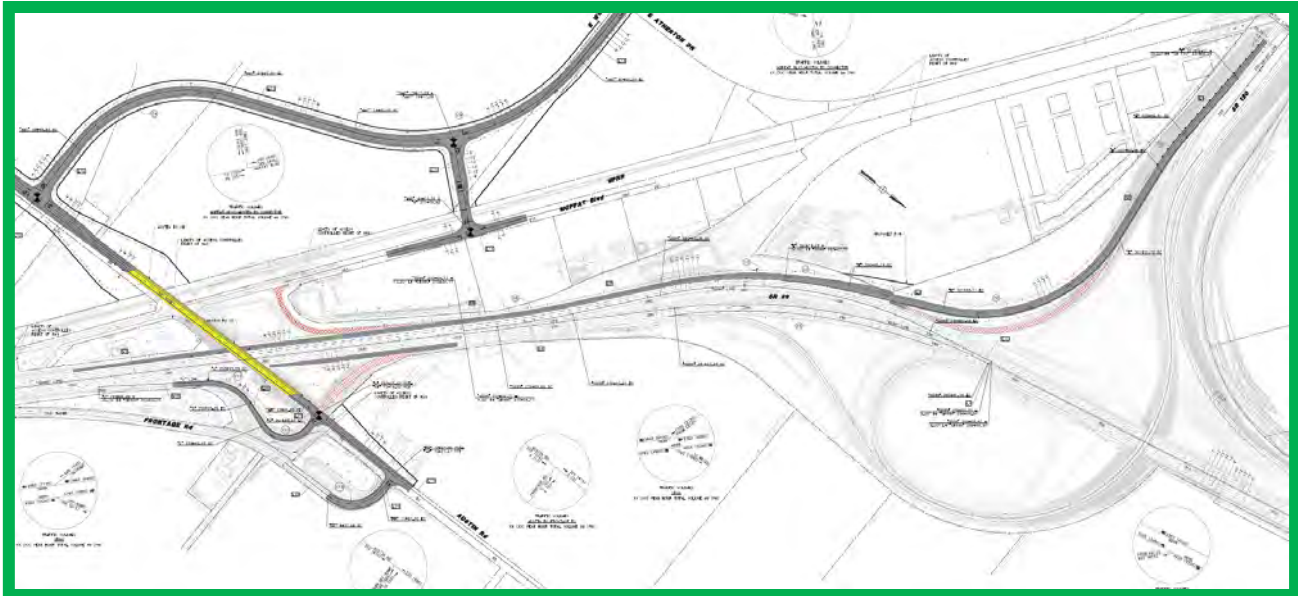


FINAL TRAFFIC OPERATIONS ANALYSIS REPORT (FTOAR) –

FOR THE STATE ROUTE 120 / STATE ROUTE 99 IMPROVEMENT PROJECT
IN SAN JOAQUIN COUNTY, CA



Prepared for

California Department of Transportation
San Joaquin Council of Governments (SJCOG)
Mark Thomas & Company

Prepared by

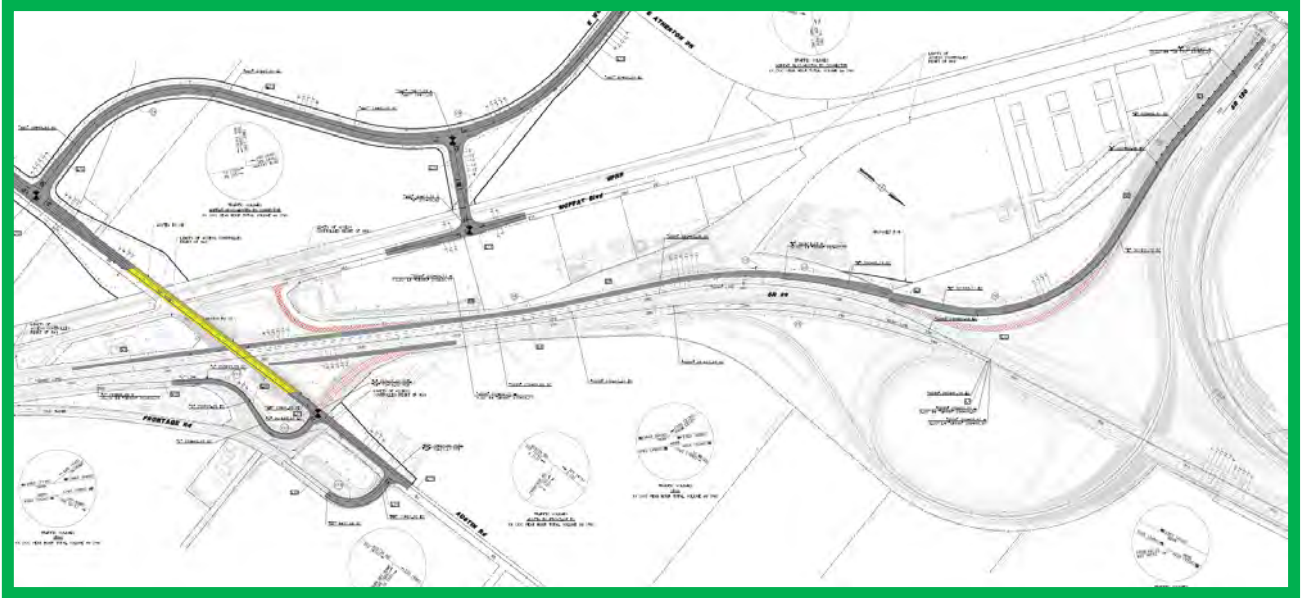
Fehr & Peers
Transportation Consultants

January 2019



FINAL TRAFFIC OPERATIONS ANALYSIS REPORT (FTOAR)

**FOR THE STATE ROUTE 120 / STATE ROUTE 99 IMPROVEMENT PROJECT
IN SAN JOAQUIN COUNTY, CA**



This Final Traffic Operations Analysis Report (FTOAR) was prepared under my direction and responsible charge. I attest to the information contained herein and have judged the qualification of any technical specialists providing engineering data upon which recommendations, conclusions, and decisions are based.

Fred Choa, P.E.
Registered Professional Traffic Engineer
Fehr & Peers

January 21, 2018

Date



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1. INTRODUCTION

This report documents the results of the Final Traffic Operations Analysis Report (TOAR) conducted for the State Route 120 (SR 120) / State Route 99 (SR 99) interchange in San Joaquin County, California. Based on review comments from Caltrans District 10 – Freeway and Highway Operations Branch, this Final TOAR (FTOAR) was completed that incorporates all thirty eight (38) Caltrans' comments dated August 31, 2018.

In the Final Draft Regional Transportation Plan / Sustainable Communities Strategy (RTP/SCS), the San Joaquin Council of Governments (SJCOG) identified the need for an improved interchange at the SR 120 / SR 99 interchange. This study area extends along SR 120 from west of the Main Street interchange, along SR 99 from north of the Yosemite Avenue interchange and south of the Jack Tone Road interchange. In addition to the freeway corridors, local street intersections in close proximity to the interchanges have been evaluated in the Final TOAR.

The interchange project would be designed to provide sufficient capacity and acceptable levels of service to serve the projected increase in traffic volumes along SR 99 and SR 120 for the following two major movements to and from Stanislaus County.

- Eastbound SR 120 to SB SR 99 during the evening peak period; and
- Northbound SR 99 to westbound SR 120 during the morning peak period.

PURPOSE AND NEED

The primary objectives of the SR 120 / SR 99 Interchange Project are:

- Relieve congestion and improve regional mobility by increasing capacity at the SR 120 / SR 99 interchange;
- Improve local traffic circulation and reduce cut-through traffic by providing additional capacity at the State Route 120 and SR 99 interchange;
- Enhance traffic safety for eastbound SR 120 by constructing a two-lane off-ramp onto southbound SR 99.

The need for the project is related to declining level of service on State Route 120, increasing wait times at local intersections near the SR 120 / SR 99 interchange, difficulty in accessing local areas, and impaired safety of motorists traveling along eastbound SR 120 during evening peak travel periods.

The San Joaquin Council of Governments retained Mark Thomas & Company and Fehr & Peers to develop geometric designs, travel demand forecasting, and operations analysis for the PA/ED. The travel demand forecasts were documented for review and comment by Caltrans District 10 Office of Advanced Planning. The Travel Demand Forecasts were formally approved by Caltrans District 10 Office of Advanced Planning for use in the operations analysis in May 2018.

PROJECT DESCRIPTION

The California Department of Transportation (Caltrans) District 10 with the cooperation of the City of Manteca and the San Joaquin Council of Governments (SJCOG) proposes to reconstruct the existing State Route (SR) 99/120 interchange. This project will add an additional lane to increase capacity on two connector ramps (eastbound SR 120 to southbound SR 99 and from northbound SR 99 to westbound SR 120), add auxiliary lanes on SR 99 and 120 to improve merging traffic movements, upgrade the existing interchange ramps at Austin Road, replace the Austin Road structure over SR 99 with a four-lane structure over both SR 99 and Union Pacific Railroad (UPRR), remove the existing at-grade crossing of the UPRR tracks at Austin Road and construct a new connector road from Austin Road to Woodward to Moffat Boulevard and widen the existing Woodward Avenue gated railroad crossing, relocate the SR 99 Frontage Road along the east side of SR 99 from Austin Road for approximately 0.8 miles and install new signing/signals/lighting improvements. Relocation of some existing utility poles, sewer and water lines.

This project will provide traffic congestion relief and improved operations of the interchange. Foundations will be driven piles, either steel or concrete. Excavation for structure footings will be up to 15 feet deep. Excavation for new drainage culverts would be up to 6 feet deep. Other roadway excavation will be up to 2 feet deep. No dewatering is expected as part of the project. The project will be importing fill, no export.

PROJECT DESIGN ELEMENTS

The proposed project includes the following elements:

- Widen the eastbound SR 120 to southbound SR 99 connector ramp from one-lane to two-lanes;
- Widen the northbound SR 99 to westbound SR 120 connector ramp from one-lane to two-lanes
- Construct a new structure over SR 99 to serve eastbound SR 120 to southbound SR 99 traffic and modify the existing structure over SR 99 to serve westbound SR 120 traffic ;
- Add an auxiliary lane in the median in each direction of SR 120 from Main Street to SR 99;
- Add an auxiliary lane in each direction on SR 99 from SR 120 to approximately one mile south. This includes widening the Moffat Overhead and Spreckles Underpass structures;
- Remove the Austin Road overcrossing and replace with a longer and wider structure spanning SR 99 and UPRR (removal consists of removing the structure and the fill located between SR 99 and Moffat Boulevard);
- Convert the Austin Road on-ramp to northbound SR 99 and to westbound SR 120 to a loop ramp that will provide separate traffic movements to SR 99 and SR 120;
- Replace the southbound exit ramp from SR 99 to Austin Road with a grade separated (braided) ramp to eliminate the weaving with SR 120 merging traffic;
- Add a new connector road from Austin Road to Woodward Avenue to Moffat Boulevard and widen the existing UPRR Woodward Avenue gated crossing; and
- Relocate the northbound SR 99 exit ramp to Austin Road to accommodate the loop on ramp and relocate the adjacent SR 99 Frontage Road for approximately 0.8 miles.

There are three proposed phases of construction.

The Phase 1A project would be as follows:

- Widen the eastbound SR 120 to southbound SR 99 connector ramp from one-lane to two-lanes;
- Remove the Austin Road overcrossing and replace with a longer structure spanning SR 99 and UPRR;
- Add a new connecting road from Austin Road to East Woodward Avenue and Moffat Boulevard and modify the existing UPRR gated crossing at East Woodward Avenue to conform to the new connector road;
- Modify the existing northbound Austin Road exit ramp to conform to the higher overcrossing profile grade;
- Temporarily close the Austin Road northbound entrance and southbound exit ramps, resulting in a partial interchange.

The Phase 1B project would be constructed after the Phase 1A project:

- Widen the northbound SR 99 to westbound SR 120 connector ramp from one-lane to two-lanes;
- Add an auxiliary lane in the existing median of westbound SR 120 from Main Street to SR 99;
- Convert the existing 99/120 separation structure to two lanes and construct a new separation structure to serve the eastbound 120 to northbound 99 connector ramp;

Phase 1C would complete the project as planned by:

- Add the southbound exit ramp from SR 99 to Austin Road by constructing a grade separated braided ramp to eliminate the weaving with SR 120 merging traffic;
- Convert the entrance ramp from Austin Road to northbound SR 99 and to westbound SR 120 to a loop ramp that will provide separate traffic movements to SR 99 and SR 120;
- Relocate the northbound SR 99 exit ramp to Austin Road to accommodate the loop on ramp;
- Relocate the SR 99 frontage road for approximately 0.8 miles to accommodate the loop on ramp;
- Add an auxiliary lane in the existing median of eastbound SR 120 from Main Street to SR 99;
- Add an auxiliary lane in each direction on SR 99 from SR 120 to approximately 1.7 mile south of the Austin Road overhead by shifting the median away from the UPRR ROW and relocating portions of the frontage road.

In the proposed first phase of construction, the NB entrance and the SB exits ramps at Austin Road would be temporarily closed, resulting in a partial interchange. Closing the NB entrance ramp provides the following benefits.

- Eliminates the traffic from Austin Road that either uses the SR 120 connector or merges onto NB SR 99.
- Allows the existing auxiliary lane serving the SR 120 connector to be extended approximately 800-feet

Closing the SB exit ramp provides the following benefits.

- Eliminates the weaving section between SR 120 and the Austin Road interchange;
- Allows the eastbound SR 120 on-ramp onto southbound SR 99 connector merge section to be extended approximately 3,000 feet

SR 120 / Union Road Interchange:

- By Year 2020 Conditions, the interchange will be reconstructed to a Diverging Diamond interchange to serve projected Manteca General Plan AM and PM peak hour demand volumes;
- Auxiliary lanes will be constructed on eastbound SR 120 from the Airport Way on-ramp to the Union Road off-ramp and the Union Road on-ramp to the Main Street off-ramp; and
- Auxiliary lanes will be constructed on westbound SR 120 from the Main Street on-ramp to the Union Road off-ramp and the Union Road on-ramp to the Airport Way off-ramp.

SR 120 / Main Street Interchange:

- Based on the SJCOG 2018 RTP/SCS Appendix F – Table 6-2, the interchange will be reconstructed by the Year 2033 to serve projected Manteca General Plan AM and PM peak hour demand volumes;
- Based on the results of the With Phase 1A Project analysis contained in the Traffic Operation Analysis Report, a PSR /PDS will be needed to determine the required interchange design. It should be noted that with the current spread diamond interchange, the footprint of the future interchange should not require additional right-of-way.

SR 120 Mainline

- Based on the SJCOG 2018 RTP/SCS Appendix F – Table 6-1, the freeway mainline will be widened from four to six lanes between SR 120 (to the west) and SR 99 (to the east) by the Year 2030 to serve projected San Joaquin County, Stanislaus County and Merced County AM and PM peak hour demand volumes.

DESIGN PERIOD EXCEPTION FOR THE SR 99 / SR 120 IMPROVEMENT PROJECT

The Project Development Team (PDT) for the State Route 99/ 120 Interchange Improvement Project (EA 10-1E740) has requested an exception to the 20-year Design Period Policy for the proposed Phase 1A project improvements.

Index 103.2 Design Period of the Highway Design Manual states:

“Geometric design of new facilities and reconstruction projects should normally be based on estimated traffic 20 years after completion of construction. With justification, design periods other than 20 years may be approved by the District Director with concurrence by the Project Delivery Coordinator.

Specifically, the PDT requested the design year period exception for the northbound SR 99 to westbound SR 120 connector because the work on this connector will be deferred until funding is available. The remainder of the project, to improve the eastbound (EB) SR 120 to southbound (SB) SR 99 connector, meets or exceeds the 20-year design period policy.

In December 2015, the Department of Transportation (Caltrans) approved a Project Study Report-Project Development Support (PSR-PDS) to reconstruct the SR 99 / SR 120 Interchange (Project). The project proposed to make improvements to the two major connector ramps to improve the operations and safety. During the development of the Project Report, the traffic study determined the EB SR 120 to SB SR 99 and the northbound (NB) SR 99 to westbound (WB) SR 120 connector ramps needed two lane exits to provide adequate level of service, rather than the single lane exit, widening to two lanes past the gore nose. The Austin Road Overcrossing was identified in the PSR-PDS to be replaced to allow additional lanes on SR 99, however it was determined that the profile grade of Austin Road could not touch down on the east side of the Union Pacific Railroad (UPRR) and needed to be extended easterly over UPRR. These changes to provide two lane exits for the major freeway connector movements, provide auxiliary lanes for these connector ramps, lengthen the Austin Road Overcrossing and the additional work to reconnect the local roadway network on the east side of UPRR resulted in the PSR-PDS estimated project construction cost to more than double to over \$90 million.

A Value Analysis (VA) study was conducted in September 2017. The study found the proposed geometric improvements identified by the project were needed to provide for the forecasted traffic, however, due to a shortfall in funding, that the proposed improvements should be staged to address the worst traffic conditions first. Although both the EB SR 120 to SB SR 99 and the NB SR 99 to WB SR 120 connector ramps currently operate at Level of Service (LOS) F in their respective peak flow direction, the EB SR 120 to SB SR 99 currently has greater operational and safety issues. There are only two lanes on EB SR 120, with one lane is dedicated to each connector ramp direction to SR 99. Because the directional distribution of traffic is 80% to SB SR 99, this results in unequal lane distribution and queuing of the # 2 lane. Impatient drivers use the #1 lane to jump the queue and cut into the #2 lane or unexpectedly slow in the otherwise free flowing #1 lane, resulting in a collision rate that is more than double statewide average. The City of Manteca and the Manteca Fire Department have expressed concerns over the frequency and severity of the collisions along EB SR 120. They also note that some drivers are exiting the freeway and using city streets to bypass the queued traffic. The NB SR 99 to WB SR 120 connector also currently operates at LOS F in the AM peak, however this movement does not have the queue jumping and collision problem that the EB SR 120 to SB SR 99 connector exhibits. There are three NB through lanes on SR 99 (widening to four lanes at the connector), allowing the through traffic the opportunity to use the #1 and #2 lanes to avoid the traffic queued to the connector. In addition, the lane distribution is better because 55% of the traffic remains on SR 99 and 45% uses the connector ramp. The existing three lane NB freeway section through Ripon acts as to constrain the traffic before it approaches the 99/120 connector.

Construct Phase 1B- Phase 1B should be budgeted to be completed by 2032 to keep the LOS above LOS E. The un-escalated construction cost of Phase 1B is \$16 million and assumes that the widening of SR 120 to 6-lanes has not been completed. If SR 120 is widened to 6-lanes prior to or concurrently with Phase 1B, the cost of Phase 1B decreases to approximately \$11 million because an auxiliary lane between SR 99 and the Main Street interchange would be constructed with that project.

The following table compares the project to the no-build condition and shows how traffic is improved over the no-build condition.

AM Peak Hour Traffic Northbound SR 99 to Westbound SR 120 Connector				
Alternative	Year	LOS	VPH	Density
Existing Condition	2017	C / F	2,090	23.1
No Project	2023	D / F	2,210	32.2
Phase 1A Project	2023	C / C	1,755	26.7
Phase 1A Project	2032	D / F	1,845	29.1
No Project	2043	F / F	2,745	41.7
Phase 1A Project	2043	D / F	1,950	31.9

Note: The Level of Service (LOS) is defined in density (passenger cars per mile per lane). It should be noted that when the off-ramp volume exceeds the capacity of a single lane off-ramp, LOS F is identified per the Highway Capacity Manual.

The Phase 1A project improves the existing condition from unacceptable LOS F to acceptable LOS C. This improvement is a combination of removing the NB SR 99 on-ramp from Austin Road, eliminating the existing merge / weave movement and constructing an additional 800 feet of deceleration lane for NB SR 99 traffic existing onto the single lane off-ramp to WB SR 120. This improvement is projected to provide acceptable level of service conditions for ten (10) years assuming a straight line traffic growth between Construction Year 2023 and Design Year 2043. It should be noted that northbound SR 99 peak hour traffic cannot grow in a continuous straight line because SR 99 across the Stanislaus River and through Ripon will be constrained during a single peak hour. This will result in peak hour spreading and multiple hours of congestion on northbound SR 99 between the Stanislaus River and the SR 99 / SR 120 freeway-to-freeway interchange. The projected straight line growth in traffic on northbound SR 99 will not occur until the Stanislaus River Bridge is widened from 3 to 4 travel lanes in each direction (8 total).

