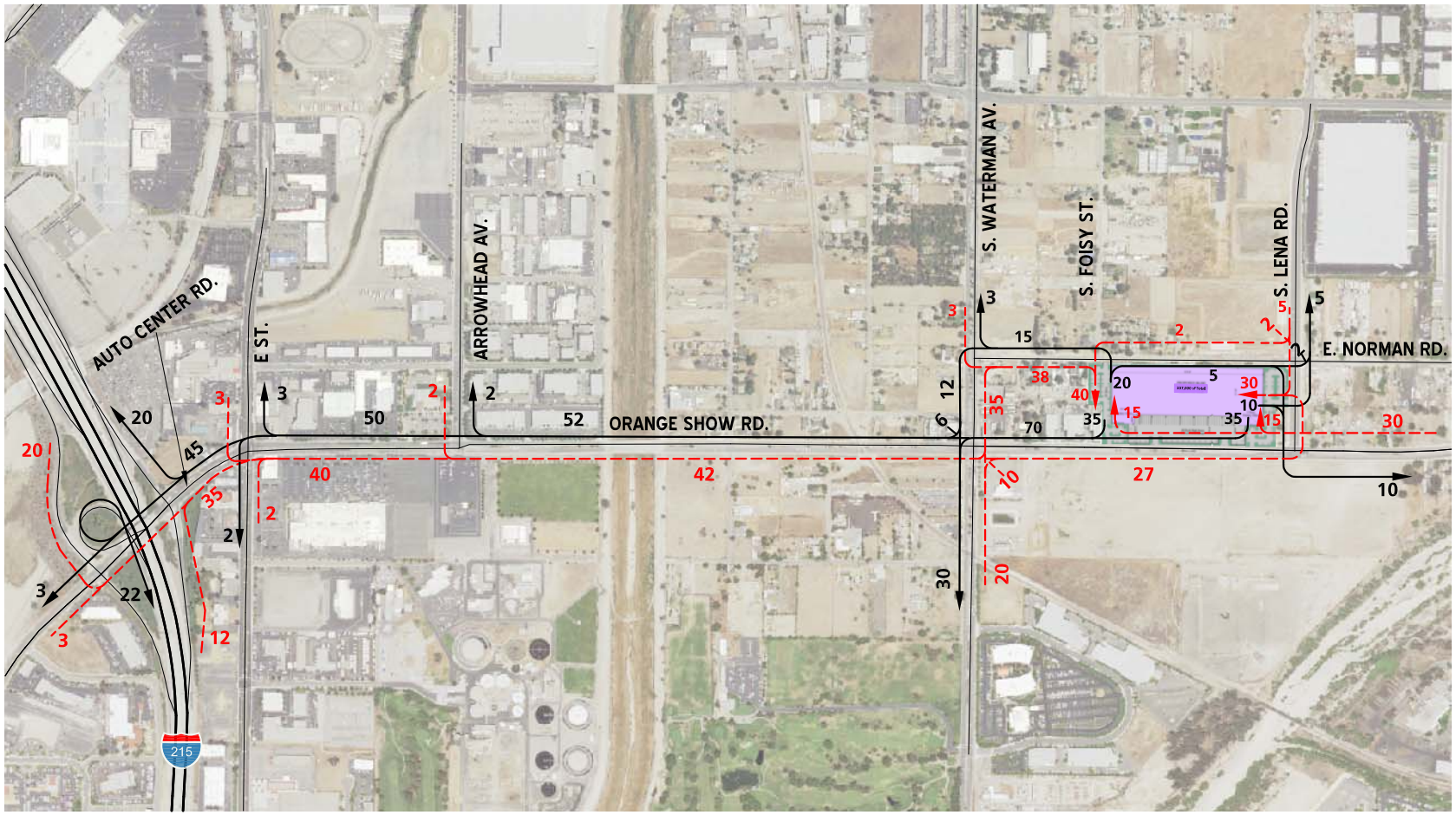


EXHIBIT 4-2: PROJECT (PASSENGER CAR) TRIP DISTRIBUTION



LEGEND:

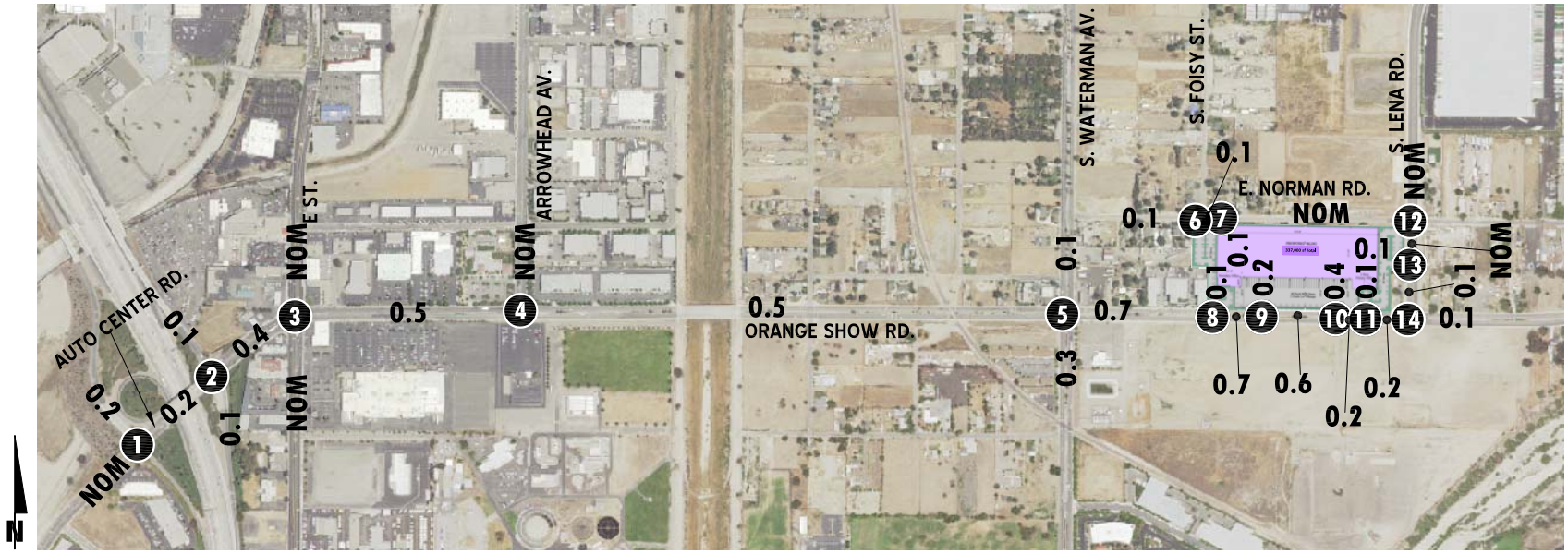
10 = PERCENT TO/FROM PROJECT

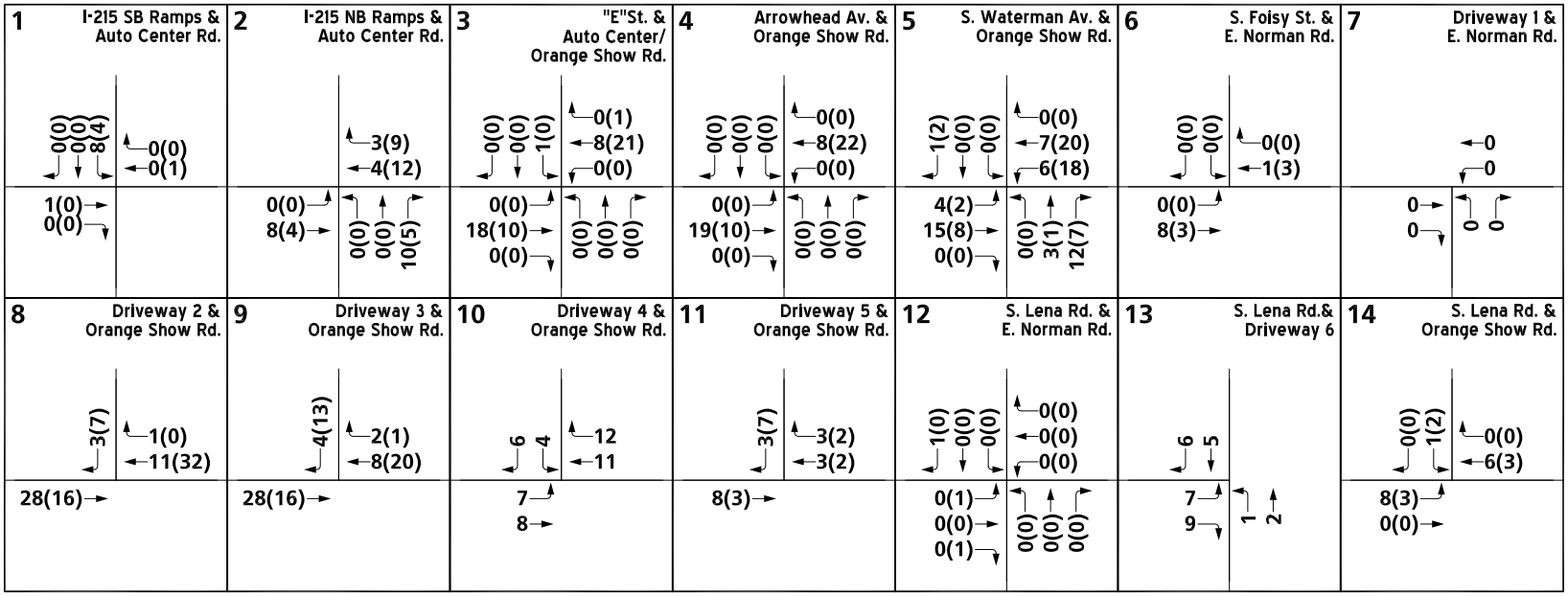
← = OUTBOUND

← - - = INBOUND

N

EXHIBIT 4-3: PROJECT ONLY TRAFFIC VOLUMES (IN PCE)





LEGEND:

10(10) = AM(PM) PEAK HOUR INTERSECTION VOLUMES

10.0 = VEHICLES PER DAY (1000'S)

NOM = NOMINAL, LESS THAN 50 VEHICLES PER DAY

4.5 CONSTRUCTION TRAFFIC

Project construction activities may potentially result in temporary and transient traffic deficiencies related to:

- Construction employee commutes;
- Import of construction materials and soils; and
- Transport and use of heavy construction equipment.

The Applicant would be required to develop and implement a City-approved Construction Traffic Management Plan addressing potential construction-related traffic detours and disruptions. In general, the Construction Traffic Management Plan would ensure that to the extent practical, construction traffic would access the Project site during off-peak hours; and that construction traffic would be routed to avoid travel through, or proximate to, sensitive land uses.

4.6 BACKGROUND TRAFFIC

Future year traffic forecasts have been based upon a background (ambient) growth factor of 3% per year. The ambient growth factor is intended to approximate traffic growth. The total ambient growth is 6.09% for 2017 traffic conditions (compounded growth of three percent per year over 2 years). This ambient growth rate is added to existing traffic volumes to account for area-wide growth not reflected by cumulative development projects. Ambient growth has been added to daily and peak hour traffic volumes on surrounding roadways, in addition to traffic generated by the development of future projects that have been approved but not yet built and/or for which development applications have been filed and are under consideration by governing agencies.

Ambient growth has been added to daily and peak hour traffic volumes on surrounding roadways, in addition to traffic generated by the development of future projects that have been approved but not yet built and/or for which development applications have been filed and are under consideration by governing agencies.

The currently adopted Southern California Association of Governments (SCAG) 2012 Regional Transportation Plan (RTP) (April 2012) growth forecasts for the City of San Bernardino identifies projected growth in population of 209,900 in 2008 to 261,400 in 2035, or a 24.54 percent increase over the 27 year period. (5) The change in population equates to roughly a 0.82 percent annual growth rate, compounded annually. Similarly, growth over the same 27 year period in households is projected to increase by 29.51 percent, or 0.96 percent annual growth rate. Finally, growth in employment over the same 27 year period is projected to increase by 43.44 percent, or a 1.34 percent annual growth rate.

Based on a comparison of Existing traffic volumes to the Horizon Year (2035) forecasts, the average growth rate is estimated at approximately 1.24 percent compounded annually between Existing and Horizon Year (2040) traffic conditions. The annual growth rate at each individual intersection is not lower than 0.87 percent to as high as 1.90 percent compounded annually over the same time period. Therefore, the annual growth rate utilized for the purposes of this analysis

would appear to conservatively approximate the anticipated regional growth in traffic volumes in the City of San Bernardino for both near term and long range traffic conditions, especially when considered along with the addition of cumulative development project traffic and project-related traffic. As such, the growth in traffic volumes assumed in this traffic impact analysis would tend to overstate, as opposed to understate, the potential impacts to traffic and circulation.

4.7 CUMULATIVE DEVELOPMENT TRAFFIC

California Environmental Quality Act (CEQA) guidelines require that other reasonably foreseeable development projects which are either approved or being processed concurrently in the study area also be included as part of a cumulative analysis scenario. A cumulative project list was developed from a recent traffic study in the City of San Bernardino.

Exhibit 4-4 illustrates the cumulative development location map. A summary of cumulative development projects and their proposed land uses are shown on Table 4-3. If applicable, the traffic generated by individual cumulative projects was manually added to the With Cumulative traffic conditions forecasts to ensure that traffic generated by the listed cumulative development projects in Table 4-3 are reflected as part of the background traffic.

Based on the identified cumulative development project traffic generation and trip distribution patterns, cumulative development project ADT, AM and PM peak hour volumes are shown on Exhibit 4-5.

4.8 NEAR-TERM CONDITIONS

The “buildup” approach combines existing traffic counts with a background ambient growth factor to forecast the EA (2017), EAP (2017), EAC (2017), and EAPC (2017) traffic conditions. An ambient growth factor of 6.09% accounts for background (area-wide) traffic increases that occur over time up to the year 2017 from the year 2015 (compounded three percent per year growth over a 2 year period). Project traffic is added to assess EAP (2017) and EAPC (2017) traffic conditions, respectively. Traffic volumes generated by cumulative development projects are then added to assess the EAC (2017) and EAPC (2017) traffic conditions. The 2017 roadway networks are similar to the existing conditions roadway network with the exception of future roadways and intersections proposed to be developed by the Project.

