2.5 Traffic and Transportation/Pedestrian and Bicycle Facilities

2.5.1 Regulatory Setting

The Department, as assigned by the FHWA, directs that full consideration should be given to the safe accommodation of pedestrians and bicyclists during the development of federal-aid highway projects (see 23 CFR 652). It further directs that the special needs of the elderly and the disabled must be considered in all federal-aid projects that include pedestrian facilities. When current or anticipated pedestrian and/or bicycle traffic presents a potential conflict with motor vehicle traffic, every effort must be made to minimize the detrimental effects on all highway users who share the facility.

In July 1999, USDOT issued an Accessibility Policy Statement pledging a fully accessible multimodal transportation system. Accessibility in federally assisted programs is governed by the USDOT regulations (49 CFR Part 27) implementing Section 504 of the Rehabilitation Act (29 USC 794). The FHWA has enacted regulations for the implementation of the 1990 Americans with Disabilities Act (ADA), including a commitment to build transportation facilities that provide equal access for all persons. These regulations require application of the ADA requirements to federal-aid projects, including Transportation Enhancement Activities.

2.5.2 Affected Environment

This section is based on the Final Traffic Operations Report prepared for the SR 55 (I-5 to SR 91) Widening Project Approval/Environmental Document, dated July 2018.

2.5.2.1 Existing Facilities

Roadway Facilities

SR 55, also known as the Costa Mesa Freeway, is a north-south corridor traversing Orange County. The SR 55 corridor is 17.9 miles long and passes through six cities in an urbanized setting, beginning at Pacific Coast Highway (SR 1) at the south end and ending at SR 91 at the north end. SR 55 was originally constructed in 1962 as a four-lane freeway, with the portion north of Chapman Avenue opening in 1962 and the segment south of Chapman Avenue opening in 1966. Since then, two additional general purpose lanes and a HOV lane have been added in each direction. SR 55 was extended to 19th Street in Costa Mesa in 1990, and the first direct HOV/ Transit Way Connector at the I-5/SR 55 interchange was opened in late 1995. The HOV direct connectors at the I-405/SR 55 interchange were completed in early 2005. A few recent improvements include an auxiliary lane in the southbound direction between the Dyer Road on-ramp and MacArthur Boulevard off-ramp, which was constructed in 2010, and between the Edinger Avenue on-ramp and East Dyer Road off-ramp in 2012. In addition, the HOV lane was striped throughout its length within the project limits to allow continuous access with the exception of the transition areas to the SR 22, I-405, and I-5 HOV connectors.

Within the project limits, the SR 55 corridor currently has three to five general purpose lanes in each direction. HOV and auxiliary lanes also exist, where feasible, in each direction. Between I-5 and SR 91 there are five local interchanges on SR 55 at 4th Street/Irvine Boulevard, 17th Street, Chapman Avenue, Katella Avenue, and Lincoln Avenue. One freeway-to-freeway interchange at

SR 22 is located between 17th Street and Chapman Avenue. The project segment of SR 55 traverses a highly urbanized, densely populated area with closely spaced interchanges with arterial streets and other freeways. The operational characteristics of the project segment of SR 55 are influenced by a concentration of merge, diverge, and weaving operations associated with those tightly spaced interchanges.

Pedestrian and Bicycle Facilities

Within site boundaries, pedestrians and bicyclists can currently cross the project segment of SR 55 at the following locations where arterial streets cross SR 55:

- Main Street overcrossing
- First Street overcrossing
- Irvine Boulevard/4th Street overcrossing
- 17th Street overcrossing
- Santa Clara Avenue overcrossing
- Fairhaven Avenue overcrossing
- La Veta Avenue overcrossing
- Chapman Avenue undercrossing
- Walnut Avenue overcrossing
- Collins Avenue overcrossing
- Katella Avenue undercrossing
- Taft Avenue undercrossing
- Meats Avenue overcrossing
- Lincoln Avenue undercrossing

These arterials generally include sidewalks on at least one side of the road segments as they cross SR 55. No designated off-street bike paths/trails are present on these arterials; however, Class II bike lanes exist along Meats Avenue and Walnut Avenue, and Class III bike routes exist along Taft Avenue. In addition, the City of Tustin General Plan designates Santa Clara Avenue as future Class II bike lanes; and the City of Orange Bikeway Master Plan also designates Lincoln Avenue, La Veta Avenue, and Fairhaven Avenue as future Class II bike lanes.

2.5.2.2 Study Area

The study corridor (Figure 2.5-1) covers SR 55 between I-5 and SR 91 (from Post Mile 10.4 to Post Mile R17.9) and includes the freeway-to-freeway connectors at the three interchanges at SR 55/I-5, SR 55/SR 22, and SR 55/SR 91. The study locations consist of the SR 55 mainline segments and ramp junctions in the study area. The study area also consists of ramp terminal intersections, intersections directly adjacent to the ramp terminal intersections, and several local intersections.

Figure 2.5-1. Study Corridor

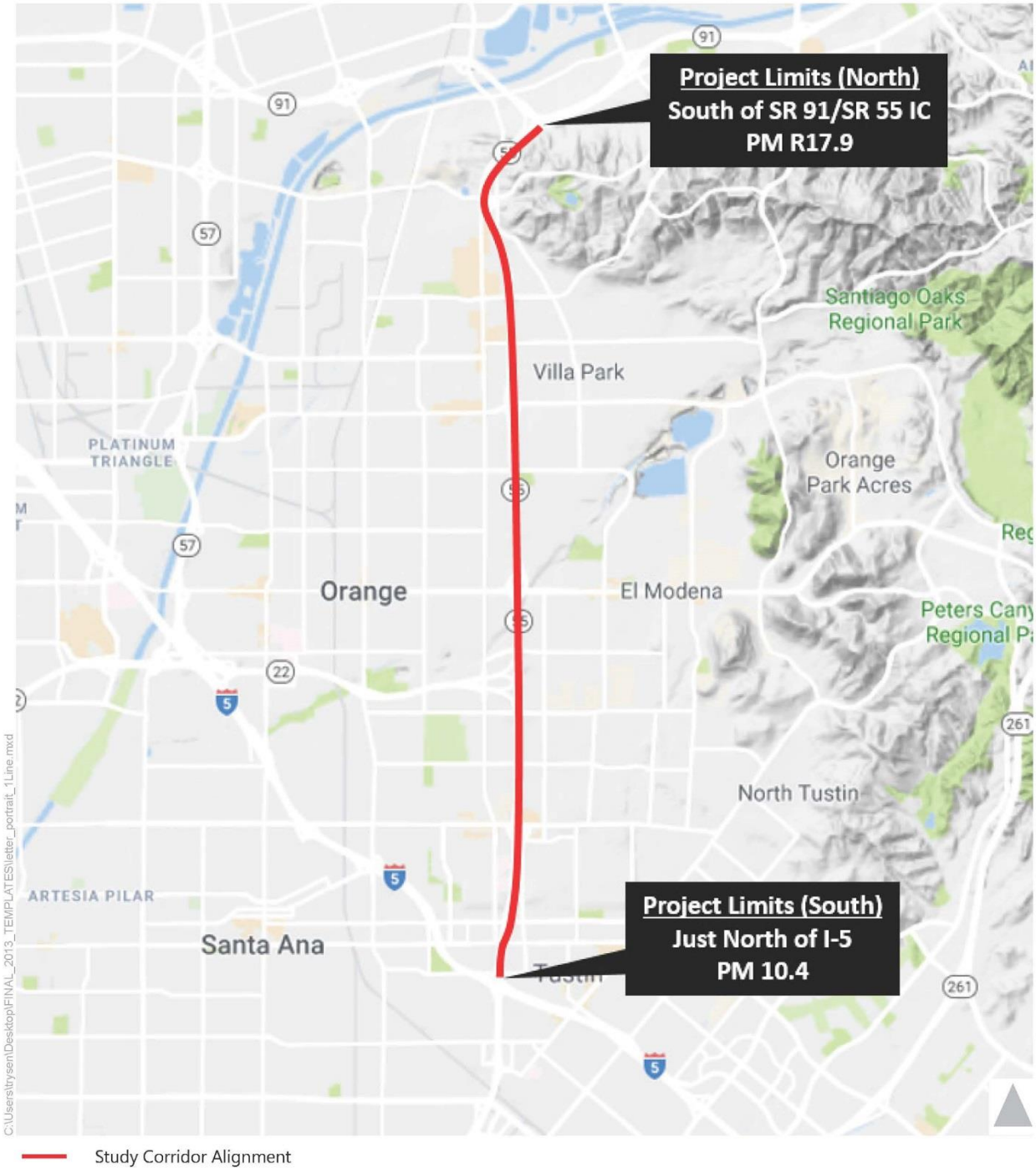


Figure 2.5-1
Study Corridor

Source: Fehr & Peers 2018

Study Freeway Facilities

1. Freeway mainline segments on SR 55 between I-5 and SR 91

2. The on- and off-ramps (including the freeway-to-freeway connectors) at the study interchanges of I-5, 4th Street/Irvine Boulevard, 17th Street, SR 22, Chapman Avenue, Katella Avenue, Meats Avenue (future), Lincoln Avenue, and SR 91

Study Intersections

1. Tustin Street / SR 55 southbound off-ramp
2. Tustin Street / Lincoln Avenue
3. Tustin Street / SR 55 southbound on-ramp
4. Santiago Boulevard / Lincoln Avenue
5. Santiago Boulevard / SR 55 northbound ramps
6. Meats Avenue / Tustin Street
7. Meats Avenue / SR 55 southbound ramp (future)
8. Meats Avenue / SR 55 northbound ramp (future)
9. Meats Avenue / Santiago Boulevard
10. Katella Avenue / Tustin Street
11. Katella Avenue / SR 55 southbound ramp
12. Katella Avenue / Sacramento Street / SR 55 northbound off-ramp
13. Katella Avenue / Handy Street
14. Chapman Avenue / Tustin Street
15. Chapman Avenue / North Wayfield Street
16. Chapman Avenue / SR 55 southbound ramp
17. Chapman Avenue / SR 55 northbound ramp
18. Chapman Avenue / Yorba Street
19. 17th Street / Tustin Avenue
20. 17th Street / Ponderosa Street
21. 17th Street / SR 55 southbound ramps / Deodar Street
22. 17th Street / SR 55 northbound ramps
23. 17th Street / Yorba Street / Carroll Way
24. 4th Street / Tustin Avenue
25. 4th Street / SR 55 southbound ramps
26. 4th Street / SR 55 northbound ramps
27. Irvine Boulevard / Yorba Street
28. First Street / Tustin Avenue / I-5 southbound connector (future)
29. Tustin Street / SR 22 westbound on-ramp (local)
30. 17th Street / Enderle Center Drive / Yorba Street (local)
31. First Street / Yorba Street / Pacific Street (local)

The SR 55/Meats Avenue interchange is proposed to be completed by Year 2023, as stated in the SCAG's 2016 financially constrained RTP/SCS; however, due to funding uncertainty, completion of this interchange will likely be postponed beyond 2035. Based on conversations with and concurrence from the City of Orange, Caltrans District 12, and OCTA, the SR 55/Meats Avenue interchange would be excluded from the Opening Year 2035 analysis but would be included as future roadway improvements under Design Year 2055 conditions.

2.5.2.3 Study Scenarios

Two project alternatives including the No Build alternative were analyzed under both Opening Year 2035 and Design Year 2055 conditions. A series of improvements proposed for the SR 55 corridor was evaluated, and concurrence to carry one Build Alternative forward for this IS/EA was concluded. The project descriptions of the project alternatives are presented in the following section. The study scenarios for traffic operations analysis include the following:

1. Existing (2017) Conditions
2. Opening Year (2035) No Build Alternative
3. Opening Year (2035) Build Alternative
4. Design Year (2055) No Build Alternative
5. Design Year (2055) Build Alternative

2.5.2.4 Methodology

Traffic Forecasting Methodology

The Orange County Transportation Analysis Model (OCTAM) version 4.0 TransCAD model was used to develop the traffic forecasts for this project. The SCAG's 2016 financially constrained RTP/SCS, adopted in April 2016, and Amendment 1, adopted in April 2017 (SCAG 2017), were used to develop the baseline roadway network. The OCTAM 4.0 model was then updated to reflect the projects listed in the 2016 financially constrained RTP/SCS and Amendment 1 using the descriptions stated in the RTP/Amendment 1 plus additional available project details. The project completion dates identified in the RTP/Amendment 1 were used to determine inclusion of these projects as future roadway improvements when developing the Opening Year (2035) and Design Year (2055) traffic forecasts. The only exception is the SR 55/Meats Avenue interchange. This interchange is proposed to be completed by Year 2023 as stated in the RTP/SCS; however, due to funding uncertainty, completion of this interchange will likely be postponed beyond 2035. Based on conversations with and concurrence from the City of Orange, Caltrans, and OCTA, the SR 55/Meats Avenue interchange would be excluded from the Opening Year (2035) analysis but would be included as future roadway improvements under Design Year (2055) conditions.

In addition to the network improvements, coordination with OCTA and the corridor cities ensures that proposed local development projects are reflected in the OCTAM model, including the proposed senior housing development at the south side of the Tustin Avenue and First Street intersection in the City of Santa Ana and several proposed development projects in the City of Tustin, including the Specific Plan studies in Downtown (Old Town), the Red Hill Avenue corridor north and south of I-5, and Tustin Legacy.

The OCTAM model has Base Year (2012) and Future Year (2040) scenarios. OCTA's Regional Modeling and Traffic Operations Section was used to develop and finalize the Future Year (2040) models consistent with the SCAG's 2016 financially constrained RTP. Once approved by OCTA, the 2040 OCTAM model was then used to develop model scenarios for the No Build and Build Alternative to forecast the Design Year (2055) traffic volumes. In addition, another set of models was developed to estimate traffic forecasts for the Opening Year (2035) conditions, under which the projects with completion date of beyond Year 2035 were removed from the models to reflect the 2035 buildout conditions.

Traffic forecasts for study locations were developed using the difference methodology which is consistent with methodologies delineated in the National Cooperative Highway Research Program Report (NCHRP) 255 published by the Transportation Research Board (TRB): Highway Traffic Data for Urbanized Area Project Planning and Design (Pedersen and Samdahl 1982). The Base Year (2012) and Future Year (2040) models were used to calculate the annual growth at study facilities, which was then applied to existing (2017) traffic counts to develop the Opening Year (2035) and Design Year (2055) traffic forecasts.

Operations Analysis Methodology

Freeway Analysis: Freeway mainline and ramp junctions were analyzed using the VISSIM microscopic multi-modal traffic flow simulation software. All components of freeway operations (i.e., mainline, on-ramp merge, off-ramp diverge, and weaving sections) operate as a single integrated system with congestion and queues affecting both upstream and downstream traffic operations. VISSIM was used for this operations analysis to capture the effects between all the freeway components and the system-wide measures of effectiveness (MOE). The freeway segments were analyzed using the *Highway Capacity Manual, 6th Edition* (HCM; TRB 2016), and the methodologies contained in VISSIM are consistent with the procedures and methodologies of HCM. The LOS was calculated for each study facility based on density in number of vehicles per hour per lane. Table 2.5-1 describes the LOS thresholds for freeway sections identified in the HCM 6th Edition. The peak-hour density calculations provided are consistent with the definitions from the HCM, which defines four freeway section types: merge, diverge, weave, and basic.

Table 2.5-1: Freeway LOS Threshold

LOS	Description	Mainline (Basic) Density (vplpm) [a]	Ramp/Weave Density (vplpm) [a]
A	Free-flow speeds prevail. Vehicles are almost completely unimpeded in their ability to maneuver within the traffic stream.	< 11	< 10
B	Free-flow speeds are maintained. The ability to maneuver with the traffic stream is only slightly restricted.	> 11 to 18	> 10 to 20
C	Flow with speeds at or near free-flow speeds. Freedom to maneuver within the traffic stream is noticeably restricted, and lane changes require more care and vigilance on the part of the driver.	> 18 to 26	> 20 to 28
D	Speeds decline slightly with increasing flows. Freedom to maneuver with the traffic stream is more noticeably limited, and the driver experiences reduced physical and psychological comfort.	> 26 to 35	> 28 to 35
E	Operation at capacity. There are virtually no usable gaps within the traffic stream, leaving little room to maneuver. Any disruption can be expected to produce a breakdown with queuing.	> 35 to 45	> 35 to 45 [b]
F	Represents a breakdown in flow.	> 45	> 45 [b]

Notes: vplpm: vehicles per lane per mile
a Density is reported in vehicles per lane per mile.
b The maximum density for ramp junctions and weaving sections under LOS E is not defined in the HCM. The maximum density for basic segments of 45 vplpm was assumed to apply to ramp junctions and weaving sections.
Source: Fehr & Peers, *State Route 55 (I-5 to SR-91) Widening Project Final Traffic Operations Report* (July 2018), p. 19.

Intersection Analysis: Ramp terminal intersections and the intersections adjacent to the ramp terminal intersections were also included and analyzed in the same VISSIM network with the freeway segments in order to capture the interactions between freeway, ramps, and adjacent

arterial intersections. Intersection operations were conducted using methodologies contained in the HCM 6th Edition. The HCM methodology for signalized intersections estimates the average control delay for vehicles at the intersection while the methodology for unsignalized intersections estimates the worst-case movement control delay for two-way stop-controlled intersections and the average control delay for all-way stop-controlled intersections. After the quantitative delay estimates are complete, the methodology assigns a qualitative letter grade that represents the operations of the intersection. These grades range from LOS A (minimal delay) to LOS F (congested conditions). LOS E represents at-capacity operations. Descriptions of the LOS letter grades for both signalized and unsignalized intersections are provided in Table 2.5-2.

Local intersection analysis was completed using the Intersection Capacity Utilization (ICU) methodology. Most jurisdictions in Orange County and the Orange County Congestion Management Program utilize this methodology as the standard approach for evaluating signalized intersection operations. The ICU methodology evaluates the critical movements for each signal and compares that to the critical movement capacity of the intersection, resulting in a volume-to-capacity (V/C) ratio. After the quantitative V/C estimates are complete, the methodology assigns a qualitative LOS grade representing the quality of intersection operations. Descriptions of the LOS letter grades for intersection V/C ratios are also provided in Table 2.5-2.

Table 2.5-2: Intersection LOS Threshold

LOS	Description	Signalized Intersections Delay (seconds/vehicle)	Signalized Intersections Volume/Capacity Ratio	Unsignalized Intersections Delay (seconds/vehicle)
A	Very low delay occurs due to little or no conflicting traffic.	< 10.0	0.00 – 0.60	< 10.0
B	Low delay occurs although conflicting traffic becomes noticeable.	> 10.0 to 20.0	0.61 – 0.70	> 10.0 to 15.0
C	Average delays result from increased conflicting traffic.	> 20.0 to 35.0	0.71-0.80	> 15.0 to 25.0
D	Longer delays occur due to a reduction in available gaps. At signals, individual cycle failures are noticeable.	> 35.0 to 55.0	0.81-0.90	>25.0 to 35.0
E	High delays and extensive queues occur. This value indicates volume-to-capacity ratios. This is considered to be the limit of acceptable delay.	> 55.0 to 80.0	0.91-1.00	> 35.0 to 50.0
F	Delays are unacceptable to most drivers due to over-saturation.	> 80.0	>1.00	> 50.0

Source: Fehr & Peers, State Route 55 (I-5 to SR-91) Widening Project Final Traffic Operations Report (July 2018), p. 20.

Analysis Evaluation Criteria

The analysis evaluation criteria described below were used to determine acceptable traffic operating conditions and are based on the level of service policies identified by Caltrans (jurisdiction for freeway mainline/ramp/ramp terminal intersection) and the Cities of Anaheim, Orange, Santa Ana, and Tustin (jurisdiction for local intersections).