STUDY AREA

The SR 120 / SR 99 interchange will be constructed at the location of the existing SR 120 / SR 99 Interchange (PM 5.822). The interchange will provide improved access to and from SR 99 (south) and SR 120 (west) to serve the increased traffic demand due to existing and future planned development in the southern San Joaquin County (Ripon, Manteca, and San Joaquin County) and the significant growth projected in Stanislaus and Merced Counties. The interchange will include two travel lanes of the eastbound SR 120 to southbound SR 99 ramp and two lanes on the northbound SR 99 to westbound SR 120 ramp. The project contains additional features that were described in detail in the previous section. **Figure 1** presents the freeway study area and study intersections for the SR 120 / SR 99 Interchange Project:

- Eastbound SR 120 from west of Main Street to SR 99;
- Westbound SR 120 from SR 99 to west of Main Street;
- Northbound SR 99 from south of Jack Tone Road to north of Yosemite Avenue; and
- Southbound SR from north of Yosemite Avenue to south of Jack Tone Road.

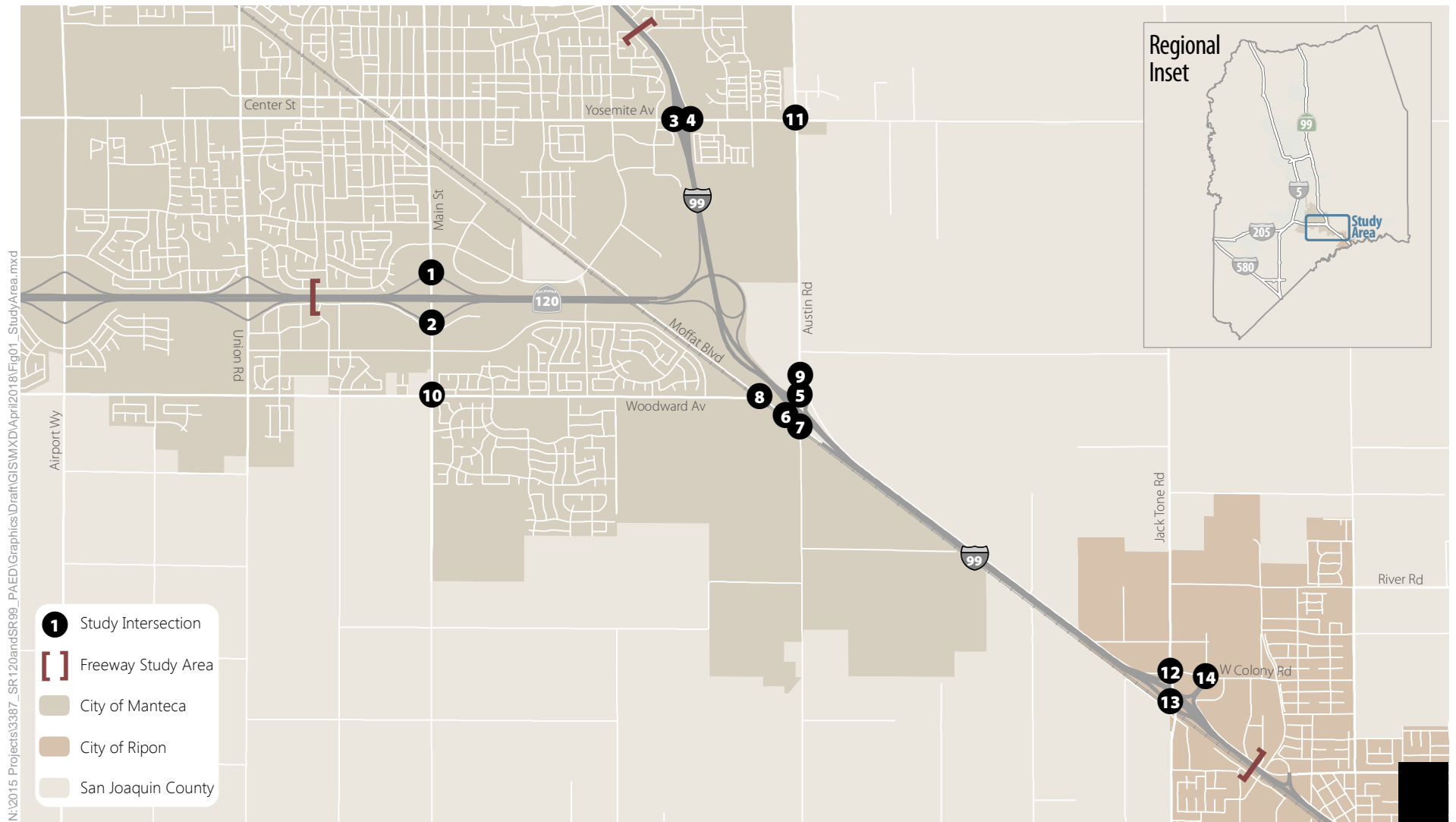


Figure 1

SR 120/SR 99 Project Study Area

In addition, the following fourteen (14) study intersections were selected in coordination with the Project Development Team (PDT) which was comprised of the San Joaquin Council of Governments (SJCOG), Caltrans District 10, City of Manteca, and Mark Thomas for analysis during weekday AM and PM peak hours:

- | | |
|---------------------------------------|--|
| 1. SR 120 EB Ramps / Main Street; | 8. Woodward Avenue / Moffat Boulevard; |
| 2. SR 120 WB Ramps / Main Street; | 9. Austin Road / Frontage Road; |
| 3. SR 99 NB Ramps / Yosemite Avenue; | 10. Woodward Avenue / Main Street; |
| 4. SR 99 SB Ramps / Yosemite Avenue; | 11. Austin Road / Yosemite Avenue; |
| 5. SR 99 NB Ramps / Austin Road; | 12. SR 99 Ramps / Jack Tone Road; |
| 6. SR 99 SB Ramps / Moffat Boulevard; | 13. SR 99 SB Ramps / Jack Tone Road; and |
| 7. Austin Road / Moffat Boulevard; | 14. Hoff Drive / Colony Road. |

2. ANALYSIS METHODOLOGY

This chapter describes the methods used to analyze study intersections and network performance. The processes used to develop the existing traffic volumes and future year (2023 and 2043) travel demand forecasts are described in Chapters 3 and 4, respectively.

INTERSECTIONS AND FREEWAYS

The Synchro/SimTraffic microsimulation software package (Version 10) was used to analyze all unsignalized and signalized study intersections. This program is consistent with the technical approach documented in the *Highway Capacity Manual – 6th Edition* (TRB, 2016) for calculating delay at signalized and unsignalized intersections. It considers roadway design, intersection geometries, turn pocket storage lengths, and intersection control on intersection queuing and delays. Therefore, intersection delay/level of service results documented in the Traffic Operations Analysis Report (TOAR) are based on the SimTraffic results.

The Highway Capacity Software (HCS) 2016 was used to analyze all freeway mainline, on-ramp merge, off-ramp diverge and weaving sections. This program is consistent with the technical approach documented in the *Highway Capacity Manual – 6TH Edition* (TRB, 2016) for calculating density in passenger cars per hour per lane (pcphpl) and corresponding level of service.

The following describes the specific inputs, model parameters, and other aspects of the SimTraffic modeling:

Existing/Planned Lane Configurations:

- The existing and planned roadway geometrics and intersection lane configurations entered into the SimTraffic model are presented in the intersection volume figures.

Peak Hour Factors:

- The peak hour factor (PHF) observed in the field was determined to range from 0.93 to 0.95 during AM and PM peak hour conditions.
- It should be noted that a lower PHF of 0.90 (versus the field data collected 0.93 to 0.95 PHF) was used for all study intersections under existing, construction year 2023, and design year 2043 conditions. This will provide an additional level of confidence (conservative) in the traffic analysis contained in this TOAR.

These methodologies were applied using Synchro 10 to analyze all study intersections. The following describes many of the specific inputs into Synchro 10:

- Lane Configurations and Pocket Lengths: were entered into Synchro based on aerial imagery measurements or Geometric Approval Drawings (GADs) developed by Mark Thomas;

- Signal Timings: actual timing plans provided by Caltrans and the City of Manteca were entered. All signalized intersections currently operate in either actuated-uncoordinated or actuated-coordinated modes with cycle lengths that generally range from 60 to 140 seconds;
- Heavy Vehicle %:
 - HCM definition (any vehicles with more than four wheels on the ground) was used to input heavy vehicles into SimTraffic 10 software program.
 - For freeway mainlines, the Draft TOAR Existing Conditions analysis applied a heavy vehicle percentage of 10 percent during both AM and PM peak hours. It should be noted that both these values are slightly lower than the daily truck percentage reported in the 2014 Annual Average Daily Truck traffic on the California State Highway System of:
 - 18.40 percent at Post Mile R0.493 (Mossdale Junction Route 5); and
 - 14.70 percent at Post Mile T6.87 (Manteca north Junction Route 99).
 - The primary reason is that truck traffic during morning (7:15 to 8:15 AM) and evening (4:45 to 5:45 PM) peak hours is lower than the rest of the day because truck drivers avoid peak commute times and the percentage of commute traffic is much higher during peak hour conditions.
 - Based on comments from Caltrans District 10 – Freeway and Highway Operation Branch, and follow-up discussions with Caltrans and SJCOG, the Project Development Team has agreed to use the 14.7% daily truck percentage for both AM and PM peak hours for the HCS freeway mainline, on-ramp merge, off-ramp diverge and weaving analysis.
 - It should be noted that the use of the 14.7% truck percentage will not apply to the Synchro / SimTraffic analysis. It should also be noted that the use of the 14.7% is a case by case decision and will result in conservative density and level of service results for the SR 120 / SR 99 Improvement Project.
- Pedestrians and bicyclists: observed levels entered into Synchro 10. When none available, a conservative standard of 2 or 5 was inputted to account for walk time variability.
 - Observed levels were observed to range from 0-2 pedestrians during weekday AM and PM peak hour conditions at the fourteen study intersections.
 - Pedestrian walk times and volumes were coded in the Synchro / SimTraffic 10 models to fully analyze pedestrian calls under existing, construction year 2023, and design year 2043 conditions.

SimTraffic Modeling

- Consistent with Caltrans District 10 – Freeway and Highway Operations Branch preferences (e.g., required for the SR 120 / McKinley Avenue Interchange, SR 99 / Mitchel Road Interchange, I-205 / Chrisman Road Interchange, and SR 120 / Union Road interchange projects), the SimTraffic model was run for the entire peak hour using the following four 15-minute intervals:
 - 15-minute – no PHF
 - 15-minute – with PHF of 0.90
 - 15-minute – no PHF
 - 15-minute – no PHF
- For each scenario, the results of 12 SimTraffic Version 10 model runs were averaged to yield the reported conclusions. Outputs include average delay, 95th percentile vehicle queues, and total network performance (vehicle hours of delay, total stops, vehicle miles traveled, fuel consumption, greenhouse gas emissions etc.) as reported by SimTraffic.

Reported Results

- The average delay and LOS are reported for the critical movement for unsignalized intersections.
- The average delay and LOS are reported the entire intersection for signalized intersections.
- **Table 1** displays the density ranges associated with each LOS category for basic freeway segments, weaving section, and ramp merge/diverge movements.
- **Table 2** displays the delay range associated with each LOS category for signalized and unsignalized intersections.

LEVEL OF SERVICE STANDARDS

The following LOS standards are relevant to this study:

- Caltrans – Based on consultations with Caltrans Traffic Operations staff, intersections within the Caltrans right-of-way should operate at LOS D or better for all movements.
- City of Manteca - The City's General Plan identifies the minimum acceptable operations criteria for signalized intersection and all-way stop controlled intersection to be LOS D
- City of Ripon - The City's General Plan identifies the minimum acceptable operations criteria for signalized intersection and all-way stop controlled intersection to be LOS D

TABLE 1: FREEWAY LEVEL OF SERVICE (LOS) CRITERIA

Level of Service (LOS)	Density (Passenger Cars per Mile per Lane) ¹	
	Mainline and Weaving Section	Ramp Merge/Diverge
A	≤ 11	≤ 10
B	> 11 to 18	> 10 to 20
C	> 18 to 26	> 20 to 28
D	> 26 to 35	> 28 to 35
E	> 35 to 45	> 35
F	> 45 or any v_d/c ratio > 1.00 ¹	Demand exceeds capacity ²

Notes: ¹ v_d/c ratio = demand flow rate divided by the capacity of a given segment.

² Occurs when freeway demand exceeds upstream (diverge) or downstream (merge) freeway segment capacity, or if off-ramp demand exceeds off-ramp capacity.

Source: Exhibits 10-7 and 13-2 *Highway Capacity Manual* (Transportation Research Board, 2010).

TABLE 2: INTERSECTION LEVEL OF SERVICE (LOS) CRITERIA

Level of Service (LOS)	Average Control Delay (seconds per vehicle)	
	Signalized Intersections	Unsignalized Intersections
A	≤ 10	≤ 10
B	> 10 to 20	> 10 to 15
C	> 20 to 35	> 15 to 25
D	> 35 to 55	> 25 to 35
E	> 55 to 80	> 35 to 50
F	> 80	> 50

Notes: The average delay reported for signalized intersections is for all vehicles passing through the intersection, whereas the average delay reported for unsignalized intersections is for the minor street movement with the greatest delay.

Source: *Highway Capacity Manual* (Transportation Research Board, 6th Edition).

3. EXISTING CONDITIONS

This chapter describes existing conditions within the study area including the existing roadway network, traffic data collection, and existing traffic operations. The following Appendices contain the Existing Conditions analysis:

- Appendix A – Existing Conditions – AM Peak Hour - Eastbound SR 120 and Southbound SR 99 HCS Freeway Mainline, On-Ramp Merge, Off-Ramp Diverge Analysis and Weaving Section Analysis;
- Appendix B – Existing Conditions – AM Peak Hour - Northbound SR 99 and Westbound SR 120 HCS Freeway Mainline, On-Ramp Merge, Off-Ramp Diverge Analysis and Weaving Section Analysis;
- Appendix C – Existing Conditions – PM Peak Hour - Eastbound SR 120 and Southbound SR 99 HCS Freeway Mainline, On-Ramp Merge, Off-Ramp Diverge Analysis and Weaving Section Analysis;
- Appendix D – Existing Conditions – PM Peak Hour - Northbound SR 99 and Westbound SR 120 HCS Freeway Mainline, On-Ramp Merge, Off-Ramp Diverge Analysis and Weaving Section Analysis;
- Appendix M – Existing Conditions – AM Peak Hour Synchro / SimTraffic Input Data and SimTraffic Analysis Results Based on 12 SimTraffic Model Runs; and
- Appendix N – Existing Conditions – PM Peak Hour Synchro / SimTraffic Input Data and SimTraffic Analysis Results Based on 12 SimTraffic Model Runs.

ROADWAY SYSTEM

State Route (SR) 120 – is an east-west four-lane freeway within the study area that connects Interstate 5 and State Route 99 through Lathrop and Manteca. SR 120 provides interchanges at Yosemite Avenue, Airport Way, Union Road, and Main Street. It is grade-separated above McKinley Avenue and a new interchange will be constructed by Year 2023. In addition, a PSR / PDS is currently being completed by SJCOG to widen SR 120 from four to six lanes by Year 2034. If funding becomes available sooner, widening of SR 120 would occur by Year 2030. SR 120 has a posted speed limit of 65 miles per hour (mph).

Main Street Interchange (PostMile 5.312) – is a spread-diamond interchange configuration, in which Main Street is elevated above SR 120. The ramp terminal intersections are spaced approximately 1,400 feet apart, and operate with traffic signals. Main Street provides one lane in each direction south of SR 120. North of SR 120, Main Street provides two travel lanes in each direction.

State Route (SR) 99 – is a north-south six-lane freeway within the study area that connects Lodi and Sacramento to the north and Modesto and Merced to the south. It provides interchanges at Yosemite Avenue, Austin Road and Jack Tone Road in the project study area. It is grade-separated below SR 120 at the SR 120 / SR 99 interchange with single lane direct ramps. SR 99 has a posted speed limit of 65 miles per hour (mph).

Yosemite Avenue Interchange (PostMile 6.654) – is a tight-diamond interchange configuration, in which Yosemite Avenue is below SR 120. The ramp terminal intersections are spaced approximately 500 feet apart, and operate with coordinated traffic signals. Yosemite Avenue provides four travel lanes (dual left-turn and two through lanes) underneath SR 120.

Austin Road Interchange (Approximately PostMile 4.822) – is a modified spread diamond configuration on the north side of SR 99. On the south side of SR 120, a hook off-ramp onto Moffett Boulevard and a diagonal on-ramp from Austin Road / Moffat Boulevard is provided. Austin Road is constructed above SR 120 with a two lane bridge connecting Moffat Boulevard to the south and Yosemite Avenue to the north.

TRAFFIC DATA COLLECTION

The freeway mainline counts were obtained from Caltrans' Performance Measure System (PeMS) for every Tuesday, Wednesday and Thursday for the entire Year 2015 (excluding holidays) from a traffic monitoring station located on SR 120 under the Union Road overcrossing. Based on data contained on Caltrans Traffic Census Program webpage (<http://traffic-counts.dot.ca.gov/>), the annual yearly growth rate on SR 120 between I-5 (to the west) and SR 99 (to the east) was determined to be 1.5 percent per year. Therefore, a three percent (3%) growth rate (1.5 % per year x 2 years) was applied to the 2015 volumes to determine preliminary Existing (Year 2017) AM and PM peak hour freeway mainline volumes.

Weekday morning (7-9 AM) and evening (4-6 PM) peak period turning movement counts were collected at the following 14 study intersections in August, September and October, 2016:

- | | |
|---------------------------------------|--|
| 1. SR 120 EB Ramps / Main Street; | 8. Woodward Avenue / Moffat Boulevard; |
| 2. SR 120 WB Ramps / Main Street; | 9. Austin Road / Frontage Road; |
| 3. SR 99 NB Ramps / Yosemite Avenue; | 10. Woodward Avenue / Main Street; |
| 4. SR 99 SB Ramps / Yosemite Avenue; | 11. Austin Road / Yosemite Avenue; |
| 5. SR 99 NB Ramps / Austin Road; | 12. SR 99 Ramps / Jack Tone Road; |
| 6. SR 99 SB Ramps / Moffat Boulevard; | 13. SR 99 SB Ramps / Jack Tone Road; and |
| 7. Austin Road / Moffat Boulevard; | 14. Hoff Drive / Colony Road. |

It should be noted that the results of the one (1) day counts were not used directly in this TOAR. The Existing AM and PM peak hour count volumes (by turning movement) were adjusted (increased) working directly with Caltrans District 10 Office of Advanced Planning. Therefore, Existing AM and PM Peak hour volumes used in this Traffic Operations Analysis Report (TOAR) represent peak month – peak hour volumes. In addition, Construction Year 2023 and Design Year 2043 travel demand forecasts also represent peak month – peak hour volumes.

Figures 2A and 2B present the final adjusted and approved Existing Year 2017 AM Peak Hour Conditions and provide the following information:

- Existing Year 2017 AM Peak Hour Volume;
 - Existing Year 2017 HCS 6th Edition AM Peak Hour Density;
 - Freeway Mainline Lanes, Off-Ramp Lane(s) and On-Ramp Lane(s); and
 - Existing Year 2017 HCS 6th Edition AM Peak Hour HCS 6th Edition Level of Service.
- Acceptable Level of Service A through D are shown in Green;
Unacceptable / Marginal Level of Service E is shown in Yellow; and
Unacceptable Level of Service F is shown in Red.