The near-term traffic analysis includes the following traffic conditions, with the various traffic components:

- EA (2017)
    - Existing 2015 PCE volumes
    - Ambient growth traffic (6.09%)
- EAP (2017)
    - Existing 2015 PCE volumes
    - Ambient growth traffic (6.09%)
    - Project Traffic

EXHIBIT 4-4: CUMULATIVE DEVELOPMENT PROJECTS LOCATION MAP

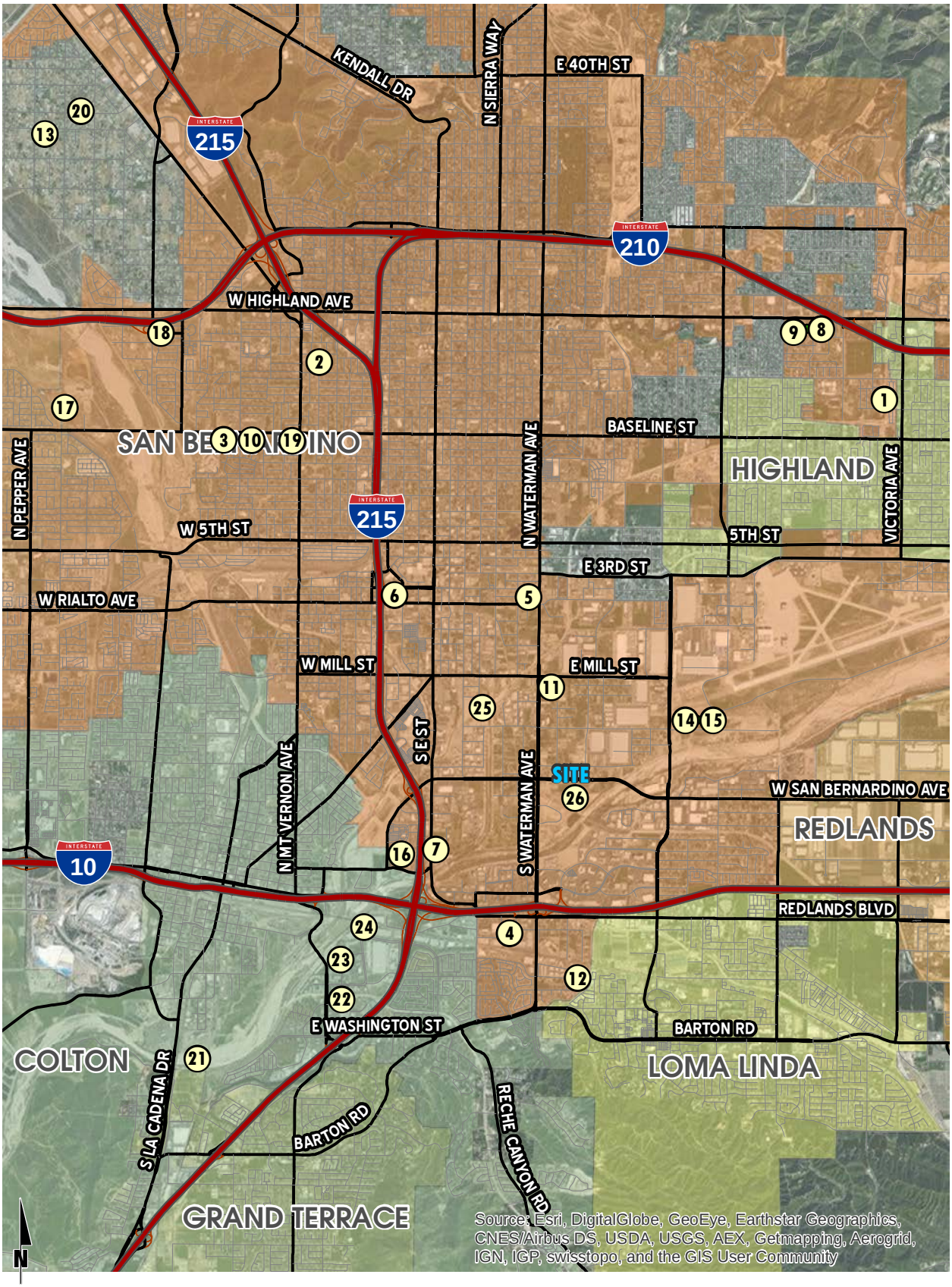
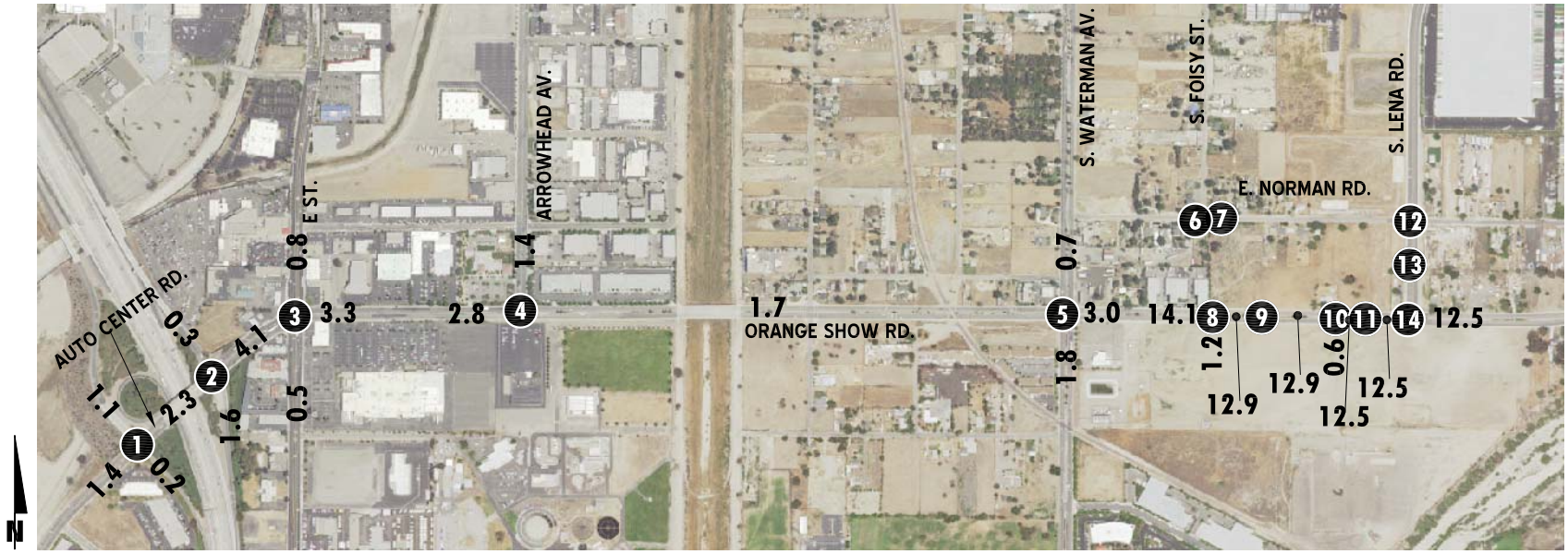


EXHIBIT 4-5: CUMULATIVE DEVELOPMENT PROJECTS ONLY TRAFFIC VOLUMES (IN PCE)



1 I-215 SB Ramps & Auto Center Rd.	2 I-215 NB Ramps & Auto Center Rd.	3 "E"St. & Auto Center/ Orange Show Rd.	4 Arrowhead Av. & Orange Show Rd.	5 S. Waterman Av. & Orange Show Rd.	6 S. Foisy St. & E. Norman Rd.	7 Driveway 1 & E. Norman Rd.
5(0) 0(0) 41(20) → ; ← 31(69) ← 30(93)	← 22(24) ← 37(159)	8(12) 7(15) 3(5) → ; ← 2(10) ← 40(153) ← 2(6)	34(104) 0(1) 4(6) → ; ← 7(5) ← 35(80) ← 0(0)	2(4) 21(18) 5(5) → ; ← 3(6) ← 36(83) ← 23(55)	0(0) 0(0) → ; ← 0(0) ← 0(0)	Intersection Does Not Exist
23(6) → 2(10) ↓	12(1) → 52(26) → ; 24(3) 1(0) 182(119)	18(8) → 171(85) → 21(8) ↓ ; 4(3) 9(13) 5(1)	114(3) → 96(39) → 0(0) ↓ ; 0(0) 0(0) 0(0)	3(5) → 59(38) → 7(1) ↓ ; 1(3) 9(23) 49(29)	0(0) → 0(0) →	

8 Driveway 2 & Orange Show Rd.	9 Driveway 3 & Orange Show Rd.	10 Driveway 4 & Orange Show Rd.	11 Driveway 5 & Orange Show Rd.	12 S. Lena Rd. & E. Norman Rd.	13 S. Lena Rd.& Driveway 6	14 S. Lena Rd. & Orange Show Rd.
← 336(488)	Intersection Does Not Exist	← 331(466) ← 5(2)	Intersection Does Not Exist	0(0) 0(0) 0(0) → ; ← 0(0) ← 0(0) ← 0(0)	Intersection Does Not Exist	0(0) 0(0) → ; ← 0(0) ← 336(468)
482(550) → 56(27) ↓ ; 25(61)		466(548) → 20(10) ↓ ; 12(28) 0(0)		0(0) → 0(0) → 0(0) ↓ ; 0(0) 0(0) 0(0)		0(0) → 446(548) →

LEGEND:

10(10) = AM(PM) PEAK HOUR INTERSECTION VOLUMES

10.0 = VEHICLES PER DAY (1000'S)

NOM = NOMINAL, LESS THAN 50 VEHICLES PER DAY

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URBAN CROSSROADS

Table 4-3

Land Use Summary of Cumulative Development Projects

TAZ	Project Name	Land Use[1]	Quantity	Units[2]
1	CUP 12-04	Religious Facility Addition	0.714	TSF
2	CUP 12-06	Commercial Retail	9.180	TSF
		Fast Food w/ Drive Thru	2.400	TSF
3	CUP 12-12	K-6 Charter School	300	STU
4	CUP 12-13	Auditorium, Community Center	20.000	TSF
5	CUP 12-14	Discount Store	9.026	TSF
6	CUP 12-20	Discount Store	10.500	TSF
7	CUP 12-22	Auditorium, Banquet Hall	5.233	TSF
		Restaurant	0.800	TSF
8	CUP 13-01	Discount Store	26.907	TSF
9	CUP 13-07	Discount Store	12.500	TSF
10	CUP 13-14	Gas Station w/ Convenience Market	2.789	TSF
11	DP2 12-02	Warehousing	345.802	TSF
12	DP2 12-03	Automobile Parts and Service Center	24.953	TSF
13	DP2 12-09	Industrial Park	1,789.990	TSF
14	DP2 12-10	General Light Industrial	480.570	TSF
15	DP2 12-14	General Light Industrial	871.900	TSF
16	DP2 12-18	Automobile Dealership	30.300	TSF
17	DP-D13-01	Shipping Container Storage Yard	12	AC
18	DP-D13-02	Discount Store	12.406	TSF
19	DP-D13-05	Commercial Retail	9.180	TSF
20	Spring Trails Specific Plan	SFDR	304	DU
21	Soil Safe Land Improvement Project	Soil Safe Project	19	AC
22	Education/Office Building	General Office	114.071	TSF
23	Pacific Rail - Metal Shredder	Metal Shredder	1	MS
24	Steel Road/Santa Ana	Industrial Park	159.276	TSF
25	National Orange Show Industrial	High-Cube Warehouse	616.000	TSF
		General Light Industrial	57.750	TSF
		Warehousing	78.960	TSF
26	Alliance California Gateway South	High-Cube Warehouse	1199.360	TSF

[1] SFDR = Single Family Detached Residential

[2] DU = Dwelling Units; TSF = Thousand Square Feet; STU = Students; AC = Acres; MS = Metal Shredder

- EAC (2017)
  - Existing 2015 PCE volumes
  - Ambient growth traffic (6.09%)
  - Cumulative Development Traffic
- EAPC (2017)
  - Existing 2015 PCE volumes
  - Ambient growth traffic (6.09%)
  - Cumulative Development traffic
  - Project Traffic

4.9 HORIZON YEAR (2040) VOLUME DEVELOPMENT

Traffic projections for Horizon Year (2040) Without Project conditions were derived from the SBTAM using accepted procedures for model forecast refinement and smoothing. The traffic forecasts reflect the area-wide growth anticipated between Existing conditions and Horizon Year traffic conditions. In most instances the traffic model zone structure is not designed to provide accurate turning movements along arterial roadways unless refinement and reasonableness checking is performed. Therefore, the Horizon Year peak hour forecasts were refined using the model derived long-range forecasts, base (validation) year model forecasts, along with existing peak hour traffic count data. The SBTAM has a base (validation) year of 2008 and a horizon (future forecast) year of 2035. The difference in model volumes (2035-2008) defines the growth in traffic over the 27-year period.

The refined future peak hour approach and departure volumes obtained from the model output data are then entered into a spreadsheet program consistent with the National Cooperative Highway Research Program (NCHRP Report 255), along with initial estimates of turning movement proportions. A linear programming algorithm is used to calculate individual turning movements which match the known directional roadway segment forecast volumes computed in the previous step. This program computes a likely set of intersection turning movements from intersection approach counts and the initial turning proportions from each approach leg.

The future Horizon Year peak hour turning movements were then reviewed by Urban Crossroads, Inc. for reasonableness, and in some cases, were adjusted to achieve reasonable growth for 2040 by applying a factor of 5.33 (1.04 percent compounded over 5 years) based on the SCAG RTP, and reasonable diversion between parallel routes. The result of this traffic forecasting procedure is a series of traffic volumes which are suitable for traffic operations analysis.

The Project only traffic forecasts have been generated by applying the trip generation, distribution and traffic assignment calculations. Project traffic volumes were then added to the refined future year volumes to determine Horizon Year (2040) With Project traffic conditions. Flow conservation checks and forecast adjustments were performed as necessary to ensure that all future traffic volume forecasts are reasonable and to ensure the flow of traffic volumes between closely spaced intersections is maintained. In order words, traffic flow between two closely spaced intersections, such as two freeway ramp locations, is verified in order to make certain that vehicles leaving one intersection are entering the adjacent intersection and that

there are no unexplained loss of vehicles. The result of this traffic forecasting procedure is a series of traffic volumes which are suitable for traffic operations analysis.

Post-processing worksheets for Horizon Year (2040) with Project traffic conditions are provided in Appendix 4.2.

5 EXISTING PLUS PROJECT TRAFFIC CONDITIONS

This section discusses the traffic forecasts for Existing plus Project (E+P) conditions and the resulting intersection operations, freeway mainline operations, and traffic signal warrant analyses for each phase of development.

5.1 ROADWAY IMPROVEMENTS

The lane configurations and traffic controls assumed to be in place for E+P conditions are consistent with those shown previously on Exhibit 3-1, with the exception of the Project driveways and those facilities assumed to be in place prior to or constructed by the Project to provide site access are also assumed to be in place for E+P conditions.

5.2 EXISTING PLUS PROJECT TRAFFIC VOLUME FORECASTS

This scenario includes Existing traffic volumes plus Project traffic. Exhibit 5-1 shows the weekday ADT and peak hour volumes which can be expected for E+P traffic conditions.

5.3 INTERSECTION OPERATIONS ANALYSIS

E+P peak hour traffic operations have been evaluated for the study area intersections based on the analysis methodologies presented in Section 2 *Methodologies* of this TIA.

The intersection analysis results are summarized in Table 5-1 and shown on Exhibit 5-2, which indicates that there are no study area intersections are anticipated to operate at unacceptable LOS for E+P conditions.

The intersection operations analysis worksheets for E+P traffic conditions are included in Appendix 5.1 of this TIA.

5.4 TRAFFIC SIGNAL WARRANTS ANALYSIS

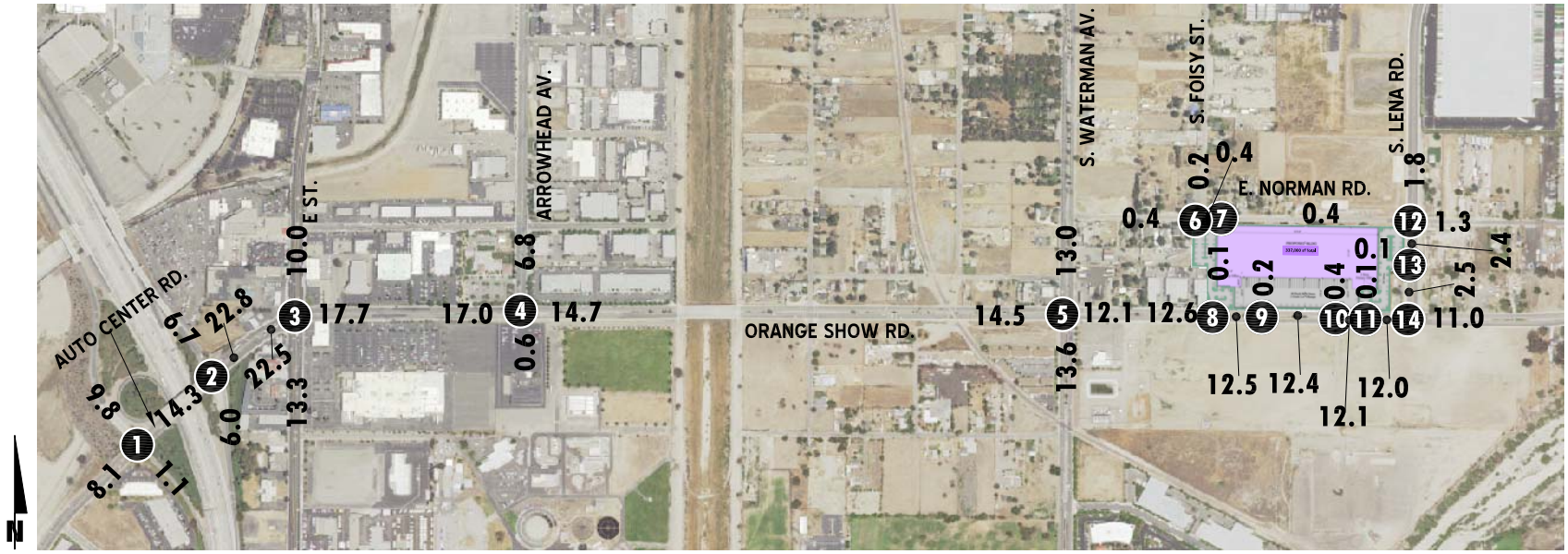
There are no traffic signals anticipated to meet peak hour volume based or planning level (Caltrans) ADT traffic signal warrants with the addition of Project traffic (see Appendix 5.2).

5.5 OFF-RAMP QUEUING ANALYSIS

A queuing analysis was performed for the off-ramps at the I-215 Freeway and Auto Center Road interchange to assess vehicle queues for the off ramps that may potentially result in deficient peak hour operations at the ramp-to-arterial intersections and may potentially “spill back” onto the I-215 Freeway mainline. Queuing analysis findings are presented in Table 5-2 for E+P traffic conditions. It is important to note that off-ramp lengths are consistent with the measured distance between the intersection and the freeway mainline.