Caltrans

The Caltrans' Guide for the Preparation of Traffic Impact Studies (Caltrans 2002) states "Caltrans endeavors to maintain a target LOS at the transition between LOS "C" and LOS "D" (see Appendix "C-3") on State highway 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". For the purpose of this study, LOS D is assumed to be the criteria for SR 55 mainline segments, on- and off-ramps, and ramp terminal intersections.

City of Anaheim

The City of Anaheim General Plan Circulation Element (City of Anaheim 2018) has established that the LOS should be LOS D or better for major intersections in the city and LOS E or better for Congestion Management Plan (CMP) roadways and intersections.

City of Orange

The City of Orange Traffic Impact Analysis Guidelines (August 2007) states that a volume/capacity ratio of 0.90 (LOS D) shall be the lowest acceptable Service Level at intersections per the City's General Plan Circulation Element and Growth Management Element requirements (City of Orange 2015).

City of Santa Ana

Per the City of Santa Ana General Plan Circulation Element (January 2010), LOS D has been established as the maximum acceptable LOS for major intersections in the city except in major development areas. The CMP establishes LOS E as the maximum level of operation for CMP roadways (freeways and Smart Streets).

City of Tustin

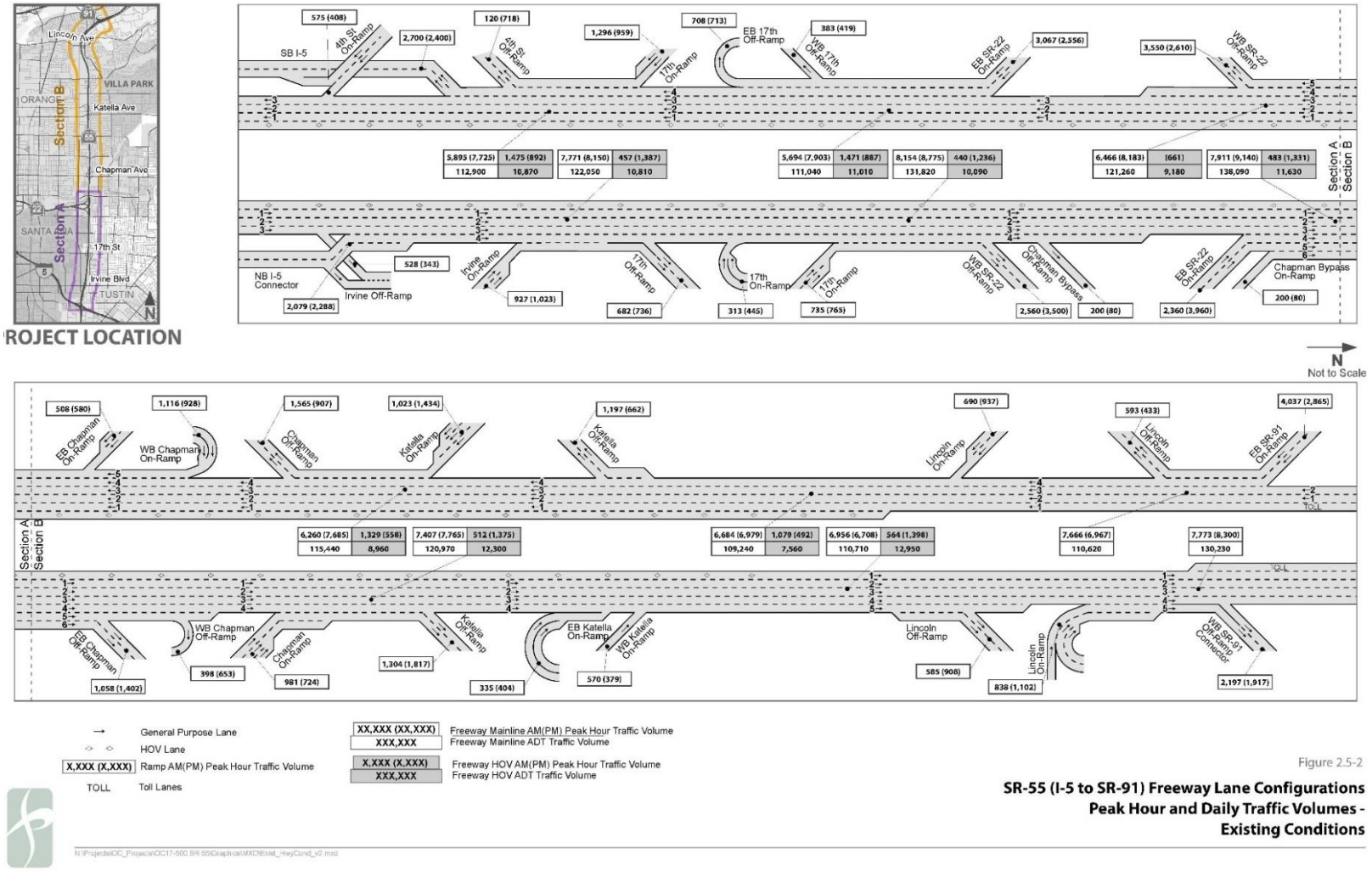
The City of Tustin General Plan Circulation Element (City of Tustin 2017) has established LOS D as a threshold standard to monitor capacity needs for both ADT link volumes and peak-hour volumes, except for designated Smart Streets for which LOS E is the recommended standard for these facilities.

Based on the above LOS policies identified by Caltrans and local jurisdictions, LOS D is considered the criteria for acceptable operations for the purpose of this project.

2.5.2.5 Existing Traffic Operations

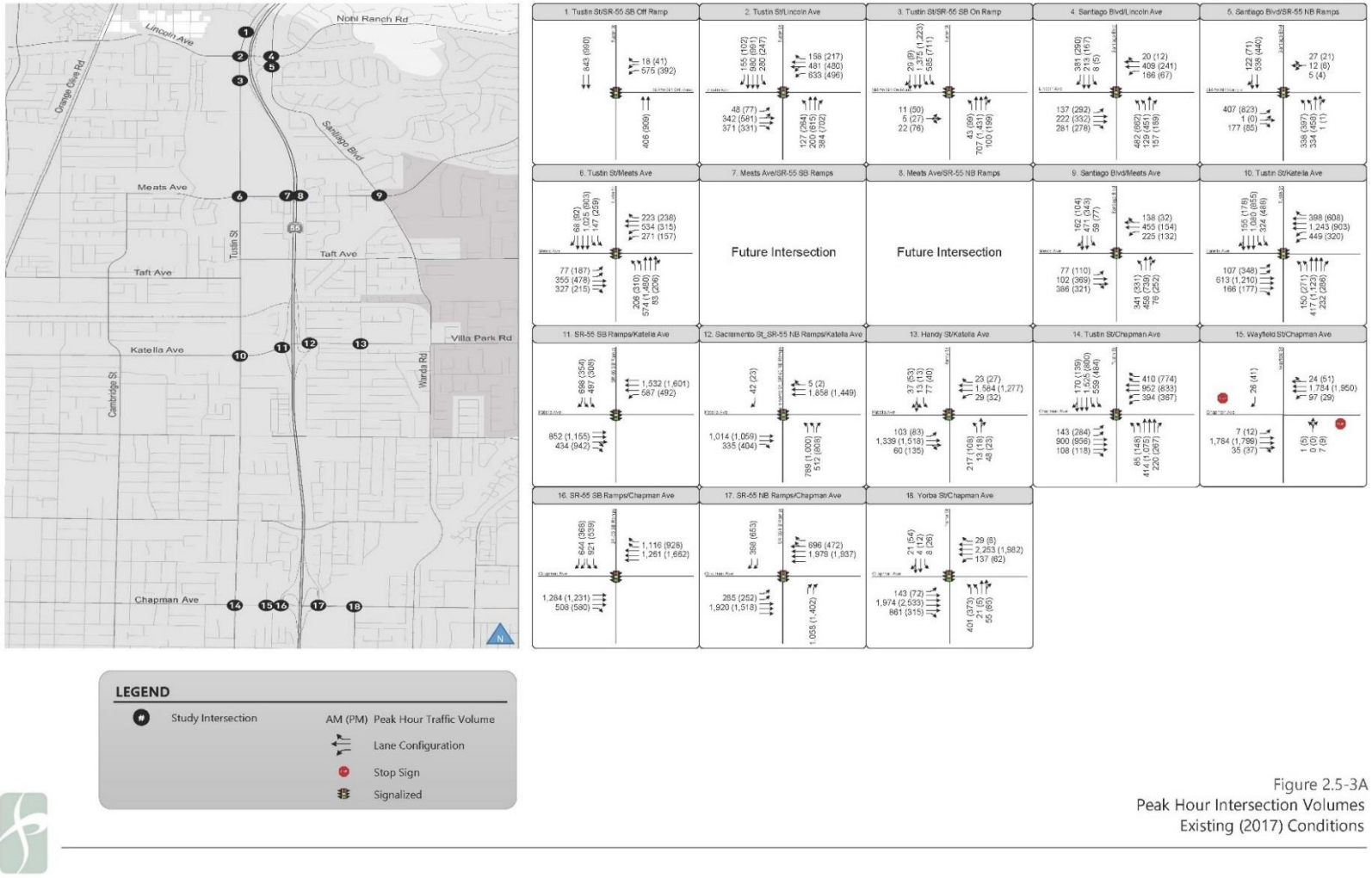
Existing traffic conditions described in this section are based on traffic counts and traffic conditions in 2017. All traffic counts were collected when schools were in session. Figure 2.5-2 shows the existing (2017) peak hour and daily traffic volumes for freeway mainline segments and ramps. The study intersection existing peak hour turning movement traffic volumes are displayed in Figure 2.5-3a and Figure 2.5-3b.

Figure 2.5-2. Peak Hour and Daily Traffic Volumes – Existing Conditions



Source: Fehr & Peers 2018

Figure 2.5-3a. Peak Hour Intersection Volumes – Existing (2017) Conditions



Source: Fehr & Peers 2018

Figure 2.5-3b. Peak-Hour Intersection Volumes – Existing (2017) Conditions

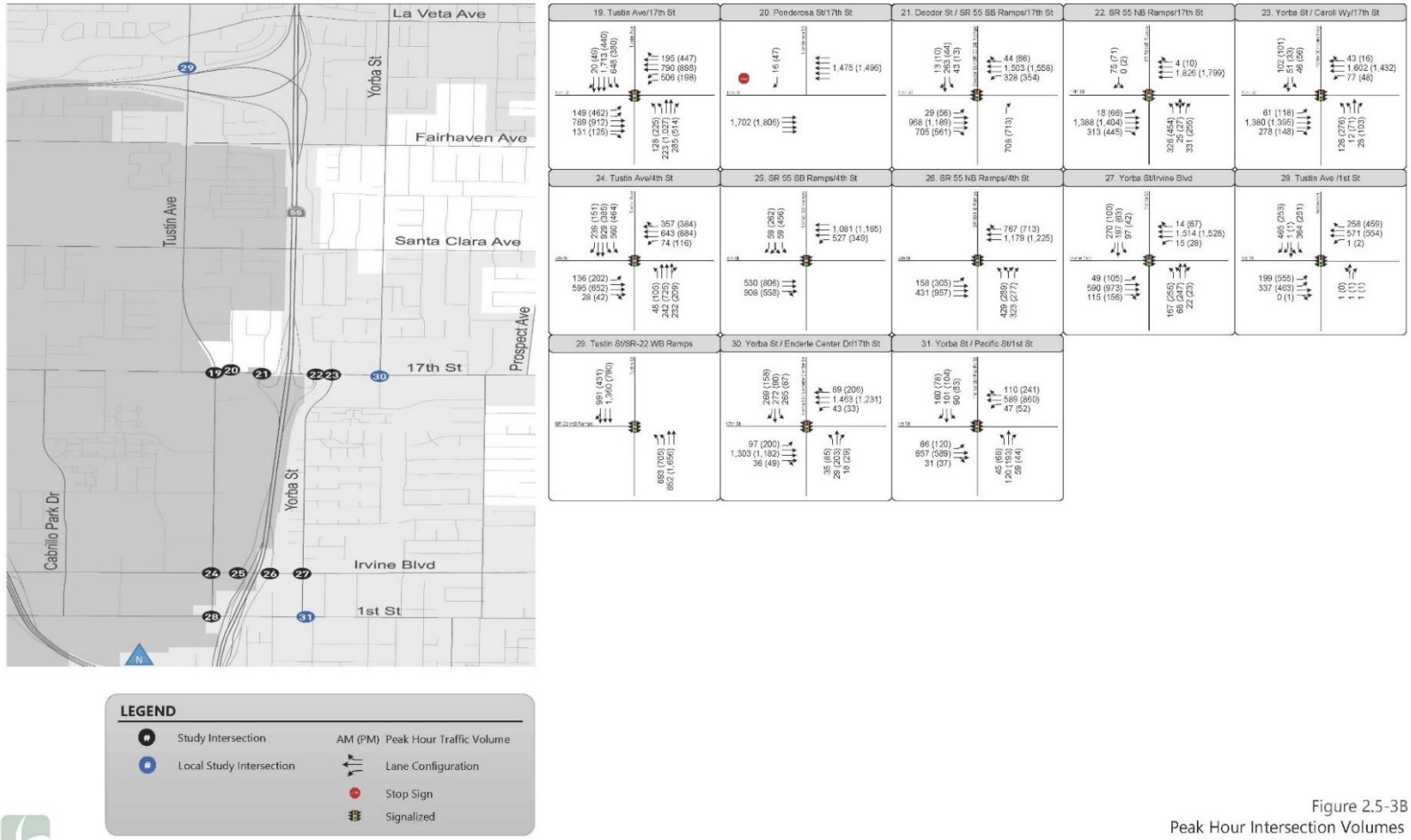


Figure 2.5-3B
Peak Hour Intersection Volumes
Existing (2017) Conditions

Source: Fehr & Peers 2018

This page intentionally left blank

Freeway Operations

Table 2.5-3a and Table 2.5-3b show the AM and PM peak-hour density and LOS for the study freeway mainline segments and ramp junctions on northbound and southbound SR 55, respectively. Traffic congestion with deficient LOS (E and F) currently occurs on southbound SR 55 in the AM peak hour and on northbound SR 55 in the PM peak hour.

During the AM peak hour, most of the study locations on northbound SR 55 operate at LOS D or better, except for the Irvine Boulevard off-ramp, northbound I-5 on-ramp, eastbound 17th Street on-ramp, westbound Katella Avenue on-ramp, and the Lincoln Avenue off-ramp, which operate at LOS E or F conditions. During the PM peak hour, all the study locations on northbound SR 55 experience severe congestion and operate at LOS E or F conditions. Multiple congestion hot spots exist in the northbound direction at 17th Street, SR 22 off-ramp, and SR 91, which result in significant vehicle queues extending from SR 91 throughout the study corridor to I-5 and beyond.

Table 2.5-3a: Existing Northbound SR 55 Freeway Operations

No.	Location	Type	AM Peak Hour Density [a]	AM Peak Hour LOS	PM Peak Hour Density [a]	PM Peak Hour LOS
1	SR 55 NB: Irvine Blvd off-ramp	Diverge	**36.6** [b]	**E** [b]	**86.5** [b]	**F** [b]
2	SR 55 NB: NB I-5 on-ramp	Merge	**37.2** [b]	**E** [b]	**111.1** [b]	**F** [b]
3	SR 55 NB: Irvine Blvd on-ramp to 17th St off-ramp	Weave	32.1	D	**86.3** [b]	**F** [b]
4	SR 55 NB: 17th St EB on-ramp	Merge	**46.1** [b]	**F** [b]	**103.6** [b]	**F** [b]
5	SR 55 NB: 17th St WB on-ramp to SR 22 off-ramp	Weave	28.1	D	**70.8** [b]	**F** [b]
6	SR 55 NB: Chapman Ave Bypass off-ramp	Diverge	32.1	D	**36.8** [b]	**E** [b]
7	SR 55 NB: SR 22 on-ramp to Chapman Ave off-ramp	Weave	23.9	C	**55.1** [b]	**F** [b]
8	SR 55 NB: Chapman Ave WB off-ramp	Diverge	25.8	C	**54.2** [b]	**F** [b]
9	SR 55 NB: Chapman Ave on-ramp	Merge	23.8	C	**77.6** [b]	**F** [b]
10	SR 55 NB: Chapman Ave on-ramp to Katella Ave off-ramp	Basic	22.8	C	**77.0** [b]	**F** [b]
11	SR 55 NB: Katella Ave off-ramp	Diverge	24.0	C	**78.0** [b]	**F** [b]
12	SR 55 NB: Katella Ave EB on-ramp	Merge	27.4	C	**111.8** [b]	**F** [b]
13	SR 55 NB: Katella Ave WB on-ramp	Merge	**36.8** [b]	**E** [b]	**104.0** [b]	**F** [b]
14	SR 55 NB: Katella Ave WB on-ramp to Lincoln Ave off-ramp	Basic	32.9	D	**68.9** [b]	**F** [b]
15	SR 55 NB: Lincoln Ave off-ramp	Diverge	**37.8** [b]	**E** [b]	**70.8** [b]	**F** [b]
16	SR 55 NB: Lane Drop to Lincoln Ave on-ramp	Basic	34.4	D	**74.6** [b]	**F** [b]
17	SR 55 NB: Lincoln Ave on-ramp to SR 91 off-ramp	Weave	25.6	C	**89.3** [b]	**F** [b]

Notes: Ave: Avenue; Blvd: Boulevard; EB: eastbound; LOS: level of service; NB: northbound; SR: State Route; St: Street; WB: westbound

a Density is reported in vehicles per hour per lane.

b **Bold** font indicates unacceptable LOS E or F conditions.

Source: Fehr & Peers, *State Route 55 (I-5 to SR-91) Widening Project Final Traffic Operations Report* (July 2018), p. 32.

Table 2.5-3b: Existing Southbound SR 55 Freeway Operations

No.	Location	Type	AM Peak Hour Density [a]	AM Peak Hour LOS	PM Peak Hour Density [a]	PM Peak Hour LOS
1	SR 55 SB: SR 91 on-ramp to Lincoln Ave off-ramp	Weave	**37.1** [b]	**E** [b]	26.7	C
2	SR 55 SB: Lincoln Ave on-ramp	Merge	**82.5** [b]	**F** [b]	**40.4** [b]	**E** [b]
3	SR 55 SB: Lincoln Ave on-ramp to Katella Ave off-ramp	Basic	**72.5** [b]	**F** [b]	26.6	C
4	SR 55 SB: Katella Ave off-ramp	Diverge	**78.2** [b]	**F** [b]	26.2	C
5	SR 55 SB: Katella Ave on-ramp to Chapman Ave off-ramp	Weave	**78.8** [b]	**F** [b]	27.6	C
6	SR 55 SB: Chapman Ave WB on-ramp	Merge	**63.3** [b]	**F** [b]	27.1	C
7	SR 55 SB: Chapman Ave EB on-ramp	Merge	**92.9** [b]	**F** [b]	30.9	D
8	SR 55 SB: SR 22 off-ramp	Diverge	**56.7** [b]	**F** [b]	**44.6** [b]	**F** [b]
9	SR 55 SB: SR 22 on-ramp	Merge	**147.0** [b]	**F** [b]	25.8	C
10	SR 55 SB: 17th St WB off-ramp	Diverge	**125.5** [b]	**F** [b]	28.8	D
11	SR 55 SB: 17th St EB off-ramp	Diverge	**90.1** [b]	**F** [b]	31.5	D
12	SR 55 SB: 17th St on-ramp to 4th St off-ramp	Weave	**95.4** [b]	**F** [b]	**39.1** [b]	**E** [b]
13	SR 55 SB: SB I-5 off-ramp	Diverge	**65.8** [b]	**F** [b]	**41.6** [b]	**E** [b]
14	SR 55 SB: 4th St on-ramp	Merge	**44.2** [b]	**F** [b]	24.7	C

Notes: Ave: Avenue; EB: eastbound; LOS: level of service; SB: southbound; SR: State Route; St: Street; WB: westbound
a Density is reported in vehicles per hour per lane.
b **Bold** font indicates unacceptable LOS E or F conditions.
Source: Fehr & Peers, *State Route 55 (I-5 to SR-91) Widening Project Final Traffic Operations Report* (July 2018), p. 32.