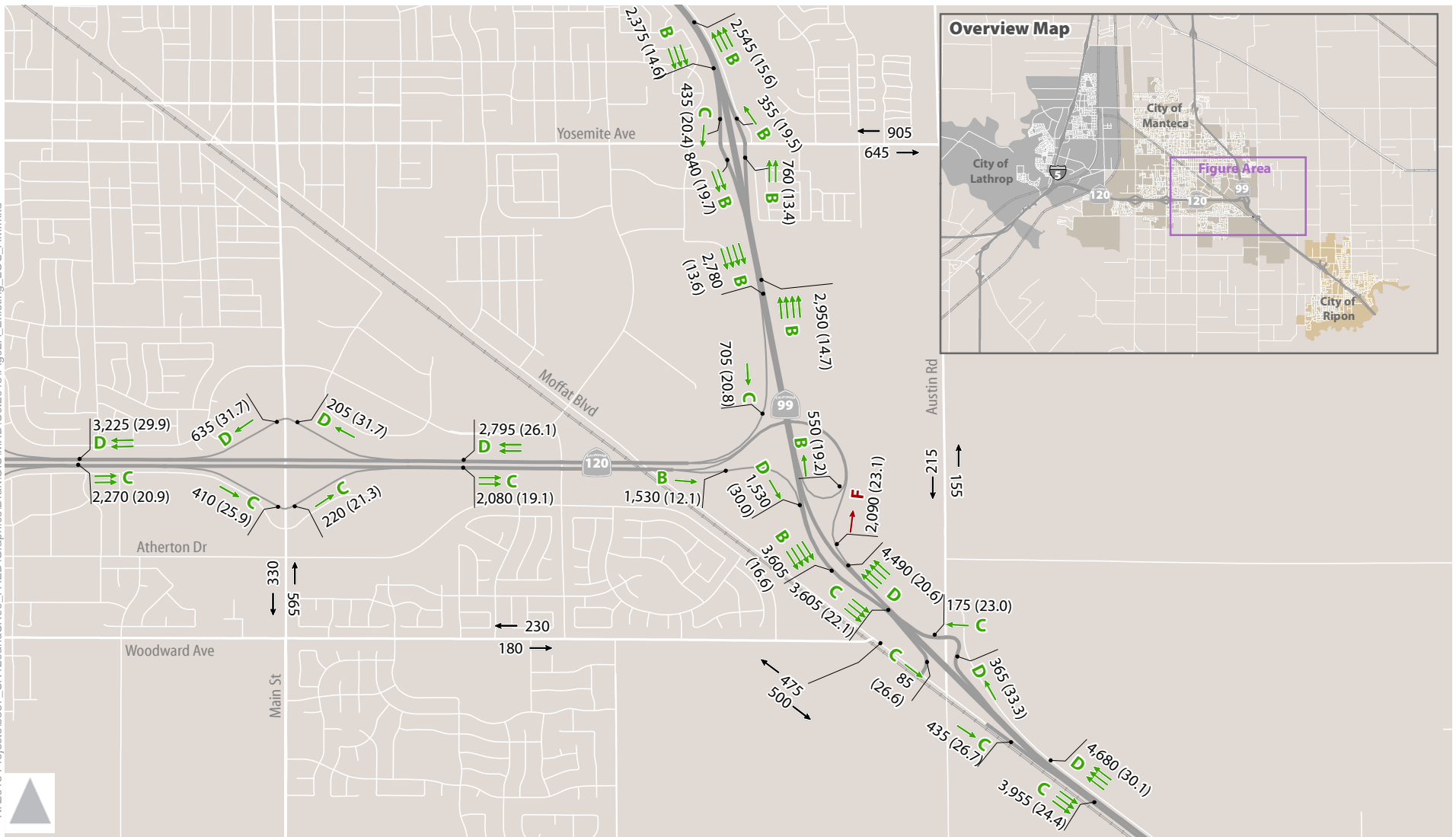
The primary conclusions of the Existing Conditions analysis presented in Figure 2A are:

1. During the AM peak hour, the directional split on SR 120 is approximately 60% westbound and 40% eastbound.
2. During the morning peak hour, the NB SR 99 to WB SR 120 freeway-to-freeway ramp operates at LOS F conditions;
3. The eastbound SR 120 single lane off-ramp to southbound SR 99 operates at LOS B conditions with a density of 12.1 pc/mpl.
4. The remaining 29 of the 30 study segments (96.7%) operates at acceptable Level of Service B, C, or D conditions.

The primary conclusions of the Existing Conditions analysis presented in Figure 2B are:

1. During the AM peak hour, the directional split on SR 99 is approximately 55% northbound and 45% southbound.
2. During the morning peak hour, all nine (9) study segments (100%) operates at acceptable Level of Service B, C, or D conditions.

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x,xxx Peak Hour Volume
(xx.x) Density

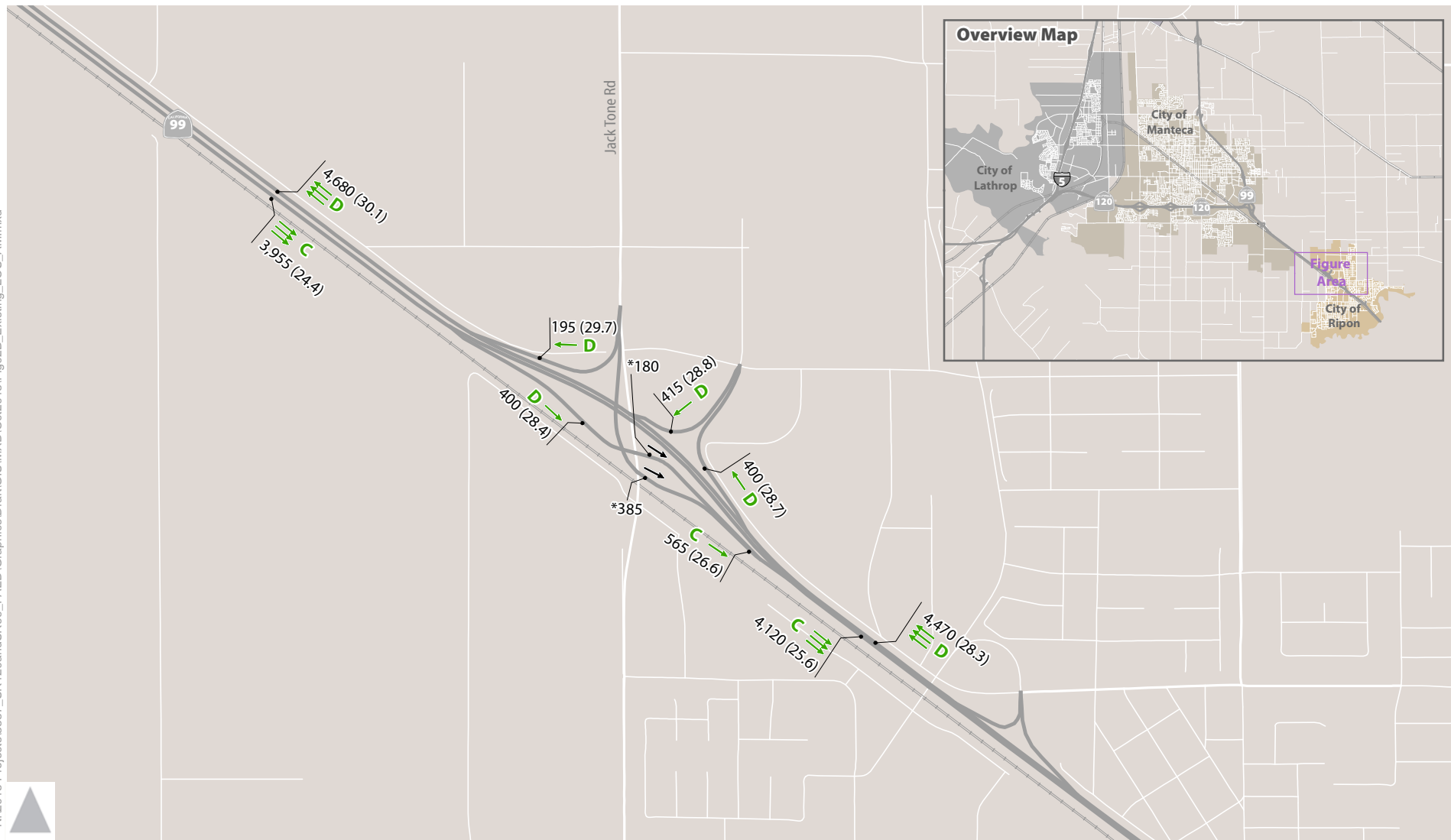
Freeway Lane
Auxiliary Lane

Acceptable Level of Service - **A, B, C** and **D**
Unacceptable Level of Service - **E** and **F**

Figure 2A

AM Peak Hour Freeway Volume and Level of Service -
Existing Year 2017 Conditions

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x,xxx Peak Hour Volume
 (xx.x) Density
 ← Freeway Lane

Acceptable Level of Service - **A, B, C** and **D**
 Unacceptable Level of Service - **E** and **F**

Note: (*) Indicates a non-freeway segment.



Figure 2B
 AM Peak Hour Freeway Volume and Level of Service -
 Existing Year 2017 Conditions

Figures 3A and 3B present the final adjusted and approved Existing Year 2017 PM Peak Hour Conditions and provide the following information:

- Existing Year 2017 PM Peak Hour Volume;
- Existing Year 2017 HCS 6th Edition PM Peak Hour Density;
- Freeway Mainline Lanes, Off-Ramp Lane(s) and On-Ramp Lane(s); and
- Existing Year 2017 HCS 6th Edition PM Peak Hour HCS 6th Edition Level of Service.
Acceptable Level of Service A through D are shown in Green;
Unacceptable / Marginal Level of Service E is shown in Yellow; and
Unacceptable Level of Service F is shown in Red.

The primary conclusions of the Existing Conditions analysis presented in Figure 3A are:

1. During the PM peak hour, the directional split on SR 120 is approximately 55% eastbound and 45% westbound.
2. During the evening peak hour, eastbound SR 120 operates at LOS D conditions from the Main Street interchange to the SR 120 / SR 99 freeway to freeway interchange;
3. It should be noted that with a density of 20.4 pcpmpl, the off-ramp diverge would be LOS C. But because the capacity of the single lane off-ramp (2,100 vehicles) is exceeded by the 2,365 vehicles exiting eastbound SR 120 onto southbound SR 99, the single lane off-ramp to southbound SR 99 operates at LOS F conditions.
4. Severe congestion and slow travel speeds on SR 120 result in diversion of traffic onto the eastbound SR 120 off-ramp to Main Street, resulting in LOS E conditions;
5. With 82% of the SR 120 traffic (2,365 of the 2,885) exiting SR 120 onto southbound SR 99, the unequal lane utilization results in stop and go conditions on eastbound SR 120 and LOS F conditions on the #2 lane on eastbound SR 120;
6. With the heavy on-ramp traffic entering southbound SR 99 from the single lane eastbound SR 99 on-ramp, the SB SR 99 merge section operates at LOS F conditions;
7. During the evening peak hour, with the conservative 14.7% truck percentage, the northbound off-ramp from SR 99 to westbound is operating at LOS F conditions; and
8. The remaining 25 of the 29 study segments (86.2%) operates at acceptable Level of Service B, C, or D conditions.

The primary conclusions of the Existing Conditions analysis presented in Figure 3B are:

1. During the PM peak hour, the directional split on SR 99 is approximately 55% southbound and 45% northbound.
2. During the evening peak hour, southbound SR 99 is approaching operating capacity based on the HCS analysis with a density of 33.1 pcphpl.
3. Field observations indicate that a combination of the horizontal curvature at the SR 99 / Jack Tone Road interchange, diversion traffic entering southbound SR 99 from the Main Street Interchange in Ripon results in stop and go operations on southbound SR 99 between Jack Tone Road and the Stanislaus River bridge.
4. All five (5) northbound SR 99 study segments (100%) operates at acceptable Level of Service C or D conditions.

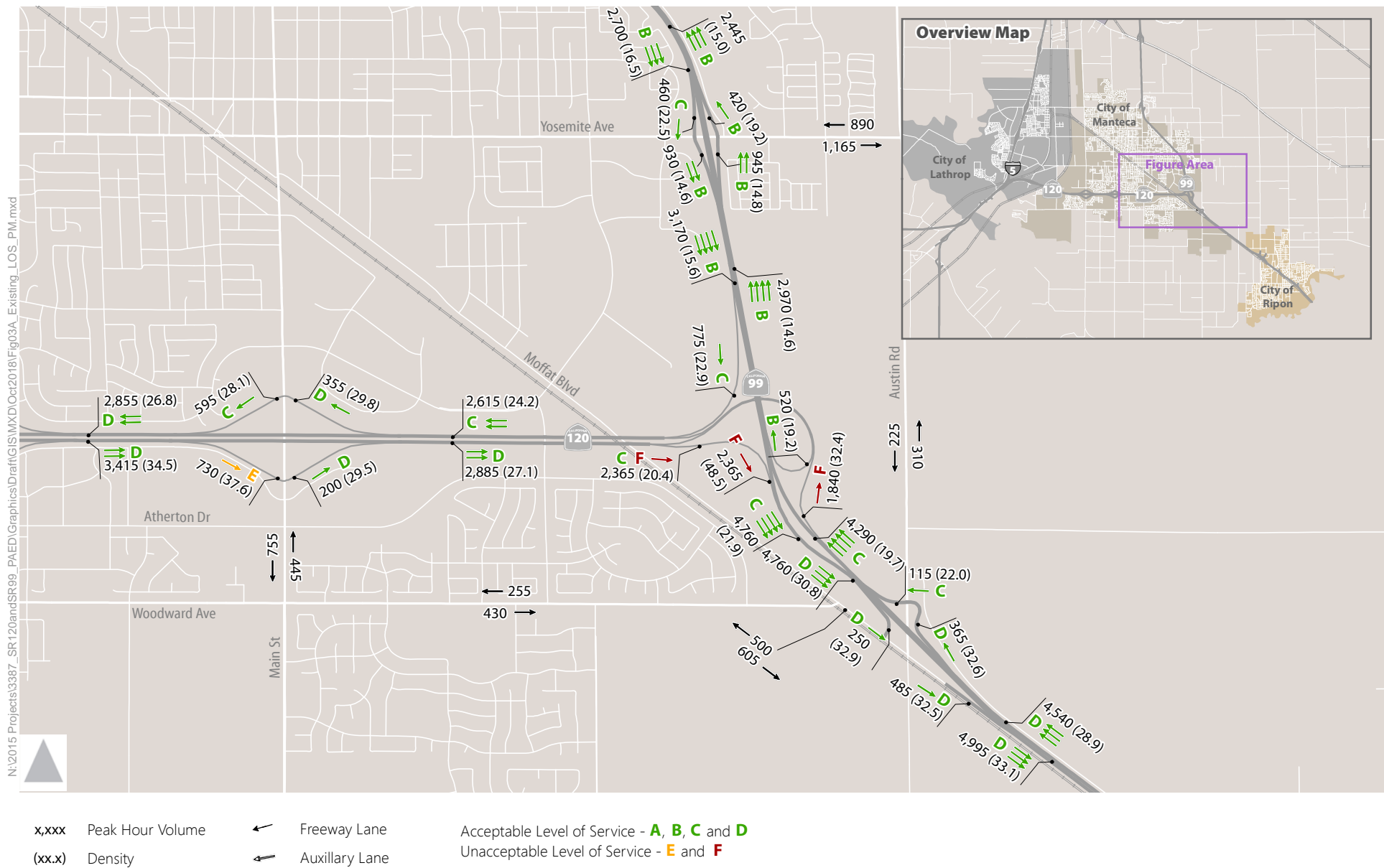


Figure 3A

PM Peak Hour Freeway Volume and Level of Service - Existing Year 2017 Conditions

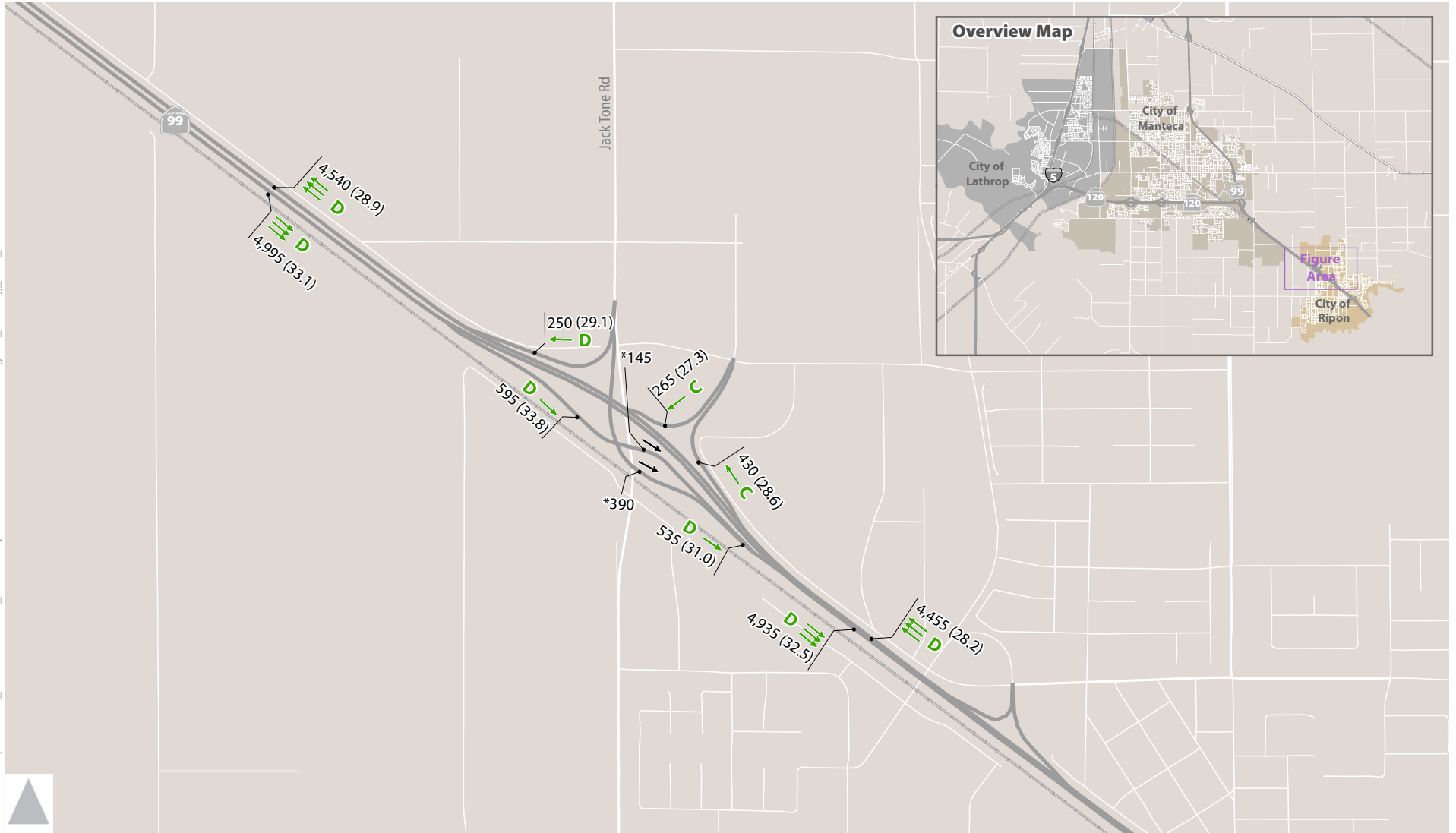


Figure 3B

PM Peak Hour Freeway Volume and Level of Service - Existing Year 2017 Conditions

Figure 4 presents the Existing AM Peak Hour Traffic Volumes, Delay by Movement and Intersection Configurations and Control. It also shows the intersections operating at acceptable level of service condition A, B, C, or D in green, marginal level of service condition E in yellow and unacceptable level of service condition F in red.