As shown on Table 5-2, consistent with Existing traffic conditions, there are no movements that are anticipated to experience queuing issues during the weekday AM or weekday PM peak 95th

EXHIBIT 5-1: E+P TRAFFIC VOLUMES (IN PCE)



1 I-215 SB Ramps & Auto Center Rd.	2 I-215 NB Ramps & Auto Center Rd.	3 "E"St. & Auto Center/ Orange Show Rd.	4 Arrowhead Av. & Orange Show Rd.	5 S. Waterman Av. & Orange Show Rd.	6 S. Foisy St. & E. Norman Rd.	7 Driveway 1 & E. Norman Rd.
258(170) 39(45) 1043(648)		59(267) 139(299) 58(140)	198(348) 9(7) 85(164)	85(113) 525(718) 58(101)	8(4) 8(7)	
249(449) 261(409)	236(704) 360(768)	37(95) 396(786) 90(201)	100(120) 305(670) 5(11)	48(60) 277(487) 93(84)	59(4) 9(15)	67(16) 0(0)
132(412) 29(108)	49(188) 1124(872)	196(196) 1138(988) 537(417)	280(266) 867(968) 8(8)	183(190) 432(782) 276(162)	62(6) 13(27)	14(31) 7(3)
	150(89) 3(8) 777(709)	100(368) 111(358) 66(159)	0(23) 1(18) 1(19)	72(199) 574(576) 65(82)		1(3) 0(1)

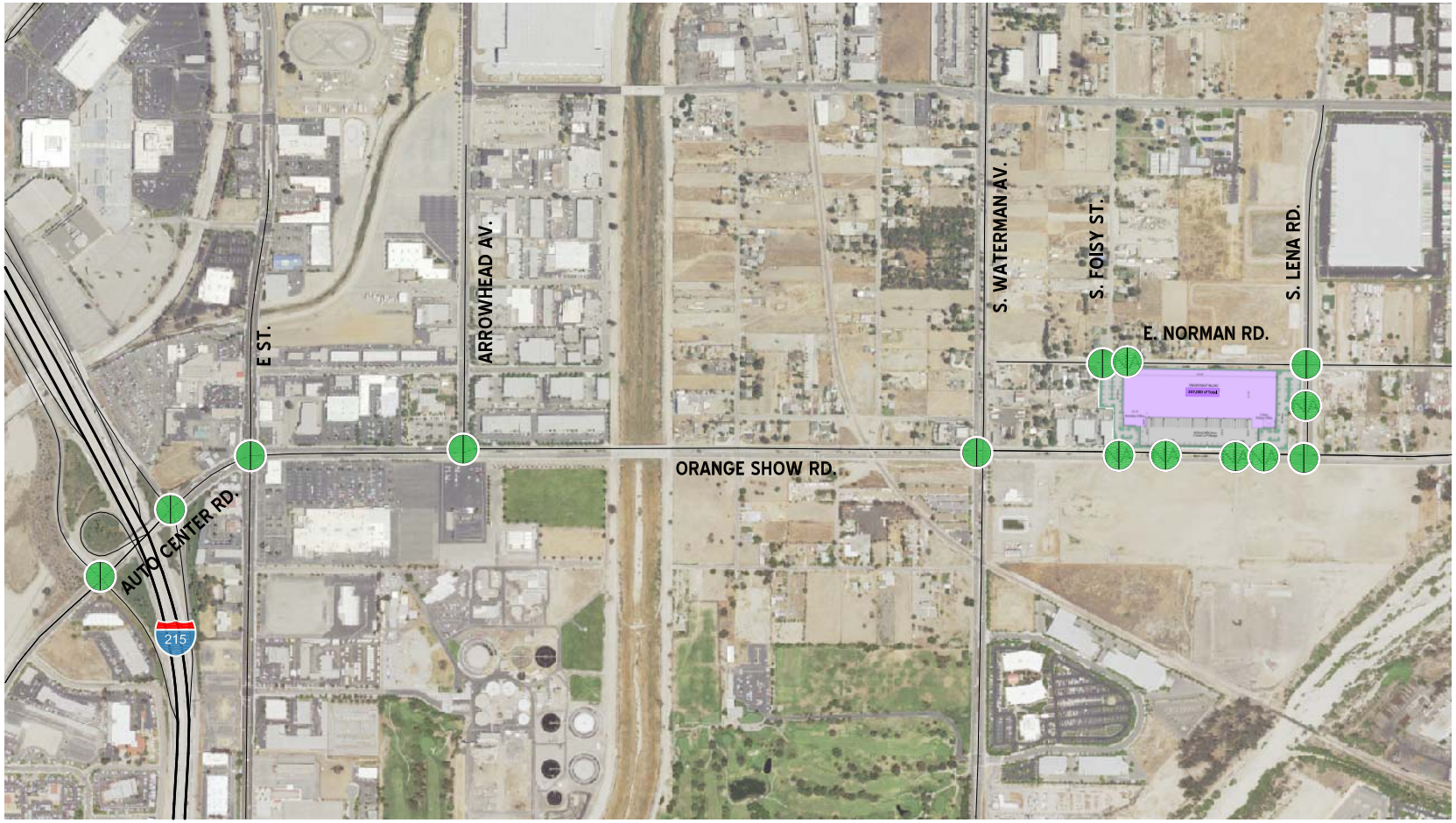
8 Driveway 2 & Orange Show Rd.	9 Driveway 3 & Orange Show Rd.	10 Driveway 4 & Orange Show Rd.	11 Driveway 5 & Orange Show Rd.	12 S. Lena Rd. & E. Norman Rd.	13 S. Lena Rd.& Driveway 6	14 S. Lena Rd. & Orange Show Rd.
3(7)	4(13)	4(13) 0(0)	3(7)	33(8) 116(102) 0(14)	1(0) 136(135)	118(116) 19(21)
3(1) 425(657)	2(1) 424(645)	2(1) 422(634)	3(1) 421(629)	3(9) 8(10) 14(28)		29(79) 306(515)
589(990)	589(990)	15(10) 574(980)	574(980)	0(7) 7(21) 7(6)	0(1) 1(1)	97(116) 477(864)
				24(2) 82(101) 13(91)	5(2) 121(193)	

LEGEND:

10(10) = AM(PM) PEAK HOUR INTERSECTION VOLUMES

10.0 = VEHICLES PER DAY (1000'S)

EXHIBIT 5-2: SUMMARY OF PEAK HOUR INTERSECTION LOS FOR E+P (2015) CONDITIONS



LEGEND:

- = AM PEAK HOUR ACCEPTABLE LOS
- = AM PEAK HOUR DEFICIENT LOS
- = PM PEAK HOUR ACCEPTABLE LOS
- = PM PEAK HOUR DEFICIENT LOS

N

Table 5-1

Intersection Analysis for E+P Conditions

#	Intersection	Traffic Control[2]	Existing (2015) Delay[1] (secs.) AM	Existing (2015) Delay[1] (secs.) PM	Existing (2015) LOS AM	Existing (2015) LOS PM	Existing (2015) Average v/c[3, 7] AM	Existing (2015) Average v/c[3, 7] PM	E+P Delay[1] (secs.) AM	E+P Delay[1] (secs.) PM	E+P LOS AM	E+P LOS PM	E+P Average v/c[3, 7] AM	E+P Average v/c[3, 7] PM	Δ v/c Difference AM	Δ v/c Difference PM	Significant Impact?[6]
1	I-215 SB Ramps / Auto Center Rd.	TS	29.3	13.3	C	B	0.61	--	29.6	14.4	C	B	0.65	--	0.04	--	No
2	I-215 NB Ramps / Auto Center Rd.	TS	15.1	13.0	B	B	--	--	15.2	18.7	B	B	--	--	--	--	No
3	E St. / Auto Center Rd. / Orange Show Rd.[4, 5]	TS	23.2	36.2	C	D	0.63	0.81	20.4	39.2	C	D	0.64	0.82	0.01	0.01	No
4	Arrowhead Av. / Orange Show Rd.	TS	23.5	29.3	C	C	0.40	0.53	25.3	29.7	C	C	0.42	0.54	0.02	0.01	No
5	S. Waterman Av. / Orange Show Rd.	TS	33.2	39.9	C	D	0.64	0.79	34.3	40.1	C	D	0.64	0.81	0.00	0.02	No
6	S. Foisy St. / E. Norman Rd.	CSS	9.1	8.7	A	A	--	--	9.2	8.7	A	A	--	--	--	--	No
7	Driveway 1 / E. Norman Rd.	**CSS**	Does Not Exist				--	--	9.2	8.9	A	A	--	--	--	--	No
8	Driveway 2 / Orange Show Rd.	**CSS**	Does Not Exist				--	--	9.7	10.7	A	B	--	--	--	--	No
9	Driveway 3 / Orange Show Rd.	**CSS**	Does Not Exist				--	--	9.7	10.7	A	B	--	--	--	--	No
10	Driveway 4 / Orange Show Rd.	**CSS**	Does Not Exist				--	--	9.6	10.6	A	B	--	--	--	--	No
11	Driveway 5 / Orange Show Rd.	**CSS**	Does Not Exist				--	--	9.6	10.5	A	B	--	--	--	--	No
12	S. Lena Rd. / E. Norman Rd.	AWS	8.4	8.6	A	A	--	--	8.4	8.6	A	A	--	--	--	--	No
13	S. Lena Rd. / Driveway 6	**CSS**	Does Not Exist				--	--	8.7	9.3	A	A	--	--	--	--	No
14	S. Lena Rd. / Orange Show Rd.	CSS	13.8	19.5	B	C	--	0.35	14.1	19.8	B	C	--	0.35	--	0.00	No

1 Per the 2010 Highway Capacity Manual, overall average intersection delay and level of service are shown for intersections with a traffic signal or all-way stop control. For intersections with cross street stop control, the delay and level of service for the worst individual movement (or movements sharing a single lane) are shown.

2 CSS = Cross-street Stop; AWS = All Way Stop; TS = Traffic Signal; **CSS** = Improvement

3 Volume to capacity ratio has been reported using the HCM 2000 methodology (as HCM 2010 does not report the overall v/c) for intersections operating at LOS C or worse, consistent with the City of San Bernardino Traffic Impact Study Guidelines.

4 Although there is a second northbound left turn lane, the analysis has been performed assuming a single left as vehicles headed onto the I-215 Northbound often block the inner left turn lane. As a result, the inner left turn lane does not get adequately utilized each cycle.

5 Field observations indicate that during the AM peak hour, one of the two eastbound left turn lanes were coned off and not utilized. The cones were no longer present during the PM peak hour. As such, analysis was performed assuming a single eastbound left turn lane during the AM peak hour under Existing (2015) conditions.

6 Significant impact has been identified if the change in v/c exceeds the applicable thresholds per the City of San Bernardino Traffic Impact Study Guidelines

7 The TIA Guidelines have significance criteria based on v/c difference for LOS C or worse. As such,v/c ratios and difference in v/c have not been reported for LOS "A" or LOS "B".

Table 5-2

Peak Hour Freeway Off-Ramp Queuing Summary for E+P Conditions

Intersection	Movement	Available Stacking Distance (Feet)	Existing (2015)				E+P			
			95th Percentile Queue (Feet)		Acceptable?[1]		95th Percentile Queue (Feet)		Acceptable?[1]	
			AM Peak	PM Peak	AM	PM	AM Peak	PM Peak	AM	PM
I-215 SB Off-Ramp / Auto Center Rd.	SBL	2,695	517 [2]	193	Yes	Yes	521 [2]	194	Yes	Yes
	SBL/T	2,230	432 [2]	181	Yes	Yes	439 [2]	182	Yes	Yes
	SBR	465	29	33	Yes	Yes	29	33	Yes	Yes
I-215 NB Off-Ramp / Auto Center Rd.	NBL	925	54	41	Yes	Yes	54	41	Yes	Yes
	NBL/T	1,050	51	39	Yes	Yes	51	39	Yes	Yes
	NBR	275	178	129	Yes	Yes	180	131	Yes	Yes

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

[2] 95th percentile volume exceeds capacity, queue may be longer

percentile traffic flows for E+P traffic conditions. Worksheets for E+P traffic conditions off-ramp queuing analysis are provided in Appendix 5.3.

5.6 RECOMMENDED IMPROVEMENTS

No improvement strategies have been recommended as there are no intersections that are anticipated to operate at an unacceptable LOS under E+P conditions.

6 EA (2017) AND EAP (2017) TRAFFIC CONDITIONS

This section discusses the traffic forecasts for EA (2017) and EAP (2017) conditions and the resulting intersection operations, traffic signal warrant, and freeway mainline operations analyses.

6.1 ROADWAY IMPROVEMENTS

The lane configurations and traffic controls assumed to be in place for EA (2017) and EAP (2017) conditions are consistent with those shown previously on Exhibit 3-1, with the exception of the Project driveways and those facilities assumed to be in place prior to or constructed by the Project to provide site access are also assumed to be in place for EAP (2017) conditions.

6.2 EA (2017) TRAFFIC VOLUME FORECASTS

This scenario includes Existing traffic volumes plus an ambient growth factor of 6.09%. The weekday ADT, weekday AM, and PM peak hour volumes which can be expected for EA (2017) traffic conditions are shown on Exhibit 6-1.

6.3 EAP (2017) TRAFFIC VOLUME FORECASTS

This scenario includes Existing traffic volumes plus an ambient growth factor of 6.09% and the addition of Project traffic. The weekday ADT, weekday AM, and PM peak hour volumes which can be expected for EAP (2017) traffic conditions are shown on Exhibit 6-2.

6.4 INTERSECTION OPERATIONS ANALYSIS

EA and EAP (2017) peak hour traffic operations have been evaluated for the study area intersections based on the analysis methodologies presented in Section 2 *Methodologies* of this TIA. The intersection analysis results are summarized in Table 6-1 for both EA and EAP (2017) conditions.

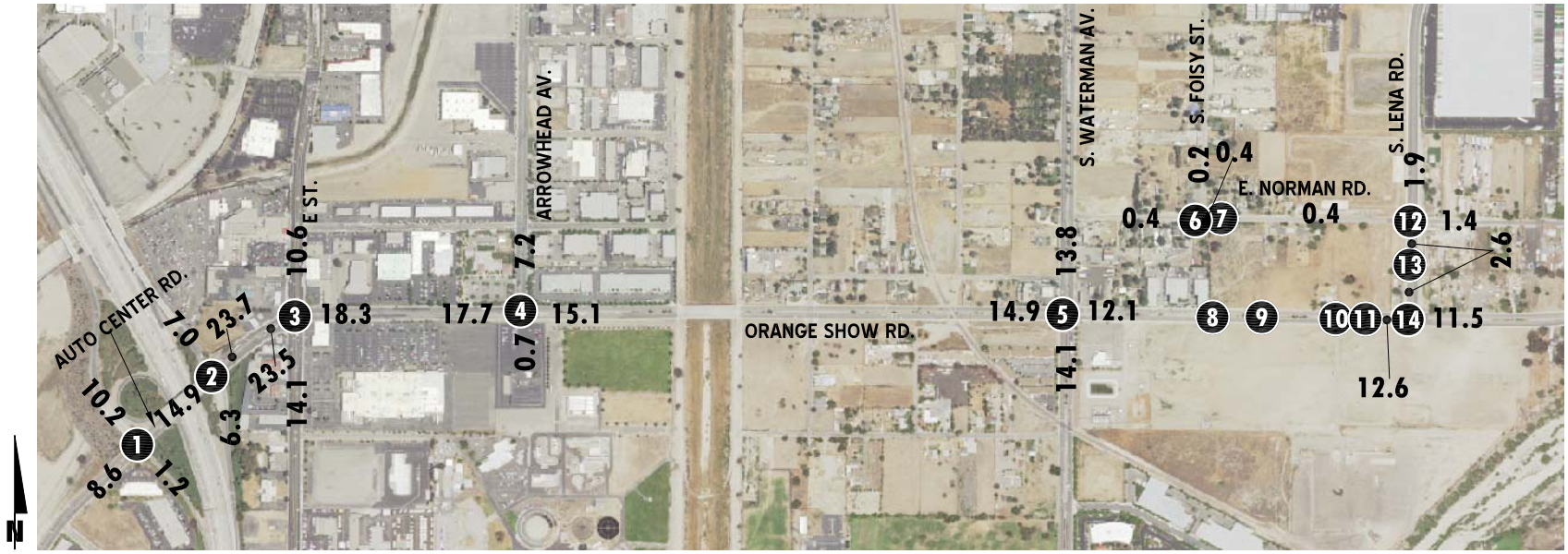
6.4.1 EA (2017) CONDITIONS

All study area intersections are anticipated to continue to operate at acceptable levels of service with the application of a 6.09% ambient growth factor on existing traffic forecasts. Consistent with Table 6-1, a summary of the peak hour intersection LOS for EA (2017) conditions are shown on Exhibit 6-3. The intersection operations analysis worksheets for EA (2017) traffic conditions are included in Appendix 6.1 of this TIA.