In the southbound direction, SR 55 experiences significant congestion during the AM peak hour due to heavy commute traffic, which results in LOS E or F conditions at all the study locations on southbound SR 55 from SR 91 to I-5. During the PM peak hour, most of study locations operate at LOS D or better with the exception of the Lincoln Avenue on-ramp, SR 22 off-ramp due to downstream congestion along westbound SR 22, the weaving segment between 17th Street on-ramp and 4th Street off-ramp, and the southbound I-5 off-ramp, which operate at LOS E or F conditions during the PM peak hour.

Intersection Operations

Table 2.5-4 shows the AM and PM peak hour delay and LOS for the study intersections. As shown, the majority of the study intersections operate at LOS D or better in the AM peak hour, except for the 17th Street/Tustin Street, 4th Street/Tustin Street, and the 4th Street/Yorba Street intersection operating at LOS F conditions. During the PM peak hour, heavier traffic demand along arterials causes more intersections to operate at deficient LOS E or F conditions, including the Tustin Street intersections near Lincoln Avenue, a few intersections along Meats Avenue and Katella Avenue, 17th Street intersections at Tustin Street and Ponderosa Street, and the 4th Street intersections at Tustin Street and Yorba Street due to the vehicle queue spillback from the 4th Street/SR 55 interchange.

Table 2.5-4: Existing Intersection Operations

No.	Intersection	Control	AM Delay [a]	AM LOS	PM Delay [a]	PM LOS
1	Tustin St/SR 55 SB off-ramp	Signal	15	B	**145** [c]	**F** [c]
2	Tustin St/Lincoln Ave	Signal	48	D	**104** [c]	**F** [c]
3	Tustin St/SR 55 SB on-ramp	Signal	17	B	**72** [c]	**E** [c]
4	Santiago Blvd/Lincoln Avenue	Signal	39	D	34	C
5	Santiago Blvd/SR 55 NB on-ramp	Signal	28	C	44	D
6	Meats Ave/Tustin St	Signal	35	C	**86** [c]	**F** [c]
7	Meats Ave/SR 55 SB ramps	Future Intersection	0	0	0	0
8	Meats Ave/SR 55 NB ramps	Future Intersection	0	0	0	0
9	Meats Ave/Santiago Blvd	Signal	37	D	**64** [c]	**E** [c]
10	Katella Ave/Tustin St	Signal	37	D	**77** [c]	**E** [c]
11	Katella Ave/SR 55 SB ramps	Signal	38	D	38	D
12	Katella Ave/SR 55 NB ramps	Signal	40	D	**89** [c]	**F** [c]
13	Katella Ave/Handy St	Signal	28	C	41	D
14	Chapman Ave/Tustin St	Signal	43	D	52	D
15	Chapman Ave/Wayfield St	Side Street Stop	16	B	23	C
16	Chapman Ave/SR 55 SB ramps	Signal	23	C	19	B
17	Chapman Ave/SR 55 NB ramps	Signal	28	C	12	B
18	Chapman Ave/Yorba St	Signal	40	D	27	C
19	17th St/Tustin St	Signal	**97** [c]	**F** [c]	**62** [c]	**E** [c]
20	17th St/ Ponderosa St	Side Street Stop	10	B	**40** [c]	**E** [c]
21	17th St/SR 55 SB ramps	Signal	51	D	22	C
22	17th St/SR 55 NB ramps	Signal	19	B	41	D
23	17th St/Yorba St/Carroll Way	Signal	47	D	53	D
24	4th St/Tustin St	Signal	**103** [c]	**F** [c]	**56** [c]	**E** [c]
25	4th St/SR 55 SB ramps	Signal	22	C	25	C
26	4th St/SR 55 NB ramps	Signal	28	C	34	C
27	4th St/Yorba St	Signal	**88** [c]	**F** [c]	**182** [c]	**F** [c]
28	First St/Tustin St	Signal	23	C	23	C
29	Tustin St/SR 22 WB on-ramp	Signal	24	C	15	B
30	17th St/Enderle Center Dr/Yorba St [b]	Signal	0.59	A	0.62	A
31	First St/Yorba St/Pacific St [b]	Signal	0.39	A	0.53	A

Notes: Ave: Avenue; Dr: Drive; EB: eastbound; LOS: level of service; NB: northbound; SB: southbound; SR: State Route; St: Street; WB: westbound

a Delay is reported for seconds per vehicle.

b Volume/capacity ratio is reported for the local intersections.

c **Bold** text indicates unacceptable level of service.

Source: Fehr & Peers, *State Route 55 (I-5 to SR-91) Widening Project Final Traffic Operations Report* (July 2018), p. 34.

Systemwide Performance

While LOS is a typical indicator of transportation facility performance, the systemwide performance metrics have become effective measurements in evaluating transportation system performance and have been applied in many transportation projects. The systemwide

performance measures used for this project include travel time, travel speeds, number of vehicles served by the study network, and vehicle-hours of delay (VHD).

Table 2.5-5 shows the AM and PM peak hour travel time and speeds for the SR 55 corridor. During the AM peak hour, northbound SR 55 traffic travel at free-flow speed at most of the study corridor. In the southbound direction, heavy congestion between I-5 and SR 22 results in an average speed of less than 20 mph. North of SR 22, the travel speed increases to approximately 30 mph through SR 91. The total travel time for southbound SR 55 is approximately 18 minutes with the average speed of 25 mph.

During the PM peak hour, significant congestion along the northbound SR 55 results in an average speed of approximately 30 mph through the study corridor from I-5 to SR 91. The total travel time for northbound SR 55 is approximately 15 minutes. The southbound traffic flows quite well with a free-flow speed at most locations except for some slowdown at the SR 22 off-ramp due to downstream congestion at the westbound SR 22, 17th Street on-ramp to 4th Street off-ramp, and the southbound I-5 off-ramp. The total travel time for southbound SR 55 is approximately seven minutes with the average speed of 63 mph.

Table 2.5-5: Existing SR 55 Corridor Peak Hour Travel Time

Direction	Location	AM Peak Hour Travel Time (min:sec)	AM Peak Hour Speed	PM Peak Hour Travel Time (min:sec)	PM Peak Hour Speed
NB SR 55	I-5 to SR 22	2:20	64	5:00	31
NB SR 55	SR 22 to SR 91	4:20	64	9:50	29
NB SR 55	**I-5 to SR 91 (Total)**	**6:40**	**64**	**14:50**	**29**
SB SR 55	SR 91 to SR 22	9:50	29	4:30	64
SB SR 55	SR 22 to I-5	8:00	19	2:30	62
SB SR 55	**SR 91 to I-5 (Total)**	**17:50**	**25**	**7:00**	**63**

Notes: I-: Interstate; min: minutes; NB: northbound; SB: southbound; sec: seconds; SR: State Route
Source: Fehr & Peers, *State Route 55 (I-5 to SR-91) Widening Project Final Traffic Operations Report* (July 2018), p. 35.

In addition, other systemwide traffic metrics (number of vehicles served by the network, VHD, and average delay per vehicle) were reported for both the AM and PM peak periods and are shown in Table 2.5-6. The results reflect the higher observed level of congestion in the AM peak period, which translates to fewer people getting through the corridor and higher average vehicle delay. The average delay is approximately 2.5 minutes during the AM peak period and slightly above two minutes for PM travelers.

Table 2.5-6: Existing SR 55 Systemwide Traffic Metrics

Traffic Metrics	AM Peak Period	PM Peak Period
Number of Vehicles Served	193,540	240,100
VHD (vehicle hours of delay)	8,330	8,520
Delay per Vehicle (sec/veh)	150	130

Notes: sec/veh: seconds per vehicle
Source: Fehr & Peers, *State Route 55 (I-5 to SR-91) Widening Project Final Traffic Operations Report* (July 2018), p. 36.

2.5.3 Environmental Consequences

2.5.3.1 Temporary Impacts

No Build Alternative

Under this alternative, no reconstruction or improvements would be made to the existing SR 55 corridor. As a result, the No Build Alternative would not result in temporary impacts related to traffic and circulation.

Build Alternative

The construction of the Build Alternative would result in temporary impacts to traffic circulation and pedestrian and bicycle access on and in the vicinity of the project segment of SR 55. Those impacts could include short-term closures of freeway and arterial facilities and modifications to the existing facilities as described below.

It is anticipated that no reductions in the number of mainline traveled lanes will occur during peak-hour period. Standard lane widths of 12 feet will remain on a majority of the mainline; however, a minimum lane width of 11 feet will occur in tight locations on the mainline and ramps. Local overnight ramp closures would be required to make improvements on the ramps and overhead signage installation. Temporary lane closures are required to stage construction when installing k-rail, when lanes are being restriped, and when the freeway is being restored to its completed condition. Temporary overnight full roadway closure on Lincoln Avenue will be required for bridge falsework (installation and removal) and construction. Temporary full freeway closure will be needed for overhead sign construction at various locations on SR 55. These temporary closures will be limited to off-peak hours, and adequate notification would be provided to the public and emergency service providers.

Conceptual stage construction for this project has identified the need for two stages. In the first stage, the existing mainline lanes will be shifted and restriped toward the median, and traffic will move to the temporary lanes. On- and off-ramps will also be restriped, and traffic will be shifted to the temporary lanes. Stage 1 will begin constructing portions of the mainline freeway, ramp, and retaining walls. northbound and southbound 4th Street off-ramp termini improvements, southbound Katella Avenue interchange, and bridge construction at Lincoln Avenue will be completed at this stage. In Stage 1A, additional gore improvements will be constructed. In the Stage 2, portions of the temporary mainline lanes will be maintained to complete the remaining improvements. The temporary northbound and southbound mainline striping between 4th Street and 17th Street will be shifted to the outside to construct the median. The remaining ramp, gore, and retaining wall improvements will also be completed at this stage. During both stages, temporary railing (Type K) will be provided as protection from traffic, and the work area and will be relocated as necessary.

Preliminary conceptual Stage Construction Plans are provided in Appendix E: Project Plans.

The total duration of construction activities is anticipated to last for approximately 24 months. Temporary closures of the SR 55 mainline, interchange ramps, and local arterials would be limited to overnight (between 10:00 p.m. and 5:00 a.m.) with limited durations.

These temporary modifications would allow for traffic to pass through the project area on SR 55, the ramps, and the arterials; but those travelers would be expected to experience some delays as they travel on those facilities.

The following Project Features have been identified to minimize impacts to during construction.

PF-T-1 **Transportation Management Plan**. A Transportation Management Plan (TMP) will be developed during final design and will be implemented by the construction contractor during project construction to address short-term traffic circulation and access effects during project construction. Specifically, during final design, a qualified traffic engineer will prepare the TMP, which will include, but not be limited to, the elements described below to reduce traveler delays and enhance traveler safety during project construction. The TMP will be approved by OCTA and Caltrans District 12 during final design and will be incorporated into the plans, specifications, and estimates.

The purpose of the TMP is to address the short-term traffic and transportation impacts during construction of the project. The objectives of the TMP are to:

- Maintain traffic safety during construction
- Effectively maintain an acceptable level of traffic flow throughout the transportation system during construction
- Minimize traffic delays and facilitate reduction of the overall duration of construction activities
- Minimize detours and impacts to pedestrians and bicyclists
- Foster public awareness of the project and related transportation and traffic impacts
- Achieve public acceptance of construction of the project and the TMP measures

The TMP will contain, but not be limited to, the following elements intended to reduce traveler delay and enhance traveler safety. These elements will be refined during final design and incorporated in the TMP for implementation during project construction.

- **Public Information/Public Awareness Campaign (PAC)**. The primary goal of the PAC is to educate motorists, business owners and operators, residents, elected officials, and government agencies about project construction activities and associated transportation impacts. The PAC is an important tool for reaching target audiences with important construction project information and is anticipated to include, but not be limited to:
    - Rideshare information
    - Brochures and mailers
    - Media releases
    - Paid advertising

  - Public meetings
  - Broadcast fax and email services
  - Telephone hotline
  - Notification to targeted groups
  - Commercial traffic reporters/feeds
  - Project website
  - Visual information
  - Local cable television and news
  - Internet postings

- **Traveler Information Strategies**. The effective implementation of a traveler information system during construction is crucial for enabling motorists to make informed decisions about their travel plans and options with real-time traffic information. That real-time traffic information will include information on mainline, ramp, lane, and arterial closures and detours; travel delays; access to adjacent land uses; "businesses are open" signing; and other signing and information to assist travelers in navigating through, around, and in construction areas. Key components of the traveler information system are anticipated to include, but not be limited to:

  - Fixed and portable changeable message signs
  - Ground-mounted signs
  - Automated work zone information systems
  - Highway advisory radio
  - Lane closure website
  - Caltrans highway information network
  - Bicycle and pedestrian information
  - Commute Smart website

- **Incident Management**. Effective incident management will ensure that incidents in and near construction areas are cleared quickly and do not result in substantial delays for the traveling public in the vicinity of work zones. Incident management includes, but is not limited to:

  - Caltrans Construction Zone Enhanced Enforcement Program (COZEEP)
  - Freeway Service Patrol
  - Traffic surveillance stations
  - Caltrans Transportation Management Center
  - Traffic management team
  - Towing services

- **Construction Strategies**. The TMP will include procedures to lessen the transportation effects of project-related construction activities and will include, but not be limited to, consideration of the following:

  - Conflicts with other projects and special events
  - Construction staging alternatives
  - Mainline lane closures
  - Local road closures

  - Ramp and connector closures (no two consecutive on- or off-ramps in the same direction would be closed at the same time)
  - Pedestrian and bicycle detours and facility closures
  - Traffic control improvements
  - Coordination with other projects
  - Project phasing
  - Traffic screens
  - Truck traffic restrictions

- **Demand Management**. Temporarily reducing the overall traffic volumes on the project segment of SR 55 could reduce the short-term adverse effects of construction on traffic operations. The TMP will include, but not be limited to, the following strategies that could reduce vehicular demand in the study area during project construction:

  - Rideshare incentives
  - Transit services
  - Shuttle services
  - Variable work hours and telecommuting
  - Park-and-ride lots

- **Alternate Route Strategies**. The TMP will provide strategies for notifying motorists, pedestrians, and bicyclists of planned construction activities. This notification will allow travelers to make informed decisions about their travel plans, including the consideration of possible alternate routes. The TMP will finalize the detour and alternate routes for motorists, specifically addressing the following:

  - Mainline lane closures
  - Ramp/connector closures
  - Local road closures
  - Temporary highway or shoulder use
  - Local street improvements
  - Temporary detours and closures of bicycle and pedestrian facilities
  - Traffic signal coordination

The design/build contractor will implement the measures in the TMP during construction.

PF-T-2 Prior to and during construction, the construction contractor will coordinate with OCTA Central Communications regarding all temporary mainline ramp and arterial closures and detour plans that would affect OCTA bus routes to minimize temporary delays to OCTA bus service.

2.5.3.2 Permanent Impacts

As noted above, the following future year scenarios are considered in the traffic analysis:

1. Opening Year (2035) No Build Alternative
2. Opening Year (2035) Build Alternative

3. Design Year (2055) No Build Alternative)
4. Design Year (2055) Build Alternative

Figure 2.5-4 displays the Opening Year 2035 freeway traffic forecasts under the No Build Alternative. Figure 2.5-5a and Figure 2.5-5b show the Opening Year 2035 intersection traffic forecasts under the No Build Alternative. The Opening Year 2035 freeway and intersection traffic forecasts under the Build Alternative are shown in Figure 2.5-6, Figure 2.5-7a, and Figure 2.5-7b, respectively.

Under the Design Year 2055, the freeway and intersection traffic forecasts for the No Build Alternative are displayed in Figure 2.5-8, Figure 2.5-9a, and Figure 2.5-9b. The freeway and intersection traffic forecasts under the Build Alternative are shown in Figure 2.5-10, Figure 2.5-11a, and Figure 2.5-11b.

No Build Alternative

Under this alternative for Opening Year 2035, no improvements would be made to the existing SR 55 corridor other than routine roadway maintenance. Under Design Year 2055, the SR 55/Meats Avenue interchange was assumed to be in place.

Opening Year 2035 Conditions

The Opening Year 2035 operations analysis results for the No Build Alternative are summarized in Table 2.5-7a (northbound SR 55 AM), Table 2.5-7b (northbound SR 55 PM), Table 2.5-7c (southbound SR 55 AM), Table 2.5-7d (southbound SR 55 PM), Table 2.5-8a (intersection AM), Table 2.5-8b (intersection AM), Table 2.5-9a (travel time AM), Table 2.5-9b (travel time PM), and Table 2.5-10 (systemwide traffic metrics).

Freeway Operations: During the AM peak hour, southbound SR 55 would experience heavy congestion with deficient LOS E or F conditions from SR 91 to Katella Avenue. Most of the study locations on northbound SR 55 south of Katella Avenue off-ramp would operate at LOS D or better during the AM peak hour. North of Katella Avenue to SR 91, a majority of the northbound SR 55 study locations would operate at LOS E or F conditions due to higher demand along the corridor by 2035. During the PM peak hour, all the study locations on northbound SR 55 would experience noticeable congestion and operate at LOS F conditions. Southbound SR 55 from Chapman Avenue to I-5 would also experience moderate congestion with LOS E or F conditions at several study locations.

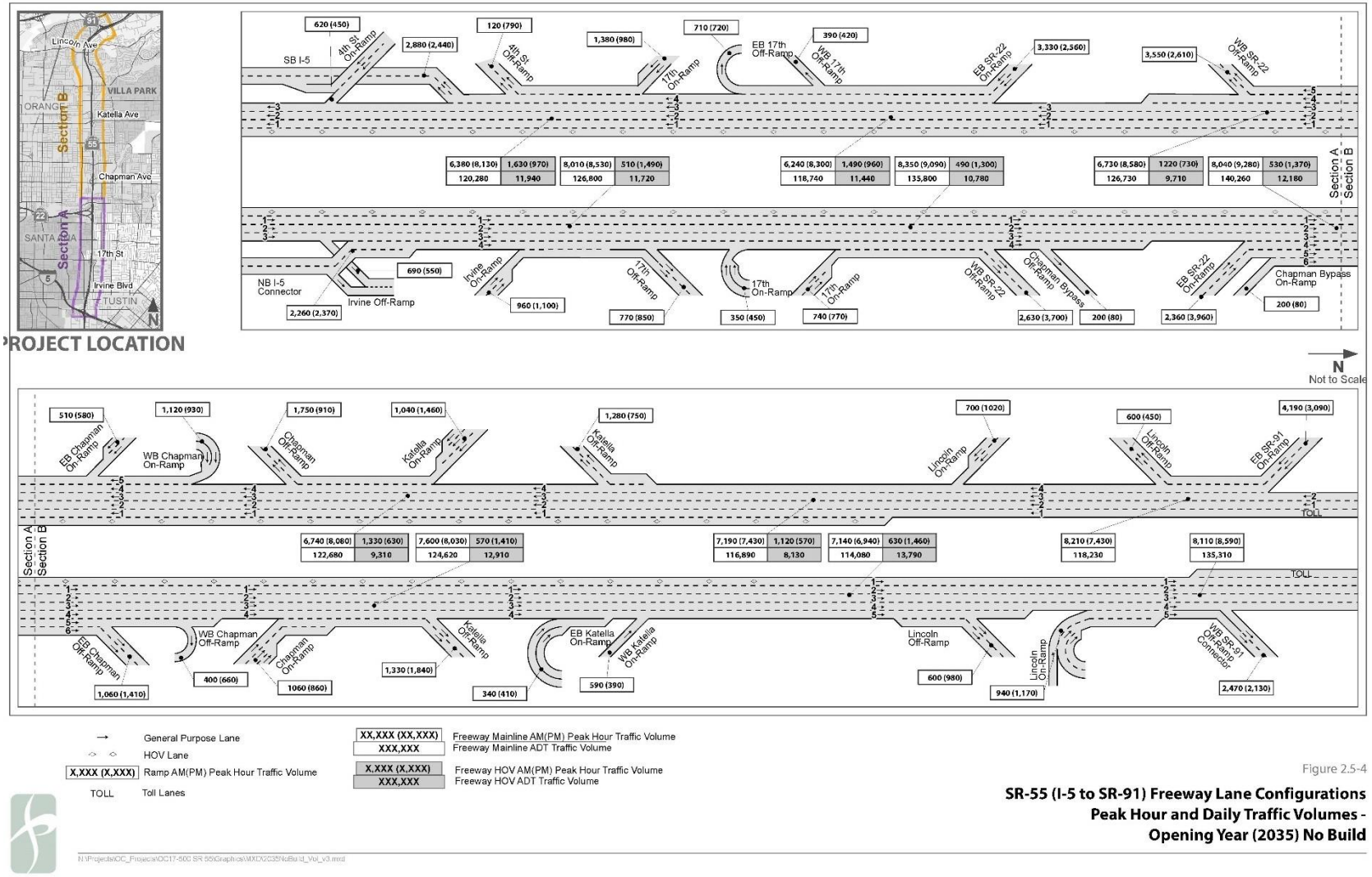
Intersection Operations: Most of the study intersections would operate at LOS D or better during the AM peak hour. Under the PM peak hour, 14 out of the 31 study intersections would experience noticeable traffic congestion and operate at LOS E or F conditions.