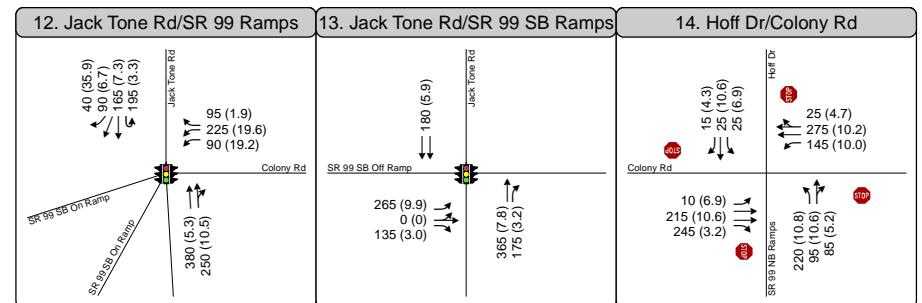
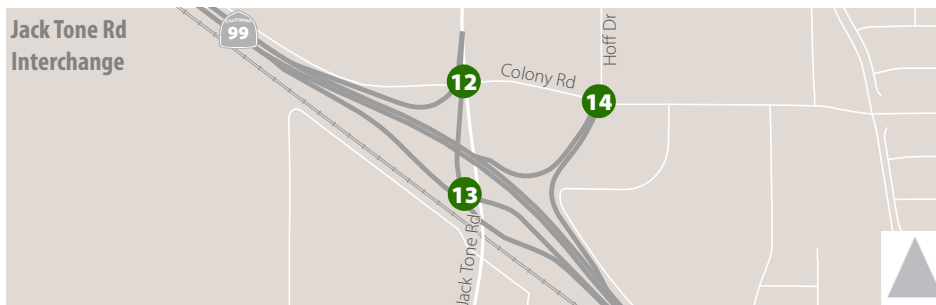
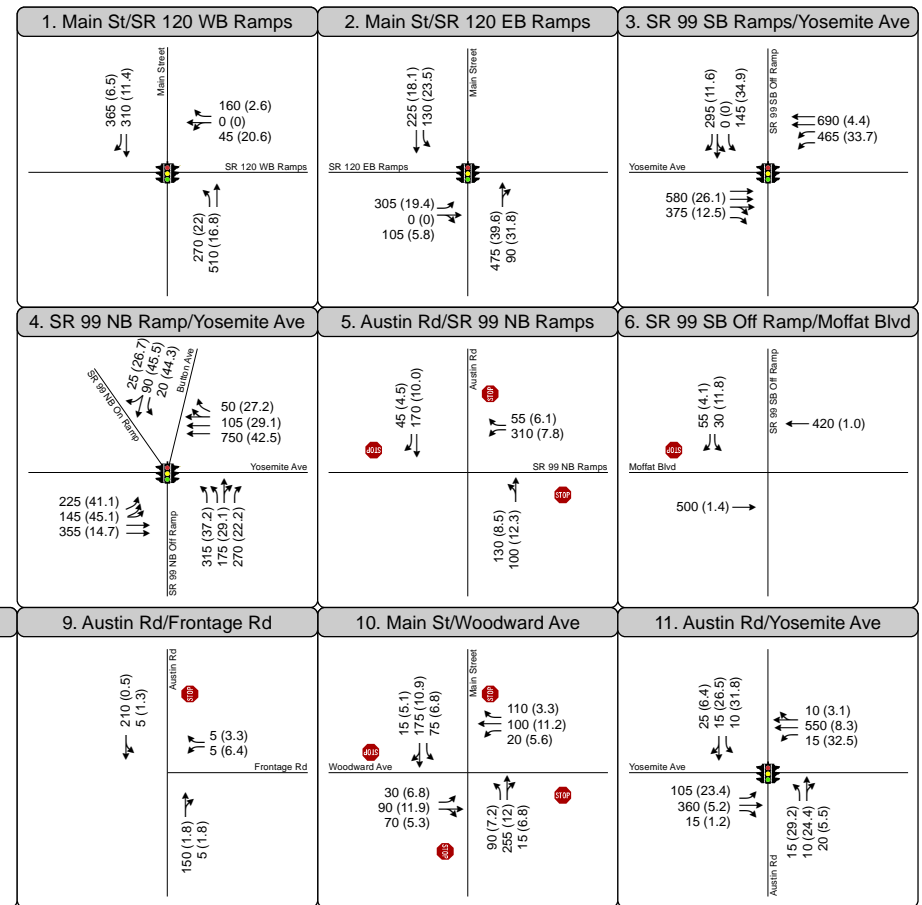
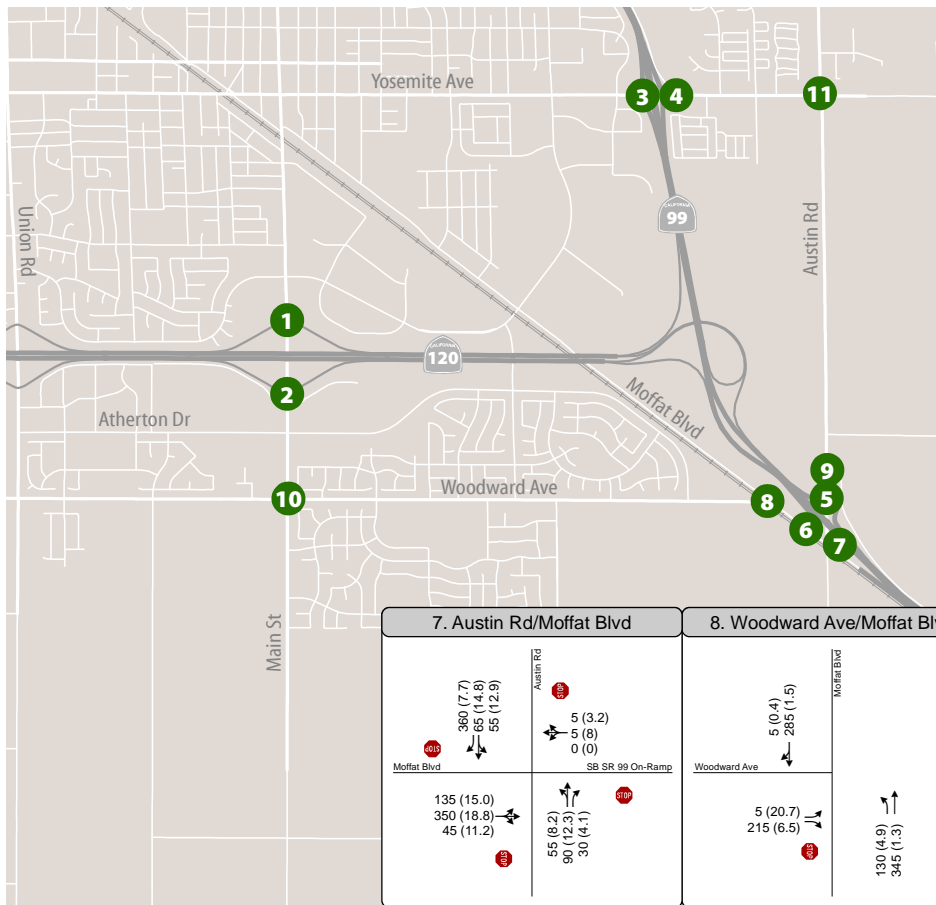
Figure 5 presents the Existing PM Peak Hour Traffic Volumes, Delay by Movement and Intersection Configurations and Control. It also shows the intersections operating at acceptable level of service condition A, B, C, or D in green, marginal level of service condition E in yellow and unacceptable level of service condition F in red.

Table 3 presents the results of the Existing AM and PM Peak Hour Intersection Level of Service Analysis. The primary conclusions of the AM and PM peak hour analysis are:

1. During both AM and PM peak hours, all seven (7) signalized intersections operate at acceptable LOS A, B, or C conditions.
2. During the AM peak hour, all six (6) all-way stop controlled intersections operate at acceptable LOS A or B conditions.
3. During both AM and PM peak hours, the one (1) side street stop controlled intersection operates at LOS A conditions.
4. During the PM peak hour, three (3) of the six (6) all-way stop controlled intersections (50.0%) operate at acceptable LOS A or D conditions.
5. Due to congestion and diversion of traffic from Eastbound SR 120 onto City of Manteca streets and back onto the freeway at the Southbound SR 99 Austin Road on-ramp, the following three (3) all-way stop controlled intersection operate at LOS E conditions:
 - a. SB SR 99 Off-Ramp / Moffat Boulevard;
 - b. Moffat Boulevard / Austin Road; and
 - c. Moffat Boulevard / Woodward Avenue.

Table 4 presents the 95th Percentile Queue Length by Movement for the following eleven (11) study intersections. It should be noted that the three study intersections at the SR 99 / Jack Tone interchange were not evaluated since the Phase 1A Project does not close the NB SR 99 off-ramp to Austin Road or the SB SR 99 on-ramp from Austin Road.

- | | |
|---------------------------------------|--|
| 1. SR 120 EB Ramps / Main Street; | 7. Austin Road / Moffat Boulevard; |
| 2. SR 120 WB Ramps / Main Street; | 8. Woodward Avenue / Moffat Boulevard; |
| 3. SR 99 NB Ramps / Yosemite Avenue; | 9. Austin Road / Frontage Road; |
| 4. SR 99 SB Ramps / Yosemite Avenue; | 10. Woodward Avenue / Main Street; and |
| 5. SR 99 NB Ramps / Austin Road; | 11. Austin Road / Yosemite Avenue. |
| 6. SR 99 SB Ramps / Moffat Boulevard; | |



1 Study Intersection
 Turn Lane
 AM (Delay) Peak Hour Traffic Volume and Delay

Traffic Signal
 Stop Sign

Acceptable Level of Service - A, B, C and D

Unacceptable Level of Service - E and F

Figure 4
Peak Hour Traffic Volumes and Lane Configurations -
Existing AM Peak Hour Conditions

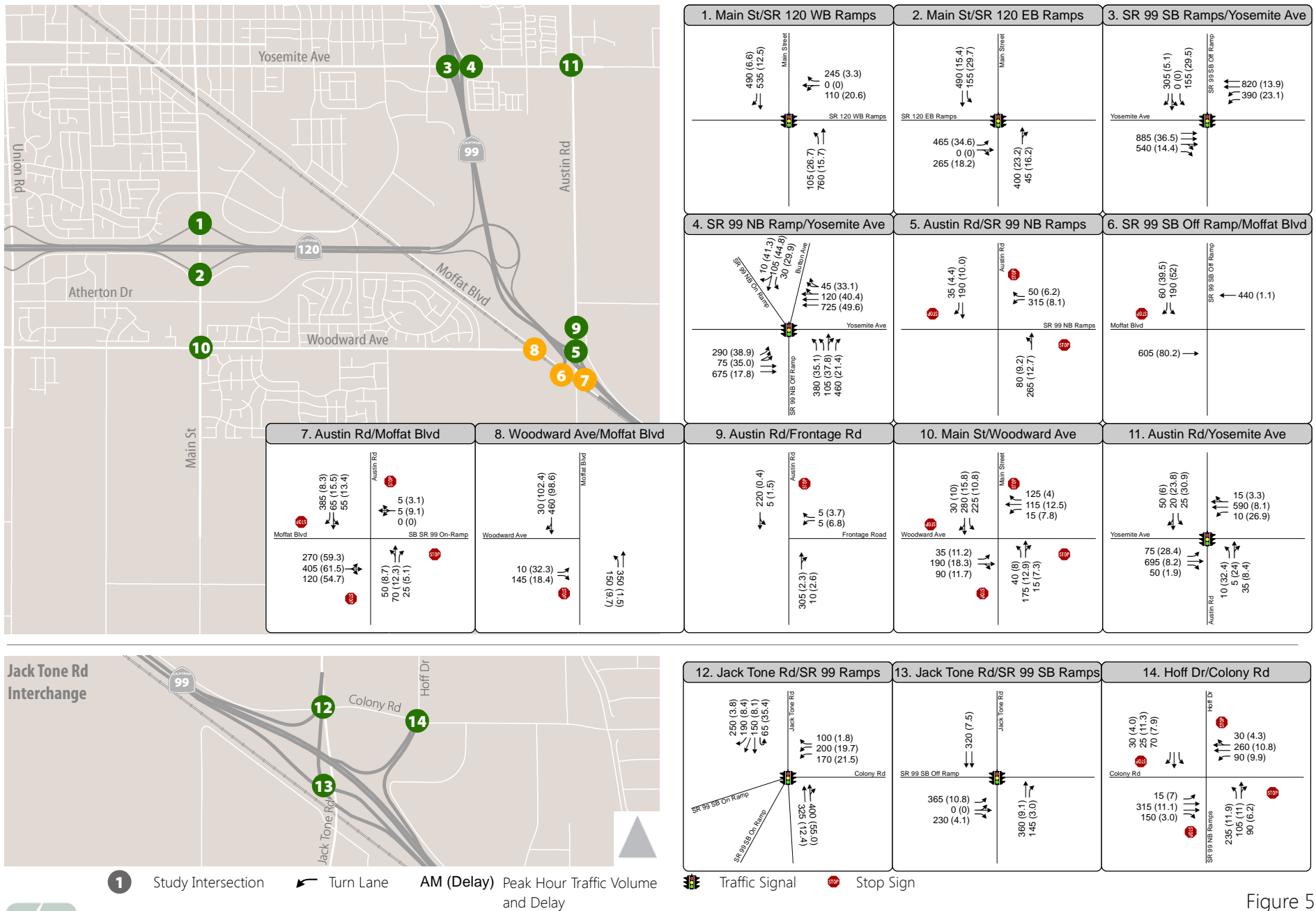


Figure 5
Peak Hour Traffic Volumes and Lane Configurations -
Existing PM Peak Hour Conditions

TABLE 3: INTERSECTION ANALYSIS – EXISTING AM AND PM PEAK HOUR CONDITIONS

Intersection	Control	AM Peak Hour		PM Peak Hour	
		Delay / Movement (sec/veh)	LOS	Delay / Movement (sec/veh)	LOS
1. WB SR 120 Ramps / Main Street	Signal	13.1	B	12.4	B
2. EB SR 120 Ramps / Main Street	Signal	26.4	C	23.6	C
3. SB SR 99 Ramps / Yosemite Avenue	Signal	18.5	B	17.3	B
4. NB SR 99 Ramps / Yosemite Avenue	Signal	35.0	C	33.6	C
5. NB SR 99 Ramps / Austin Road	All Way Stop Controlled	8.6	A	9.6	A
6. SB SR 99 Off-Ramp / Moffat Blvd	All Way Stop Controlled	1.7	A	46.4	E
7. Moffat Blvd / Austin Road	All Way Stop Controlled	12.7	B	36.3	E
8. Moffat Blvd / Woodward Ave	All Way Stop Controlled	3.0	A	45.8	E
9. Frontage Road / Austin Road	Side-Street Stop Controlled	6.4 (WB Left-Turn)	A	6.8 (WB Left-Turn)	A
10. Woodward / Main Street	All Way Stop Controlled	9.1	A	12.6	B
11. Yosemite Avenue / Austin Road	Signal	9.6	A	9.6	A
12. NB SR 99 Ramps / Jack Tone Road	Signal	9.6	A	10.8	B
13. SB SR 99 Ramps / Jack Tone Road	Signal	6.7	A	7.7	A
14. NB SR 99 Ramps / Colony Road	All Way Stop Controlled	8.6	A	9.4	A

Source: *Highway Capacity Manual* (Transportation Research Board, 6th Edition).
Results Based on 12 SimTraffic Version 10 Model Runs

BOLD denotes unacceptable Level of Service (LOS)

**TABLE 4: 95TH PERCENTILE QUEUE LENGTH BY MOVEMENT
– EXISTING AM AND PM PEAK HOUR CONDITIONS**

Intersection	Movement	Available Storage (Feet)	AM Peak Hour	PM
				Peak Hour
1. WB SR 120 Ramps / Main Street	WB LT / TH	1,740	61	96
	NB LT	230	210	158
	NB TH	1,451	308	417
	SB TH	1,920	159	255
	SB RT	1,920	134	149
2. EB SR 120 Ramps / Main Street	EB LT	1,732	209	424
	EB TH / RT	190	85	265
	NB TH / RT	996	600	286
	SB LT	230	114	164
	SB TH	1,451	168	267
3. SB SR 99 Ramps / Yosemite Avenue	EB TH	1,830	290	269
	EB TH	1,830	194	265
	EB TH / RT	1,830	201	268
	EB RT	365	150	230
	WB TH	335	312	263
	WB TH	335	300	225
	WB RT	335	79	136
	WB RT	335	80	141
	SB LT	350	82	82
	SB LT / RT	1,010	116	137
4. NB SR 99 Ramps / Yosemite Avenue	SB RT	350	149	170
	EB LT	335	268	294
	EB LT	335	259	267
	EB TH	335	144	253
	EB TH	335	144	259
	WB TH	1,045	438	416
	WB TH	1,045	365	363
	WB TH / RT	1,045	257	303
	WB RT	265	88	119
	NB LT	350	194	207
	NB LT	962	221	238
	NBTH / RT	962	297	281
	NB RT	350	249	243
	SB LT	823	74	89
	SB LT/ TH	170	156	158

**TABLE 4: 95TH PERCENTILE QUEUE LENGTH BY MOVEMENT
– EXISTING AM AND PM PEAK HOUR CONDITIONS (CONTINUED)**

Intersection	Movement	Available Storage (Feet)	AM Peak Hour	PM
				Peak Hour
5. NB SR 99 Ramps / Austin Road	WB LT	558	110	109
	WB RT	25	67	66
	NB LT / TH	801	75	91
	SB TH	433	79	78
	SB RT	25	63	62
6. SB SR 99 Off-Ramp / Moffat Blvd	EB TH	521	0	757
	WB TH	384	6	7
	SB LT	806	43	386
	SB RT	25	56	68
7. Moffat Blvd / Austin Road	EB LT / TH / RT	384	205	504
	WB LT / TH / RT	615	30	30
	NB LT / TH	1,012	80	83
	NB RT	80	39	37
	SB LT / TH	801	94	104
	SB RT	25	69	70
8. Moffat Blvd / Woodward Ave	EB LT	1,723	26	72
	EB RT	45	61	65
	NB LT	150	69	92
	NBTH	521	13	44
	SB TH / RT	922	5	1,036
9. Frontage Road / Austin Road	WB LT	767	23	23
	WB RT	25	29	31
	NB TH / RT	433	3	3
	SB LT / TH	804	8	12

Results Based on 12 SimTraffic Version 10 Model Runs

BOLD denotes 95th Percentile Queue Length Exceeds Available Storage

**TABLE 4: 95TH PERCENTILE QUEUE LENGTH BY MOVEMENT
– EXISTING AM AND PM PEAK HOUR CONDITIONS (CONTINUED)**

Intersection	Movement	Available Storage (Feet)	AM Peak Hour	PM
				Peak Hour
10. Woodward / Main Street	EB LT	95	46	70
	EB TH / RT	612	83	158
	WB LT	175	32	31
	WB TH	634	65	72
	WB RT	634	56	68
	NB LT	250	54	42
	NB TH / RT	656	104	93
	SB LT	250	50	98
	SB TH / RT	522	77	134
11. Yosemite Avenue / Austin Road	EB LT	250	104	112
	EB TH	1,717	140	265
	EB RT	1,717	23	38
	WB LT	470	37	31
	WB TH	1,382	165	166
	WB TH / RT	270	125	132
	NB LT	225	35	28
	NB TH / RT	1,120	42	47
	SB LT	225	40	53
	SB TH / RT	1,043	63	71

Results Based on 12 SimTraffic Version 10 Model Runs

BOLD denotes 95th Percentile Queue Length Exceeds Available Storage

The primary results of the Existing AM Peak 95th Percentile Queue Length by Movement analysis are:

- Seventy-two (72) of the seventy-eight (78) movements have 95th Percentile queue lengths less than the available storage; and
- Six (6) of the seventy-eight (78) movements (7.7%) have 95th Percentile queue lengths greater than the available storage.

The primary results of the Existing PM Peak 95th Percentile Queue Length by Movement analysis are:

- Sixty-nine (69) of the seventy-eight (78) movements have 95th Percentile queue lengths less than the available storage; and
- Nine (9) of the seventy-eight (78) movements (11.5%) have 95th Percentile queue lengths greater than the available storage.

Table 5 presents the total network performance measures of effectiveness for the Synchro / SimTraffic Models for Existing AM and PM Peak Hour Conditions.