6.4.2 EAP (2017) CONDITIONS

All study area intersections are anticipated to continue to operate at acceptable levels of service with the addition of Project traffic, consistent with EA (2017) traffic conditions. Consistent with Table 6-1, a summary of the peak hour intersection LOS for EAP (2017) conditions are shown on Exhibit 6-4. The intersection operations analysis worksheets for EAP (2017) traffic conditions are included in Appendix 6.2 of this TIA.

EXHIBIT 6-1: EA (2017) TRAFFIC VOLUMES (IN PCE)



1 I-215 SB Ramps & Auto Center Rd.	2 I-215 NB Ramps & Auto Center Rd.	3 "E"St. & Auto Center/ Orange Show Rd.	4 Arrowhead Av. & Orange Show Rd.	5 S. Waterman Av. & Orange Show Rd.	6 S. Foisy St. & E. Norman Rd.	7 Driveway 1 & E. Norman Rd.
274(180) 41(48) 1098(683) 259(464) 277(432) 138(437) 31(115)	247(737) 377(802) 52(199) 1184(920) 159(94) 3(8) 815(747)	63(283) 147(317) 60(149) 39(100) 411(811) 95(213) 207(208) 1190(1038) 569(442) 106(390) 117(380) 69(168)	210(369) 10(7) 90(174) 106(127) 315(687) 5(12) 297(282) 901(1017) 8(8) 0(24) 1(19) 1(20)	90(119) 557(760) 62(107) 50(64) 285(494) 92(71) 188(199) 445(822) 292(172) 76(211) 606(610) 60(83)	8(4) 8(7) 63(4) 8(13) 65(6) 6(25)	Intersection Does Not Exist

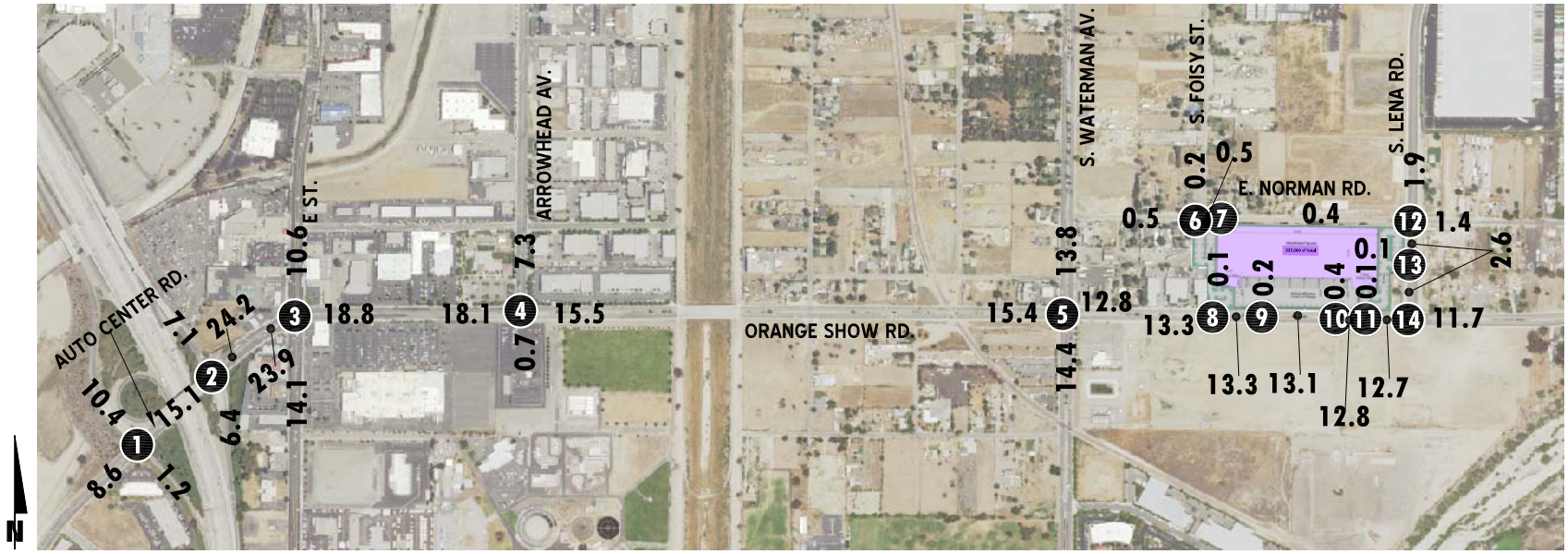
8 Driveway 2 & Orange Show Rd.	9 Driveway 3 & Orange Show Rd.	10 Driveway 4 & Orange Show Rd.	11 Driveway 5 & Orange Show Rd.	12 S. Lena Rd. & E. Norman Rd.	13 S. Lena Rd.& Driveway 6	14 S. Lena Rd. & Orange Show Rd.
Intersection Does Not Exist	Intersection Does Not Exist	Intersection Does Not Exist	Intersection Does Not Exist	34(8) 123(108) 0(15) 3(10) 8(11) 14(29) 0(7) 7(22) 7(5) 25(2) 87(106) 14(97)	Intersection Does Not Exist	125(123) 19(20) 31(84) 313(541) 98(121) 506(917)

LEGEND:

10(10) = AM(PM) PEAK HOUR INTERSECTION VOLUMES

10.0 = VEHICLES PER DAY (1000'S)

EXHIBIT 6-2: EAP (2017) TRAFFIC VOLUMES (IN PCE)



1 I-215 SB Ramps & Auto Center Rd.	2 I-215 NB Ramps & Auto Center Rd.	3 "E"St. & Auto Center/ Orange Show Rd.	4 Arrowhead Av. & Orange Show Rd.	5 S. Waterman Av. & Orange Show Rd.	6 S. Foisy St. & E. Norman Rd.	7 Driveway 1 & E. Norman Rd.
274(180) 41(48) 1106(687) → ; ← 263(476) ← 277(433)	← 250(746) ← 381(814)	63(283) 147(317) 61(149) → ; ← 39(101) ← 419(832) ← 95(213)	210(369) 10(7) 90(174) → ; ← 106(127) ← 323(709) ← 5(12)	90(120) 557(761) 62(107) → ; ← 50(64) ← 293(515) ← 98(88)	8(4) 8(7) → ; ← 63(4) ← 9(16)	← 71(17) ← 0(0)
139(437) → 31(115) ↓	52(199) → 1192(924) → ; 159(94) ↑ 3(8) ↑ 823(752) ↱	207(208) → 1206(1047) → 569(442) ↳ ; 106(390) ↑ 117(380) ↑ 69(168) ↱	297(282) → 918(1026) → 8(8) ↳ ; 0(24) ↑ 1(19) ↑ 1(20) ↱	193(201) → 458(829) → 292(172) ↳ ; 76(211) ↑ 608(611) ↑ 68(87) ↱	65(6) → 13(28) →	15(32) → 7(3) ↳ ; 1(3) ↑ 0(1) ↱

8 Driveway 2 & Orange Show Rd.	9 Driveway 3 & Orange Show Rd.	10 Driveway 4 & Orange Show Rd.	11 Driveway 5 & Orange Show Rd.	12 S. Lena Rd. & E. Norman Rd.	13 S. Lena Rd.& Driveway 6	14 S. Lena Rd. & Orange Show Rd.
3(7) → ; ← 3(1) ← 450(695)	4(13) → ; ← 2(1) ← 449(683)	4(13) 0(0) → ; ← 2(1) ← 447(672)	3(7) → ; ← 3(1) ← 446(667)	35(8) 123(108) 0(15) → ; ← 3(10) ← 8(11) ← 14(29)	1(0) 144(143) → ; ← 5(2) ← 128(205)	125(123) 20(22) → ; ← 31(84) ← 323(546)
623(1050) →	623(1050) →	15(10) → 608(1040) →	608(1040) →	0(7) → 7(22) → 7(6) ↳ ; 25(2) ↑ 87(107) ↑ 14(97) ↱	0(1) → 1(1) ↳	103(123) → 506(917) →

LEGEND:

10(10) = AM(PM) PEAK HOUR INTERSECTION VOLUMES

10.0 = VEHICLES PER DAY (1000'S)

NOM = NOMINAL, LESS THAN 50 VEHICLES PER DAY

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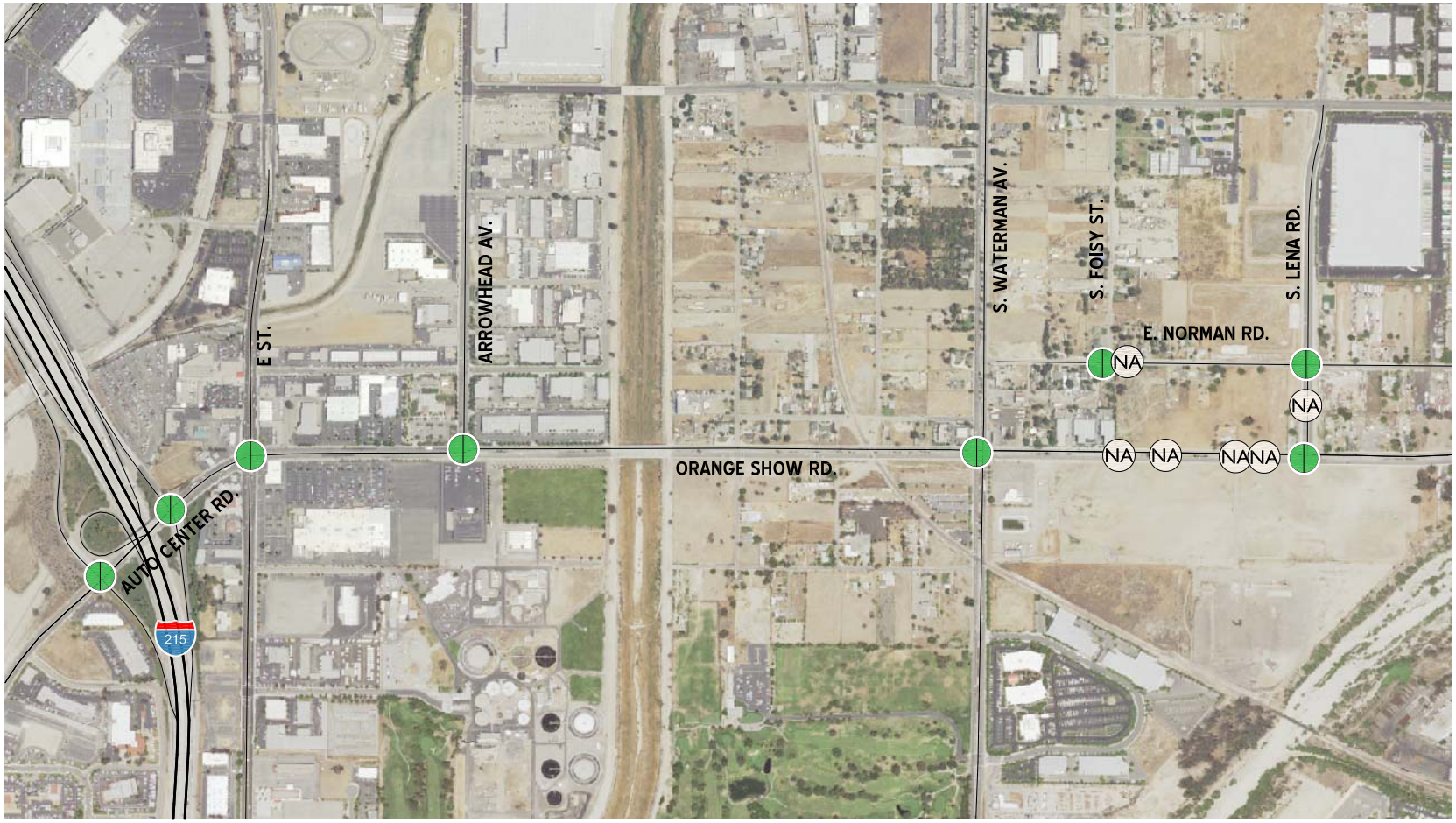
URBAN CROSSROADS

EXHIBIT 6-3: SUMMARY OF PEAK HOUR INTERSECTION LOS FOR EA (2017) CONDITIONS

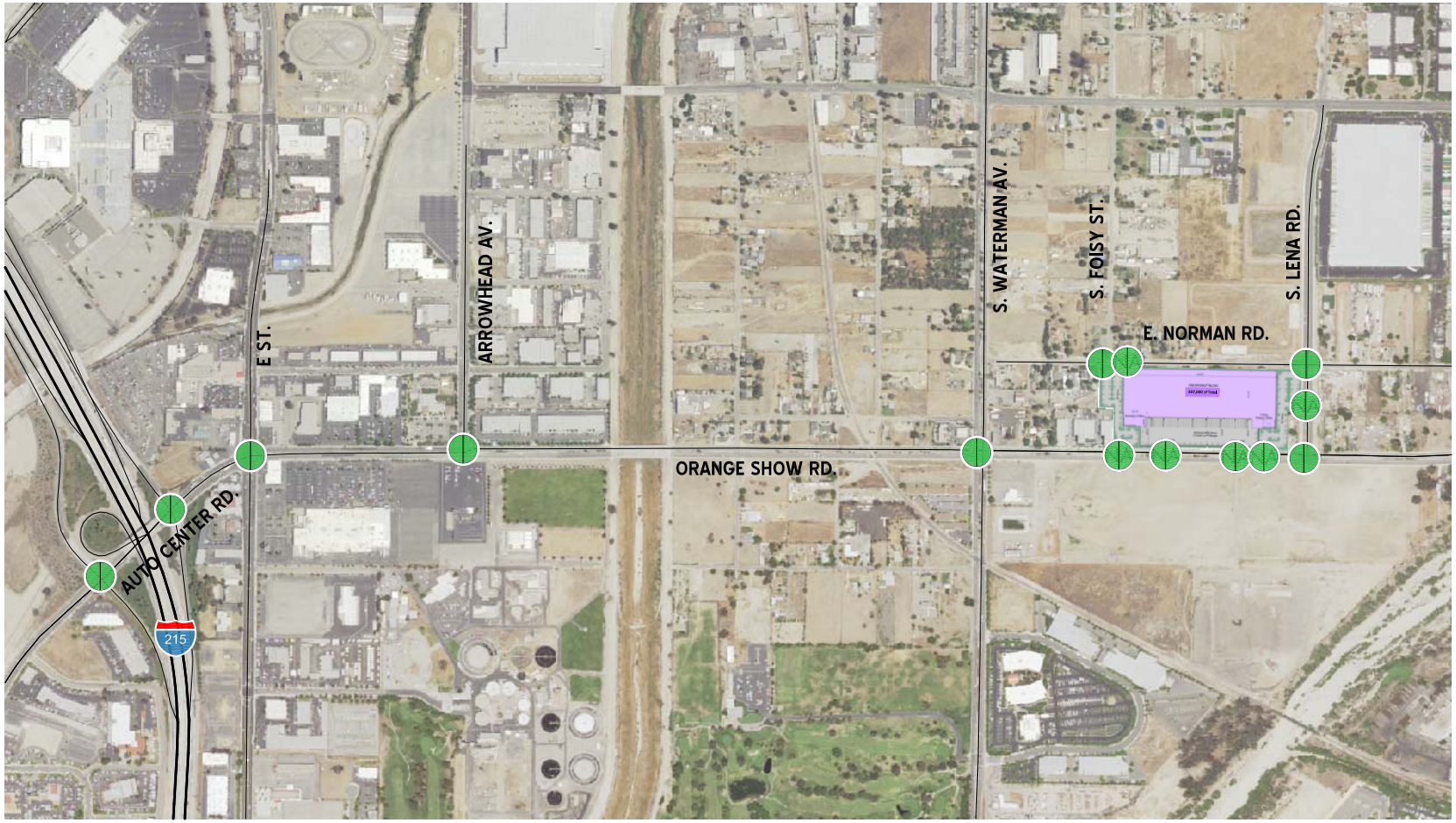


LEGEND:

- = AM PEAK HOUR ACCEPTABLE LOS
- = AM PEAK HOUR DEFICIENT LOS
- = PM PEAK HOUR ACCEPTABLE LOS
- = PM PEAK HOUR DEFICIENT LOS
- (NA) = NOT AN ANALYSIS LOCATION FOR THIS SCENARIO

N

EXHIBIT 6-4: SUMMARY OF PEAK HOUR INTERSECTION LOS FOR EAP (2017) CONDITIONS



LEGEND:

- = AM PEAK HOUR ACCEPTABLE LOS
- = AM PEAK HOUR DEFICIENT LOS
- = PM PEAK HOUR ACCEPTABLE LOS
- = PM PEAK HOUR DEFICIENT LOS

N

Table 6-1

Intersection Analysis for EA and EAP (2017) Conditions

#	Intersection	Traffic Control[2]	EA (2017) Delay[1] (secs.) AM	EA (2017) Delay[1] (secs.) PM	EA (2017) LOS AM	EA (2017) LOS PM	EA (2017) Average v/c[3, 6] AM	EA (2017) Average v/c[3, 6] PM	EAP (2017) Delay[1] (secs.) AM	EAP (2017) Delay[1] (secs.) PM	EAP (2017) LOS AM	EAP (2017) LOS PM	EAP (2017) Average v/c[3, 6] AM	EAP (2017) Average v/c[3, 6] PM	Δ v/c Difference AM	Δ v/c Difference PM	Significant Impact?[5]
1	I-215 SB Ramps / Auto Center Rd.	TS	31.2	13.6	C	B	0.65	--	31.5	13.6	C	B	0.69	--	0.04	--	No
2	I-215 NB Ramps / Auto Center Rd.	TS	16.2	17.9	B	B	--	--	17.8	17.8	B	B	--	--	--	--	No
3	E St. / Auto Center Rd. / Orange Show Rd.[4]	TS	23.4	38.3	C	D	0.66	0.86	25.3	41.7	C	D	0.67	0.87	0.01	0.01	No
4	Arrowhead Av. / Orange Show Rd.	TS	23.7	29.7	C	C	0.42	0.56	25.2	33.8	C	C	0.44	0.57	0.02	0.01	No
5	S. Waterman Av. / Orange Show Rd.	TS	34.1	41.5	C	D	0.67	0.84	35.0	41.9	C	D	0.67	0.86	0.00	0.02	No
6	S. Foisy St. / E. Norman Rd.	CSS	9.2	8.7	A	A	--	--	9.2	8.7	A	A	--	--	--	--	No
7	Driveway 1 / E. Norman Rd.	**CSS**	Does Not Exist				--	--	9.2	8.9	A	A	--	--	--	--	No
8	Driveway 2 / Orange Show Rd.	**CSS**	Does Not Exist				--	--	9.8	10.8	A	B	--	--	--	--	No
9	Driveway 3 / Orange Show Rd.	**CSS**	Does Not Exist				--	--	9.8	10.8	A	B	--	--	--	--	No
10	Driveway 4 / Orange Show Rd.	**CSS**	Does Not Exist				--	--	9.7	10.8	A	B	--	--	--	--	No
11	Driveway 5 / Orange Show Rd.	**CSS**	Does Not Exist				--	--	9.7	10.7	A	B	--	--	--	--	No
12	S. Lena Rd. / E. Norman Rd.	AWS	8.4	8.7	A	A	--	--	8.5	8.7	A	A	--	--	--	--	No
13	S. Lena Rd. / Driveway 6	**CSS**	Does Not Exist				--	--	8.7	9.4	A	A	--	--	--	--	No
14	S. Lena Rd. / Orange Show Rd.	CSS	14.3	20.9	B	C	--	0.37	14.6	21.2	B	C	--	0.37	--	0.00	No

1 Per the 2010 Highway Capacity Manual, overall average intersection delay and level of service are shown for intersections with a traffic signal or all-way stop control. For intersections with cross street stop control, the delay and level of service for the worst individual movement (or movements sharing a single lane) are shown.

2 CSS = Cross-street Stop; AWS = All Way Stop; TS = Traffic Signal; **CSS** = Improvement

3 Volume to capacity ratio has been reported using the HCM 2000 methodology (as HCM 2010 does not report the overall v/c) for intersections operating at LOS C or worse, consistent with the City of San Bernardino Traffic Impact Study Guidelines.

4 Although there is a second northbound left turn lane, the analysis has been performed assuming a single left as vehicles headed onto the I-215 Northbound often block the inner left turn lane. As a result, the inner left turn lane does not get adequately utilized each cycle.

5 Significant impact has been identified if the change in v/c exceeds the applicable thresholds per the City of San Bernardino Traffic Impact Study Guidelines

6 The TIA Guidelines have significance criteria based on v/c difference for LOS C or worse. As such,v/c ratios and difference in v/c have not been reported for LOS "A" or LOS "B".

6.5 TRAFFIC SIGNAL WARRANTS ANALYSIS

No additional study area intersections are anticipated to meet traffic signal warrants for either EA (2017) or EAP (2017) traffic conditions, in addition to those previously warranted under Existing traffic conditions (see Appendix 6.3 and 6.4).

6.6 OFF-RAMP QUEUING ANALYSIS

A queuing analysis was performed for the off-ramps at the I-215 Freeway at the Auto Center Drive interchanges to assess vehicle queues for the off ramps that may potentially result in deficient peak hour operations at the ramp-to-arterial intersections and may potentially "spill back" onto the I-215 Freeway mainline. Queuing analysis findings are presented in Table 6-2 for EA (2017) and EAP (2017) traffic conditions. It is important to note that off-ramp lengths are consistent with the measured distance between the intersection and the freeway mainline. As shown on Table 6-2, there are no movements that are anticipated to experience queuing issues during the weekday AM or weekday PM peak 95th percentile traffic flows for either EA (2017) or EAP (2017) traffic conditions.

Worksheets for EA (2017) conditions off-ramp queuing analysis are provided in Appendix 6.5. Worksheets for EAP (2017) conditions off-ramp queuing analysis are provided in Appendix 6.6.

6.7 RECOMMENDED IMPROVEMENTS

No improvement strategies have been recommended as there are no intersections that are anticipated to operate at an unacceptable LOS under EA (2017) and EAP (2017) conditions.

Table 6-2

Peak Hour Freeway Off-Ramp Queuing Summary for EA and EAP (2017) Conditions

Intersection	Movement	Available Stacking Distance (Feet)	EA				EAP			
			95th Percentile Queue (Feet)		Acceptable?[1]		95th Percentile Queue (Feet)		Acceptable?[1]	
			AM Peak	PM Peak	AM	PM	AM Peak	PM Peak	AM	PM
I-215 SB Off-Ramp / Auto Center Rd.	SBL	2,695	565 [2]	208	Yes	Yes	569 [2]	209	Yes	Yes
	SBL/T	2,230	501 [2]	194	Yes	Yes	503 [2]	196	Yes	Yes
	SBR	465	29	35	Yes	Yes	29	35	Yes	Yes
I-215 NB Off-Ramp / Auto Center Rd.	NBL	925	58	42	Yes	Yes	58	42	Yes	Yes
	NBL/T	1,050	55	41	Yes	Yes	55	41	Yes	Yes
	NBR	275	197	150	Yes	Yes	206	152	Yes	Yes

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

[2] 95th percentile volume exceeds capacity, queue may be longer

7 EAC (2017) AND EAPC (2017) TRAFFIC CONDITIONS

This section discusses the traffic forecasts for EAC (2017) and EAPC (2017) conditions and the resulting intersection operations, traffic signal warrant, and freeway mainline operations analyses.

7.1 ROADWAY IMPROVEMENTS

The lane configurations and traffic controls assumed to be in place for EAC (2017) and EAPC (2017) conditions are consistent with those shown previously on Exhibit 3-1, with the exception of the following:

- Driveways and those facilities assumed to be constructed by cumulative developments to provide site access are also assumed to be in place for EAC (2017) and EAPC (2017) (e.g., intersection and roadway improvements along the cumulative development's frontages and driveways).
- Project driveways and those facilities assumed to be in place prior to or constructed by the Project to provide site access are also assumed to be in place for EAPC (2017) conditions.

7.2 EAC (2017) TRAFFIC VOLUME FORECASTS

This scenario includes Existing traffic volumes plus an ambient growth factor of 6.09% in conjunction with the addition of cumulative development traffic. The weekday ADT, weekday AM, and PM peak hour volumes which can be expected for EAC (2017) traffic conditions are shown on Exhibit 7-1.

7.3 EAPC (2017) TRAFFIC VOLUME FORECASTS

This scenario includes Existing traffic volumes plus an ambient growth factor of 6.09% in conjunction with the addition of cumulative project development and the addition of Project traffic. The weekday ADT, weekday AM, and PM peak hour volumes which can be expected for EAP (2017) traffic conditions are shown on Exhibit 7-2.

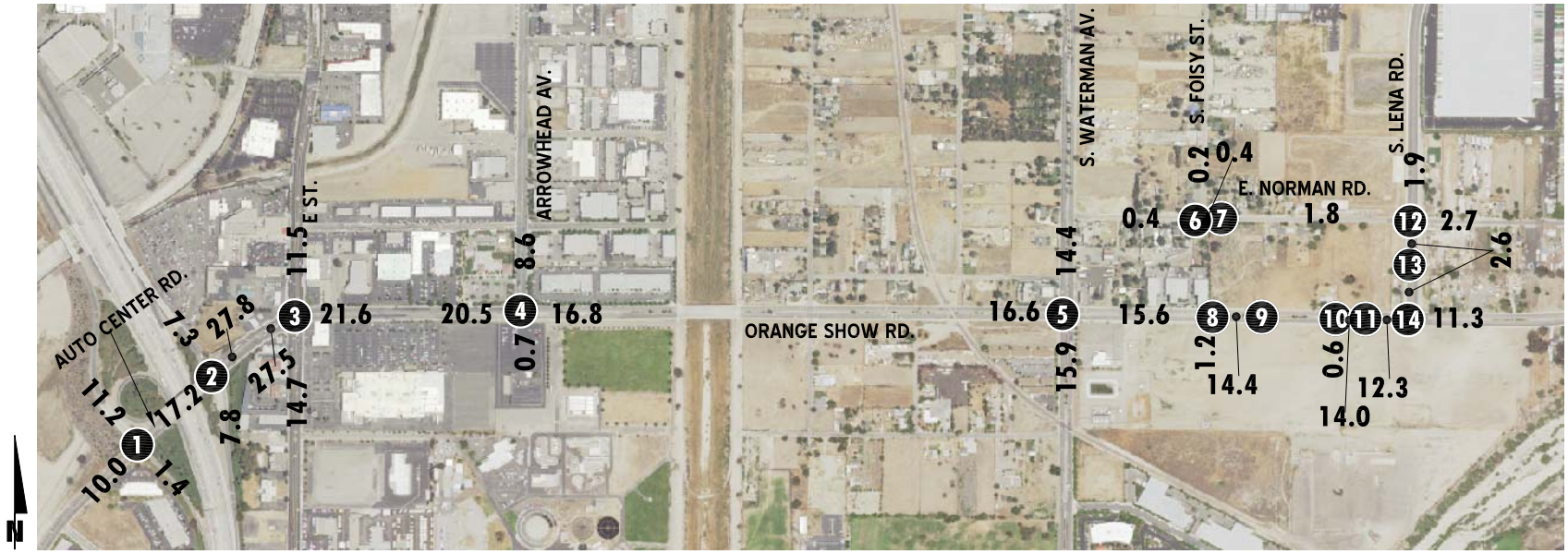
7.4 INTERSECTION OPERATIONS ANALYSIS

EAC and EAPC (2017) peak hour traffic operations have been evaluated for the study area intersections based on the analysis methodologies presented in Section 2 *Methodologies* of this TIA. The intersection analysis results are summarized in Table 7-1 for both EAC and EAPC (2017) conditions.

7.4.1 EAC (2017) CONDITIONS

All study area intersections are anticipated to continue to operate at acceptable levels of service with the application of a 6.09% ambient growth factor and the addition of cumulative development traffic on existing traffic forecasts. Consistent with Table 7-1, a summary of the peak hour intersection LOS for EAC (2017) conditions are shown on Exhibit 7-3. The intersection operations analysis worksheets for EAC (2017) traffic conditions are included in Appendix 7.1 of this TIA.

EXHIBIT 7-1: EAC (2017) TRAFFIC VOLUMES (IN PCE)



1 I-215 SB Ramps & Auto Center Rd.	2 I-215 NB Ramps & Auto Center Rd.	3 "E"St. & Auto Center/ Orange Show Rd.	4 Arrowhead Av. & Orange Show Rd.	5 S. Waterman Av. & Orange Show Rd.	6 S. Foisy St. & E. Norman Rd.	7 Driveway 1 & E. Norman Rd.
278(180) 41(48) 1139(703) 290(533) 306(525) 161(442) 33(125)	269(761) 414(961) 64(201) 1236(946) 183(97) 4(8) 997(866)	70(296) 154(332) 63(154) 41(110) 451(964) 97(219) 225(216) 1361(1123) 590(450) 110(393) 126(392) 74(169)	244(473) 9(8) 94(180) 113(133) 350(767) 5(11) 411(286) 997(1056) 8(8) 0(24) 1(19) 1(20)	92(123) 578(778) 66(112) 53(69) 320(577) 115(125) 192(204) 503(860) 299(173) 78(214) 615(633) 109(111)	8(4) 8(7) 63(4) 8(13) 65(6) 6(25)	Intersection Does Not Exist

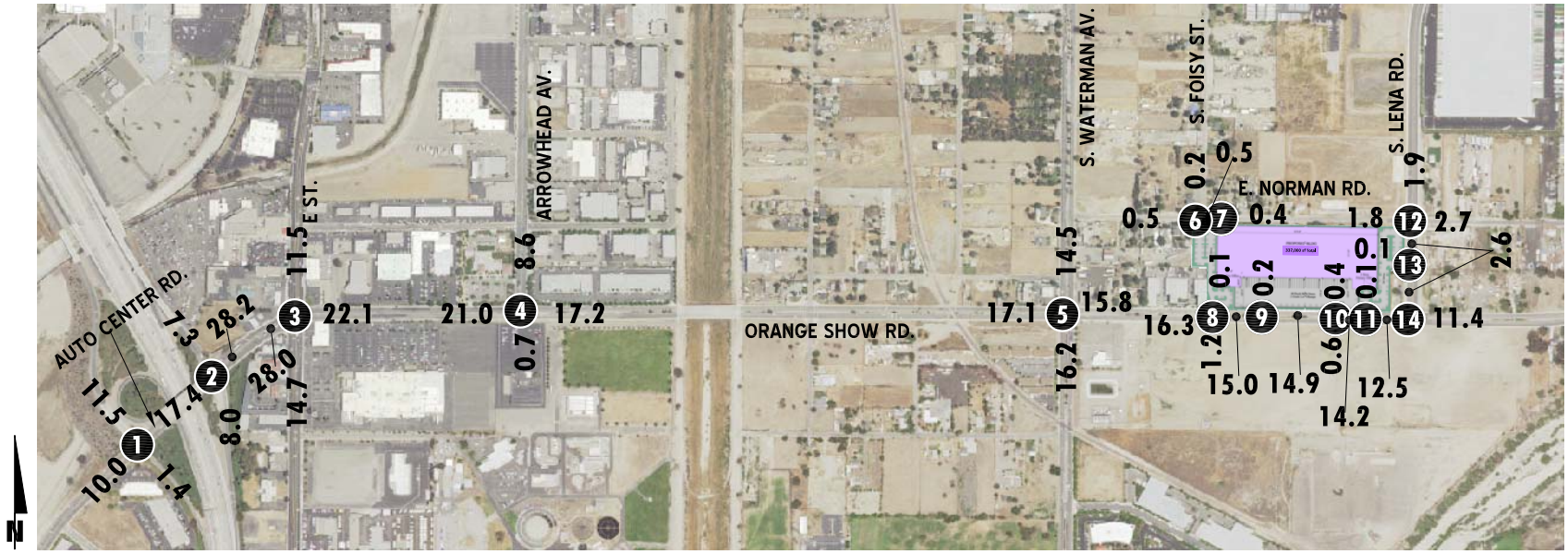
8 Driveway 2 & Orange Show Rd.	9 Driveway 3 & Orange Show Rd.	10 Driveway 4 & Orange Show Rd.	11 Driveway 5 & Orange Show Rd.	12 S. Lena Rd. & E. Norman Rd.	13 S. Lena Rd.& Driveway 6	14 S. Lena Rd. & Orange Show Rd.
481(740) 659(1071) 56(27) 25(61)	Intersection Does Not Exist	469(718) 5(2) 664(1122) 20(10) 12(28) 0(0)	Intersection Does Not Exist	34(8) 123(108) 0(15) 3(10) 8(11) 14(29) 0(7) 7(22) 7(5) 25(2) 87(106) 14(97)	Intersection Does Not Exist	125(123) 19(20) 31(84) 349(597) 98(121) 566(1001)

LEGEND:

10(10) = AM(PM) PEAK HOUR INTERSECTION VOLUMES

10.0 = VEHICLES PER DAY (1000'S)