SR 55 Corridor Travel Time: During the AM peak hour, the northbound vehicles would travel at approximately 60 mph between I-5 and SR 22 and then expect moderate slowdown to 51 mph between SR 22 and SR 91. In the southbound direction, substantial congestion along southbound SR 55 under the No Build Alternative would result in an average speed of 30 mph between SR 91 and SR 22 and less than 30 mph between SR 22 and I-5. During the PM peak hour, significant congestion along the northbound SR 55 would result in an average speed of 26 mph

through the study corridor, while the southbound SR 55 traffic would flow much better, with a speed of 60 mph from SR 91 to SR 22 and approximately 55 mph from SR 22 to I-5.

Systemwide Traffic Metrics: Increasing congestion along the SR 55 corridor by 2035 would result in higher vehicle delay under the No Build Alternative under both AM and PM peak periods.

Figure 2.5-4. Peak Hour and Daily Traffic Volumes – Opening Year (2035) No Build



Source: Fehr & Peers 2018

Figure 2.5-5a. Peak Hour Intersection Volumes – Opening Year (2035) No Build Conditions

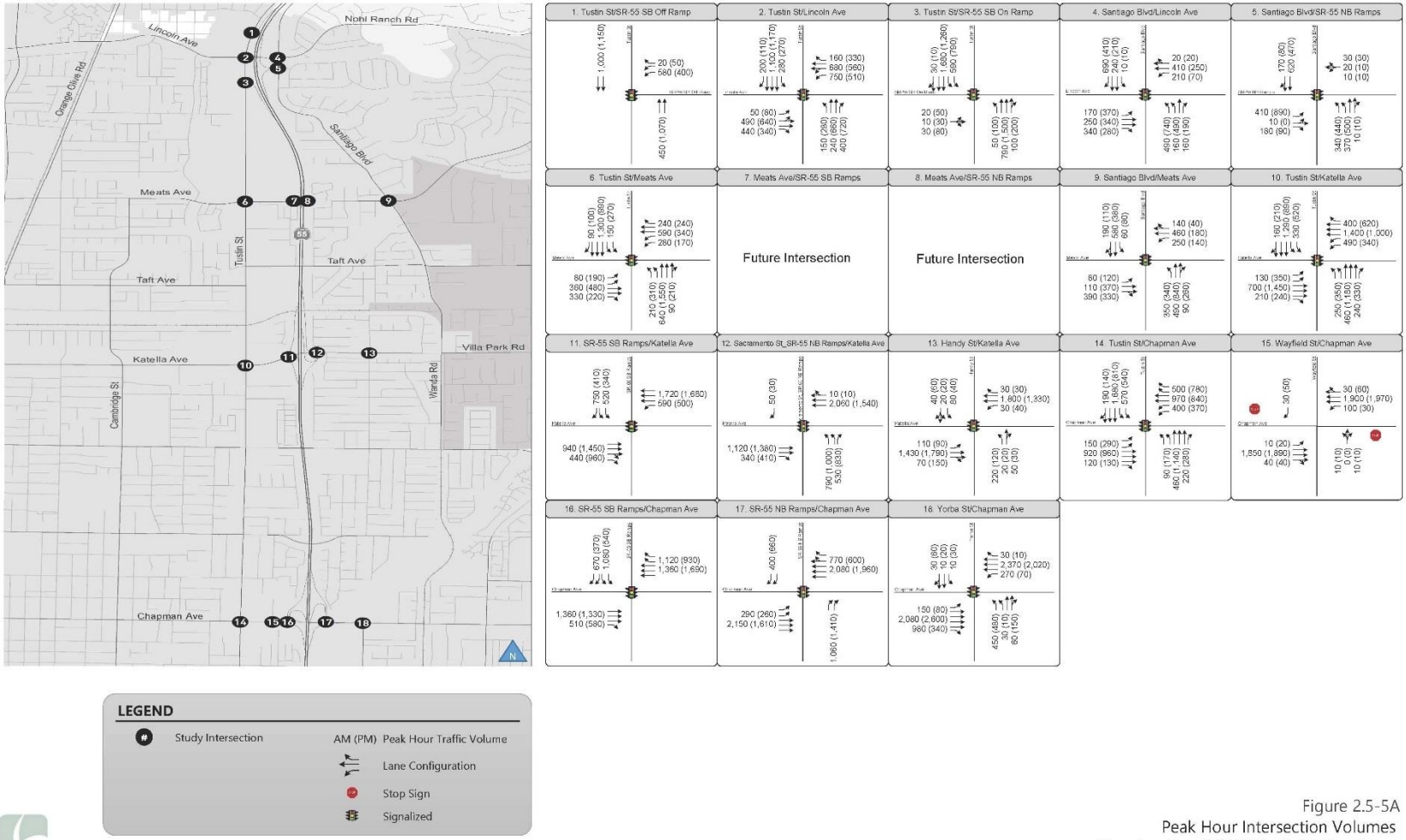


Figure 2.5-5A
Peak Hour Intersection Volumes
Opening Year (2035) No Build Conditions

Source: Fehr & Peers 2018

Figure 2.5-5b. Peak Hour Intersection Volumes – Opening Year (2035) No Build Conditions

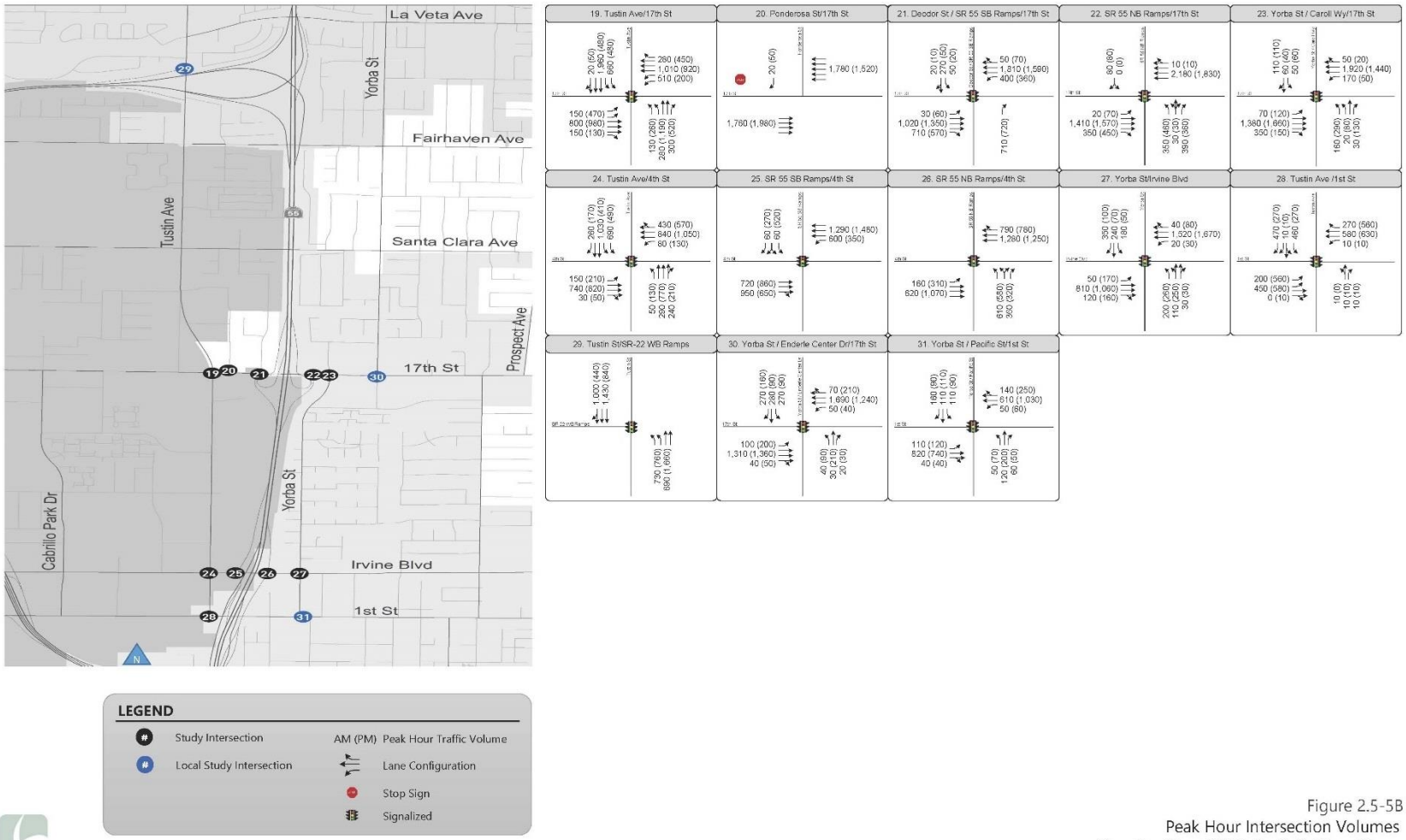
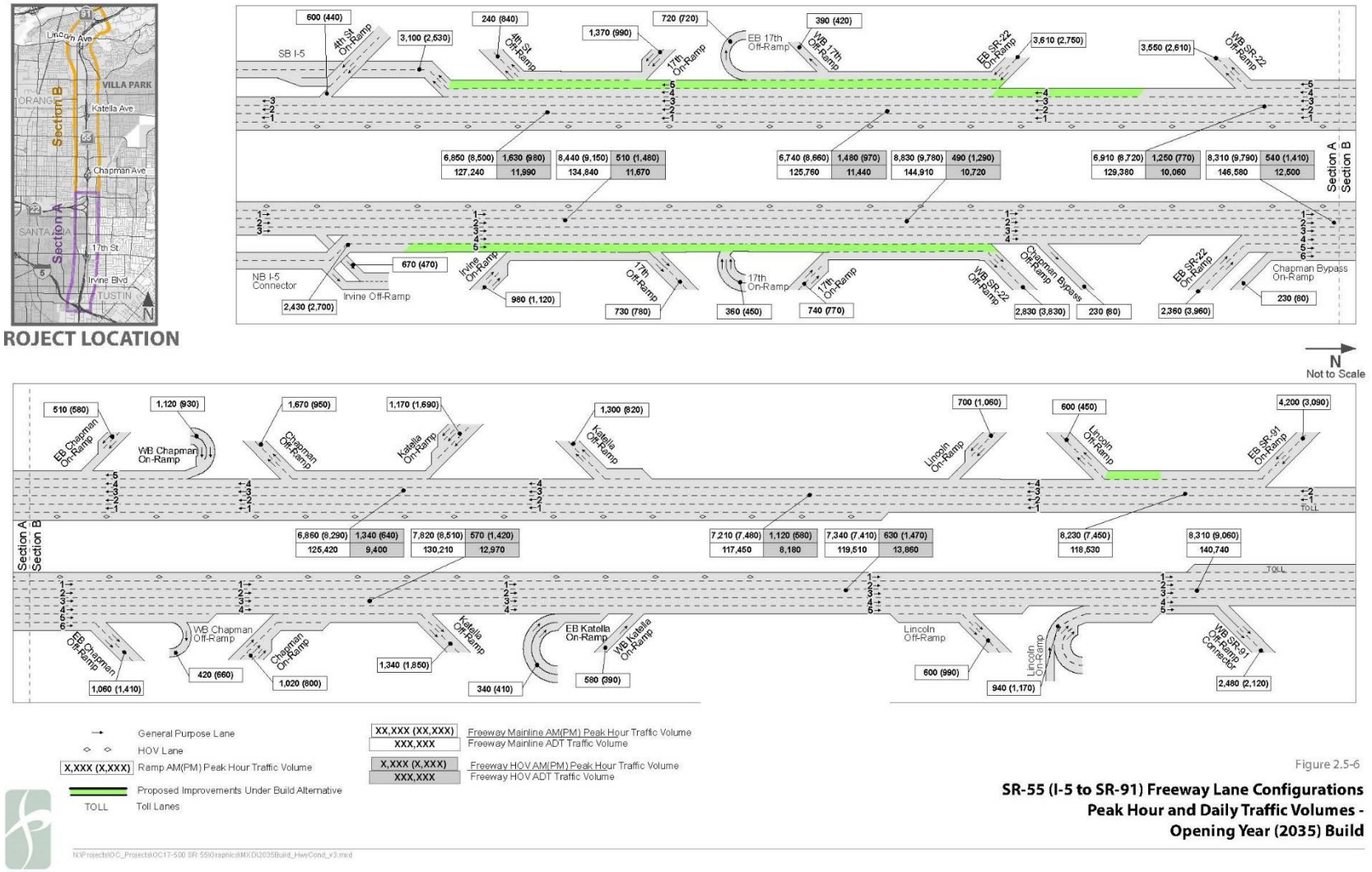


Figure 2.5-5B
Peak Hour Intersection Volumes
Opening Year (2035) No Build Conditions

Source: Fehr & Peers 2018

Figure 2.5-6. Peak Hour and Daily Traffic Volumes – Opening Year (2035) Build



Source: Fehr & Peers 2018

Figure 2.5-7a. Peak Hour Intersection Volumes – Opening Year (2035) Build Conditions

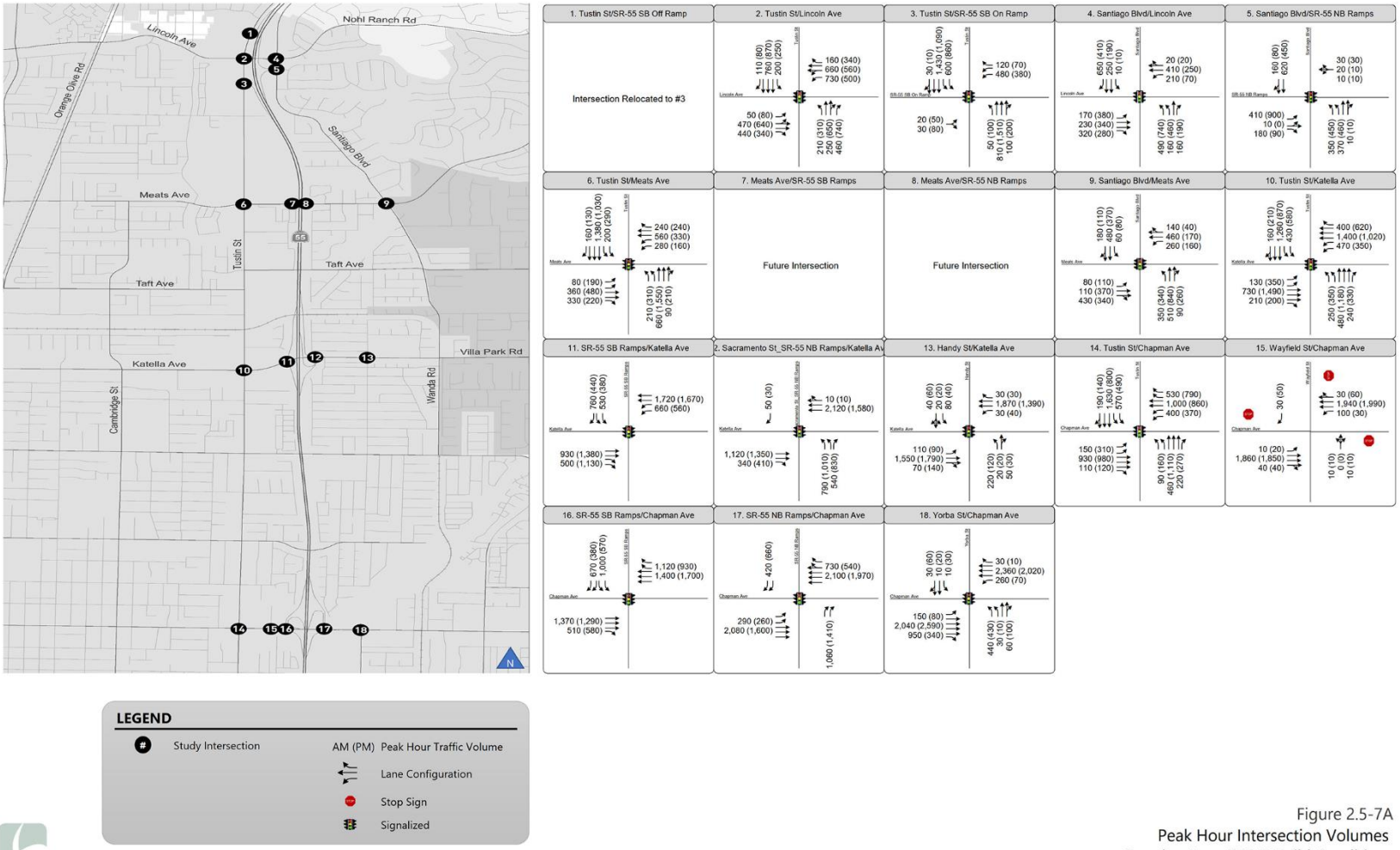


Figure 2.5-7A
Peak Hour Intersection Volumes
Opening Year (2035) Build Conditions

Source: Fehr & Peers 2018

Figure 2.5-7b. Peak Hour Intersection Volumes – Opening Year (2035) Build Conditions