The results of the Total Network Performance (Table 4) set the baseline conditions for Existing AM and PM peak hour conditions are:

Total Vehicle Hours of Delay (VHD) is defined as the amount of delay all vehicles incur within the project study area from the SR 120 / Main Street interchange, SR 99 / Yosemite Avenue interchange, SR 99 / Austin Road interchange, SR 99 / Jack Tone Road interchange, and other local intersections. During AM Peak Hour Conditions (7:15 to 8:15 AM), a total of 88.1 VHD occurs in the project study area. During PM Peak Hour Conditions (4:45 to 5:45 PM), a total of 145.1 VHD occurs in the project study area. The goal of the proposed SR 120 / SR 99 Interchange Project is to reduce VHD when compared to No Project Conditions.

Total Stops is defined as the total number of stops all vehicles incur within the project study area from the SR 120 / Main Street interchange, SR 99 / Yosemite Avenue interchange, SR 99 / Austin Road interchange, SR 99 / Jack Tone Road interchange, and other local intersections. During AM Peak Hour Conditions (7:15 to 8:15 AM), a total of 11,405 stops occur in the project study area. During PM Peak Hour Conditions (4:45 to 5:45 PM), a total of 14,275 stops occur in the project study area. The goal of the SR 120 / SR 99 Interchange Project is to reduce the total number of stops when compared to No Project Conditions.

Vehicle Miles Travelled (VMT) is defined as the total distance all vehicles incur within the project study area from the SR 120 / Main Street interchange, SR 99 / Yosemite Avenue interchange, SR 99 / Austin Road interchange, SR 99 / Jack Tone Road interchange, and other local intersections. During AM Peak Hour Conditions (7:15 to 8:15 AM), the VMT is 7,139 miles within in the project study area. During PM Peak Hour Conditions (4:45 to 5:45 PM), the VMT is 8,817 miles within in the project study area. The goal of the SR 120 / SR 99 Interchange Project is to reduce VMT when compared to No Project Condition

TABLE 5: TOTAL NETWORK PERFORMANCE – EXISTING CONDITIONS

Measure of Effectiveness	Based on 12 SimTraffic Model Runs	
	AM Peak Hour	PM Peak Hour
Total Vehicle Hours of Delay (VHD)	88.1	145.1
Total Stops	11,405	14,275
Vehicle Miles of Travel (VMT)	7,139	8,817
Vehicle Hours Travelled (VHT)	318	433
Total Fuel Consumption	263	331
Total Vehicle Emissions (lbs of CO2)	4,997	6,289
Average Speed (MPH)	23	21
Vehicles Entering Network in Peak Hour	11,071	13,658
Vehicles Entering Network in Peak Hour	11,071	13,618
Percent (%) Demand Served	100.0 %	99.7 %

Source: Results Based on 12 SimTraffic Version 10 Model Runs

The results of the Total Network Performance (Table 4) set the baseline conditions for Existing AM and PM peak hour conditions are (continued):

Total Fuel Consumption is defined as the total gallons of fuel (gasoline and diesel) all vehicles use within the project study area from the SR 120 / Main Street interchange, SR 99 / Yosemite Avenue interchange, SR 99 / Austin Road interchange, SR 99 / Jack Tone Road interchange, and other local intersections. During AM Peak Hour Conditions (7:15 to 8:15 AM), the total fuel consumption is 263 gallons within in the project study area. During PM Peak Hour Conditions (4:45 to 5:45 PM), the total fuel consumption is 331 gallons within in the project study area. The goal of the SR 120 / SR 99 Interchange Project is to reduce total fuel consumption.

Total Vehicle Emissions is defined as the total pounds (lbs) of emissions (CO – Carbon Monoxide, NOx – Nitrogen Oxides, and VOC – Volatile Oxygen Compounds) all vehicles emit while burning fossil fuels as they travel within the project study area from the SR 120 / Main Street interchange, SR 99 / Yosemite Avenue interchange, SR 99 / Austin Road interchange, SR 99 / Jack Tone Road interchange, and other local intersections.

The total vehicle emissions shown in the Total Network Performance is based on output from the SimTraffic Analysis for Carbon Dioxide (CO₂) and provides a relative comparison of total vehicle emissions for No Project and With Project Conditions. According to the Environmental Protection Agency (EPA) and the California Air resources Board (CA ARB), about 18.9 pounds of CO₂ are produced when a gallon of gasoline is combusted that contains 10% ethanol.

During AM Peak Hour Conditions (7:15 to 8:15 AM), the total emissions is 4,997 lbs within in the project study area. During PM Peak Hour Conditions (4:45 to 5:45 PM), the total emissions is 6,289 lbs within in the project study area. The goal of the SR 120 / SR 99 Interchange Project is to reduce total fuel consumption when compared to No Project Conditions.

Average Speed is defined as the average speed of vehicles accelerating, decelerating and traveling through the Synchro / SimTraffic Model network from the SR 120 / Main Street interchange, SR 99 / Yosemite Avenue interchange, SR 99 / Austin Road interchange, SR 99 / Jack Tone Road interchange, and other local intersections during the peak hour. During AM Peak Hour Conditions (7:15 to 8:15 AM), the Average Speed of 23 miles per hour. During PM Peak Hour Conditions (4:45 to 5:45PM), the he Average Speed of 21 miles per hour. The goal of the SR 120 / SR 99 Interchange Project is to improve Average Speed through the Synchro / SimTraffic Model network.

Percent (%) Demand Served is defined as the percentage of vehicles entering (i.e. demand) the Synchro / SimTraffic Model network from the SR 120 / Main Street interchange, SR 99 / Yosemite Avenue interchange, SR 99 / Austin Road interchange, SR 99 / Jack Tone Road interchange, and other local intersections during the peak hour that exit (i.e. served) the network during the same peak hour. During AM Peak Hour Conditions (7:15 to 8:15 AM), the Percent (%) Demand Served is 100.0%. During PM Peak Hour Conditions (4:45 to 5:45PM), the Percent (%) Demand Served is 99.7%. The goal of the SR 120 / SR 99 Interchange Project is to increase Percent (%) Demand Served when compared to No Project Conditions.

4. TRAVEL DEMAND FORECASTS

This chapter describes the process used to develop traffic demand forecasts for the SR 120 / SR 99 Interchange Project. It describes the traffic model validation process and presents the methodology used to develop the Caltrans District 10 Office of Advanced Planning approved Construction Year 2023 and Design Year 2043 traffic forecasts. Appendix KK contains the approved SR 120 / SR 99 Project Information FactSheet dated March, 2018, and the signed approval letter dated April 5, 2018.

SUBAREA MODEL DEVELOPMENT

The overall approach to developing the sub-area model started with the recognition that regional-scale travel demand models do not contain sufficient detail or sensitivity for local applications such as developing freeway mainline, on-ramp, off-ramp, ramp terminal intersection, local intersection and roadway traffic volume forecasts for Traffic Operations Analysis Reports (TOAR). Instead, the regional model provides a starting point for creating more detailed sub-area or corridor models. Having a valid sub-area model is a critical step in ensuring a high level of confidence in the traffic volume forecasts that will be used to evaluate the local and regional benefits of the State Route 120 / State Route 99 Interchange Project.

ROADWAY NETWORK AND TRAFFIC ANALYSIS ZONES (TAZ)

Before starting the sub-area model development, we thoroughly reviewed the San Joaquin County Council of Governments (SJCOG) Travel Demand Forecasting (TDF) model in the Cube/Voyager platform, the regional and local roadway network, and the TAZ detail in the City of Manteca, City of Ripon and San Joaquin County for appropriateness for project-scale application and coding accuracy. Based on this review, it was determined that we needed to refine the model to provide sufficient roadway network detail and TAZs structure.

Travel Demand Forecasting used the current RTP / Air Quality Model, Build-out of the City of Manteca, City of Ripon and San Joaquin County General Plans, and included the 2014 Regional Transportation Plan / Sustainable Communities Strategy Project List for:

- Mainline Highway Improvements (Table 6-1 from SJCOG RTP);
- Interchange Improvements (Table 6-1 from SJCOG RTP); and
- Regional Roadway Improvements (Table 6-3 from SJCOG RTP).

The only enhancement to the Model was to code the new SR 120 / McKinley Avenue Interchange for the Construction Year 2023 and Design Year 2043 Travel Demand Model. In addition, auxiliary lanes were added between the Airport Way and Union Road interchange and the Main Street and Union Road interchanges were added for the Construction Year 2023 With Project and Design Year 2043 Travel Demand Model. Lastly, land use information for development projects in the City of Manteca, City of Ripon and San Joaquin County were verified and adjusted to match project specific EIR trip generation.

FUTURE DESIGN YEAR 2043 LAND USE INPUTS

We followed these steps to develop future year land use inputs:

- Identified population growth trends based on California Department of Finance (DOF) projections for San Joaquin County.
- Identified proposed land use allocation within the county based on the City of Manteca, City of Lathrop, City of Ripon and San Joaquin County General Plans
- Allocated approved and pending development to the study area.

MODEL CALIBRATION AND VALIDATION

An appropriate and practical traffic forecasting model must replicate actual conditions to within a certain level of accuracy and demonstrate sufficient sensitivity to changes in the model's input variables. Since no model can precisely replicate all counts, we use established validation guidelines.

The following describes four parameters and performance standards for evaluating model accuracy.

1. **Model/Count Ratio:** Model/count ratio is computed by dividing the model-assigned volume by the actual traffic count for individual roadways model-wide.

Standard: Model/count ratios should be close to 1.00.

2. **Deviation:** Deviation is the difference between the model volume and the actual count, divided by the actual count.

Standard: At least 75 percent of roadway links should be within their maximum desirable deviation, which ranges from approximately 5 to 60 percent, depending on the total volume on the link.

3. **Correlation Coefficient:** The correlation coefficient estimates the correlation between the actual traffic counts and the estimated traffic volumes from the model.

Standard: The suggested model-wide correlation coefficient is greater than 0.88.

4. **The Percent Root Mean Square Error (PRMSE):** PRMSE is the square root of the model volume minus the actual count squared divided by the number of counts. It is a measure similar to standard deviation in that it assesses the accuracy of the entire model.

Standard: The suggested appropriate aggregate PRMSE is less than 40 percent for all links with counts, or by facility type and area type.

VALIDATION RESULTS

We completed the iterative process of model validation by comparing the output of the sub-area model to roadway traffic counts. Validation statistics were calculated for the sub-area model for each step and adjustments to model parameters were completed before the Existing Model was deemed validated.

Table 6 shows that the SJCOG TDF Model meets all four criteria during both AM and PM Peak Hour conditions:

1. Model / Count Ratio of 1.03 for AM peak hour conditions, 1.07 for PM peak hour conditions, and 1.06 for Daily conditions;
2. Percent Within Maximum Deviation of 83% for AM peak hour conditions, 83% for PM peak hour conditions, and 80% for Daily conditions;
3. Percent RMSE of 41% for AM peak hour conditions, 39% for PM peak hour conditions, and 28% for Daily conditions; and
4. Average Correlation Coefficient of 0.97 for AM peak hour conditions, 0.97 for PM peak hour conditions, and 0.99 for Daily conditions.

TABLE 6 SR 120 / SR 99 (SJCOG SUB-AREA) MODEL VALIDATION RESULTS				
Time Period	Model/Count Ratio¹	Percent within Maximum Deviation²	Percent RMSE³	Average Correlation Coefficient⁴
AM Peak Hour	1.03	83%	41%	0.97
PM Peak Hour	1.07	83%	39%	0.97
Daily	1.06	80%	28%	0.99
Notes: ¹ Standard: Close to 1.0 ratio. ² Standard: At least 75 percent of roadway links within their maximum desirable deviation. ³ Standard: Lower than 40 percent aggregate PRMSE. ⁴ Standard: Greater than a 0.88 correlation coefficient. Source: Fehr & Peers, March 2018.				

APPROVED TRAVEL DEMAND FORECASTS

Using the validated SJCOG sub-area TDF Model, Design Year (2043) unconstrained traffic volume forecasts were developed for the SR 120 and SR 99 freeway mainline, on-ramps, off-ramps, and study intersections.

The traffic forecasting adjustment procedure known as the “difference method” was used to develop Year 2043 traffic forecasts. For a given freeway mainline, on-ramp, off-ramp, ramp terminal intersection, local intersection or roadway segment, this forecasting procedure is calculated as follows:

$$\text{Year 2043 Forecast} = \text{Existing Volume} + (\text{Year 2043 TDF Model} - \text{Base Year (2017) TDF Model})$$

This method accounts for allowable differences between the Base Year (2017) TDF model and the adjusted / approved Existing AM and PM peak hour traffic counts.

Straight-line interpolation between Existing (2017) and Design Year (2043) land use forecasts for the SJCOG Regional Travel Demand Forecasting Model (Cube / Voyager) platform that has been refined for the City of Manteca, City of Ripon and unincorporated San Joaquin County was used to develop Construction Year (2023) traffic volume forecasts.

A Project Information submittal was prepared and submitted to Caltrans District 10 Office of Advanced Planning in February 2018. Based on review comments, subsequent information was provided in late March 2018 and early April 2018, formal approval was received on April 5, 2018 for the following:

- Design Year 2043 No Project a AM and PM Peak Hour traffic volumes;
- Design Year 2043 With Phase 1A Project AM and PM Peak Hour traffic volumes;
- Design Year 2043 With Ultimate Project AM and PM Peak Hour traffic volumes;
- Construction Year 2023 No Project AM and PM Peak Hour traffic volumes; and
- Construction Year 2023 With Phase 1A Project AM and PM Peak Hour traffic volumes.

5. CONSTRUCTION YEAR 2023 TRAFFIC OPERATIONS

This chapter presents the traffic operations analysis results for No Build and With Phase 1A Project under Construction Year 2023 AM and PM peak hour conditions.

CONSTRUCTION YEAR 2023 NO PROJECT CONDITIONS

The following Appendices contain the Construction Year 2023 No Project conditions analysis:

- Appendix E – Construction Year 2023 No Project Conditions – AM Peak Hour - Eastbound SR 120 and Southbound SR 99 HCS Freeway Mainline, On-Ramp Merge, Off-Ramp Diverge Analysis and Weaving Section Analysis;
- Appendix F – Construction Year 2023 No Project Conditions – AM Peak Hour - Northbound SR 99 and Westbound SR 120 HCS Freeway Mainline, On-Ramp Merge, Off-Ramp Diverge Analysis and Weaving Section Analysis;
- Appendix G – Construction Year 2023 No Project Conditions – PM Peak Hour - Eastbound SR 120 and Southbound SR 99 HCS Freeway Mainline, On-Ramp Merge, Off-Ramp Diverge Analysis and Weaving Section Analysis;
- Appendix H – Construction Year 2023 No Project Conditions – PM Peak Hour - Northbound SR 99 and Westbound SR 120 HCS Freeway Mainline, On-Ramp Merge, Off-Ramp Diverge Analysis and Weaving Section Analysis;
- Appendix O – Construction Year 2023 No Project Conditions – AM Peak Hour Synchro / SimTraffic Input Data and SimTraffic Analysis Results Based on 12 SimTraffic Model Runs; and
- Appendix P – Construction Year 2023 No Project Conditions – PM Peak Hour Synchro / SimTraffic Input Data and SimTraffic Analysis Results Based on 12 SimTraffic Model Runs.

Figure 6A and 6B present the Construction Year 2023 No Project AM Peak Hour Conditions and provide the following information:

- Construction Year 2023 No Project AM Peak Hour Volume;
- Construction Year 2023 No Project HCS 6th Edition AM Peak Hour Density;
- Freeway Mainline Lanes, Off-Ramp Lane(s) and On-Ramp Lane(s); and
- Construction Year 2023 No Project HCS 6th Edition AM Peak Hour HCS 6th Edition Level of Service. Acceptable Level of Service A through D are shown in Green; Unacceptable / Marginal Level of Service E is shown in Yellow; and Unacceptable Level of Service F is shown in Red.

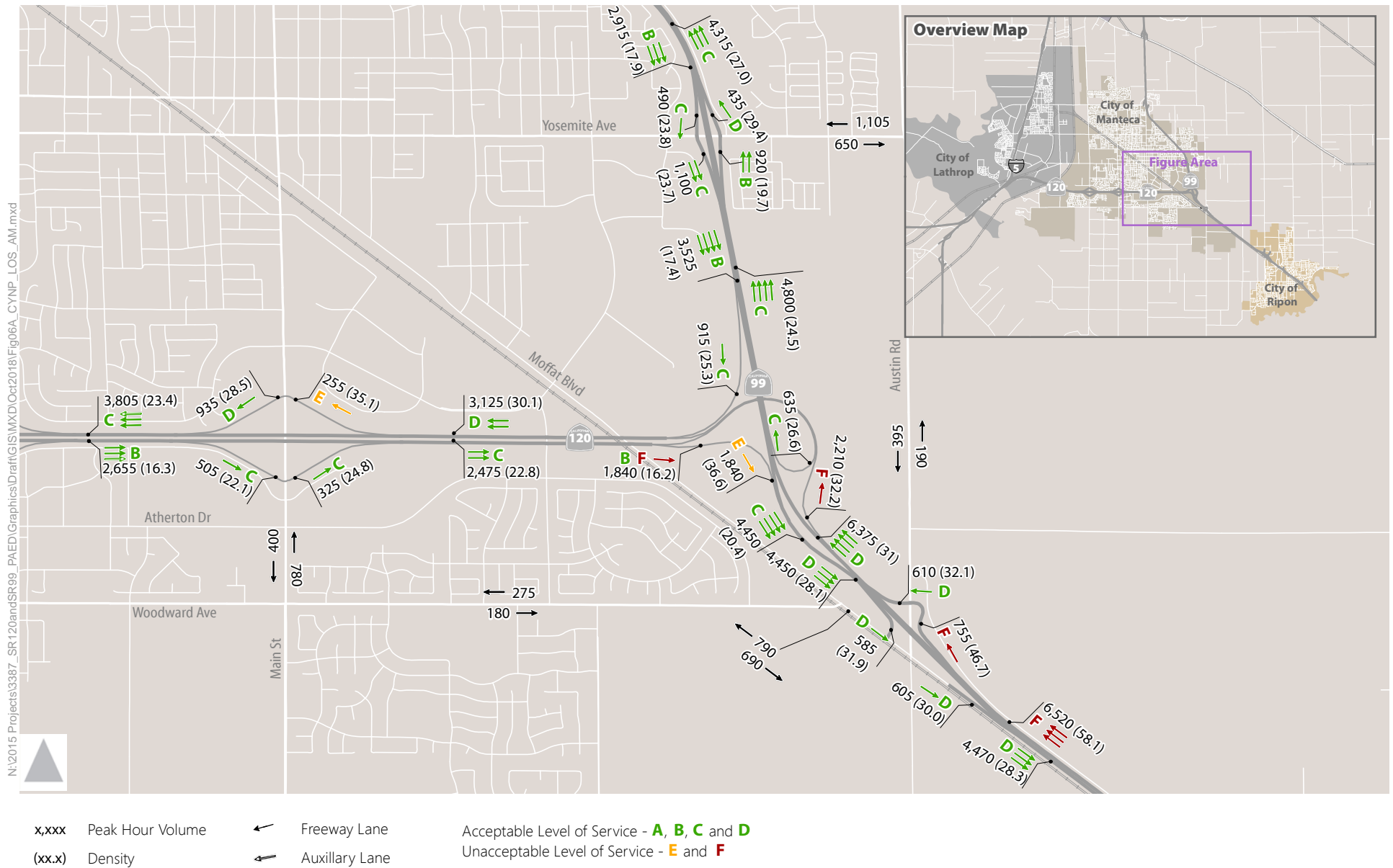
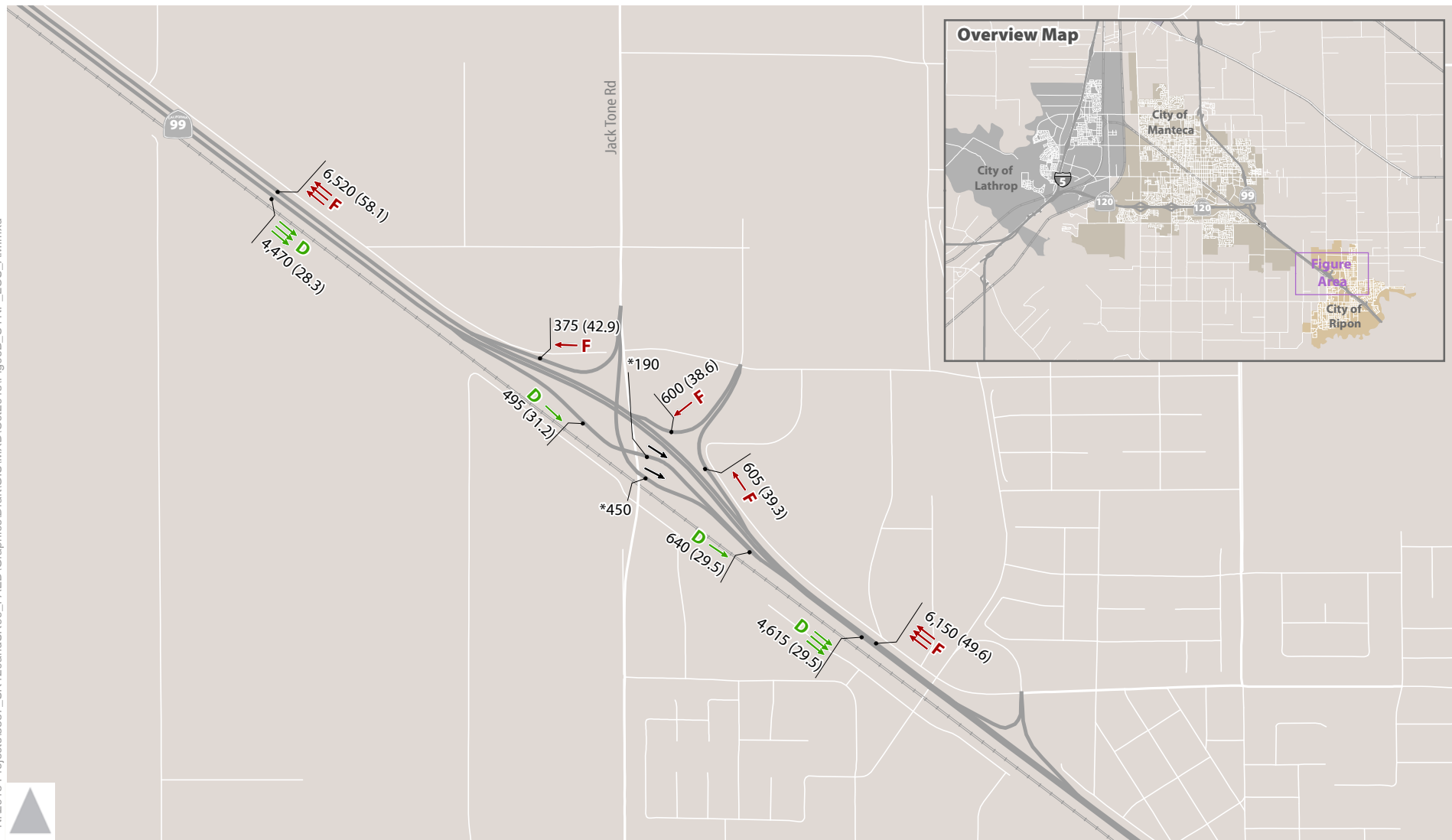