EXHIBIT 7-2: EAPC (2017) TRAFFIC VOLUMES (IN PCE)



1 I-215 SB Ramps & Auto Center Rd.	2 I-215 NB Ramps & Auto Center Rd.	3 "E"St. & Auto Center/ Orange Show Rd.	4 Arrowhead Av. & Orange Show Rd.	5 S. Waterman Av. & Orange Show Rd.	6 S. Foisy St. & E. Norman Rd.	7 Driveway 1 & E. Norman Rd.
278(180) 41(48) 1147(707)	272(770) 418(973)	70(296) 154(332) 64(154)	244(473) 9(8) 94(180)	92(124) 578(779) 66(112)	8(4) 8(7)	71(17) 0(0)
294(545) 306(526)		41(111) 459(985) 97(219)	113(133) 358(789) 5(11)	53(69) 328(598) 121(142)	63(4) 9(16)	
162(442) 33(125)	64(201) 1244(950)	225(216) 1377(1132) 590(450)	411(286) 1014(1065) 8(8)	197(206) 516(867) 299(173)	65(6) 13(28)	15(32) 7(3)
	183(97) 4(8) 1005(871)	110(393) 126(392) 74(169)	0(24) 1(19) 1(20)	78(214) 617(634) 117(115)		1(3) 0(1)

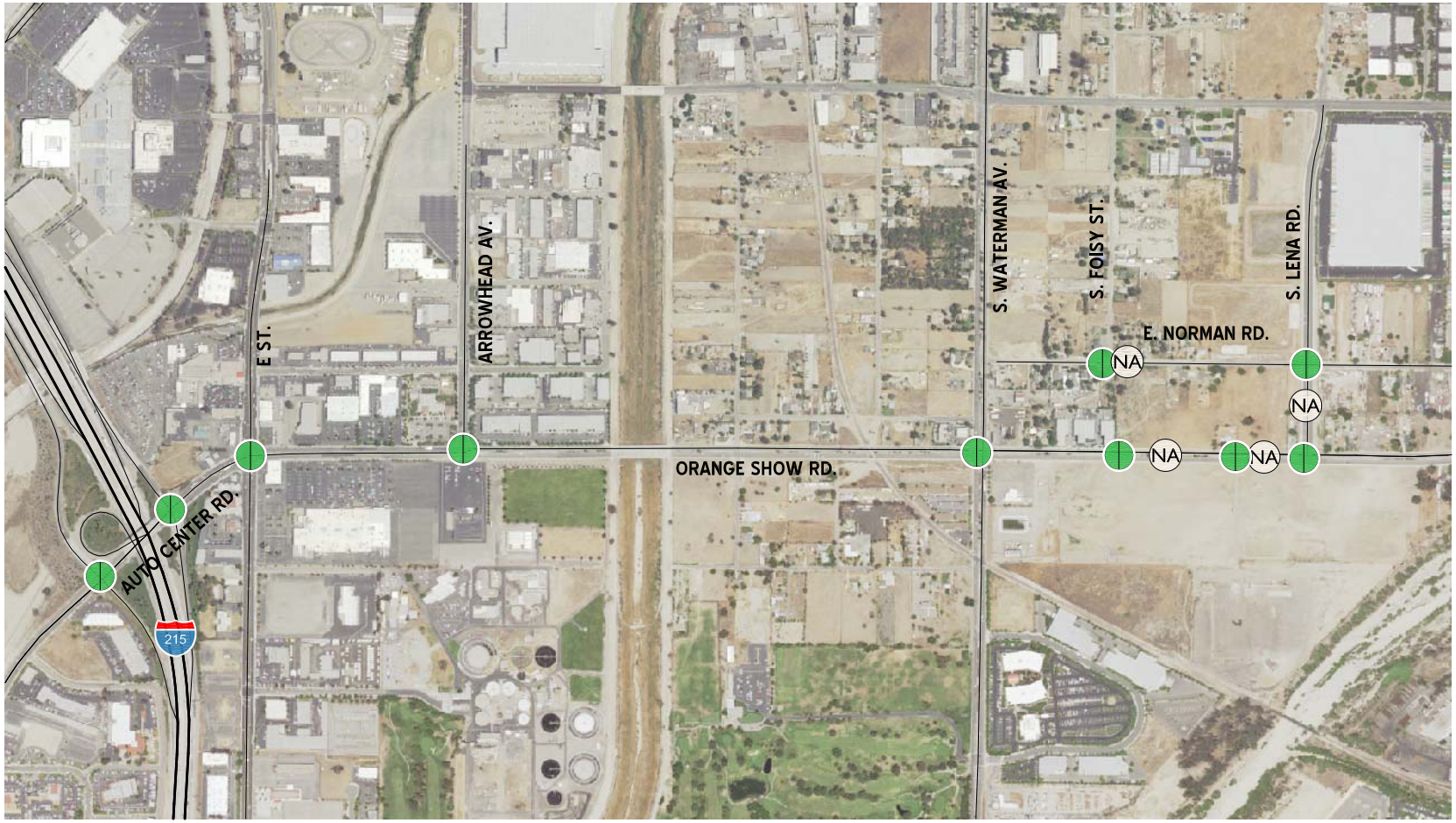
8 Driveway 2 & Orange Show Rd.	9 Driveway 3 & Orange Show Rd.	10 Driveway 4 & Orange Show Rd.	11 Driveway 5 & Orange Show Rd.	12 S. Lena Rd. & E. Norman Rd.	13 S. Lena Rd.& Driveway 6	14 S. Lena Rd. & Orange Show Rd.
3(7)	4(13)	4(13) 0(0) 0(0)	3(7)	35(8) 123(108) 0(15)	1(0) 144(143)	125(123) 20(22)
3(1) 492(772)	2(1) 491(766)	2(1) 477(727) 5(2)	3(1) 481(724)	3(10) 8(11) 14(29)		31(84) 359(602)
679(1083) 56(27)	704(1144)	15(10) 669(1124) 20(10)	669(1124)	0(7) 7(22) 7(6)	0(1) 1(1)	103(123) 566(1001)
25(61)		12(28) 0(0) 0(0)		25(2) 87(107) 14(97)	5(2) 128(205)	

LEGEND:

10(10) = AM(PM) PEAK HOUR INTERSECTION VOLUMES

10.0 = VEHICLES PER DAY (1000'S)

EXHIBIT 7-3: SUMMARY OF PEAK HOUR INTERSECTION LOS FOR EAC (2017) CONDITIONS



LEGEND:

- = AM PEAK HOUR ACCEPTABLE LOS
- = AM PEAK HOUR DEFICIENT LOS
- = PM PEAK HOUR ACCEPTABLE LOS
- = PM PEAK HOUR DEFICIENT LOS
- (NA) = NOT AN ANALYSIS LOCATION FOR THIS SCENARIO

N

Table 7-1

Intersection Analysis for EAC and EAPC (2017) Conditions

#	Intersection	Traffic Control[2]	EAC (2017) Delay[1] (secs.) AM	EAC (2017) Delay[1] (secs.) PM	EAC (2017) LOS AM	EAC (2017) LOS PM	EAC (2017) Average v/c[3, 6] AM	EAC (2017) Average v/c[3, 6] PM	EAPC (2017) Delay[1] (secs.) AM	EAPC (2017) Delay[1] (secs.) PM	EAPC (2017) LOS AM	EAPC (2017) LOS PM	EAPC (2017) Average v/c[3, 6] AM	EAPC (2017) Average v/c[3, 6] PM	Δ v/c Difference AM	Δ v/c Difference PM	Significant Impact?[5]
1	I-215 SB Ramps / Auto Center Rd.	TS	32.7	13.7	C	B	0.69	--	33.2	16.3	C	B	0.70	--	0.01	--	No
2	I-215 NB Ramps / Auto Center Rd.	TS	28.0	19.6	C	B	0.92	0.77	28.8	23.4	C	C	0.93	0.78	0.01	0.01	No
3	E St. / Auto Center Rd. / Orange Show Rd.[4]	TS	30.9	40.6	C	D	0.74	0.91	33.3	42.8	C	D	0.75	0.92	0.01	0.01	No
4	Arrowhead Av. / Orange Show Rd.	TS	27.0	36.1	C	D	0.53	0.60	27.9	36.8	C	D	0.53	0.61	0.00	0.01	No
5	S. Waterman Av. / Orange Show Rd.	TS	38.0	42.5	D	D	0.70	0.90	39.3	43.4	D	D	0.71	0.91	0.01	0.01	No
6	S. Foisy St. / E. Norman Rd.	CSS	9.2	8.7	A	A	--	--	9.2	8.7	A	A	--	--	--	--	No
7	Driveway 1 / E. Norman Rd.	**CSS**	Does Not Exist				--	--	9.2	8.9	A	A	--	--	--	--	No
8	Driveway 2 / Orange Show Rd.	**CSS**	9.4	11.2	B	B	--	--	9.9	11.2	B	B	--	--	--	--	No
9	Driveway 3 / Orange Show Rd.	**CSS**	Does Not Exist				--	--	9.9	11.3	B	B	--	--	--	--	No
10	Driveway 4 / Orange Show Rd.	**CSS**	11.8	14.8	B	B	--	--	12.7	14.8	B	B	--	--	--	--	No
11	Driveway 5 / Orange Show Rd.	**CSS**	Does Not Exist				--	--	9.9	11.0	A	B	--	--	--	--	No
12	S. Lena Rd. / E. Norman Rd.	AWS	8.4	8.7	A	A	--	--	8.5	8.7	A	A	--	--	--	--	No
13	S. Lena Rd. / Driveway 6	**CSS**	Does Not Exist				--	--	8.7	9.4	A	A	--	--	--	--	No
14	S. Lena Rd. / Orange Show Rd.	CSS	14.9	22.5	B	C	--	0.39	14.9	22.8	B	C	--	0.39	--	0.00	No

1 Per the 2010 Highway Capacity Manual, overall average intersection delay and level of service are shown for intersections with a traffic signal or all-way stop control. For intersections with cross street stop control, the delay and level of service for the worst individual movement (or movements sharing a single lane) are shown.

2 CSS = Cross-street Stop; AWS = All Way Stop; TS = Traffic Signal; **CSS** = Improvement

3 Volume to capacity ratio has been reported using the HCM 2000 methodology (as HCM 2010 does not report the overall v/c) for intersections operating at LOS C or worse, consistent with the City of San Bernardino Traffic Impact Study Guidelines.

4 Although there is a second northbound left turn lane, the analysis has been performed assuming a single left as vehicles headed onto the I-215 Northbound often block the inner left turn lane. As a result, the inner left turn lane does not get adequately utilized each cycle.

5 Significant impact has been identified if the change in v/c exceeds the applicable thresholds per the City of San Bernardino Traffic Impact Study Guidelines

6 The TIA Guidelines have significance criteria based on v/c difference for LOS C or worse. As such,v/c ratios and difference in v/c have not been reported for LOS "A" or LOS "B".

7.4.2 EAPC (2017) CONDITIONS

All study area intersections are anticipated to continue to operate at acceptable levels of service with the addition of Project traffic, consistent with EAC traffic conditions. Consistent with Table 7-1, a summary of the peak hour intersection LOS for EAPC (2017) conditions are shown on Exhibit 7-4. The intersection operations analysis worksheets for EAPC (2017) traffic conditions are included in Appendix 7.2 of this TIA.

7.5 TRAFFIC SIGNAL WARRANTS ANALYSIS

No additional study area intersections are anticipated to meet traffic signal warrants for either EAC (2017) or EAPC (2017) traffic conditions, in addition to those previously warranted under Existing traffic conditions (see Appendix 7.3 and 7.4).

7.6 OFF-RAMP QUEUING ANALYSIS

A queuing analysis was performed for the off-ramps at the I-215 Freeway at the Auto Center Drive interchanges to assess vehicle queues for the off ramps that may potentially result in deficient peak hour operations at the ramp-to-arterial intersections and may potentially "spill back" onto the I-215 Freeway mainline. Queuing analysis findings are presented in Table 7-2 for EAC (2017) and EAPC (2017) traffic conditions. It is important to note that off-ramp lengths are consistent with the measured distance between the intersection and the freeway mainline. As shown on Table 7-2, there are no movements that are anticipated to experience queuing issues during the weekday AM or weekday PM peak 95th percentile traffic flows for either EAC (2017) or EAPC (2017) traffic conditions.

Worksheets for EAC (2017) and EAPC (2017) conditions off-ramp queuing analysis are provided in Appendix 7.5 and 7.6, respectively.

7.7 QUEUING ANALYSIS AT WATERMAN AVENUE AND ORANGE SHOW ROAD

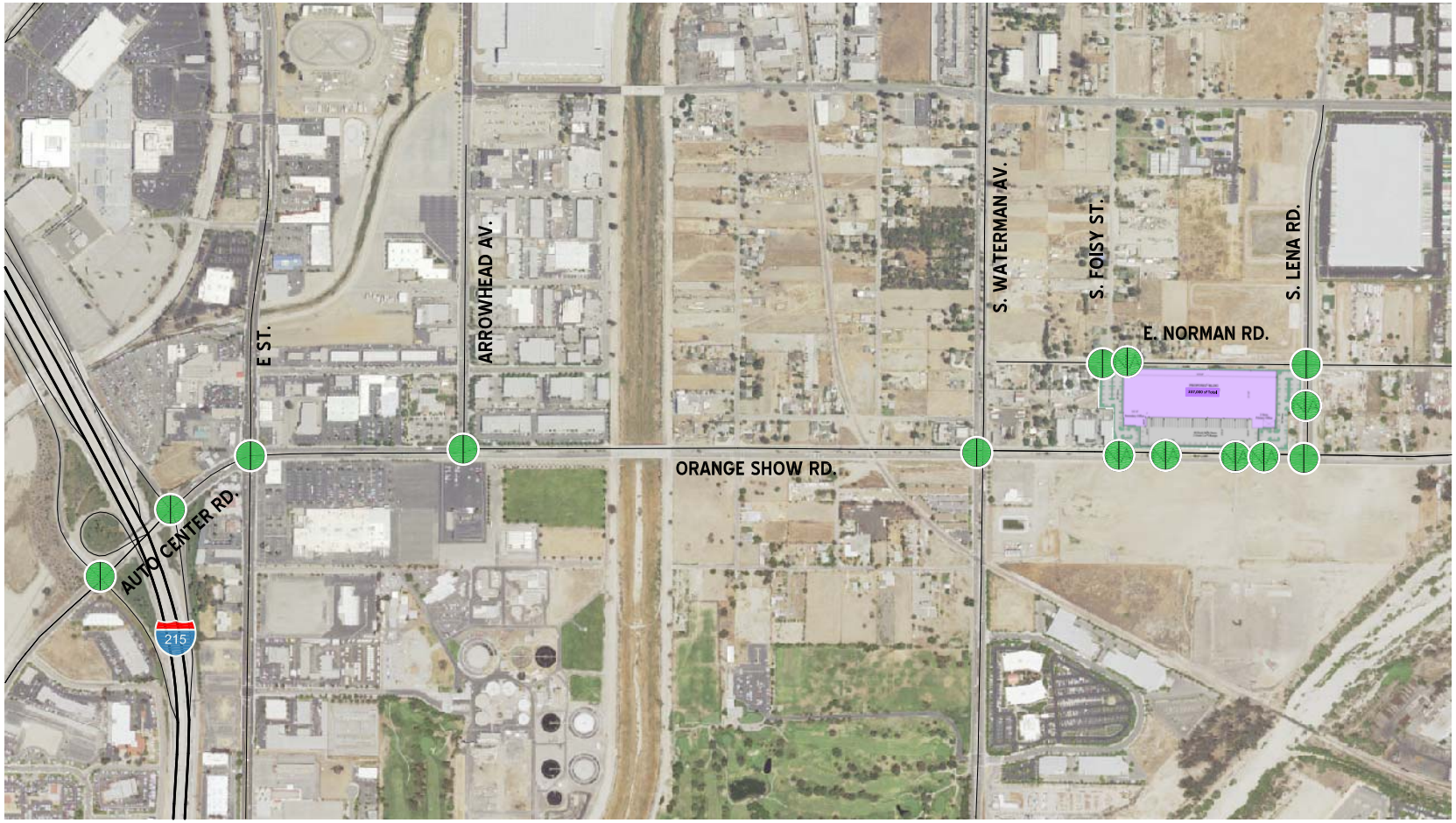
A queuing analysis was performed at the intersection for Waterman Avenue and Orange Show Road to assess vehicle queues that could potentially queue back to the at-grade railroad crossing on Orange Show Road, just west of Waterman Avenue and on Waterman Avenue, south of Orange Show Road. Queuing analysis findings are presented in Table 7-3 for EAPC (2017) traffic conditions. It is important to note that the lengths and distances are consistent with the measured distance between the intersection and the railroad. As shown on Table 7-3, there are no movements that are anticipated to experience queuing issues during the weekday AM or weekday PM peak 95th percentile traffic flows for EAPC (2017) traffic conditions.