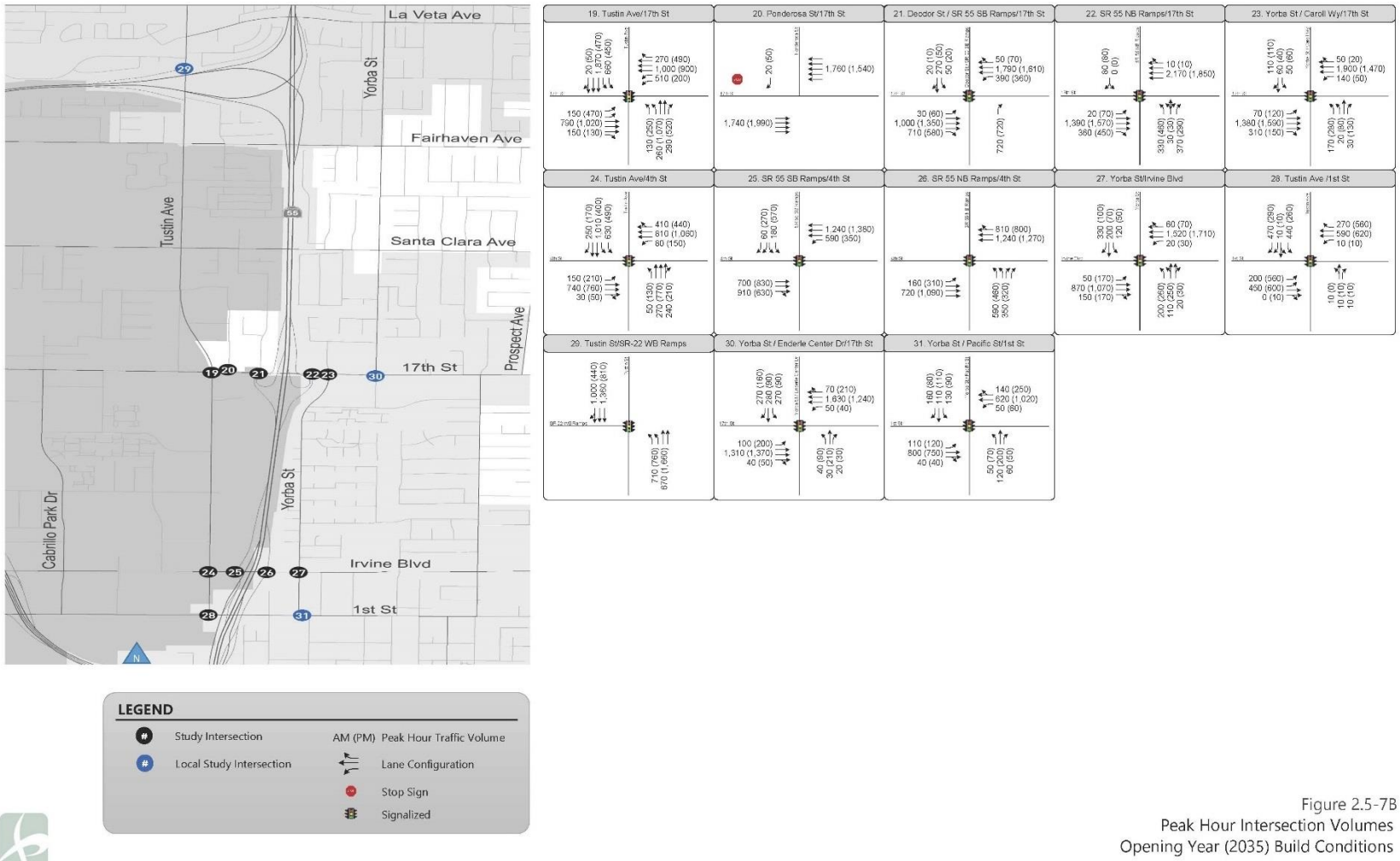
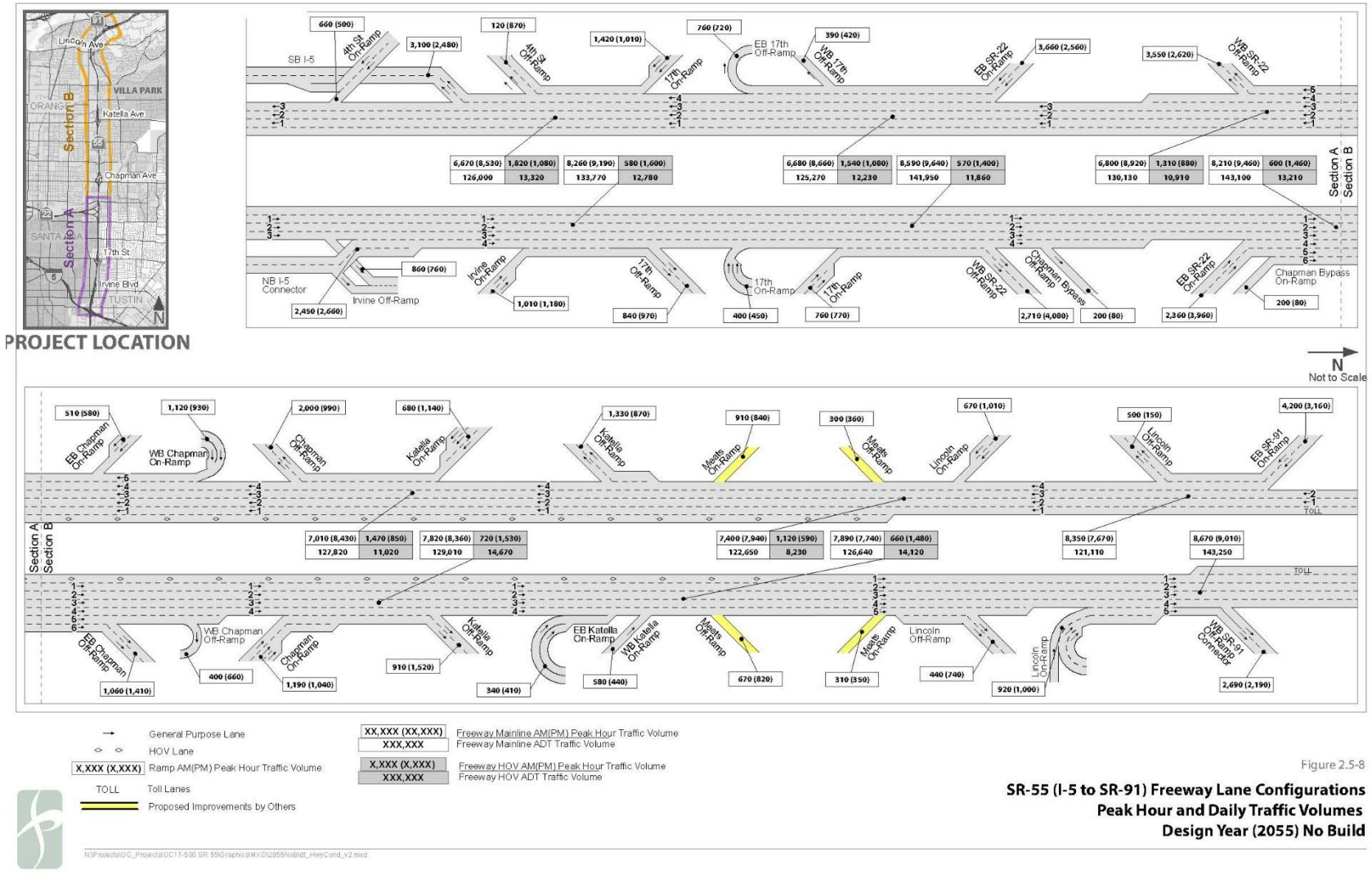


Figure 2.5-7B
Peak Hour Intersection Volumes
Opening Year (2035) Build Conditions

Source: Fehr & Peers 2018

Figure 2.5-8. Peak Hour and Daily Traffic Volumes– Design Year (2055) No Build



Source: Fehr & Peers 2018

Figure 2.5-9a. Peak Hour Intersection Volumes – Design Year (2055) No Build Conditions

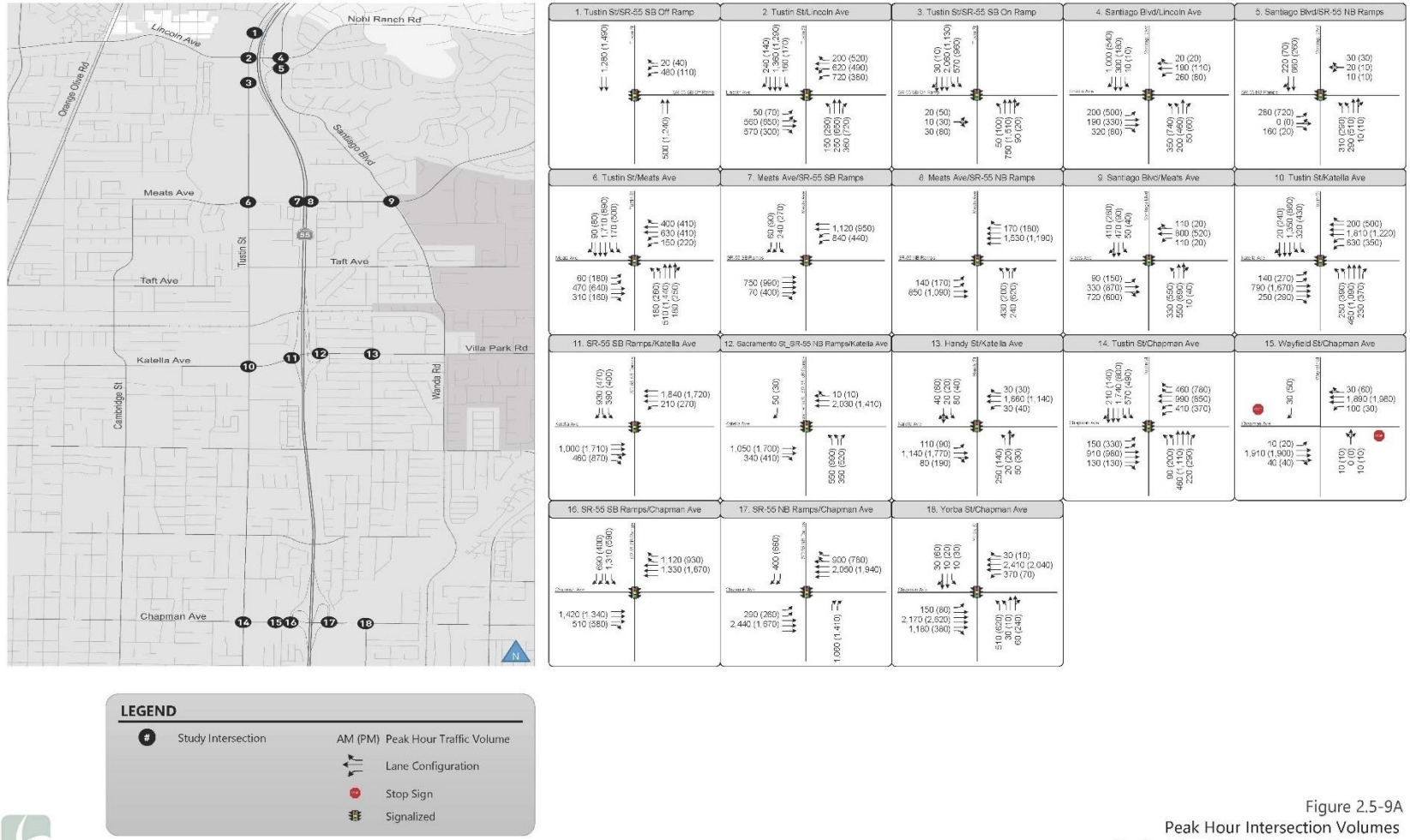


Figure 2.5-9A
Peak Hour Intersection Volumes
Design Year (2055) No Build Conditions

Source: Fehr & Peers 2018

Figure 2.5-9b. Peak Hour Intersection Volumes – Design Year (2055) No Build Conditions

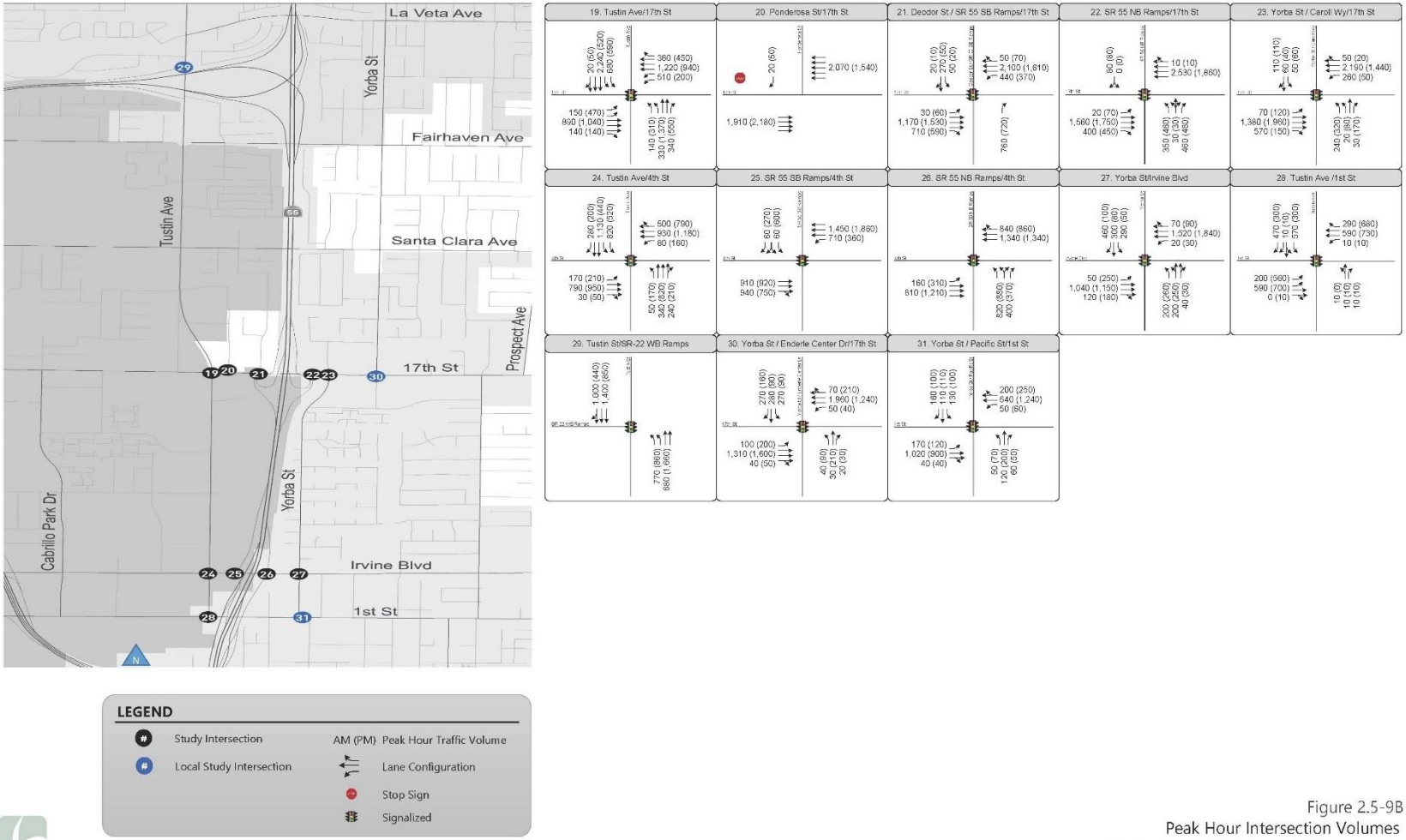
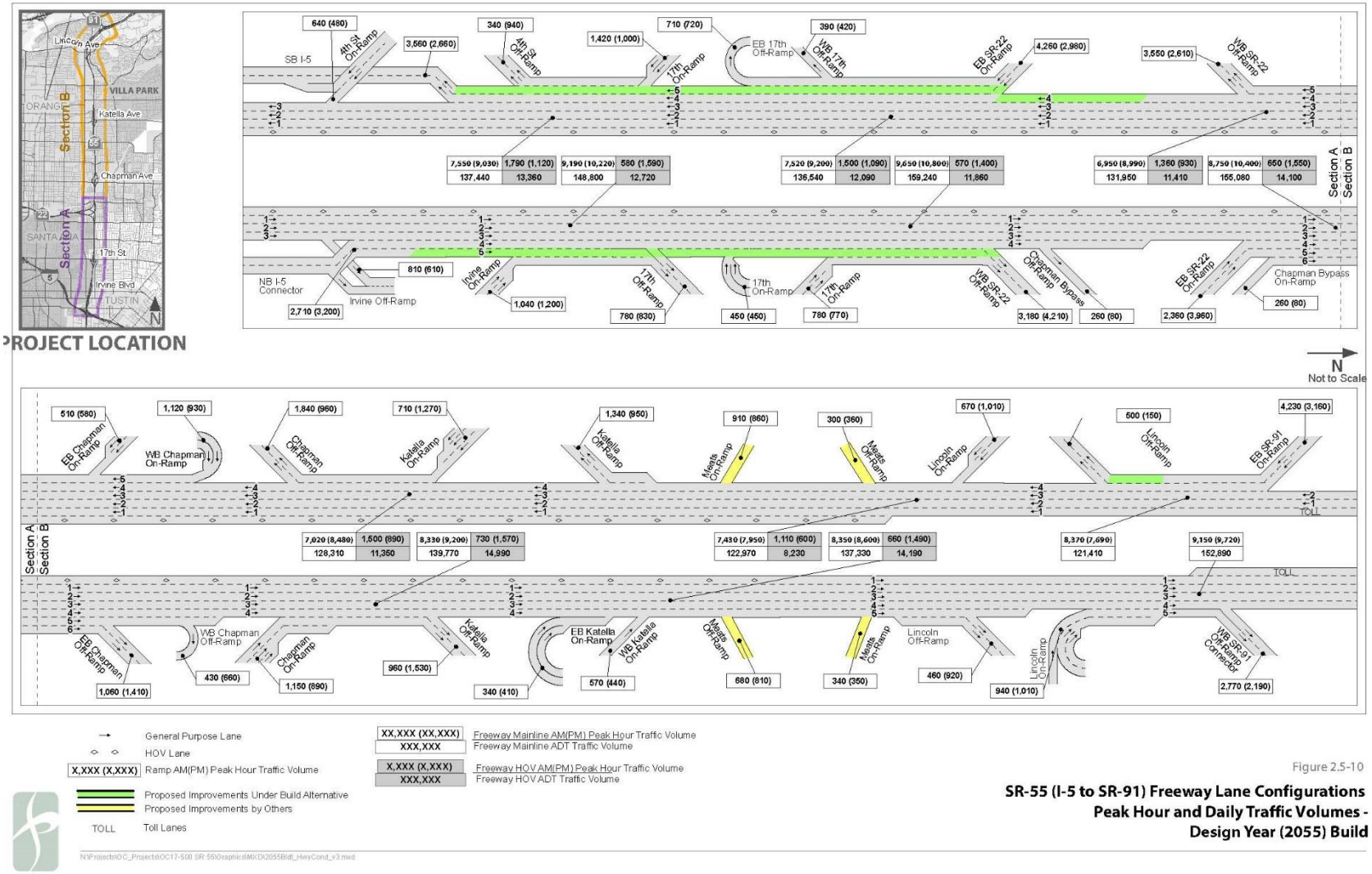


Figure 2.5-9B
Peak Hour Intersection Volumes
Design Year (2055) No Build Conditions

Source: Fehr & Peers 2018

Figure 2.5-10. Peak Hour and Daily Traffic Volumes– Design Year (2055) Build Conditions



Source: Fehr & Peers 2018

Figure 2.5-11a. Peak Hour Intersection Volumes – Design Year (2055) Build Conditions