Figure 6A

AM Peak Hour Freeway Volume and Level of Service -
Construction Year 2023 No Project Conditions



x,xxx Peak Hour Volume
 (xx.x) Density
 ← Freeway Lane

Acceptable Level of Service - **A, B, C** and **D**
 Unacceptable Level of Service - **E** and **F**

Note: (*) Indicates a non-freeway segment.

AM Peak Hour Freeway Volume and Level of Service -
 Construction Year 2023 No Project Conditions

Figure 6B

The primary conclusions of the Construction Year 2023 No Project analysis presented in Figure 6A are:

1. During the AM peak hour, the directional split on SR 120 is projected to continue to be approximately 60% westbound and 40% eastbound.
2. During the morning peak hour, NB SR 99 between Jack Tone Road and Austin Road is projected to degrade to LOS F conditions;
3. The NB SR 99 off-ramp to Austin Road is projected to degrade to LOS F conditions;
4. The NB SR 99 to WB SR 120 freeway-to-freeway ramp is projected to continue to operate at LOS F conditions;
5. The WB SR 120 off-ramp to Main Street is projected to degrade to LOS E conditions;
6. It should be noted that with a density of 16.2 pcpmpl, the off-ramp diverge would be LOS B. But because the capacity of the single lane off-ramp (2,100 vehicles) is exceeded by the 1,840 vehicles exiting eastbound SR 120 onto southbound SR 99, the single lane off-ramp to southbound SR 99 operates at LOS F conditions.
7. With the heavy on-ramp traffic entering southbound SR 99 from the single lane eastbound SR 99 on-ramp, the SB SR 99 merge section operates at LOS E conditions;
8. The remaining 24 of the 30 study segments (80.0%) operates at acceptable Level of Service B, C, or D conditions.

The primary conclusions of the Construction Year 2023 No Project analysis presented in Figure 6B are:

1. During the AM peak hour, the directional split on SR 99 is projected to increase to approximately 60% northbound and 40% southbound.
2. During the morning peak hour, all five (100%) NB SR 99 study segments are projected to degrade to LOS F conditions;
3. All four (100%) SB SR 99 study segments (100%) are projected to continue to operate at acceptable Level of Service D conditions; and
4. Overall, five (5) of the (9) study segments (55.6%) are projected to operate at acceptable Level of Service conditions.

Figures 7A and 7B present the Construction Year 2023 No Project PM Peak Hour Conditions and provide the following information:

- Construction Year 2023 No Project PM Peak Hour Volume;
- Construction Year 2023 No Project HCS 6th Edition PM Peak Hour Density;
- Freeway Mainline Lanes, Off-Ramp Lane(s) and On-Ramp Lane(s); and
- Construction Year 2023 No Project HCS 6th Edition PM Peak Hour HCS 6th Edition Level of Service. Acceptable Level of Service A through D are shown in Green; Unacceptable / Marginal Level of Service E is shown in Yellow; and Unacceptable Level of Service F is shown in Red.

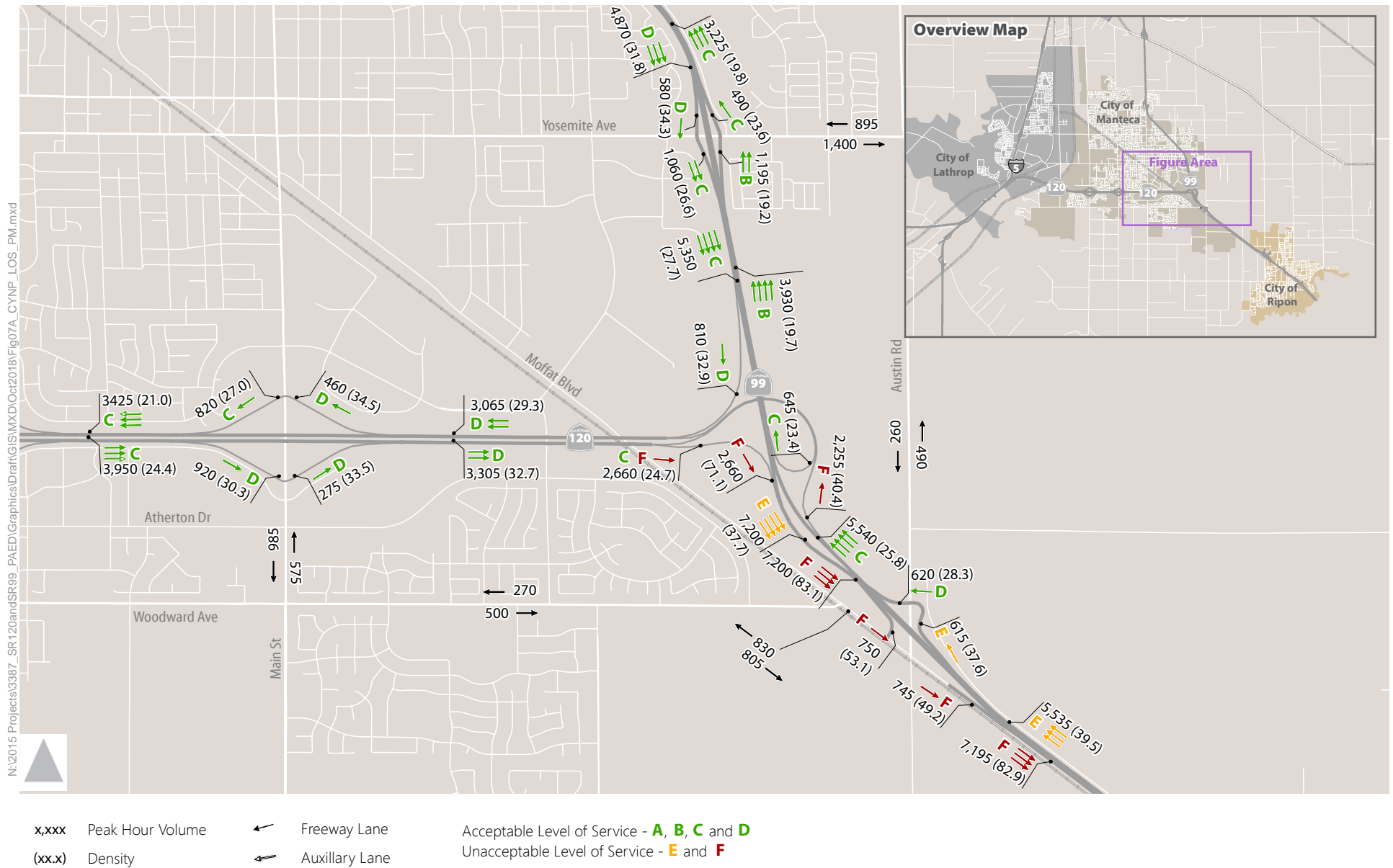
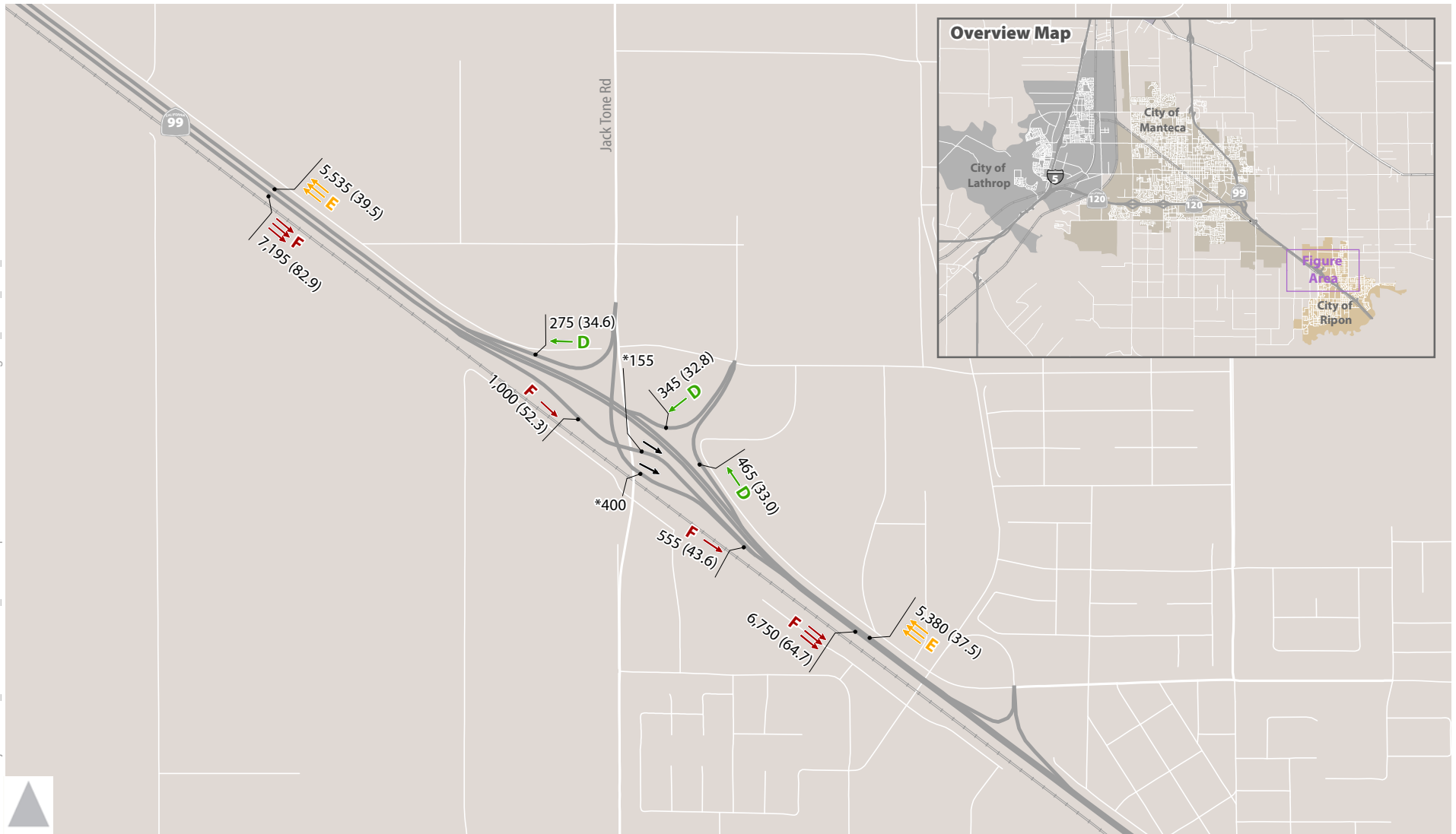


Figure 7A

PM Peak Hour Freeway Volume and Level of Service -
Construction Year 2023 No Project Conditions



x,xxx Peak Hour Volume
 (xx.x) Density
 ← Freeway Lane

Acceptable Level of Service - **A, B, C** and **D**
 Unacceptable Level of Service - **E** and **F**

Note: (*) Indicates a non-freeway segment.

Figure 7B
 PM Peak Hour Freeway Volume and Level of Service -
 Construction Year 2023 No Project Conditions



The primary conclusions of the Construction Year 2023 No Project analysis presented in Figure 7A are:

1. During the PM peak hour, the directional split on SR 120 is projected to continue to be approximately 55% eastbound and 45% westbound;
2. During the evening peak hour, the construction of the Diverging Diamond Interchange at the SR 120 / Union Road interchange and the eastbound Auxiliary Lane between the Union Road on-ramp and the Main Street off-ramp (2 mixed flow and 1 auxiliary lane) will improve this segment on EB SR 120 to acceptable LOS C conditions;
3. The EB SR 120 off-ramp to Main Street is also projected to improve to acceptable LOS D conditions;
4. Eastbound SR 120 is projected to continue to operate at LOS D conditions from east of the Main Street on-ramp to the SR 120 / SR 99 freeway to freeway interchange;
5. Severe congestion and slow travel speeds on SR 120 would result in additional diversion of traffic onto the eastbound SR 120 off-ramp to Main Street, traveling to Woodward Avenue and accessing the SB SR 99 on-ramp at Austin Road;
6. With 81% of the SR 120 traffic (2,660 of the 3,305) exiting SR 120 onto southbound SR 99, the unequal lane utilization results in stop and go conditions on eastbound SR 120;
7. It should be noted that with a density of 24.7 pcpmpl, the off-ramp diverge would be LOS C. But because the capacity of the single lane off-ramp (2,100 vehicles) exceeded by the 2,660 vehicles exiting eastbound SR 120 onto southbound SR 99, the single lane off-ramp to southbound SR 99 operates at LOS F conditions.
8. With the heavy on-ramp traffic entering southbound SR 99 from the single lane eastbound SR 99 on-ramp, the SB SR 99 merge section operates at LOS F conditions;
9. Southbound SR 99 is projected to degrade to LOS E or F conditions from the SR 120 EB on-ramp to south of the Austin Road on-ramp;
10. Northbound SR 99 is projected to degrade to LOS E conditions from north of the Jack Tone interchange to the Austin Road off-ramp;
11. The NB SR 99 off-ramp to Austin Road is projected to degrade to LOS E conditions;
12. The Northbound SR 99 off-ramp to WB SR 120 is projected to continue to operate at LOS F conditions; and
13. The remaining 20 of the 30 study segments (66.7%) are projected to continue to operate at acceptable Level of Service B, C, or D conditions.

The primary conclusions of the Construction Year 2023 No Project analysis presented in Figure 7B are:

1. During the PM peak hour, the directional split on SR 99 is projected to increase slightly southbound, with approximately 57% southbound and 43% northbound;
2. During the evening peak hour, southbound SR 99 will exceed operating capacity based on the HCS analysis and degrade to LOS F conditions from south of the Austin Road interchange to south of the Jack Tone interchange;
3. The Northbound SR 99 mainline is projected to degrade to LOS E conditions from south of the Jack Tone interchange to south of the Austin Road interchange; and
4. The remaining three (3) of the nine (9) study segments (33.3%) are projected to continue to operate at D conditions.

Table 7 presents the results of the Construction Year 2023 No Project AM and PM Peak Hour Intersection Level of Service Analysis.

**TABLE 7: INTERSECTION ANALYSIS – CONSTRUCTION YEAR 2023 NO PROJECT
AM AND PM PEAK HOUR CONDITIONS**

Intersection	Control	AM Peak Hour		PM Peak Hour	
		Delay / Movement (sec/veh)	LOS	Delay / Movement (sec/veh)	LOS
1. WB SR 120 Ramps / Main Street	Signal	23.6	C	16.1	B
2. EB SR 120 Ramps / Main Street	Signal	50.4	D	39.4	D
3. SB SR 99 Ramps / Yosemite Avenue	Signal	25.9	C	19.9	B
4. NB SR 99 Ramps / Yosemite Avenue	Signal	58.4	E	38.7	D
5. NB SR 99 Ramps / Austin Road	All Way Stop Controlled	99.5	F	77.6	F
6. SB SR 99 Off-Ramp / Moffat Blvd	All Way Stop Controlled	>120	F	>120	F
7. Moffat Blvd / Austin Road	All Way Stop Controlled	>120	F	>120	F
8. Moffat Blvd / Woodward Ave	All Way Stop Controlled	>120	F	>120	F
9. Frontage Road / Austin Road	Side-Street Stop Controlled	20.1 (WB Left-Turn)	C	7.3 (WB Left-Turn)	A
10. Woodward / Main Street	All Way Stop Controlled	27.2	D	78.0	F
11. Yosemite Avenue / Austin Road	Signal	11.8	B	13.8	B
12. NB SR 99 Ramps / Jack Tone Road	Signal	9.7	A	13.6	B
13. SB SR 99 Ramps / Jack Tone Road	Signal	8.9	A	12.6	B
14. NB SR 99 Ramps / Colony Road	All Way Stop Controlled	23.4	C	11.7	B

Source: *Highway Capacity Manual* (Transportation Research Board, 6th Edition).
Results Based on 12 SimTraffic Version 10 Model Runs

BOLD denotes unacceptable Level of Service (LOS)

Figure 8 presents the Construction Year 2023 No Project AM Peak Hour Traffic Peak Hour Traffic Volumes, Delay by Movement and Intersection Configurations and Control. It also shows the intersections operating at acceptable level of service condition A, B, C, or D in green, marginal level of service condition E in yellow and unacceptable level of service condition F in red.

The primary conclusions of the AM peak hour analysis are:

1. During the AM peak hour, six (6) of the seven (7) signalized intersections (85.7%) are projected to continue to operate at acceptable LOS A, B, C or D conditions.
2. Increased traffic volumes at the NB SR 99 Ramps / Yosemite Avenue intersection will result in LOS E conditions.
3. Two (2) of the six (6) all-way stop controlled intersections (33.3%) would continue to operate at acceptable LOS C conditions.
4. The following four all-way stop controlled intersections are projected to degrade to LOS F conditions:
 - a. NB SR 99 Ramps / Austin Road;
 - b. SB SR 99 Off-Ramp / Moffat Blvd;
 - c. Moffat Blvd / Austin Road;
 - d. Moffat Blvd / Woodward Ave.
5. The one (1) side street stop controlled intersection is projected to operate at LOS C conditions.