Worksheets for EAPC (2017) conditions queuing analysis at the intersection of Waterman Avenue and Orange Show Road are provided in Appendix 7.7.

7.8 RECOMMENDED IMPROVEMENTS

No improvement strategies have been recommended as there are no intersections that are anticipated to operate at an unacceptable LOS under EAC (2017) and EAPC (2017) conditions.

EXHIBIT 7-4: SUMMARY OF PEAK HOUR INTERSECTION LOS FOR EAPC (2017) CONDITIONS



LEGEND:

- = AM PEAK HOUR ACCEPTABLE LOS
- = AM PEAK HOUR DEFICIENT LOS
- = PM PEAK HOUR ACCEPTABLE LOS
- = PM PEAK HOUR DEFICIENT LOS

N

Table 7-2

Peak Hour Freeway Off-Ramp Queuing Summary for EAC and EAPC (2017) Conditions

Intersection	Movement	Available Stacking Distance (Feet)	EAC				EAPC			
			95th Percentile Queue (Feet)		Acceptable?[1]		95th Percentile Queue (Feet)		Acceptable?[1]	
			AM Peak	PM Peak	AM	PM	AM Peak	PM Peak	AM	PM
I-215 SB Off-Ramp / Auto Center Rd.	SBL	2,695	605 [2]	214	Yes	Yes	721	217	Yes	Yes
	SBL/T	2,230	538 [2]	201	Yes	Yes	593	201	Yes	Yes
	SBR	465	30	35	Yes	Yes	29	35	Yes	Yes
I-215 NB Off-Ramp / Auto Center Rd.	NBL	925	63	43	Yes	Yes	63	43	Yes	Yes
	NBL/T	1,050	60	41	Yes	Yes	60	41	Yes	Yes
	NBR	275	292 [2]	216 [2]	Yes[3]	Yes	304 [2]	219 [2]	Yes[3]	Yes

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

[2] 95th percentile volume exceeds capacity, queue may be longer

[3] Although the 95th percentile queue is anticipated to exceed the available storage for the turn lane, the adjacent through lane has sufficient storage to accommodate any spillover without spilling back and affecting the I-215 Freeway mainline.

Table 7-3

Intersection Queuing Summary for EAPC (2017) Conditions

Intersection	Movement	Available Stacking Distance (Feet)	95th Percentile Queue (Feet)		Acceptable? [1]	
			AM Peak	PM Peak	AM	PM
Waterman Ave. / Orange Show Road	NB	600	483	182	Yes	Yes
	EB	600	474	446	Yes	Yes

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

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8 HORIZON YEAR (2040) TRAFFIC CONDITIONS

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

8.1 ROADWAY IMPROVEMENTS

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

- Project driveways and those facilities assumed to be constructed by the Project to provide site access are also assumed to be in place for Horizon Year (2040) conditions only (e.g., intersection and roadway improvements along the Project's frontage and driveways).
- Driveways and those facilities assumed to be constructed by cumulative developments to provide site access are also assumed to be in place for Horizon Year (2040) conditions only (e.g., intersection and roadway improvements along the cumulative development's frontages and driveways).

8.2 HORIZON YEAR (2040) WITHOUT PROJECT TRAFFIC VOLUME FORECASTS

This scenario includes the refined post-processed volumes obtained from the SBTAM. The weekday ADT and weekday AM and PM peak hour volumes which can be expected for Horizon Year (2040) Without Project traffic conditions are shown on Exhibit 8-1.

8.3 HORIZON YEAR (2040) WITH PROJECT TRAFFIC VOLUME FORECASTS

This scenario includes the refined post-processed volumes obtained from the SBTAM, plus Project traffic. The weekday ADT and weekday AM and PM peak hour volumes which can be expected for Long Range With Project traffic conditions are shown on Exhibit 8-2.

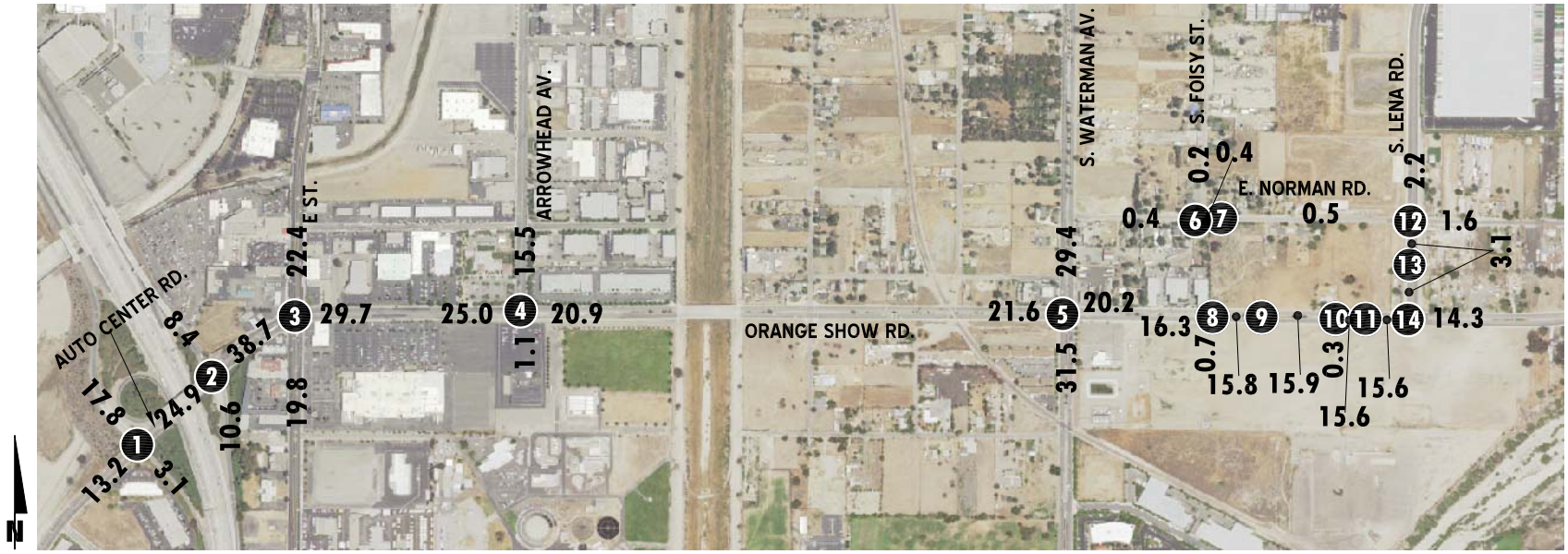
8.4 INTERSECTION OPERATIONS ANALYSIS

8.4.1 HORIZON YEAR (2040) WITHOUT PROJECT TRAFFIC CONDITIONS

LOS calculations were conducted for the study intersections to evaluate their operations under Horizon Year Without Project conditions with roadway and intersection geometrics consistent with Section 8.1 *Roadway Improvements*. As shown in Table 8-1, the study area intersections are anticipated to operate at acceptable levels of service.

A summary of the peak hour intersection LOS for Horizon Year Without Project conditions are shown on Exhibit 8-3. The intersection operations analysis worksheets for Horizon Year Without Project traffic conditions are included in Appendix 8.1 of this TIA.

EXHIBIT 8-1: HORIZON YEAR (2040) WITHOUT PROJECT TRAFFIC VOLUMES (IN PCE)



1 I-215 SB Ramps & Auto Center Rd.	2 I-215 NB Ramps & Auto Center Rd.	3 "E"St. & Auto Center/ Orange Show Rd.	4 Arrowhead Av. & Orange Show Rd.	5 S. Waterman Av. & Orange Show Rd.	6 S. Foisy St. & E. Norman Rd.	7 Driveway 1 & E. Norman Rd.
286(178) 40(91) 1378(857) ← 422(1085) ← 577(525)	← 418(819) ← 498(1504)	202(437) 230(389) 73(189) ← 68(197) ← 566(1134) ← 98(251)	321(535) 12(15) 176(276) ← 182(182) ← 394(861) ← 5(13)	107(154) 826(956) 101(143) ← 93(119) ← 338(590) ← 135(185)	10(5) 10(8) ← 76(5) ← 10(15)	Intersection Does Not Exist
372(457) → 122(257) →	181(198) → 1568(1116) → ← 436(105) ← 13(93) ← 1040(758)	429(318) → 1329(1034) → 808(434) → ← 137(402) ← 201(483) ← 119(163)	418(316) → 1045(1021) → 8(12) → ← 0(26) ← 1(19) ← 4(20)	206(240) → 512(842) → 369(172) → ← 112(242) ← 701(903) ← 97(163)	79(7) → 8(30) →	

8 Driveway 2 & Orange Show Rd.	9 Driveway 3 & Orange Show Rd.	10 Driveway 4 & Orange Show Rd.	11 Driveway 5 & Orange Show Rd.	12 S. Lena Rd. & E. Norman Rd.	13 S. Lena Rd.& Driveway 6	14 S. Lena Rd. & Orange Show Rd.
← 643(845)	Intersection Does Not Exist	← 643(815) ← 5(2)	Intersection Does Not Exist	41(8) 148(127) 0(16) ← 4(9) ← 10(13) ← 17(34)	Intersection Does Not Exist	150(146) 23(22) ← 38(100) ← 486(671)
728(1247) → 59(28) → ← 26(64)		755(1256) → 21(11) → ← 13(29) ← 0(0)		0(9) → 9(25) → 9(6) → ← 31(3) ← 105(124) ← 16(115)		114(143) → 620(1113) →

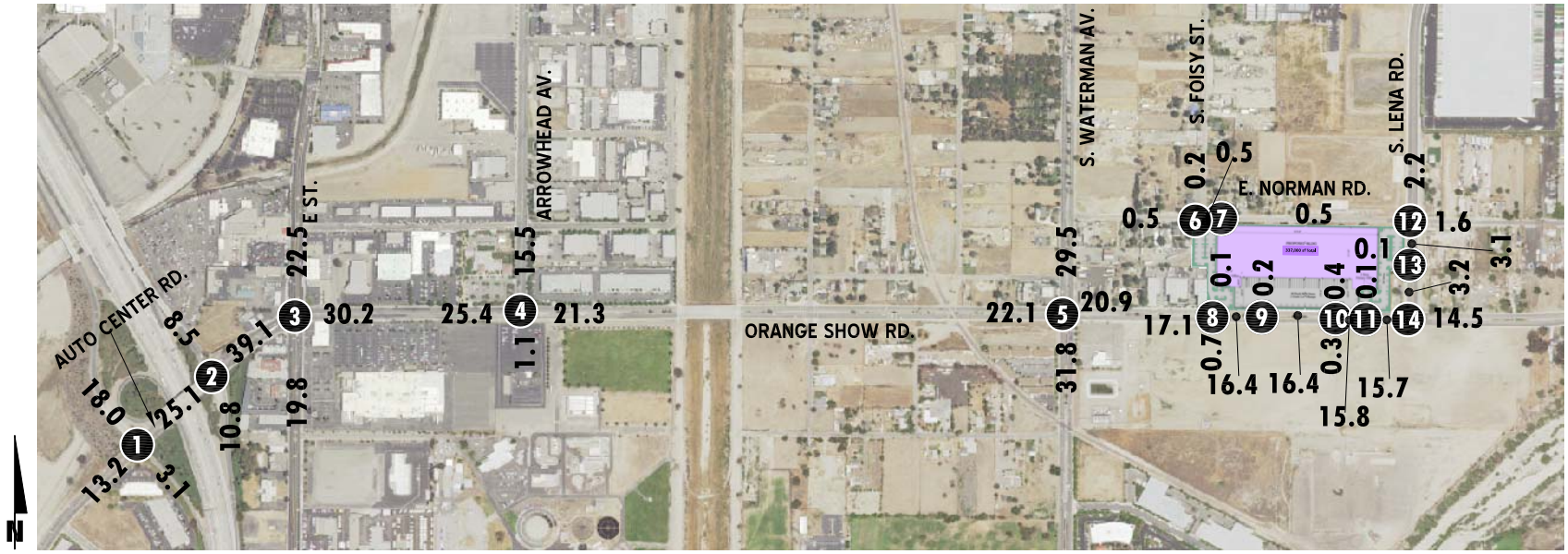
LEGEND:

10(10) = AM(PM) PEAK HOUR INTERSECTION VOLUMES

10.0 = VEHICLES PER DAY (1000'S)

URBAN CROSSROADS

EXHIBIT 8-2: HORIZON YEAR (2040) WITH PROJECT TRAFFIC VOLUMES (IN PCE)



1 I-215 SB Ramps & Auto Center Rd.	2 I-215 NB Ramps & Auto Center Rd.	3 "E"St. & Auto Center/ Orange Show Rd.	4 Arrowhead Av. & Orange Show Rd.	5 S. Waterman Av. & Orange Show Rd.	6 S. Foisy St. & E. Norman Rd.	7 Driveway 1 & E. Norman Rd.
286(178) 40(91) 1386(861)		202(437) 230(389) 74(189)	321(535) 12(15) 176(276)	107(155) 826(957) 101(143)	10(5) 10(8)	
426(1097) 577(526)	421(828) 502(1516)	68(198) 574(1155) 98(251)	182(182) 402(883) 5(13)	93(119) 346(611) 141(202)	76(5) 11(18)	86(20) 0(0)
373(457) 122(257)	181(198) 1576(1120)	429(318) 1345(1043) 808(434)	418(316) 1062(1030) 8(12)	211(242) 525(849) 369(172)	79(7) 15(33)	18(38) 7(3)
	436(105) 13(93) 1048(763)	137(402) 201(483) 119(163)	0(26) 1(19) 4(20)	112(242) 703(904) 105(167)		1(3) 0(1)

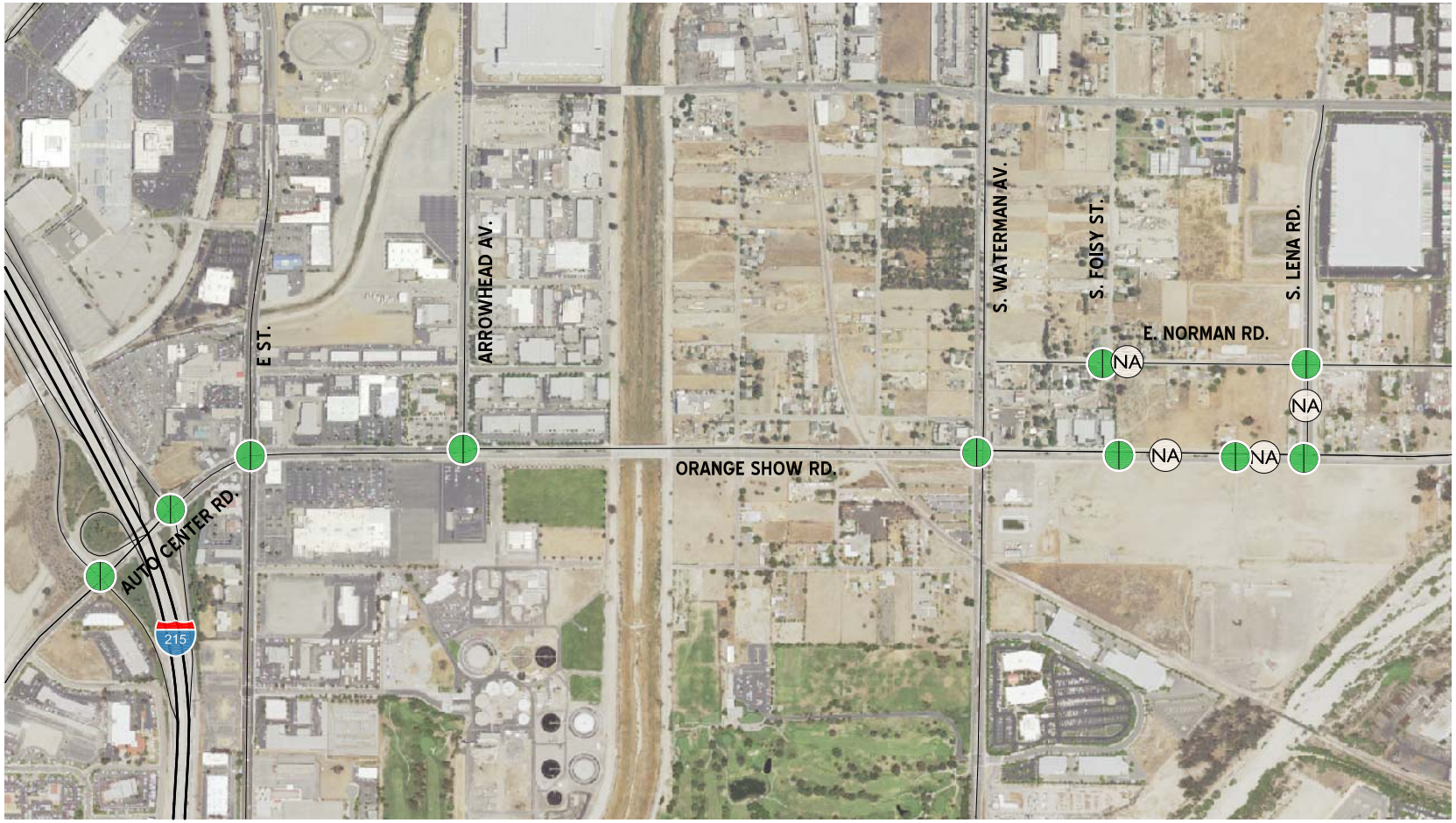
8 Driveway 2 & Orange Show Rd.	9 Driveway 3 & Orange Show Rd.	10 Driveway 4 & Orange Show Rd.	11 Driveway 5 & Orange Show Rd.	12 S. Lena Rd. & E. Norman Rd.	13 S. Lena Rd.& Driveway 6	14 S. Lena Rd. & Orange Show Rd.
3(7)	4(13)	4(13) 0(0) 0(0)	3(7)	42(8) 148(127) 0(16)	1(0) 174(169)	150(146) 24(24)
3(1) 654(877)	2(1) 653(865)	2(1) 651(824) 5(2)	3(1) 656(821)	4(9) 10(13) 17(34)		38(100) 496(676)
748(1259) 59(28)	775(1268)	15(10) 760(1258) 21(11)	760(1258)	0(9) 9(25) 9(7)	0(1) 1(1)	119(145) 620(1113)
26(64)		13(29) 0(0) 0(0)		31(3) 105(125) 16(115)	5(2) 152(242)	