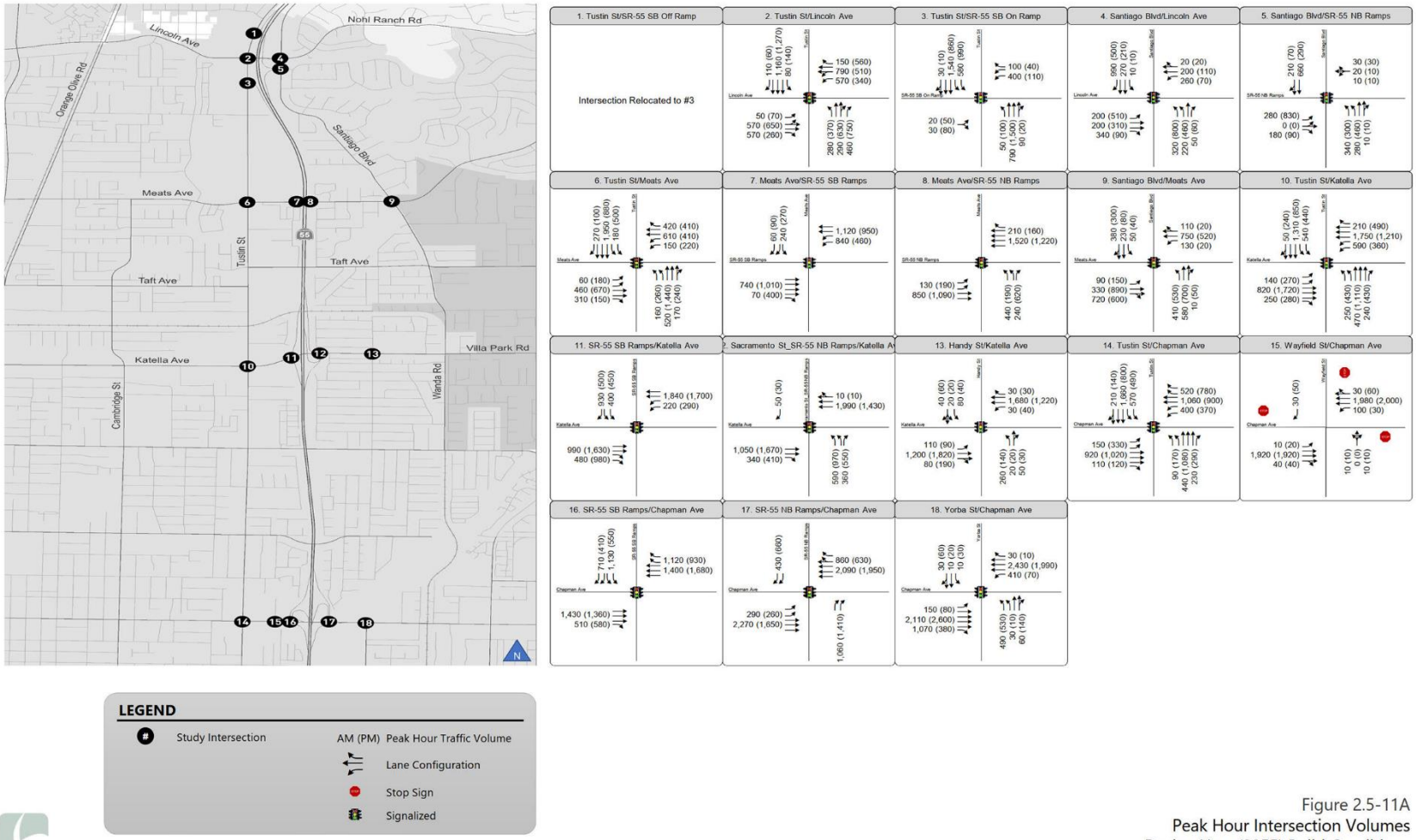


Figure 2.5-11A
Peak Hour Intersection Volumes
Design Year (2055) Build Conditions

Source: Fehr & Peers 2018

Figure 2.5-11b. Peak Hour Intersection Volumes – Design Year (2055) Build Conditions

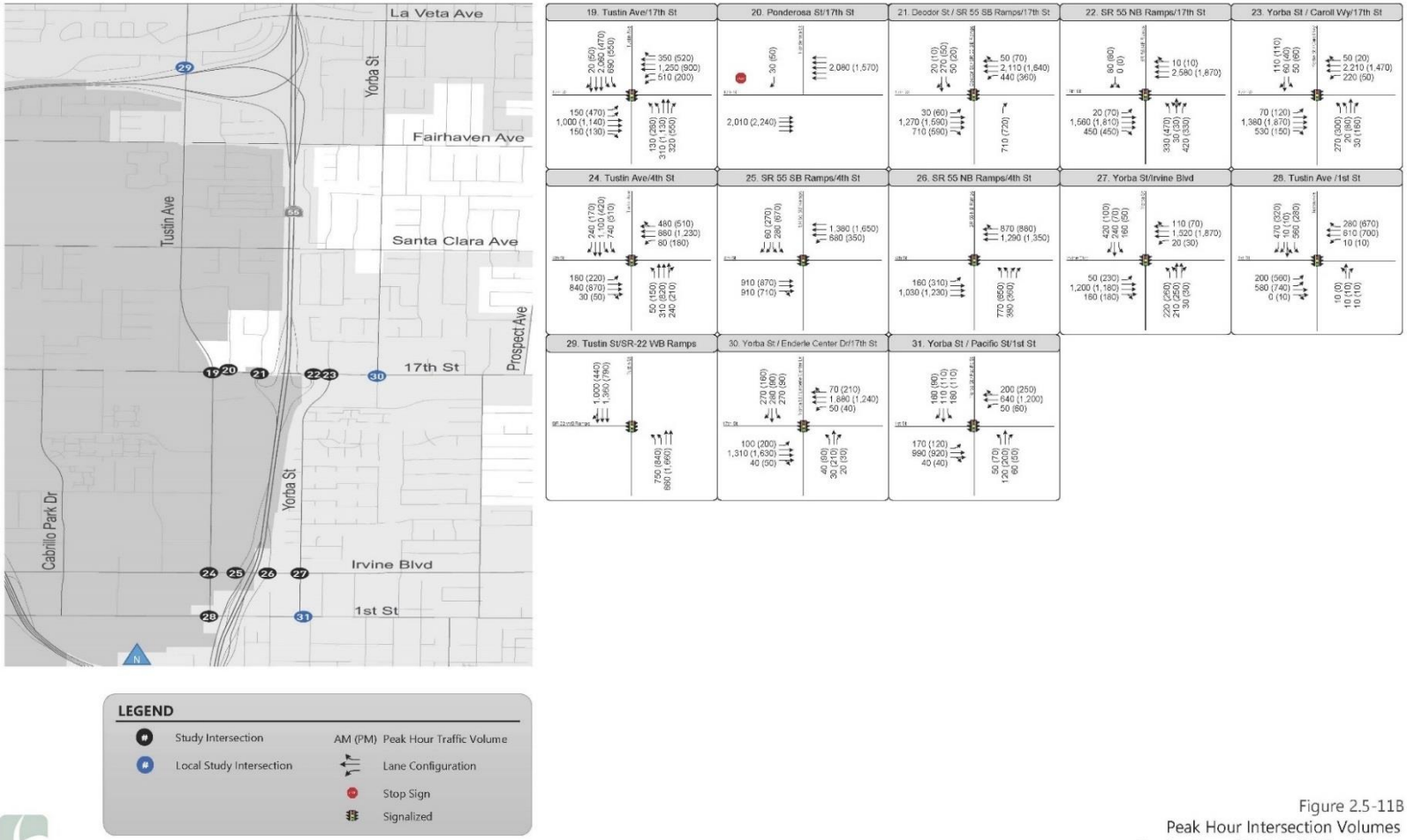


Figure 2.5-11B
Peak Hour Intersection Volumes
Design Year (2055) Build Conditions

Source: Fehr & Peers 2018

Table 2.5-7a: Opening Year 2035 Northbound SR 55 Freeway Operations AM Peak Hour

No.	Location	Type	No Build Alternative Density [a]	No Build Alternative LOS	Build Alternative Density [a]	Build Alternative LOS
1	SR 55 NB: Irvine Blvd off-ramp	Diverge	**56** [b]	**F** [b]	**47** [b]	**F** [b]
2	SR 55 NB: NB I-5 on-ramp	Merge	**68** [b]	**F** [b]	23	C
3	SR 55 NB: Irvine Blvd on-ramp to 17th St off-ramp	Weave	33	D	24	C
4	SR 55 NB: 17th St EB on-ramp	Merge	**60** [b]	**F** [b]	**42** [b]	**E** [b]
5	SR 55 NB: 17th St WB on-ramp to SR 22 off-ramp	Weave	28	C	21	C
6	SR 55 NB: Chapman Ave Bypass off-ramp	Diverge	31	D	29	D
7	SR 55 NB: SR 22 on-ramp to Chapman Ave off-ramp	Weave	23	C	25	C
8	SR 55 NB: Chapman Ave WB off-ramp	Diverge	25	C	25	C
9	SR 55 NB: Chapman Ave on-ramp	Merge	24	C	23	C
10	SR 55 NB: Chapman Ave on-ramp to Katella Ave off-ramp	Basic	27	C	23	C
11	SR 55 NB: Katella Ave off-ramp	Diverge	**49** [b]	**F** [b]	32	D
12	SR 55 NB: Katella Ave EB on-ramp	Merge	**85** [b]	**F** [b]	**80** [b]	**F** [b]
13	SR 55 NB: Katella Ave WB on-ramp	Merge	**77** [b]	**F** [b]	**79** [b]	**F** [b]
14	SR 55 NB: Katella Ave WB on-ramp to Lincoln Ave off-ramp	Basic	**55** [b]	**F** [b]	**51** [b]	**F** [b]
15	SR 55 NB: Lincoln Ave off-ramp	Diverge	**54** [b]	**F** [b]	**55** [b]	**F** [b]
16	SR 55 NB: Lane Drop to Lincoln Ave on-ramp	Basic	34	D	35	D
17	SR 55 NB: Lincoln Ave on-ramp to SR 91 off-ramp	Weave	27	C	26	C

Notes: Ave: Avenue; Blvd: Boulevard; Dr: Drive; EB: eastbound; LOS: level of service; NB: northbound; SR: State Route; St: Street; WB: westbound

a Density is reported in vehicles per hour per lane.

b **Bold** font indicates unacceptable LOS E or F conditions.

Source: Fehr & Peers, *State Route 55 (I-5 to SR-91) Widening Project Final Traffic Operations Report* (July 2018), p. 58.

Table 2.5 7b: Opening Year 2035 Northbound SR 55 Freeway Operations PM Peak Hour

No.	Location	Type	No Build Alternative Density [a]	No Build Alternative LOS	Build Alternative Density [a]	Build Alternative LOS
1	SR 55 NB: Irvine Blvd off-ramp	Diverge	**91** [b]	**F** [b]	**90** [b]	**F** [b]
2	SR 55 NB: NB I-5 on-ramp	Merge	**119** [b]	**F** [b]	**118** [b]	**F** [b]
3	SR 55 NB: Irvine Blvd on-ramp to 17th St off-ramp	Weave	**89** [b]	**F** [b]	**88** [b]	**F** [b]
4	SR 55 NB: 17th St EB on-ramp	Merge	**107** [b]	**F** [b]	**102** [b]	**F** [b]
5	SR 55 NB: 17th St WB on-ramp to SR 22 off-ramp	Weave	**76** [b]	**F** [b]	**72** [b]	**F** [b]
6	SR 55 NB: Chapman Ave Bypass off-ramp	Diverge	**74** [b]	**F** [b]	**100** [b]	**F** [b]
7	SR 55 NB: SR 22 on-ramp to Chapman Ave off-ramp	Weave	**89** [b]	**F** [b]	**103** [b]	**F** [b]

No.	Location	Type	No Build Alternative Density [a]	No Build Alternative LOS	Build Alternative Density [a]	Build Alternative LOS
8	SR 55 NB: Chapman Ave WB off-ramp	Diverge	**82** [b]	**F** [b]	**85** [b]	**F** [b]
9	SR 55 NB: Chapman Ave on-ramp	Merge	**102** [b]	**F** [b]	**102** [b]	**F** [b]
10	SR 55 NB: Chapman Ave on-ramp to Katella Ave off-ramp	Basic	**89** [b]	**F** [b]	**88** [b]	**F** [b]
11	SR 55 NB: Katella Ave off-ramp	Diverge	**87** [b]	**F** [b]	**86** [b]	**F** [b]
12	SR 55 NB: Katella Ave EB on-ramp	Merge	**118** [b]	**F** [b]	**116** [b]	**F** [b]
13	SR 55 NB: Katella Ave WB on-ramp	Merge	**111** [b]	**F** [b]	**112** [b]	**F** [b]
14	SR 55 NB: Katella Ave WB on-ramp to Lincoln Ave off-ramp	Basic	**72** [b]	**F** [b]	**89** [b]	**F** [b]
15	SR 55 NB: Lincoln Ave off-ramp	Diverge	**83** [b]	**F** [b]	**81** [b]	**F** [b]
16	SR 55 NB: Lane Drop to Lincoln Ave on-ramp	Basic	**75** [b]	**F** [b]	**82** [b]	**F** [b]
17	SR 55 NB: Lincoln Ave on-ramp to SR 91 off-ramp	Weave	**82** [b]	**F** [b]	**83** [b]	**F** [b]

Notes: Ave: Avenue; Blvd: Boulevard; EB: eastbound; LOS: level of service; SB: southbound; SR: State Route; St: Street; WB: westbound

a Density is reported in vehicles per hour per lane.

b **Bold** font indicates unacceptable LOS E or F conditions.

Source: Fehr & Peers, *State Route 55 (I-5 to SR-91) Widening Project Final Traffic Operations Report* (July 2018), p. 58.

Table 2.5-7c: Opening Year 2035 Southbound SR 55 Freeway Operations AM Peak Hour

No.	Location	Type	No Build Alternative Density [a]	No Build Alternative LOS	Build Alternative Density [a]	Build Alternative LOS
1	SR 55 SB: SR 91 on-ramp to Lincoln Ave off-ramp	Weave	**67** [b]	**F** [b]	**63** [b]	**F** [b]
2	SR 55 SB: Lincoln Ave on-ramp	Merge	**55** [b]	**F** [b]	33	D
3	SR 55 SB: Lincoln Ave on-ramp to Katella Ave off-ramp	Basic	**48** [b]	**F** [b]	28	C
4	SR 55 SB: Katella Ave off-ramp	Diverge	**60** [b]	**F** [b]	25	C
5	SR 55 SB: Katella Ave on-ramp to Chapman Ave off-ramp	Weave	**86** [b]	**F** [b]	24	C
6	SR 55 SB: Chapman Ave WB on-ramp	Merge	32	D	26	C
7	SR 55 SB: Chapman Ave EB on-ramp	Merge	**54** [b]	**F** [b]	**52** [b]	**F** [b]
8	SR 55 SB: SR 22 off-ramp	Diverge	**35** [b]	**E** [b]	**38** [b]	**E** [b]
9	SR 55 SB: SR 22 on-ramp	Merge	**120** [b]	**F** [b]	**128** [b]	**F** [b]
10	SR 55 SB: 17th St WB off-ramp	Diverge	**102** [b]	**F** [b]	**130** [b]	**F** [b]
11	SR 55 SB: 17th St EB off-ramp	Diverge	**86** [b]	**F** [b]	**93** [b]	**F** [b]
12	SR 55 SB: 17th St on-ramp to 4th St off-ramp	Weave	**79** [b]	**F** [b]	**72** [b]	**F** [b]
13	SR 55 SB: SB I-5 off-ramp	Diverge	**58** [b]	**F** [b]	**56** [b]	**F** [b]
14	SR 55 SB: 4th St on-ramp	Merge	21	C	27	C

Notes: Ave: Avenue; EB: eastbound; LOS: level of service; SB: southbound; SR: State Route; St: Street; WB: westbound

a Density is reported in vehicles per hour per lane.

b **Bold** font indicates unacceptable LOS E or F conditions.

Source: Fehr & Peers, *State Route 55 (I-5 to SR-91) Widening Project Final Traffic Operations Report* (July 2018), p. 59.

Table 2.5-7d: Opening Year 2035 Southbound SR 55 Freeway Operations PM Peak Hour

No.	Location	Type	No Build Alternative Density [a]	No Build Alternative LOS	Build Alternative Density [a]	Build Alternative LOS
1	SR 55 SB: SR 91 on-ramp to Lincoln Ave off-ramp	Weave	29	D	28	D
2	SR 55 SB: Lincoln Ave on-ramp	Merge	**45** [b]	**F** [b]	**51** [b]	**F** [b]
3	SR 55 SB: Lincoln Ave on-ramp to Katella Ave off-ramp	Basic	28	C	28	C
4	SR 55 SB: Katella Ave off-ramp	Diverge	27	C	27	C
5	SR 55 SB: Katella Ave on-ramp to Chapman Ave off-ramp	Weave	31	D	29	C
6	SR 55 SB: Chapman Ave WB on-ramp	Merge	**37** [b]	**E** [b]	27	C
7	SR 55 SB: Chapman Ave EB on-ramp	Merge	**43** [b]	**E** [b]	33	D
8	SR 55 SB: SR 22 off-ramp	Diverge	**47** [b]	**F** [b]	**49** [b]	**F** [b]
9	SR 55 SB: SR 22 on-ramp	Merge	33	D	24	C
10	SR 55 SB: 17th St WB off-ramp	Diverge	33	D	24	C
11	SR 55 SB: 17th St EB off-ramp	Diverge	35	D	25	C
12	SR 55 SB: 17th St on-ramp to 4th St off-ramp	Weave	**45** [b]	**F** [b]	26	C
13	SR 55 SB: SB I-5 off-ramp	Diverge	**45** [b]	**F** [b]	31	D
14	SR 55 SB: 4th St on-ramp	Merge	26	C	30	D

Notes: Ave: Avenue; EB: eastbound; LOS: level of service; NB: northbound; SB: southbound; SR: State Route; St: Street; WB: westbound

a Density is reported in vehicles per hour per lane.

b **Bold** font indicates unacceptable LOS E or F conditions.

Source: Fehr & Peers, *State Route 55 (I-5 to SR-91) Widening Project Final Traffic Operations Report* (July 2018), p. 59.

Table 2.5-8a: Opening Year 2035 Intersection Operations AM Peak Hour

No.	Intersection	Control	No Build Alternative Delay [a]	No Build Alternative LOS	Build Alternative Delay [a]	Build Alternative LOS
1	Tustin St/SR 55 SB off-ramp	Signal	21	C	NA	NA
2	Tustin St/Lincoln Ave	Signal	**119** [c]	**F** [c]	52	D
3	Tustin St/SR 55 SB on-ramp	Signal	18	B	30	C
4	Santiago Blvd/Lincoln Avenue	Signal	45	D	45	D
5	Santiago Blvd/SR 55 NB on-ramp	Signal	3-	C	27	C
6	Meats Ave/Tustin St	Signal	33	C	37	D
7	Meats Ave/SR 55 SB ramps	Future Intersection	NA	NA	NA	NA
8	Meats Ave/SR 55 NB ramps	Future Intersection	NA	NA	NA	NA
9	Meats Ave/Santiago Blvd	Signal	40	D	41	D
10	Katella Ave/Tustin St	Signal	43	D	54	D
11	Katella Ave/SR 55 SB ramps	Signal	34	C	29	C
12	Katella Ave/SR 55 NB ramps	Signal	28	D	31	C
13	Katella Ave/Handy St	Signal	21	C	21	C
14	Chapman Ave/Tustin St	Signal	40	D	42	D
15	Chapman Ave/Wayfield St	Side Street Stop	26	D	32	D
16	Chapman Ave/SR 55 SB ramps	Signal	16	B	13	B
17	Chapman Ave/SR 55 NB ramps	Signal	23	C	22	C
18	Chapman Ave/Yorba St	Signal	42	D	38	D
19	17th St/Tustin St	Signal	**87** [c]	**F** [c]	**87** [c]	**F** [c]
20	17th St/ Ponderosa St	Side Street Stop	11	B	18	C
21	17th St/SR 55 SB ramps	Signal	32	C	40	D
22	17th St/SR 55 NB ramps	Signal	23	C	20	C
23	17th St/Yorba St/Carroll Way	Signal	46	D	45	D
24	4th St/Tustin St	Signal	**157** [c]	**F** [c]	**154** [c]	**F** [c]
25	4th St/SR 55 SB ramps	Signal	19	B	23	C
26	4th St/SR 55 NB ramps	Signal	34	C	27	C
27	4th St/Yorba St	Signal	**89** [c]	**F** [c]	**83** [c]	**F** [c]
28	First St/Tustin St	Signal	21	C	26	C
29	Tustin St/SR 22 WB on-ramp	Signal	26	C	25	C
30	17th St/Enderle Center Dr/Yorba St [b]	Signal	0.64	A	0.62	A
31	First St/Yorba St/Pacific St [b]	Signal	0.45	A	0.47	A

Notes: Ave: Avenue; Blvd: Boulevard; Dr: Drive; EB: eastbound; LOS: level of service; NB: northbound; SB: southbound; SR: State Route; St: Street; WB: westbound; NA: not applicable

a Delay is reported for seconds per vehicle.

b Volume/capacity ratio is reported for the local intersections.

c **Bold** text indicates unacceptable level of service.