Figure 9 presents the Construction Year 2023 No Project PM Peak Hour Traffic Peak Hour Traffic Volumes, Delay by Movement and Intersection Configurations and Control. It also shows the intersections operating at acceptable level of service condition A, B, C, or D in green, marginal level of service condition E in yellow and unacceptable level of service condition F in red.

The primary conclusions of the PM peak hour analysis are:

1. During the PM peak hour, all seven (7) signalized intersections (100.0%) are projected to continue to operate at acceptable LOS B or D conditions.
2. One (1) of the six (6) all-way stop controlled intersections (16.7%) would continue to operate at acceptable LOS B conditions.
3. The following four all-way stop controlled intersections are projected to degrade to LOS F conditions:
 - a. NB SR 99 Ramps / Austin Road;
 - b. SB SR 99 Off-Ramp / Moffat Blvd;
 - c. Moffat Blvd / Austin Road;
 - d. Moffat Blvd / Woodward Ave;
 - e. Woodward Avenue / Main Street.
4. The one (1) side street stop controlled intersection is projected to operate at LOS A conditions.

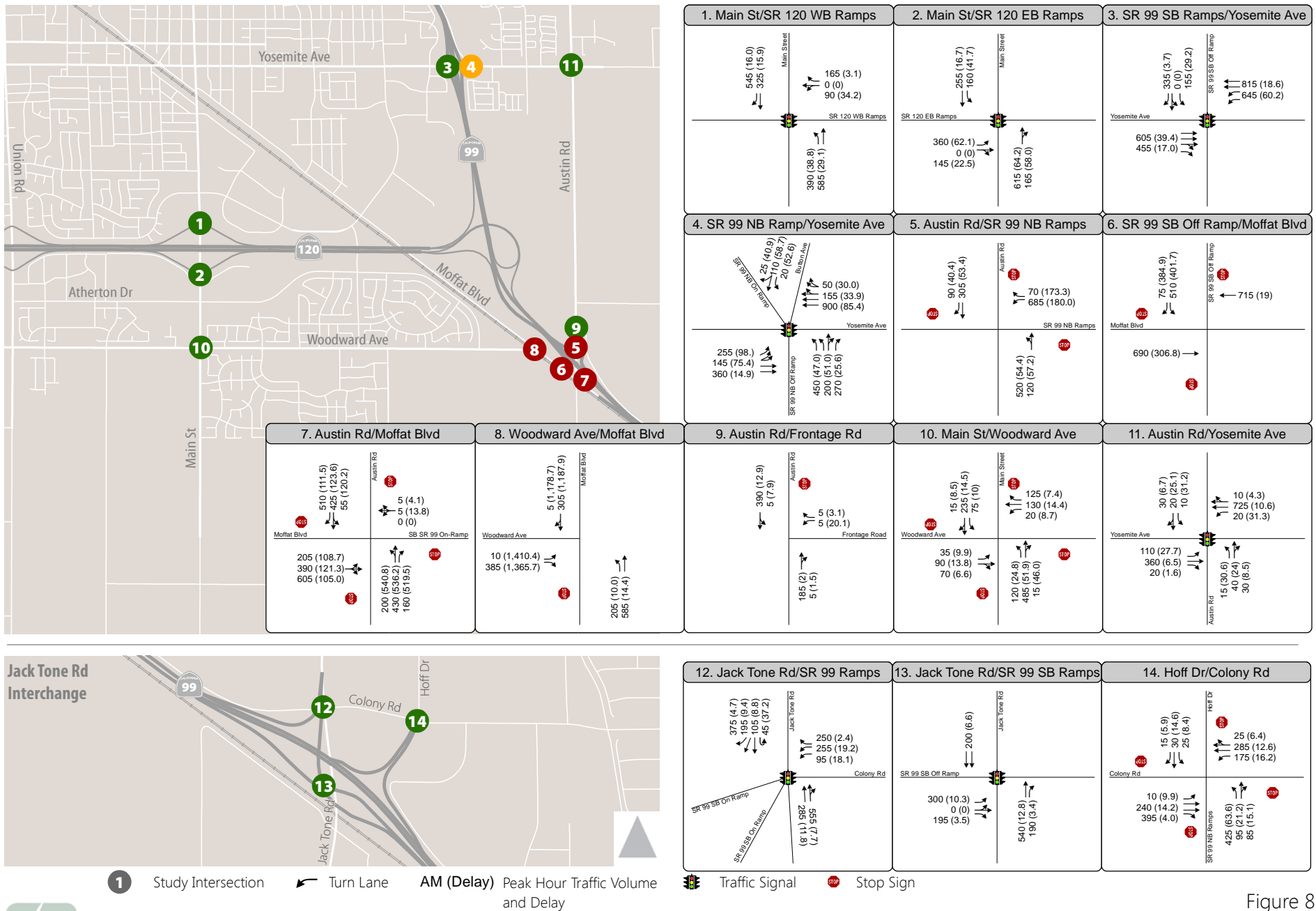
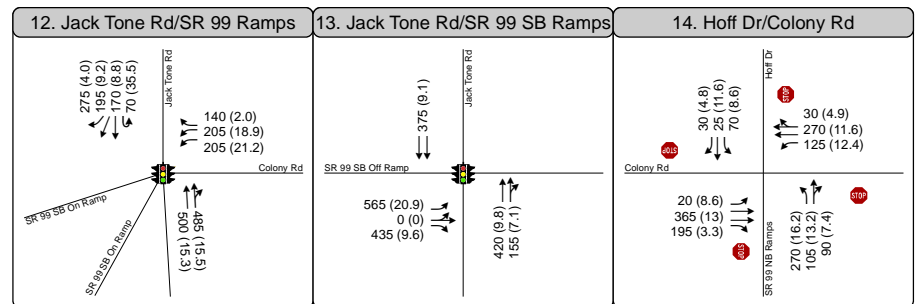
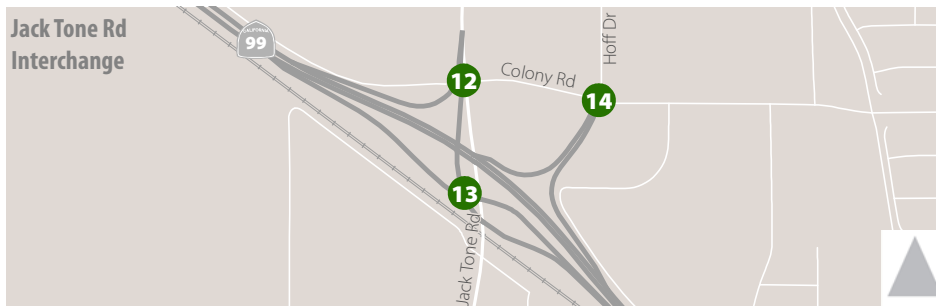
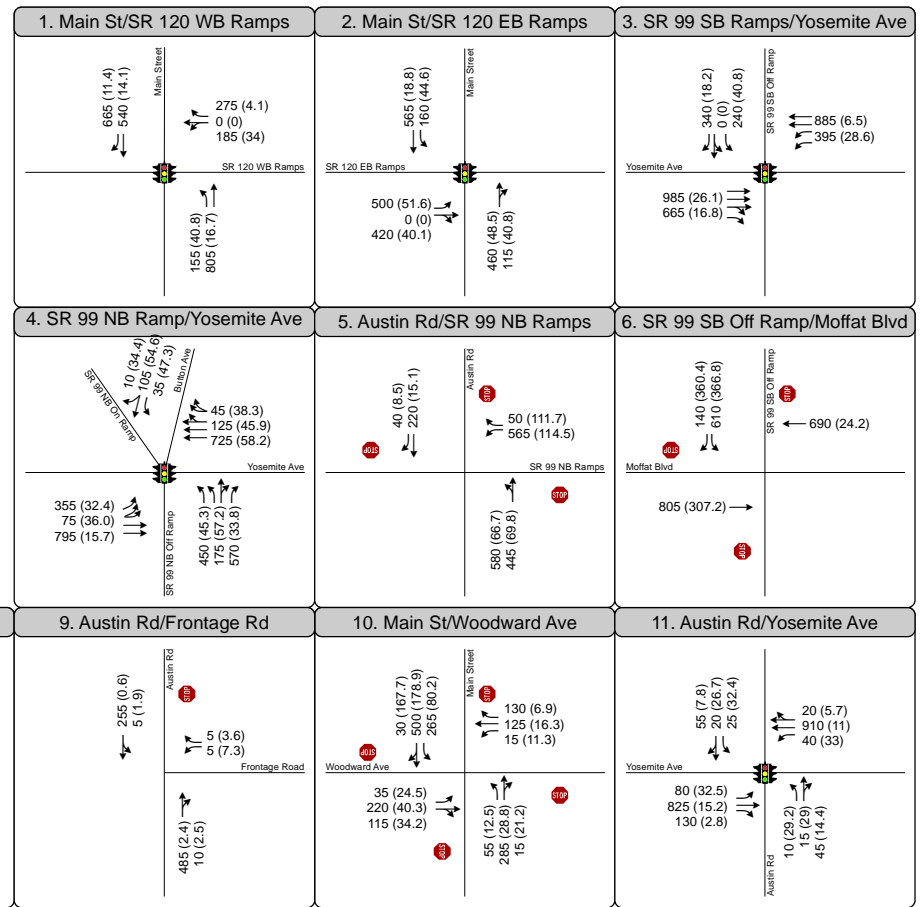
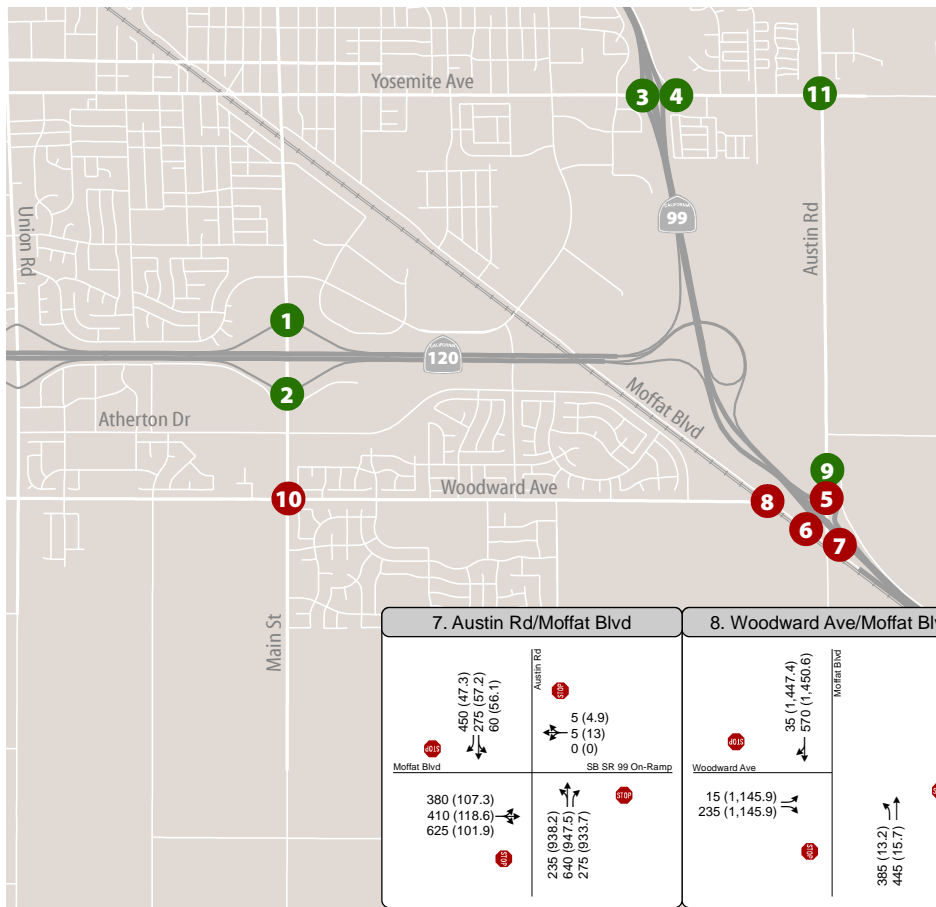


Figure 8
Peak Hour Traffic Volumes and Lane Configurations -
Construction Year 2023 No Project AM Peak Hour Conditions



1 Study Intersection
 Turn Lane
 AM (Delay) Peak Hour Traffic Volume and Delay

Traffic Signal
 Stop Sign

Acceptable Level of Service - A, B, C and D

Unacceptable Level of Service - E and F

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Figure 9
Peak Hour Traffic Volumes and Lane Configurations -
Construction Year 2023 No Project PM Peak Hour Conditions

Table 8 presents the 95th Percentile Queue Length by Movement for the following eleven (11) study intersections. It should be noted that the three study intersections at the SR 99 / Jack Tone interchange were not evaluated since the Phase 1A Project does not close the NB SR 99 off-ramp to Austin Road or the SB SR 99 on-ramp from Austin Road.

- | | |
|---------------------------------------|--|
| 1. SR 120 EB Ramps / Main Street; | 7. Austin Road / Moffat Boulevard; |
| 2. SR 120 WB Ramps / Main Street; | 8. Woodward Avenue / Moffat Boulevard; |
| 3. SR 99 NB Ramps / Yosemite Avenue; | 9. Austin Road / Frontage Road; |
| 4. SR 99 SB Ramps / Yosemite Avenue; | 10. Woodward Avenue / Main Street; and |
| 5. SR 99 NB Ramps / Austin Road; | 11. Austin Road / Yosemite Avenue. |
| 6. SR 99 SB Ramps / Moffat Boulevard; | |

The primary results of the Construction Year 2023 No Project AM Peak 95th Percentile Queue Length by Movement analysis are:

- Fifty-Eight (58) of the seventy-nine (79) movements have 95th Percentile queue lengths less than the available storage; and
- Twenty-one (21) of the seventy-nine (79) movements (26.6%) have 95th Percentile queue lengths greater than the available storage.
- This represents an increase in 15 movements and an 18.9% increase when compared to Existing AM Peak Hour Conditions.

The primary results of the Construction Year 2023 No Project PM Peak 95th Percentile Queue Length by Movement analysis are:

- Sixty (60) of the seventy-nine (79) movements have 95th Percentile queue lengths less than the available storage; and
- Nineteen (19) of the seventy-nine (79) movements (24.1%) have 95th Percentile queue lengths greater than the available storage.
- This represents an increase in 10 movements and a 12.6% increase when compared to Existing PM Peak Hour Conditions.

**TABLE 8: 95TH PERCENTILE QUEUE LENGTH BY MOVEMENT
– CONSTRUCTION YEAR 2023 NO PROJECT**

Intersection	Movement	Available Storage (Feet)	AM	PM
			Peak Hour	Peak Hour
1. WB SR 120 Ramps / Main Street	WB LT / TH	1,740	107	177
	WB RT	175	0	43
	NB LT	230	336	178
	NB TH	1,451	787	525
	SB TH	1,920	204	273
	SB RT	1,920	300	254
2. EB SR 120 Ramps / Main Street	EB LT	1,732	575	849
	EB TH / RT	190	288	312
	NB TH / RT	996	1,067	624
	SB LT	230	183	203
	SB TH	1,451	197	300
3. SB SR 99 Ramps / Yosemite Avenue	EB TH	1,830	648	354
	EB TH	1,830	417	268
	EB TH / RT	1,830	397	300
	EB RT	365	208	277
	WB TH	335	329	275
	WB TH	335	324	220
	WB RT	335	66	178
	WB RT	335	62	193
	SB LT	350	89	153
	SB LT / RT	1,010	126	192
4. NB SR 99 Ramps / Yosemite Avenue	SB RT	350	211	200
	EB LT	335	371	319
	EB LT	335	421	301
	EB TH	335	219	252
	EB TH	335	162	255
	WB TH	1,045	972	473
	WB TH	1,045	951	405
	WB TH / RT	1,045	805	354
	WB RT	265	159	147
	NB LT	350	263	248
	NB LT	962	291	277
	NBTH / RT	962	351	422
	NB RT	350	301	354
	SB LT	823	134	98
	SB LT/ TH	170	188	162

**TABLE 8: 95TH PERCENTILE QUEUE LENGTH BY MOVEMENT
– CONSTRUCTION YEAR 2023 NO PROJECT (CONTINUED)**

Intersection	Movement	Available Storage (Feet)	AM	PM
			Peak Hour	Peak Hour
5. NB SR 99 Ramps / Austin Road	WB LT	558	692	823
	WB RT	25	75	73
	NB LT / TH	801	6,000	1,616
	SB TH	433	419	114
	SB RT	25	70	66
6. SB SR 99 Off-Ramp / Moffat Blvd	EB TH	521	575	572
	WB TH	384	214	279
	SB LT	806	947	916
	SB RT	25	68	72
7. Moffat Blvd / Austin Road	EB LT / TH / RT	384	399	399
	WB LT / TH / RT	615	28	30
	NB LT / TH	1,012	5,947	15,730
	NB RT	80	136	122
	SB LT / TH	801	991	670
	SB RT	25	69	62
8. Moffat Blvd / Woodward Ave	EB LT	1,723	7,309	3,907
	EB RT	45	79	77
	NB LT	150	67	98
	NBTH	521	101	187
	SB TH / RT	922	4,978	11,849
9. Frontage Road / Austin Road	WB LT	767	23	19
	WB RT	25	33	28
	NB TH / RT	433	6	4
	SB LT / TH	804	274	17

Results Based on 12 SimTraffic Version 10 Model Runs

BOLD denotes 95th Percentile Queue Length Exceeds Available Storage

**TABLE 8: 95TH PERCENTILE QUEUE LENGTH BY MOVEMENT
– CONSTRUCTION YEAR 2023 NO PROJECT (CONTINUED)**

Intersection	Movement	Available Storage (Feet)	AM Peak Hour	PM
				Peak Hour
10. Woodward / Main Street	EB LT	95	53	115
	EB TH / RT	612	83	324
	WB LT	175	38	36
	WB TH	634	83	83
	WB RT	634	77	72
	NB LT	250	286	84
	NB TH / RT	656	609	221
	SB LT	250	60	735
	SB TH / RT	522	108	1,420
11. Yosemite Avenue / Austin Road	EB LT	250	121	188
	EB TH	1,717	155	439
	EB RT	1,717	29	89
	WB LT	470	48	72
	WB TH	1,382	207	234
	WB TH / RT	270	176	203
	NB LT	225	35	31
	NB TH / RT	1,120	72	65
	SB LT	225	37	57
	SB TH / RT	1,043	69	84

Results Based on 12 SimTraffic Version 10 Model Runs

BOLD denotes 95th Percentile Queue Length Exceeds Available Storage

**TABLE 9: TOTAL NETWORK PERFORMANCE
CONSTRUCTION YEAR 2023 NO PROJECT CONDITIONS**

Measure of Effectiveness	Based on 12 SimTraffic Model Runs	
	AM Peak Hour	PM Peak Hour
Total Vehicle Hours of Delay (VHD)	1,019	1,235
Total Stops	19,284	21,157
Vehicle Miles of Travel (VMT)	12,903	19,845
Vehicle Hours Travelled (VHT)	1,432	1,835
Total Fuel Consumption	628	853
Total Vehicle Emissions (lbs of CO2)	11,932	16,207
Average Speed (MPH)	9	11
Vehicles Entering Network in Peak Hour	15,274	18,653
Vehicles Entering Network in Peak Hour	14,011	16,975
Percent (%) Demand Served	91.7 %	91.0 %

Source: Results Based on 12 SimTraffic Version 10 Model Runs

Table 9 presents the total network performance measures of effectiveness for the Synchro / SimTraffic Models for Construction Year 2023 No Project AM and PM Peak Hour Conditions. The results of the Total Network Performance sets the baseline conditions for Construction Year 2023 No Project AM and PM peak hour conditions and will be used to define baseline conditions to determine the benefits of the proposed SR 120 / SR 99 Interchange Project for Construction Year 2023 AM and PM peak hour conditions.

The results of the Total Network Performance (Table 7) set the baseline conditions for Construction Year 2023 AM and PM peak hour conditions:

Total Vehicle Hours of Delay (VHD) - During Construction Year 2023 No Project AM Peak Hour Conditions (7:15 to 8:15 AM), a total of 1,019 VHD occurs in the project study area. During Construction Year 2023 No Project PM Peak Hour Conditions (4:45 to 5:45 PM), a total of 1,235 VHD occurs in the project study area.