LEGEND:

10(10) = AM(PM) PEAK HOUR INTERSECTION VOLUMES

10.0 = VEHICLES PER DAY (1000'S)

EXHIBIT 8-3: SUMMARY OF PEAK HOUR INTERSECTION LOS FOR HORIZON YEAR (2040) WITHOUT PROJECT CONDITIONS



LEGEND:

- = AM PEAK HOUR ACCEPTABLE LOS
- = AM PEAK HOUR DEFICIENT LOS
- = PM PEAK HOUR ACCEPTABLE LOS
- = PM PEAK HOUR DEFICIENT LOS
- (NA) = NOT AN ANALYSIS LOCATION FOR THIS SCENARIO

N

Table 8-1

Intersection Analysis for Horizon Year (2040) Conditions

#	Intersection	Traffic Control[2]	2040 Without Project						2040 With Project						Δ v/c Difference		Significant Impact?[4]
			Delay[1] (secs.)		LOS		Average v/c[3, 6]		Delay[1] (secs.)		LOS		Average v/c[3, 6]				
			AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	
1	I-215 SB Ramps / Auto Center Rd.	TS	45.4	20.9	D	C	0.94	0.52	45.6	21.9	D	C	0.95	0.52	0.01	0.00	No
2	I-215 NB Ramps / Auto Center Rd.	TS	45.0	29.3	D	C	0.91	0.84	46.1	29.8	D	C	0.92	0.88	0.01	0.04	No
3	E St. / Auto Center Rd. / Orange Show Rd.[4]	TS	36.2	48.9	D	D	0.75	0.84	36.9	51.3	D	D	0.75	0.84	0.00	0.00	No
4	Arrowhead Av. / Orange Show Rd.	TS	40.7	43.0	D	D	0.55	0.65	42.9	44.7	D	D	0.57	0.66	0.02	0.01	No
5	S. Waterman Av. / Orange Show Rd.	TS	44.6	49.6	D	D	0.78	0.91	45.8	51.5	D	D	0.79	0.93	0.01	0.02	No
6	S. Foisy St. / E. Norman Rd.	CSS	9.4	8.8	A	A	--	--	9.4	8.8	A	A	--	--	--	--	No
7	Driveway 1 / E. Norman Rd.	**CSS**	Does Not Exist				--	--	9.3	8.9	A	A	--	--	--	--	No
8	Driveway 2 / Orange Show Rd.	**CSS**	9.6	11.3	A	B	--	--	10.6	12.3	B	B	--	--	--	--	No
9	Driveway 3 / Orange Show Rd.	**CSS**	Does Not Exist				--	--	10.6	11.8	B	B	--	--	--	--	No
10	Driveway 4 / Orange Show Rd.	**CSS**	12.9	14.7	B	B	--	--	13.4	14.9	B	B	--	--	--	--	No
11	Driveway 5 / Orange Show Rd.	**CSS**	Does Not Exist				--	--	10.6	11.5	B	B	--	--	--	--	No
12	S. Lena Rd. / E. Norman Rd.	AWS	8.8	9.1	A	A	--	--	8.8	9.2	A	A	--	--	--	--	No
13	S. Lena Rd. / Driveway 6	**CSS**	Does Not Exist				--	--	8.8	9.5	A	A	--	--	--	--	No
14	S. Lena Rd. / Orange Show Rd.	CSS	17.3	26.6	C	D	0.33	0.41	17.7	27.2	C	D	0.34	0.41	0.01	0.00	No

1 Per the 2010 Highway Capacity Manual, overall average intersection delay and level of service are shown for intersections with a traffic signal or all-way stop control. For intersections with cross street stop control, the delay and level of service for the worst individual movement (or movements sharing a single lane) are shown.

2 CSS = Cross-street Stop; AWS = All Way Stop; TS = Traffic Signal; **CSS** = Improvement

3 Volume to capacity ratio has been reported using the HCM 2000 methodology (as HCM 2010 does not report the overall v/c) for intersections operating at LOS C or worse, consistent with the City of San Bernardino Traffic Impact Study Guidelines.

4 Although there is a second northbound left turn lane, the analysis has been performed assuming a single left as vehicles headed onto the I-215 Northbound often block the inner left turn lane. As a result, the inner left turn lane does not get adequately utilized each cycle.

5 Significant impact has been identified if the change in v/c exceeds the applicable thresholds per the City of San Bernardino Traffic Impact Study Guidelines

6 The TIA Guidelines have significance criteria based on v/c difference for LOS C or worse. As such,v/c ratios and difference in v/c have not been reported for LOS "A" or LOS "B".

8.4.2 HORIZON YEAR (2040) WITH PROJECT TRAFFIC CONDITIONS

As shown on Table 8-1 and illustrated on Exhibit 8-4, there are no study area intersections anticipated to experience unacceptable LOS (LOS E or worse) with the addition of Project traffic during one or more peak hours. The intersection operations analysis worksheets for Horizon Year (2040) With Project traffic conditions are included in Appendix 8.2 of this TIA. Measures to address long range deficiencies for Horizon Year traffic conditions are discussed in Section 8.8 *Long Range Deficiencies and Recommended Improvements.*

8.5 TRAFFIC SIGNAL WARRANTS ANALYSIS

There are no study area intersections are anticipated to warrant traffic signals for Horizon Year (2040) Without Project traffic conditions, in addition to those previously warranted for Existing (2015) traffic conditions (see Appendix 8.3).

There are no additional intersections anticipated to warrant a traffic signal under Horizon Year (2040) With Project traffic conditions (see Appendix 8.4).

8.6 OFF-RAMP QUEUING ANALYSIS

A queuing analysis was performed for the off-ramps at the I-215 Freeway at the Auto Center Drive interchanges to assess vehicle queues for the off ramps that may potentially result in deficient peak hour operations at the ramp-to-arterial intersections and may potentially "spill back" onto the I-215 Freeway mainline. Queuing analysis findings are presented in Table 8-2 for Horizon Year (2040) traffic conditions. It is important to note that off-ramp lengths are consistent with the measured distance between the intersection and the freeway mainline. As shown on Table 8-2, there are no movements that are anticipated to experience queuing issues during the weekday AM or weekday PM peak 95th percentile traffic flows Horizon Year (2040) traffic conditions.

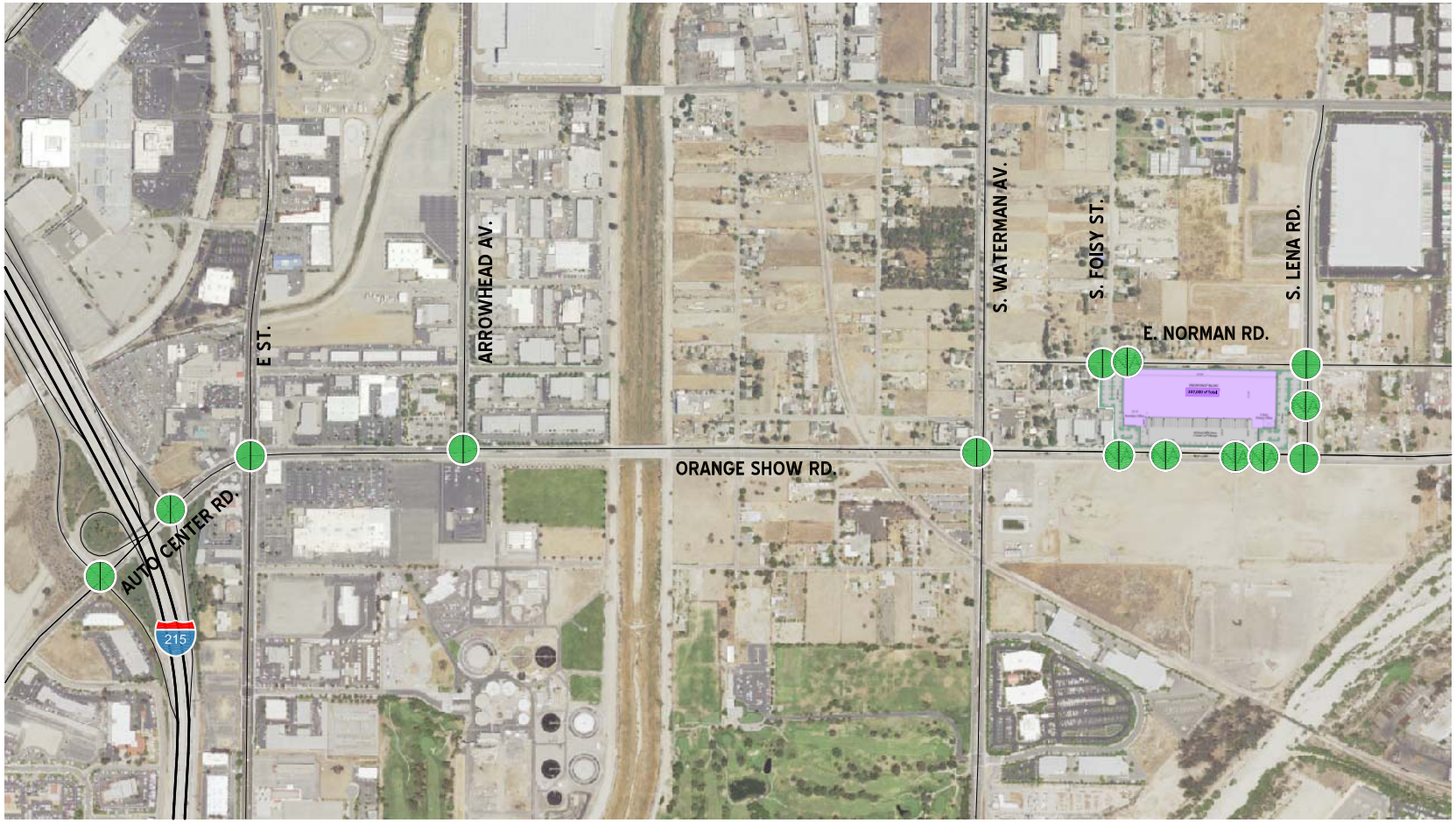
Worksheets for Horizon Year (2040) Without and With Project conditions off-ramp queuing analysis are provided in Appendix 8.5 and 8.6, respectively.

8.7 QUEUING ANALYSIS AT WATERMAN AVENUE AND ORANGE SHOW ROAD

A queuing analysis was performed at the intersection for Waterman Avenue and Orange Show Road to assess vehicle queues that could potentially queue back to the at-grade railroad crossing on Orange Show Road, just west of Waterman Avenue and on Waterman Avenue, south of Orange Show Road. Queuing analysis findings are presented in Table 8-3 for Horizon Year (2040) With Project traffic conditions. It is important to note that the lengths and distances are consistent with the measured distance between the intersection and the railroad. As shown on Table 8-3, there are no movements that are anticipated to experience queuing issues during the weekday AM or weekday PM peak 95th percentile traffic flows for Horizon Year (2040) With Project traffic conditions.

Worksheets for Horizon Year (2040) With Project conditions queuing analysis at the intersection of Waterman Avenue and Orange Show Road are provided in Appendix 8.7.

EXHIBIT 8-4: SUMMARY OF PEAK HOUR INTERSECTION LOS FOR HORIZON YEAR (2040) WITH PROJECT CONDITIONS



LEGEND:

- = AM PEAK HOUR ACCEPTABLE LOS
- = AM PEAK HOUR DEFICIENT LOS
- = PM PEAK HOUR ACCEPTABLE LOS
- = PM PEAK HOUR DEFICIENT LOS

N

Table 8-2

Peak Hour Freeway Off-Ramp Queuing Summary for Horizon Year (2040) Conditions

Intersection	Movement	Available Stacking Distance (Feet)	2040 Without Project				2040 With Project			
			95th Percentile Queue (Feet)		Acceptable?[1]		95th Percentile Queue (Feet)		Acceptable?[1]	
			AM Peak	PM Peak	AM	PM	AM Peak	PM Peak	AM	PM
I-215 SB Off-Ramp / Auto Center Rd.	SBL	2,695	1,023 [2]	316 [2]	Yes	Yes	895 [2]	317 [2]	Yes	Yes
	SBL/T	2,230	962 [2]	292 [2]	Yes	Yes	836 [2]	295 [2]	Yes	Yes
	SBR	465	31	34	Yes	Yes	27	34	Yes	Yes
I-215 NB Off-Ramp / Auto Center Rd.	NBL	925	165	69	Yes	Yes	157	75	Yes	Yes
	NBL/T	1,050	157	70	Yes	Yes	450	77	Yes	Yes
	NBR	275	368 [2]	172	Yes[3]	Yes	349 [2]	185	Yes[3]	Yes

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

[2] 95th percentile volume exceeds capacity, queue may be longer

[3] Although the 95th percentile queue is anticipated to exceed the available storage for the turn lane, the adjacent through lane has sufficient storage to accommodate any spillover without spilling back and affecting the I-215 Freeway mainline.

Table 8-3

Intersection Queuing Summary for Horizon Year (2040) Conditions

Intersection	Movement	Available Stacking Distance (Feet)	95th Percentile Queue (Feet)		Acceptable? [1]	
			AM Peak	PM Peak	AM	PM
Waterman Ave. / Orange Show Road	NB	600	288	380	Yes	Yes
	EB	600	196	481	Yes	Yes

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

8.8 LONG RANGE DEFICIENCIES AND RECOMMENDED IMPROVEMENTS

No improvement strategies have been recommended as there are no intersections that are anticipated to operate at an unacceptable LOS under Horizon Year (2040) conditions.

9 REFERENCES

1. **Department, City of San Bernardino Public Works.** *The City of San Bernardino Traffic Impact Study Guidelines.* City of San Bernardino : s.n., June 3, 2015.
2. **San Bernardino Associated Governments.** *Congestion Management Program for County of San Bernardino.* County of San Bernardino : s.n., Updated December 2007.
3. **California Department of Transportation.** *Guide for the Preparation of Traffic Impact Studies.* December 2002.
4. **Institute of Transportation Engineers.** *Trip Generation.* 9th Edition. 2012.
5. **Southern California Association of Governments.** *2012 Regional Transportation Plan.* April 2012.
6. **Transportation Research Board.** *Highway Capacity Manual (HCM).* s.l. : National Academy of Sciences, 2000.
7. **Federal Highway Administration.** Manual on Uniform Traffic Control Devices (MUTCD). [book auth.] California Department of Transportation. *California Manual on Uniform Traffic Control Devices (CAMUTCD).* 2014.
8. **California Department of Transportation.** *Freeway Performance Measurement (PeMS).* [Online] [Cited: January 7, 2014.] http://pems.dot.ca.gov/.
9. **Southern California Association of Governments.** *2012 Regional Transportation Plan.* April 2012.
10. **California Department of Transportation (Caltrans).** *Final Transportation Report for the California State Route 60 Freeway.* July 2005.
11. **Transportation Research Board.** *Highway Capacity Manual (HCM).* s.l. : National Academy of Sciences, 2010.

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