Source: Fehr & Peers, *State Route 55 (I-5 to SR-91) Widening Project Final Traffic Operations Report* (July 2018), p. 61; Fehr & Peers, *Traffic Analysis Addendum for State Route 55 From Interstate 5 to State Route 91 Improvement Project* (EA 0K720K). (August 2019), p. 4.

Table 2.5-8b: Opening Year 2035 Intersection Operations PM Peak Hour

No.	Intersection	Control	No Build Alternative Delay [a]	No Build Alternative LOS	Build Alternative Delay [a]	Build Alternative LOS
1	Tustin St/SR 55 SB off-ramp	Signal	**63** [c]	**E** [c]	NA	NA
2	Tustin St/Lincoln Ave	Signal	**128** [c]	**F** [c]	**96** [c]	**F** [c]
3	Tustin St/SR 55 SB on-ramp	Signal	**77** [c]	**E** [c]	**74** [c]	**E** [c]
4	Santiago Blvd/Lincoln Ave	Signal	40	D	36	D
5	Santiago Blvd/SR 55 NB on-ramp	Signal	**127** [c]	**F** [c]	48	D
6	Meats Ave/Tustin St	Signal	**85** [c]	**F** [c]	**82** [c]	**F** [c]
7	Meats Ave/SR 55 SB ramps	Future Intersection	NA	NA	NA	NA
8	Meats Ave/SR 55 NB ramps	Future Intersection	NA	NA	NA	NA
9	Meats Ave/Santiago Blvd	Signal	**68** [c]	**E** [c]	**66** [c]	**E** [c]
10	Katella Ave/Tustin St	Signal	**123** [c]	**F** [c]	**120** [c]	**F** [c]
11	Katella Ave/SR 55 SB ramps	Signal	38	D	49	D
12	Katella Ave/SR 55 NB ramps	Signal	**109** [c]	**F** [c]	38	D
13	Katella Ave/Handy St	Signal	**83** [c]	**F** [c]	16	B
14	Chapman Ave/Tustin St	Signal	**75** [c]	**E** [c]	**71** [c]	**E** [c]
15	Chapman Ave/Wayfield St	Side Street Stop	**245** [c]	**F** [c]	**210** [c]	**F** [c]
16	Chapman Ave/SR 55 SB ramps	Signal	40	D	33	C
17	Chapman Ave/SR 55 NB ramps	Signal	24	C	28	C
18	Chapman Ave/Yorba St	Signal	34	C	33	C
19	17th St/Tustin St	Signal	**89** [c]	**F** [c]	**63** [c]	**E** [c]
20	17th St/ Ponderosa St	Side Street Stop	31	D	22	C
21	17th St/SR 55 SB ramps	Signal	15	B	41	D
22	17th St/SR 55 NB ramps	Signal	33	C	50	D
23	17th St/Yorba St/Carroll Way	Signal	41	D	42	D
24	4th St/Tustin St	Signal	**80** [c]	**F** [c]	**78** [c]	**E** [c]
25	4th St/SR 55 SB ramps	Signal	26	C	25	C
26	4th St/SR 55 NB ramps	Signal	36	D	38	D
27	4th St/Yorba St	Signal	**210** [c]	**F** [c]	**202** [c]	**F** [c]
28	First St/Tustin St	Signal	24	C	23	C
29	Tustin St/SR 22 WB on-ramp	Signal	15	B	15	B
30	17th St/Enderle Center Dr/Yorba St [b]	Signal	0.62	A	0.62	A
31	First St/Yorba St/Pacific St [b]	Signal	0.59	A	0.59	A

Notes: Ave: Avenue; Blvd: Boulevard; Dr: Drive; EB: eastbound; LOS: level of service; NB: northbound; SB: southbound; SR: State Route; St: Street; WB: westbound.

a Delay is reported for seconds per vehicle.

b Volume/capacity ratio is reported for the local intersections.

c **Bold** text indicates unacceptable level of service.

Source: Fehr & Peers, *State Route 55 (I-5 to SR-91) Widening Project Final Traffic Operations Report* (July 2018), p. 62; Fehr & Peers, *Traffic Analysis Addendum for State Route 55 From Interstate 5 to State Route 91 Improvement Project* (EA 0K720K) (August 2019), p.4.

Table 2.5-9a: Opening Year 2035 SR 55 Corridor Peak Hour Travel Time AM Peak Hour

Direction	Location	No Build Alternative Travel Time (min:sec)	No Build Alternative Speed	Build Alternative Travel Time (min:sec)	Build Alternative Speed
NB SR 55	I-5 to SR 22	2:20	64	5:00	31
NB SR 55	SR 22 to SR 91	4:20	64	9:50	29
NB SR 55	**I-5 to SR 91 (Total)**	**6:40**	**64**	**14:50**	**29**
SB SR 55	SR 91 to SR 22	9:50	29	4:30	64
SB SR 55	SR 22 to I-5	8:00	19	2:30	62
SB SR 55	**SR 91 to I-5 (Total)**	**17:50**	**25**	**7:00**	**63**

Notes: I-: Interstate; min: minutes; NB: northbound; SB: southbound; sec: seconds; SR: State Route
Source: Fehr & Peers, *State Route 55 (I-5 to SR-91) Widening Project Final Traffic Operations Report* (July 2018), p. 63.

Table 2.1-9b: Opening Year 2035 SR 55 Corridor Peak Hour Travel Time PM Peak Hour

Direction	Location	No Build Alternative Travel Time (min:sec)	No Build Alternative Speed	Build Alternative Travel Time (min:sec)	Build Alternative Speed
NB SR 55	I-5 to SR 22	2:20	64	5:00	31
NB SR 55	SR 22 to SR 91	4:20	64	9:50	29
NB SR 55	**I-5 to SR 91 (Total)**	**6:40**	**64**	**14:50**	**29**
SB SR 55	SR 91 to SR 22	9:50	29	4:30	64
SB SR 55	SR 22 to I-5	8:00	19	2:30	62
SB SR 55	**SR 91 to I-5 (Total)**	**17:50**	**25**	**7:00**	**63**

Notes: I-: Interstate; min: minutes; NB: northbound; SB: southbound; sec: seconds; SR: State Route
Source: Fehr & Peers, State Route 55 (I-5 to SR-91) Widening Project Final Traffic Operations Report (July 2018), p. 63.

Table 2.5-10: Opening Year 2035 SR 55 Systemwide Traffic Metrics

Traffic Metrics	AM Peak Period No Build Alternative	AM Peak Period Build Alternative	PM Peak Period No Build Alternative	PM Peak Period Build Alternative
Number of Vehicles Served	211,310	213,060	250,930	252,410
VHD (vehicle hours of delay)	9,930	8,040	13,110	12,290
Delay per Vehicle (sec/veh)	170	135	185	170

Source: Fehr & Peers, State Route 55 (I-5 to SR-91) Widening Project Final Traffic Operations Report (July 2018), p. 65.

Design Year 2055 Conditions

The Design Year 2055 operations analysis results for the No Build Alternative are summarized in Table 2.5-11Table 2.5-11a (northbound SR 55 AM), Table 2.5-11b (northbound SR 55 PM), Table 2.5-11c (southbound SR 55 AM), Table 2.5-11d (southbound SR 55 PM), Table 2.5-12a (intersection AM), Table 2.5-12b (intersection AM), Table 2.5-13a (travel time AM), Table 2.5-13b (travel time PM), and Table 2.5-14 (systemwide traffic metrics).

Freeway Operations: During the AM peak hour, southbound SR 55 would experience heavy congestion with deficient LOS E or F conditions at majority of locations. Most of the study locations on northbound SR 55 would operate at LOS E or F during the AM peak hour due to increased traffic demand by 2055. During the PM peak hour, all the study locations on northbound SR 55 would experience noticeable congestion and operate at LOS F conditions. Southbound SR 55 from Chapman Avenue to I-5 would also experience moderate congestion with LOS E or F conditions at several study locations.

Intersection Operations: Twelve out of 31 study intersections would operate at LOS E or F during the AM peak hour. Under the PM peak hour, 15 out of the 31 study intersections would experience noticeable traffic congestion and operate at LOS E or F conditions.

SR 55 Corridor Travel Time: During the AM peak hour, the northbound vehicles would travel at approximately 50 mph between I-5 and SR 22 and then expect moderate slowdown to 30 mph between SR 22 and SR 91. In the southbound direction, substantial congestion along southbound SR 55 under the No Build Alternative would result in an average speed of 27 mph between SR 91 and SR 22 and 24 mph between SR 22 and I-5. During the PM peak hour, significant congestion along the northbound SR 55 would result in an average speed of approximately 25 mph through the study corridor, while the southbound SR 55 traffic would flow much better with a speed of 57 mph from SR 91 to SR 22 and 51 mph from SR 22 to I-5.

Systemwide Traffic Metrics: Increasing congestion along the SR 55 corridor by 2055 would result in higher vehicle delay under the No Build Alternative under both AM and PM peak periods.

Table 2.5-11a: Design Year 2055 Northbound SR 55 Freeway Operations AM Peak Hour

No.	Location	Type	No Build Alternative Density [a]	No Build Alternative LOS	Build Alternative Density [a]	Build Alternative LOS
1	SR 55 NB: Irvine Blvd off-ramp	Diverge	**51** [b]	**F** [b]	**45** [b]	**F** [b]
2	SR 55 NB: NB I-5 on-ramp	Merge	**52** [b]	**F** [b]	25	C
3	SR 55 NB: Irvine Blvd on-ramp to 17th St off-ramp	Weave	33	D	27	C
4	SR 55 NB: 17th St EB on-ramp	Merge	**45** [b]	**F** [b]	**45** [b]	**F** [b]
5	SR 55 NB: 17th St WB on-ramp to SR 22 off-ramp	Weave	31	D	21	C
6	SR 55 NB: Chapman Ave Bypass off-ramp	Diverge	**55** [b]	**E** [b]	28	D
7	SR 55 NB: SR 22 on-ramp to Chapman Ave off-ramp	Weave	**69** [b]	**F** [b]	**37** [b]	**E** [b]
8	SR 55 NB: Chapman Ave WB off-ramp	Diverge	**85** [b]	**F** [b]	**51** [b]	**F** [b]
9	SR 55 NB: Chapman Ave on-ramp	Merge	**107** [b]	**F** [b]	**82** [b]	**F** [b]
10	SR 55 NB: Chapman Ave on-ramp to Katella Ave off-ramp	Basic	**98** [b]	**F** [b]	**94** [b]	**F** [b]
11	SR 55 NB: Katella Ave off-ramp	Diverge	**87** [b]	**F** [b]	**89** [b]	**F** [b]
12	SR 55 NB: Katella Ave EB on-ramp	Merge	**102** [b]	**F** [b]	**102** [b]	**F** [b]
13	SR 55 NB: Katella Ave WB on-ramp	Merge	**84** [b]	**F** [b]	**87** [b]	**F** [b]
14	SR 55 NB: Katella Ave WB on-ramp to Lincoln Ave off-ramp	Basic	**56** [b]	**F** [b]	**80** [b]	**F** [b]
15	SR 55 NB: Lincoln Ave off-ramp	Diverge	**64** [b]	**F** [b]	**64** [b]	**F** [b]
16	SR 55 NB: Lane Drop to Lincoln Ave on-ramp	Basic	**40** [b]	**E** [b]	**36** [b]	**E** [b]
17	SR 55 NB: Lincoln Ave on-ramp to SR 91 off-ramp	Weave	**36** [b]	**E** [b]	30	D

Notes: Ave: Avenue; Blvd: Boulevard; EB: eastbound; LOS: level of service; NB: northbound; SR: State Route; St: Street; WB: westbound

a Density is reported in vehicles per hour per lane.

b **Bold** font indicates unacceptable LOS E or F conditions.

Source: Fehr & Peers, *State Route 55 (I-5 to SR-91) Widening Project Final Traffic Operations Report* (July 2018), p. 75.

Table 2.5 11b: Design Year 2055 Northbound SR 55 Freeway Operations PM Peak Hour

No.	Location	Type	No Build Alternative Density [a]	No Build Alternative LOS	Build Alternative Density [a]	Build Alternative LOS
1	SR 55 SB: SR 91 on-ramp to Lincoln Ave off-ramp	Weave	**91** [b]	**F** [b]	**91** [b]	**F** [b]
2	SR 55 SB: Lincoln Ave on-ramp	Merge	**123** [b]	**F** [b]	**125** [b]	**F** [b]
3	SR 55 SB: Lincoln Ave on-ramp to Katella Ave off-ramp	Basic	**92** [b]	**F** [b]	**93** [b]	**F** [b]
4	SR 55 SB: Katella Ave off-ramp	Diverge	**104** [b]	**F** [b]	**100** [b]	**F** [b]
5	SR 55 SB: Katella Ave on-ramp to Chapman Ave off-ramp	Weave	**74** [b]	**F** [b]	**85** [b]	**F** [b]
6	SR 55 SB: Chapman Ave WB on-ramp	Merge	**83** [b]	**F** [b]	**109** [b]	**F** [b]
7	SR 55 SB: Chapman Ave EB on-ramp	Merge	**107** [b]	**F** [b]	**110** [b]	**F** [b]
8	SR 55 SB: SR 22 off-ramp	Diverge	**97** [b]	**F** [b]	**87** [b]	**F** [b]
9	SR 55 SB: SR 22 on-ramp	Merge	**110** [b]	**F** [b]	**103** [b]	**F** [b]
10	SR 55 SB: 17th St WB off-ramp	Diverge	**95** [b]	**F** [b]	**96** [b]	**F** [b]
11	SR 55 SB: 17th St EB off-ramp	Diverge	**92** [b]	**F** [b]	**87** [b]	**F** [b]
12	SR 55 SB: 17th St on-ramp to 4th St off-ramp	Weave	**135** [b]	**F** [b]	**126** [b]	**F** [b]
13	SR 55 SB: SB I-5 off-ramp	Diverge	**116** [b]	**F** [b]	**113** [b]	**F** [b]
14	SR 55 SB: 4th St on-ramp	Merge	**105** [b]	**F** [b]	**77** [b]	**F** [b]

Notes: Ave: Avenue; Blvd: Boulevard; Dr: Drive; EB: eastbound; I-: Interstate; LOS: level of service; SB: southbound; SR: State Route; St: Street; WB: westbound

a Density is reported in vehicles per hour per lane.

b **Bold** font indicates unacceptable LOS E or F conditions.

Source: Fehr & Peers, *State Route 55 (I-5 to SR-91) Widening Project Final Traffic Operations Report* (July 2018), p. 76.

Table 2.5-11c: Design Year 2055 Southbound SR 55 Freeway Operations AM Peak Hour

No.	Location	Type	No Build Alternative Density [a]	No Build Alternative LOS	Build Alternative Density [a]	Build Alternative LOS
1	SR 55 SB: SR 91 on-ramp to Lincoln Ave off-ramp	Weave	**97** [b]	**F** [b]	**66** [b]	**F** [b]
2	SR 55 SB: Lincoln Ave on-ramp	Merge	**94** [b]	**F** [b]	29	D
3	SR 55 SB: Lincoln Ave on-ramp to Katella Ave off-ramp	Basic	**99** [b]	**E** [b]	27	C
4	SR 55 SB: Katella Ave off-ramp	Diverge	20	C	25	C
5	SR 55 SB: Katella Ave on-ramp to Chapman Ave off-ramp	Weave	23	C	26	C
6	SR 55 SB: Chapman Ave WB on-ramp	Merge	**38** [b]	**E** [b]	35	D
7	SR 55 SB: Chapman Ave EB on-ramp	Merge	31	D	31	D
8	SR 55 SB: SR 22 off-ramp	Diverge	**129** [b]	**F** [b]	**136** [b]	**F** [b]
9	SR 55 SB: SR 22 on-ramp	Merge	**110** [b]	**F** [b]	**131** [b]	**F** [b]
10	SR 55 SB: 17th St WB off-ramp	Diverge	**91** [b]	**F** [b]	**96** [b]	**F** [b]
11	SR 55 SB: 17th St EB off-ramp	Diverge	**80** [b]	**F** [b]	**74** [b]	**F** [b]
12	SR 55 SB: 17th St on-ramp to 4th St off-ramp	Weave	**61** [b]	**F** [b]	**54** [b]	**F** [b]
13	SR 55 SB: SB I-5 off-ramp	Diverge	21	C	27	C
14	SR 55 SB: 4th St on-ramp	Merge	**97** [b]	**F** [b]	**66** [b]	**F** [b]

Notes: Ave: Avenue; Blvd: Boulevard; Dr: Drive; EB: eastbound; I-: Interstate; LOS: level of service; SB: southbound; SR: State Route; St: Street; WB: westbound

a Density is reported in vehicles per hour per lane.

b **Bold** font indicates unacceptable LOS E or F conditions.

Source: Fehr & Peers, *State Route 55 (I-5 to SR-91) Widening Project Final Traffic Operations Report* (July 2018), p. 59.

Table 2.5-11d: Design Year 2055 Southbound SR 55 Freeway Operations PM Peak Hour

No.	Location	Type	No Build Alternative Density [a]	No Build Alternative LOS	Build Alternative Density [a]	Build Alternative LOS
1	SR 55 SB: SR 91 on-ramp to Lincoln Ave off-ramp	Weave	30	D	29	D
2	SR 55 SB: Lincoln Ave on-ramp	Merge	30	D	30	D
3	SR 55 SB: Lincoln Ave on-ramp to Katella Ave off-ramp	Basic	30	D	30	D
4	SR 55 SB: Katella Ave off-ramp	Diverge	31	D	33	D
5	SR 55 SB: Katella Ave on-ramp to Chapman Ave off-ramp	Weave	**39** [b]	**E** [b]	31	D
6	SR 55 SB: Chapman Ave WB on-ramp	Merge	**61** [b]	**F** [b]	**61** [b]	**F** [b]
7	SR 55 SB: Chapman Ave EB on-ramp	Merge	**64** [b]	**F** [b]	**71** [b]	**F** [b]
8	SR 55 SB: SR 22 off-ramp	Diverge	27	C	25	C
9	SR 55 SB: SR 22 on-ramp	Merge	31	D	35	D
10	SR 55 SB: 17th St WB off-ramp	Diverge	**37** [b]	**E** [b]	27	C
11	SR 55 SB: 17th St EB off-ramp	Diverge	**50** [b]	**F** [b]	30	D
12	SR 55 SB: 17th St on-ramp to 4th St off-ramp	Weave	**46** [b]	**F** [b]	**36** [b]	**E** [b]
13	SR 55 SB: SB I-5 off-ramp	Diverge	27	C	30	D
14	SR 55 SB: 4th St on-ramp	Merge	30	D	29	D

Notes: Ave: Avenue; Blvd: Boulevard; Dr: Drive; EB: eastbound; I-: Interstate; LOS: level of service; SB: southbound; SR: State Route; St: Street; WB: westbound

a Density is reported in vehicles per hour per lane.

b **Bold** font indicates unacceptable LOS E or F conditions.

Source: Fehr & Peers, *State Route 55 (I-5 to SR-91) Widening Project Final Traffic Operations Report* (July 2018), p. 59.

Table 2.5-12a: Design Year 2055 Intersection Operations AM Peak Hour

No.	Intersection	Control	No Build Alternative Delay [a]	No Build Alternative LOS	Build Alternative Delay [a]	Build Alternative LOS
1	Tustin St/SR 55 SB off-ramp	Signal	22	C	NA	NA
2	Tustin St/Lincoln Ave	Signal	**119** [c]	**F** [c]	52	D
3	Tustin St/SR 55 SB on-ramp	Signal	16	B	30	C
4	Santiago Blvd/Lincoln Ave	Signal	**155** [c]	**F** [c]	**154** [c]	**F** [c]
5	Santiago Blvd/SR 55 NB on-ramp	Signal	33	C	39	D
6	Meats Ave/Tustin St	Signal	33	C	37	D
7	Meats Ave/SR 55 SB ramps	Future Intersection	27	C	20	B
8	Meats Ave/SR 55 NB ramps	Future Intersection	**108** [c]	**F** [c]	29	C
9	Meats Ave/Santiago Blvd	Signal	**76** [c]	**E** [c]	**59** [c]	**E** [c]
10	Katella Ave/Tustin St	Signal	49	D	45	D
11	Katella Ave/SR 55 SB ramps	Signal	**184** [c]	**F** [c]	23	C
12	Katella Ave/SR 55 NB ramps	Signal	21	C	19	B
13	Katella Ave/Handy St	Signal	20	B	23	C
14	Chapman Ave/Tustin St	Signal	49	D	41	D
15	Chapman Ave/Wayfield St	Side Street Stop	33	D	35	D
16	Chapman Ave/SR 55 SB ramps	Signal	30	C	22	C
17	Chapman Ave/SR 55 NB ramps	Signal	**57** [c]	**E**	39	D
18	Chapman Ave/Yorba St	Signal	**81** [c]	**F** [c c]	**78** [c]	**E** [c]
19	17th St/Tustin St	Signal	**86** [c]	**F** [c]	**86** [c]	**F** [c]
20	17th St/ Ponderosa St	Side Street Stop	12	B	13	B
21	17th St/SR 55 SB ramps	Signal	33	C	37	D
22	17th St/SR 55 NB ramps	Signal	33	C	16	B
23	17th St/Yorba St/Carroll Way	Signal	**70** [c]	**E** [c]	**65** [c]	**E** [c]
24	4th St/Tustin St	Signal	**163** [c]	**F** [c]	**160** [c]	**F** [c]
25	4th St/SR 55 SB ramps	Signal	18	B	26	C
26	4th St/SR 55 NB ramps	Signal	**82** [c]	**F** [c]	30	C
27	4th St/Yorba St	Signal	**108** [c]	**F** [c]	**101** [c]	**F** [c]
28	First St/Tustin St	Signal	22	C	26	C
29	Tustin St/SR 22 WB on-ramp	Signal	28	C	27	C
30	17th St/Enderle Center Dr/Yorba St [b]	Signal	0.69	A	0.67	A
31	First St/Yorba St/Pacific St [b]	Signal	0.53	A	0.55	A

Notes: Ave: Avenue; Blvd: Boulevard; Dr: Drive; EB: eastbound; LOS: level of service; NB: northbound; SB: southbound; SR: State Route; St: Street; WB: westbound

a Delay is reported for seconds per vehicle.

b Volume/capacity ratio is reported for the local intersections.

c **Bold** text indicates unacceptable level of service.

Source: Fehr & Peers, *State Route 55 (I-5 to SR-91) Widening Project Final Traffic Operations Report* (July 2018), p. 61; Fehr & Peers, *Traffic Analysis Addendum for State Route 55 From Interstate 5 to State Route 91 Improvement Project* (EA 0K720K) (August 2019), p. 4.

Table 2.1-12b: Design Year 2055 Intersection Operations PM Peak Hour

No.	Intersection	Control	No Build Alternative Delay [a]	No Build Alternative LOS	Build Alternative Delay [a]	Build Alternative LOS
1	Tustin St/SR 55 SB off-ramp	Signal	**131** [c]	**F** [c]	NA	NA
2	Tustin St/Lincoln Ave	Signal	**103** [c]	**F** [c]	**98** [c]	**F** [c]
3	Tustin St/SR 55 SB on-ramp	Signal	**108** [c]	**F** [c]	**87** [c]	**F** [c]
4	Santiago Blvd/Lincoln Ave	Signal	**95** [c]	**F** [c]	**72** [c]	**E** [c]
5	Santiago Blvd/SR 55 NB on-ramp	Signal	43	D	54	D
6	Meats Ave/Tustin St	Signal	**170** [c]	**F** [c]	**169** [c]	**F** [c]
7	Meats Ave/SR 55 SB ramps	Future Intersection	26	C	26	C
8	Meats Ave/SR 55 NB ramps	Future Intersection	44	D	45	D
9	Meats Ave/Santiago Blvd	Signal	**74** [c]	**E** [c]	**73** [c]	**E** [c]
10	Katella Ave/Tustin St	Signal	**100** [c]	**F** [c]	**98** [c]	**F** [c]
11	Katella Ave/SR 55 SB ramps	Signal	31	C	19	B
12	Katella Ave/SR 55 NB ramps	Signal	30	C	41	D
13	Katella Ave/Handy St	Signal	17	B	26	C
14	Chapman Ave/Tustin St	Signal	**64** [c]	**E** [c]	**63** [c]	**E** [c]
15	Chapman Ave/Wayfield St	Side Street Stop	**272** [c]	**F** [c]	**218** [c]	**F** [c]
16	Chapman Ave/SR 55 SB ramps	Signal	32	C	36	D
17	Chapman Ave/SR 55 NB ramps	Signal	33	C	30	C
18	Chapman Ave/Yorba St	Signal	**79** [c]	**E** [c]	42	D
19	17th St/Tustin St	Signal	**124** [c]	**F** [c]	**123** [c]	**F** [c]
20	17th St/ Ponderosa St	Side Street Stop	28	D	22	C
21	17th St/SR 55 SB ramps	Signal	16	B	31	C
22	17th St/SR 55 NB ramps	Signal	**115** [c]	**F** [c]	**108** [c]	**F** [c]
23	17th St/Yorba St/Carroll Way	Signal	48	D	52	D
24	4th St/Tustin St	Signal	**185** [c]	**F** [c]	**154** [c]	**F** [c]
25	4th St/SR 55 SB ramps	Signal	37	D	27	C
26	4th St/SR 55 NB ramps	Signal	38	D	34	C
27	4th St/Yorba St	Signal	**203** [c]	**F** [c]	**202** [c]	**F** [c]
28	First St/Tustin St	Signal	**66** [c]	**E** [c]	45	D
29	Tustin St/SR 22 WB on-ramp	Signal	17	B	17	B
30	17th St/Enderle Center Dr/Yorba St [b]	Signal	0.62	A	0.62	A
31	First St/Yorba St/Pacific St [b]	Signal	0.66	A	0.65	A

Notes: Ave: Avenue; Blvd: Boulevard; Dr: Drive; EB: eastbound; LOS: level of service; NB: northbound; SB: southbound; SR: State Route; St: Street; WB: westbound

a Delay is reported for seconds per vehicle.

b Volume/capacity ratio is reported for the local intersections.

c **Bold** text indicates unacceptable level of service.

Source: Fehr & Peers, *State Route 55 (I-5 to SR-91) Widening Project Final Traffic Operations Report* (July 2018), p. 62.; Fehr & Peers, *Traffic Analysis Addendum for State Route 55 From Interstate 5 to State Route 91 Improvement Project* (EA 0K720K) (August 2019), p. 5.

Table 2.5-13a: Design Year 2055 SR 55 Corridor Peak Hour Travel Time AM Peak Hour

Direction	Location	No Build Alternative Travel Time (min:sec)	No Build Alternative Speed	Build Alternative Travel Time (min:sec)	Build Alternative Speed
NB SR 55	I-5 to SR 22	3:00	51	2:20	65
NB SR 55	SR 22 to SR 91	9:30	30	9:40	29
NB SR 55	**I-5 to SR 91 (Total)**	**12:30**	**35**	**12:00**	**36**
SB SR 55	SR 91 to SR 22	10:40	27	6:00	48
SB SR 55	SR 22 to I-5	6:20	24	6:30	23
SB SR 55	**SR 91 to I-5 (Total)**	**17:00**	**26**	**12:30**	**35**

Notes: I-: Interstate; min: minutes; NB: northbound; SB: southbound; sec: seconds; SR: State Route.
Source: Fehr & Peers, *State Route 55 (I-5 to SR-91) Widening Project Final Traffic Operations Report* (July 2018), p. 63.

Table 2.5-13b: Design Year 2055 SR 55 Corridor Peak Hour Travel Time PM Peak Hour

Direction	Location	No Build Alternative Travel Time (min:sec)	No Build Alternative Speed	Build Alternative Travel Time (min:sec)	Build Alternative Speed
NB SR 55	I-5 to SR 22	5:10	30	4:30	34
NB SR 55	SR 22 to SR 91	12:50	22	13:20	21
NB SR 55	**I-5 to SR 91 (Total)**	**18:00**	**24**	**17:50**	**25**
SB SR 55	SR 91 to SR 22	5:00	57	4:40	62
SB SR 55	SR 22 to I-5	3:00	51	2:20	64
SB SR 55	**SR 91 to I-5 (Total)**	**8:00**	**55**	**7:00**	**63**

Notes: I-: Interstate; min: minutes; NB: northbound; SB: southbound; sec: seconds; SR: State Route.
Source: Fehr & Peers, *State Route 55 (I-5 to SR-91) Widening Project Final Traffic Operations Report* (July 2018), p. 63.

Table 2.5-14: Design Year 2055 SR 55 Systemwide Traffic Metrics

Traffic Metrics	AM Peak Period No Build Alternative	AM Peak Period Build Alternative	PM Peak Period No Build Alternative	PM Peak Period Build Alternative
Number of Vehicles Served	214,140	217,490	252,070	254,370
VHD (vehicle hours of delay)	15,880	13,730	16,630	15,900
Delay per Vehicle (sec/veh)	260	220	230	220

Note: sec/veh: seconds per vehicle
Source: Fehr & Peers, *State Route 55 (I-5 to SR-91) Widening Project Final Traffic Operations Report* (July 2018), p. 65

Build Alternative

Under this alternative the proposed project improvement would be implemented. Under Design Year 2055, the SR 55/Meats Avenue interchange was assumed to be in place.

Opening Year 2035 Conditions

The Opening Year 2035 operations analysis results for the Build Alternative are summarized in Table 2.5-7a (northbound SR 55 AM), Table 2.5-7b (northbound SR 55 PM), Table 2.5-7c (southbound SR 55 AM), Table 2.5-7d (southbound SR 55 PM), Table 2.5-8a (intersection AM), Table 2.5-8b (intersection AM), Table 2.5-9a (travel time AM), Table 2.5-9b (travel time PM), and Table 2.5-10 (systemwide traffic metrics).

Freeway Operations: During the AM peak hour, additional capacity along northbound SR 55 mainline between I-5 and SR 22 would substantially improve traffic operations at the northbound I-5 on-ramp from LOS F to C conditions. Noticeable improvements would also occur on other northbound SR 55 study locations between I-5 and SR 22. North of SR 22, northbound SR 55 would operate at conditions similar to the No Build Alternative. In the southbound direction, the proposed improvements under the Build Alternative would substantially improve freeway operations and result in LOS D or better conditions on southbound SR 55 from Lincoln Avenue to Katella Avenue. Southbound SR 55 segments south of Chapman Avenue would expect similar or higher density compared to the No Build Alternative because more traffic would be served by the Build Alternative. During the PM peak hour, the Build Alternative would help to move traffic relatively faster between I-5 and SR 22 due to additional capacity to the mainline segment; however, the bottlenecks outside the study corridor (e.g., westbound SR 22 and eastbound SR 91) would remain; and, as a result, northbound SR 55 would still operate at LOS F conditions under the Build Alternative. In the southbound direction, the Build Alternative would resolve the capacity constraints by introducing additional capacity to this segment and would substantially improve traffic operations at most of those locations from LOS E/F to D or better during the PM peak hour.

Intersection Operations: Most of the study intersections would operate at LOS D or better during the AM peak hour, and the Build Alternative would improve one deficient intersection to LOS D or better. Under the PM peak hour, the Build Alternative would improve three of the deficient intersections to LOS D or better and two deficient intersections from LOS F to LOS E.

SR 55 Corridor Travel Time: During the AM peak hour, the Build Alternative would increase the northbound SR 55 travel speed to 65 mph between I-5 and SR 22 by providing additional capacity through the stretch; while the vehicle speeds between SR 22 and SR 91 would remain similar to the No Build Alternative. In the southbound direction, proposed improvements under the Build Alternative would significantly improve traffic operations and allow traffic to get through southbound SR 55 more quickly, which would consequently increase the average speed from 30 mph to approximately 50 mph on southbound SR 55 from SR 91 to SR 22. During the PM peak hour, additional capacity proposed under the Build Alternative would increase the northbound SR 55 speed between I-5 and SR 22 from 30 to 34 mph and would maintain the travel time for northbound SR 55 to no lower than the No Build Alternative while serving more traffic through the corridor. In the southbound direction, the Build Alternative would noticeably improve traffic flow on southbound SR 55 and increase the speed to a free-flow speed throughout the study corridor.

Systemwide Traffic Metrics: Compared to the No Build Alternative, the Build Alternative would serve 1,750 (or 2 percent) more vehicles and reduce the total delay by 1,890 vehicle-hours or 19 percent during the AM peak period and would serve 1,480 (or 1 percent) more vehicles and reduce the total delay by 820 vehicle-hours or 6 percent during the PM peak period. The average delay per vehicle under the Build Alternative would decrease by 21 and 8 percent compared to the No Build Alternative during the AM and PM peak periods, respectively.

In a summary, compared to the No Build Alternative, the Build Alternative would result in the following traffic operational conditions under the Opening Year 2035:

2035 AM Peak

- Improve traffic operational service level from LOS E or F to acceptable LOS D or better at six freeway locations
- Improve traffic operational service level from LOS E or F to acceptable LOS D or better at one study intersection
- Reduce northbound and southbound SR 55 travel time by 4 and 22 percent, respectively
- Reduce the network vehicle-hours of delay by 19 percent while serving more vehicles through the network

2035 PM Peak

- Improve traffic operational service level from LOS E or F to acceptable LOS D or better at four freeway locations
- Improve traffic operational service level from LOS E or F to acceptable LOS D or better at three study intersections
- Reduce northbound and southbound SR 55 travel time by 1 and 11 percent, respectively
- Reduce the network vehicle-hours of delay by 6 percent while serving more vehicles through the network

Design Year 2055 Conditions

The Design Year 2055 operations analysis results for the No Build Alternative are summarized in Table 2.5-11a (northbound SR 55 AM), Table 2.5-11b (northbound SR 55 PM), Table 2.5-11c (southbound SR 55 AM), Table 2.5-11d (southbound SR 55 PM), Table 2.5-12a (intersection AM), Table 2.5-12b (intersection AM), Table 2.5-13a (travel time AM), Table 2.5-13b (travel time PM), and Table 2.5-14 (systemwide traffic metrics).

Freeway Operations: During the AM peak hour, additional capacity along northbound SR 55 mainline between I-5 and SR 22 would substantially improve traffic operations between the northbound I-5 on-ramp and 17th Street off-ramp and improve the northbound I-5 on-ramp from LOS F to LOS C conditions. North of SR 22, northbound SR 55 would operate at similar conditions under the No Build and Build Alternatives. In the southbound direction, the proposed improvements under the Build Alternative would substantially improve freeway operations and result in LOS D or better conditions on southbound SR 55 from Lincoln Avenue to Katella

Avenue. Southbound SR 55 segments south of SR 22 would expect similar or higher density compared to the No Build Alternative because more traffic would be served by the Build Alternative. During the PM peak hour, the Build Alternative would help to move traffic relatively faster between I-5 and SR 22 due to additional capacity to the mainline segment; however, the bottlenecks outside the study corridor (e.g., westbound SR 22 and eastbound SR 91) would remain; and, as a result, northbound SR 55 would still operate at LOS F conditions under the Build Alternative. In the southbound direction, the Build Alternative would resolve the capacity constraints by introducing additional capacity to this segment, and substantially improve traffic operations at several locations from LOS E/F to D or better during the PM peak hour.

Intersection Operations: The Build Alternative would reduce the number of deficient intersections from 12 to 7 locations during the AM peak hour. Under the PM peak hour, the Build Alternative would improve two deficient intersections to LOS D or better and one deficient intersection from LOS F to LOS E.

SR 55 Corridor Travel Time: During the AM peak hour, the Build Alternative would increase the speed to 65 mph between I-5 and SR 22 by providing additional capacity through the stretch; however, the vehicle speeds between SR 22 and SR 91 would remain similar to the No Build Alternative. In the southbound direction, proposed improvements under the Build Alternative would significantly improve traffic operations and allow traffic travel through southbound SR 55 more quickly, which would consequently increase the average speed from 27 mph to 48 mph on southbound SR 55 from SR 91 to SR 22. During the PM peak hour, additional capacity proposed under the Build Alternative would increase the northbound SR 55 speed between I-5 and SR 22 from 30 to 34 mph and would maintain the travel time for northbound SR 55 no lower than the No Build Alternative while serving more traffic through the corridor. In the southbound direction, the Build Alternative would noticeably improve traffic flow on southbound SR 55 and increase the speed to a free-flow speed throughout the study corridor.

Systemwide Traffic Metrics: Compared to the No Build Alternative, the Build Alternative would serve 3,350 (or 2 percent) more vehicles and reduce the total delay by 2,150 vehicle-hours or 14 percent during the AM peak period and would serve 2,300 (or 1 percent) more vehicles and reduce the total delay by 730 vehicle-hours or 4 percent during the PM peak period. The average delay per vehicle under the Build Alternative would decrease by 15 and 4 percent compared to the No Build Alternative during the AM and PM peak periods, respectively.

In a summary, compared to the No Build Alternative, the Build Alternative would result in the following traffic operational conditions under the Design Year 2055:

2055 AM Peak

- Improve traffic operational service level from LOS E or F to acceptable LOS D or better at six freeway locations
- Improve traffic operational service level from LOS E or F to acceptable LOS D or better at four study intersections
- Reduce northbound and southbound SR 55 travel time by 4 and 26 percent, respectively
- Reduce the network vehicle-hours of delay by 14 percent while serving more vehicles through the network

2055 PM Peak

- Improve traffic operational service level from LOS E or F to acceptable LOS D or better at three freeway locations
- Improve traffic operational service level from LOS E or F to acceptable LOS D or better at two study intersections
- Reduce northbound and southbound SR 55 travel time by 1 and 13 percent, respectively
- Reduce the network vehicle-hours of delay by 4 percent while serving more vehicles through the network

Pedestrian and Bicycle Facilities

The Build Alternative includes minor modifications to existing arterials at their crossings of SR 55 to accommodate the permanent improvements to SR 55 and the ramps provided by the Build Alternative. If any pedestrian or bicycle facilities are modified during construction, they would be returned to their existing cross sections and to current standards no later than the completion of construction of the improvements in the Build Alternative. Specifically, at arterial crossings where modifications to the sidewalks are needed as part of the Build Alternative, those modifications would be consistent with ADA accessibility requirements. The permanent improvements in the Build Alternative would not affect the existing bike facilities at the arterial overcrossings or under crossings or on the east and west sides of the SR 55 corridor.

2.5.4 Avoidance, Minimization, and/or Mitigation Measures

The project will incorporate Project Features PF-T-1 and PF-T-2, outlined above in Section 2.5.3, Environmental Consequences, to help avoid and/or minimize potential impacts. No additional avoidance, minimization, and/or mitigation measures other than the Standard Project Features are required.