Total Stops - During Construction Year 2023 No Project AM Peak Hour Conditions (7:15 to 8:15 AM), a total of 19,284 stops occur in the project study area. During Construction Year 2023 No Project PM Peak Hour Conditions (4:45 to 5:45 PM), a total of 21,157 stops occur in the project study area.

Vehicle Miles Travelled (VMT) - During Construction Year 2023 No Project AM Peak Hour Conditions (7:15 to 8:15 AM), the VMT is 12,903 miles within in the project study area. During Construction Year 2023 No Project PM Peak Hour Conditions (4:45 to 5:45 PM), the VMT is 19,845 miles within in the project study area.

Total Fuel Consumption - During Construction Year 2023 No Project AM Peak Hour Conditions (7:15 to 8:15 AM), the total fuel consumption is 628 gallons within in the project study area. During Construction Year 2023 No Project PM Peak Hour Conditions (4:45 to 5:45 PM), the total fuel consumption is 853 gallons within in the project study area.

Total Vehicle Emissions - During Construction Year 2023 No Project AM Peak Hour Conditions (7:15 to 8:15 AM), the total emissions is 11,932 lbs within in the project study area. During Construction Year 2023 No Project PM Peak Hour Conditions (4:45 to 5:45 PM), the total emissions is 16,207 lbs within in the project study area.

Average Speed - During Construction Year 2023 No Project AM Peak Hour Conditions (7:15 to 8:15 AM), the average speed is 9 miles per hour within the project study area. During Construction Year 2023 No Project PM Peak Hour Conditions (4:45 to 5:45 PM), the average speed is 11 miles per hour within the project study area.

Percent (%) Demand Served - During Construction Year 2023 No Project AM Peak Hour Conditions (7:15 to 8:15 AM), the Percent (%) Demand Served is 91.7%. During Construction Year 2023 No Project PM Peak Hour Conditions (4:45 to 5:45PM), the Percent (%) Demand Served is 91.0%.

CONSTRUCTION YEAR 2023 WITH PHASE 1A PROJECT

The following Appendices contain the Construction Year 2023 with Phase 1A Project conditions analysis:

- Appendix I – Construction Year 2023 With Phase 1A Project Conditions – AM Peak Hour - Eastbound SR 120 and Southbound SR 99 HCS Freeway Mainline, On-Ramp Merge, Off-Ramp Diverge Analysis and Weaving Section Analysis;
- Appendix J – Construction Year 2023 With Phase 1A Project Conditions – AM Peak Hour - Northbound SR 99 and Westbound SR 120 HCS Freeway Mainline, On-Ramp Merge, Off-Ramp Diverge Analysis and Weaving Section Analysis;
- Appendix K – Construction Year 2023 With Phase 1A Project Conditions – PM Peak Hour - Eastbound SR 120 and Southbound SR 99 HCS Freeway Mainline, On-Ramp Merge, Off-Ramp Diverge Analysis and Weaving Section Analysis;
- Appendix L – Construction Year 2023 With Phase 1A Project Conditions – PM Peak Hour - Northbound SR 99 and Westbound SR 120 HCS Freeway Mainline, On-Ramp Merge, Off-Ramp Diverge Analysis and Weaving Section Analysis;

The following Appendices contain the Construction Year 2023 With Phase 1A Project conditions analysis (continued):

- Appendix Q – Construction Year 2023 With Phase 1A Project Conditions – AM Peak Hour Synchro / SimTraffic Input Data and SimTraffic Analysis Results Based on 12 SimTraffic Model Runs; and
- Appendix R – Construction Year 2023 With Phase 1A Project Conditions – PM Peak Hour Synchro / SimTraffic Input Data and SimTraffic Analysis Results Based on 12 SimTraffic Model Runs.

Figure 10A and 10B present the Construction Year 2023 With Phase 1A Project AM Peak Hour Conditions and provide the following information:

- Construction Year 2023 With Phase 1A Project AM Peak Hour Volume;
 - Construction Year 2023 With Phase 1A Project HCS 6th Edition AM Peak Hour Density;
 - Freeway Mainline Lanes, Off-Ramp Lane(s) and On-Ramp Lane(s);
 - Construction Year 2023 With Phase 1A Diverted Trips as a result of closing the NB SR 99 on-ramp and SB SR 99 off-ramp to Austin Road; and
 - Construction Year 2023 With Phase 1A Project HCS 6th Edition AM Peak Hour HCS 6th Edition Level of Service.
- Acceptable Level of Service A through D are shown in Green;
Unacceptable / Marginal Level of Service E is shown in Yellow; and
Unacceptable Level of Service F is shown in Red.

The primary conclusions of the Construction Year 2023 With Phase 1A Project presented in Figure 10A are:

1. During the AM peak hour, the directional split on SR 120 is projected to continue to be approximately 60% westbound and 40% eastbound;
2. During the morning peak hour, NB SR 99 between Jack Tone Road and Austin Road is projected to continue to operate at LOS F conditions;
3. The NB SR 99 off-ramp to Austin Road is projected to continue to operate at LOS F conditions;
4. Even with the NB SR 99 off-ramp to WB SR 120 remaining a single lane off-ramp, the closure of the NB SR 99 on-ramp and elimination of the on-ramp merge would improve when compared to No Project Conditions;
5. The NB SR 99 to WB SR 120 freeway-to-freeway ramp is projected to improve from LOS F (No Project) to LOS C (With Phase 1A Project) conditions;
6. The construction of the two-lane EB SR 120 to SB SR 99 freeway-to-freeway ramp would improve EB SR 120 to SB SR 99 operations;
7. The EB SR 120 to SB SR 99 to SB SR 99 freeway-to-freeway ramp is projected to improve from LOS E (No Project) to LOS D (With Phase 1A Project) conditions;
8. With the Phase 1A Project 27 of the 29 study segments (93.1%) are projected to operate at acceptable Level of Service B, C, or D conditions; and
9. Compared to the No Project Alternative, this represents a 10.3% improvement with the Phase 1A Project.

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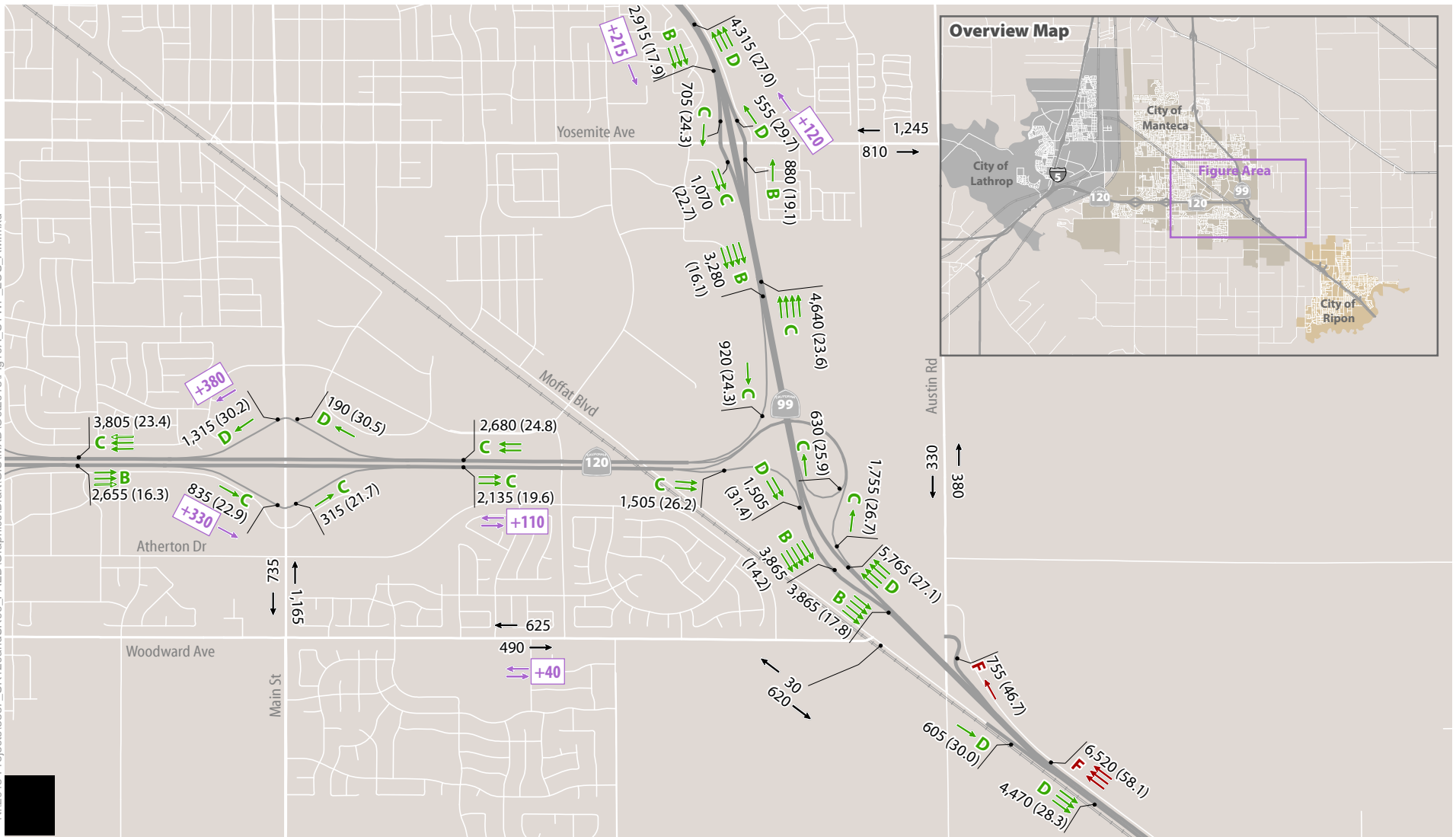


Figure 10A

AM Peak Hour Freeway Volume and Level of Service -
Construction Year 2023 With Phase 1A Project Conditions

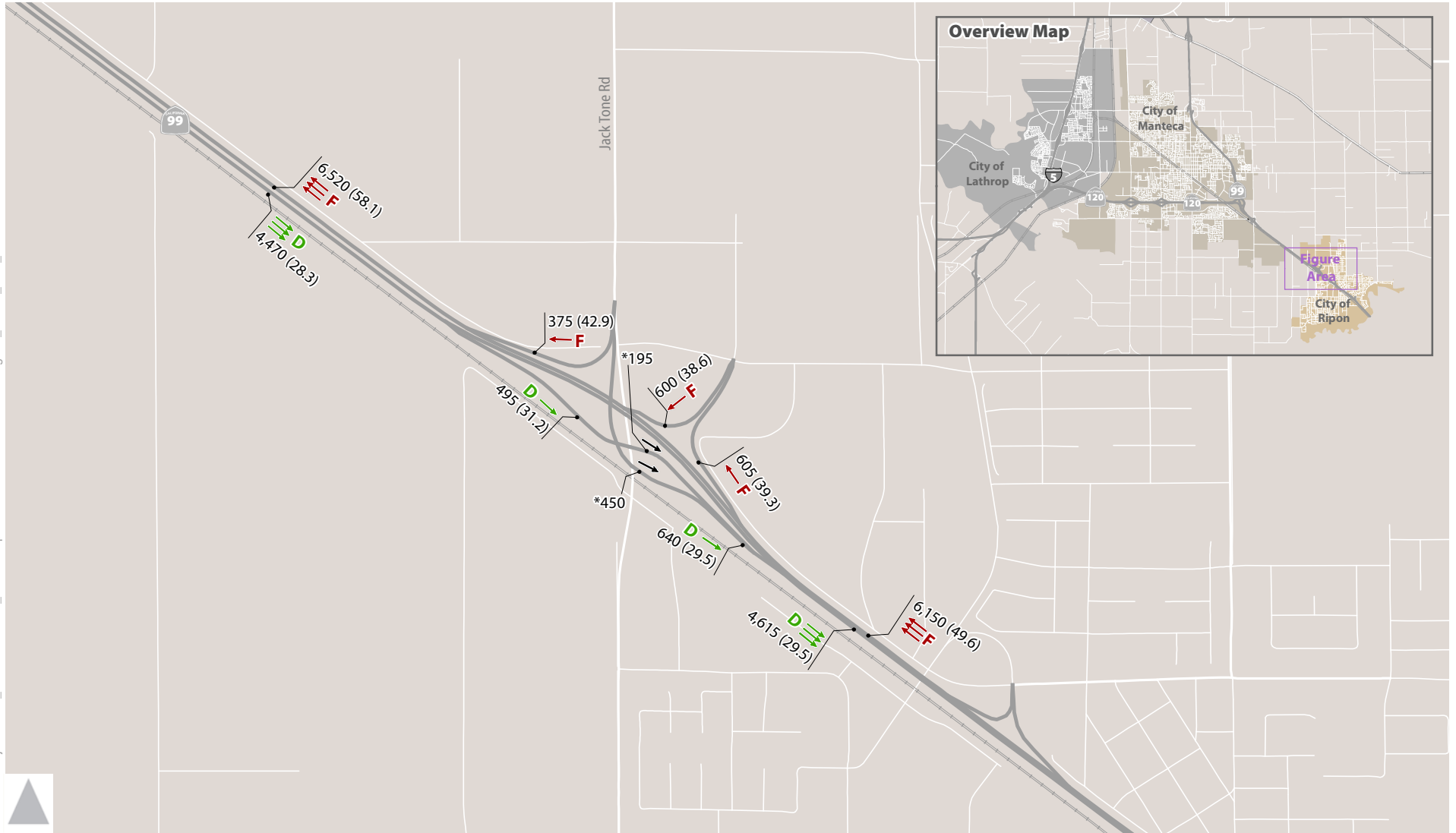


Figure 10B

AM Peak Hour Freeway Volume and Level of Service - Construction Year 2023 With Phase 1A Project Conditions

The primary conclusions of the Construction Year 2023 With Phase 1A Project analysis presented in Figure 10B are:

1. During the AM peak hour, the directional split on SR 99 is projected to increase to approximately 60% northbound and 40% southbound.
2. During the morning peak hour, all five (100%) NB SR 99 study segments are projected to continue to operate at LOS F conditions;
3. All four (100%) SB SR 99 study segments (100%) are projected to continue to operate at acceptable Level of Service D conditions;
4. Overall, five (5) of the (9) study segments (55.6%) are projected to operate at acceptable Level of Service conditions.
5. Compared to the No Project Alternative, this represents No Change with the Phase 1A Project.

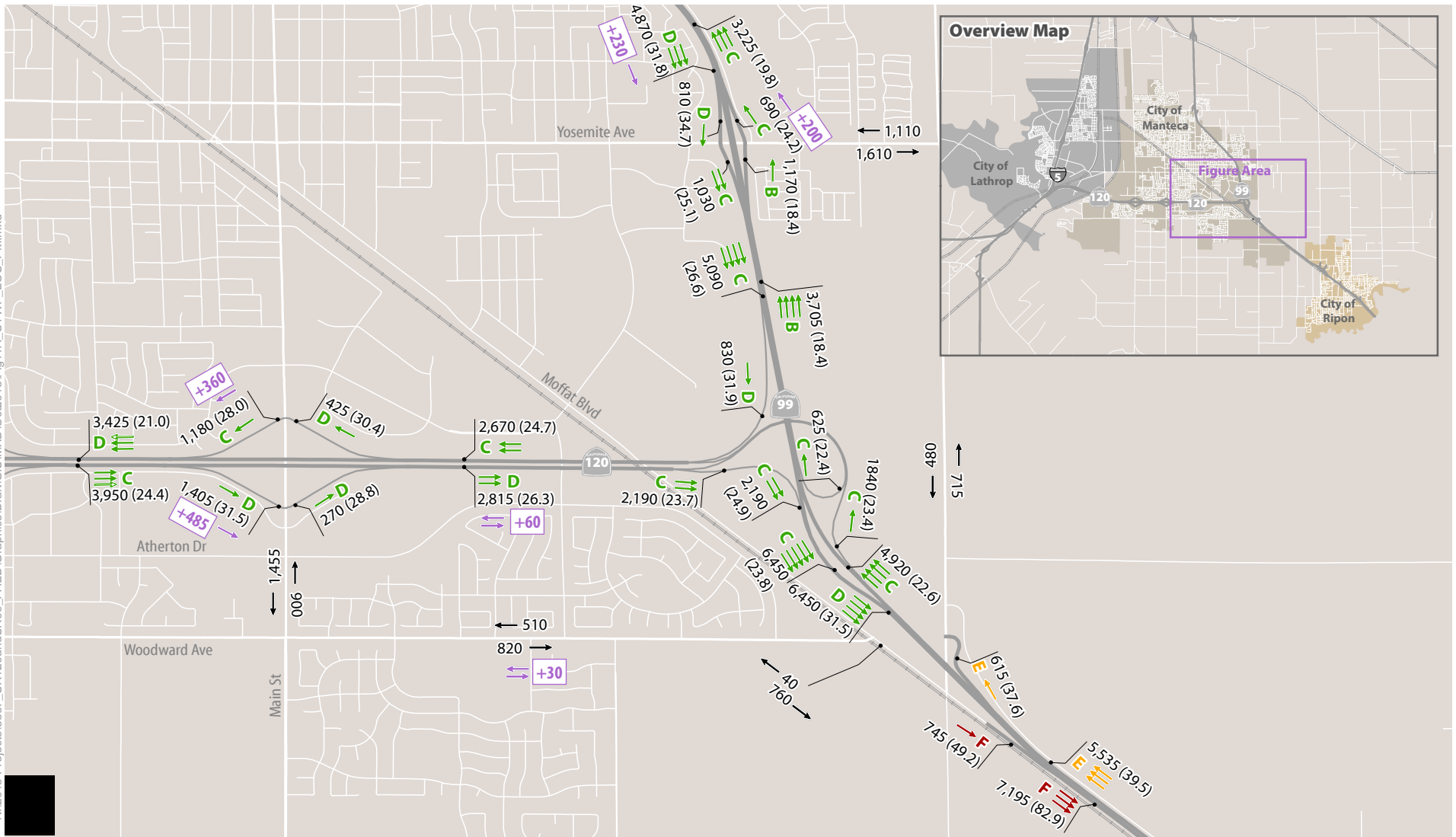
Figures 11A and 11B present the Construction Year 2023 With Phase 1A Project PM Peak Hour Conditions and provide the following information:

- Construction Year 2023 With Phase 1A Project PM Peak Hour Volume;
 - Construction Year 2023 With Phase 1A Project HCS 6th Edition PM Peak Hour Density;
 - Freeway Mainline Lanes, Off-Ramp Lane(s) and On-Ramp Lane(s);
 - Construction Year 2023 With Phase 1A Diverted Trips as a result of closing the NB SR 99 on-ramp and SB SR 99 off-ramp to Austin Road; and
 - Construction Year 2023 With Phase 1A Project HCS 6th Edition PM Peak Hour HCS 6th Edition Level of Service.
- Acceptable Level of Service A through D are shown in Green;
Unacceptable / Marginal Level of Service E is shown in Yellow; and
Unacceptable Level of Service F is shown in Red.

The primary conclusions of the Construction Year 2023 With Phase 1A Project analysis presented in Figure 11A are:

1. During the PM peak hour, the directional split on SR 120 is projected to continue to be approximately 55% eastbound and 45% westbound.
2. During the evening peak hour, the construction of the Diverging Diamond Interchange at the SR 120 / Union Road interchange and the eastbound Auxiliary Lane between the Union Road on-ramp and the Main Street on-ramp (2 mixed flow and 1 auxiliary lane) will improve this segment on EB SR 120 to acceptable LOS C conditions;
3. The Main Street on-ramp merge section would improve from LOS F (No Project) to LOS D (With Phase 1A Project) conditions.
4. The construction of the two-lane EB SR 120 to SB SR 99 freeway-to-freeway ramp would improve EB SR 120 to SB SR 99 operations;
5. The EB SR 120 to SB SR 99 to SB SR 99 freeway-to-freeway ramp is projected to improve from LOS F (No Project) to LOS C (With Phase 1A Project) conditions.

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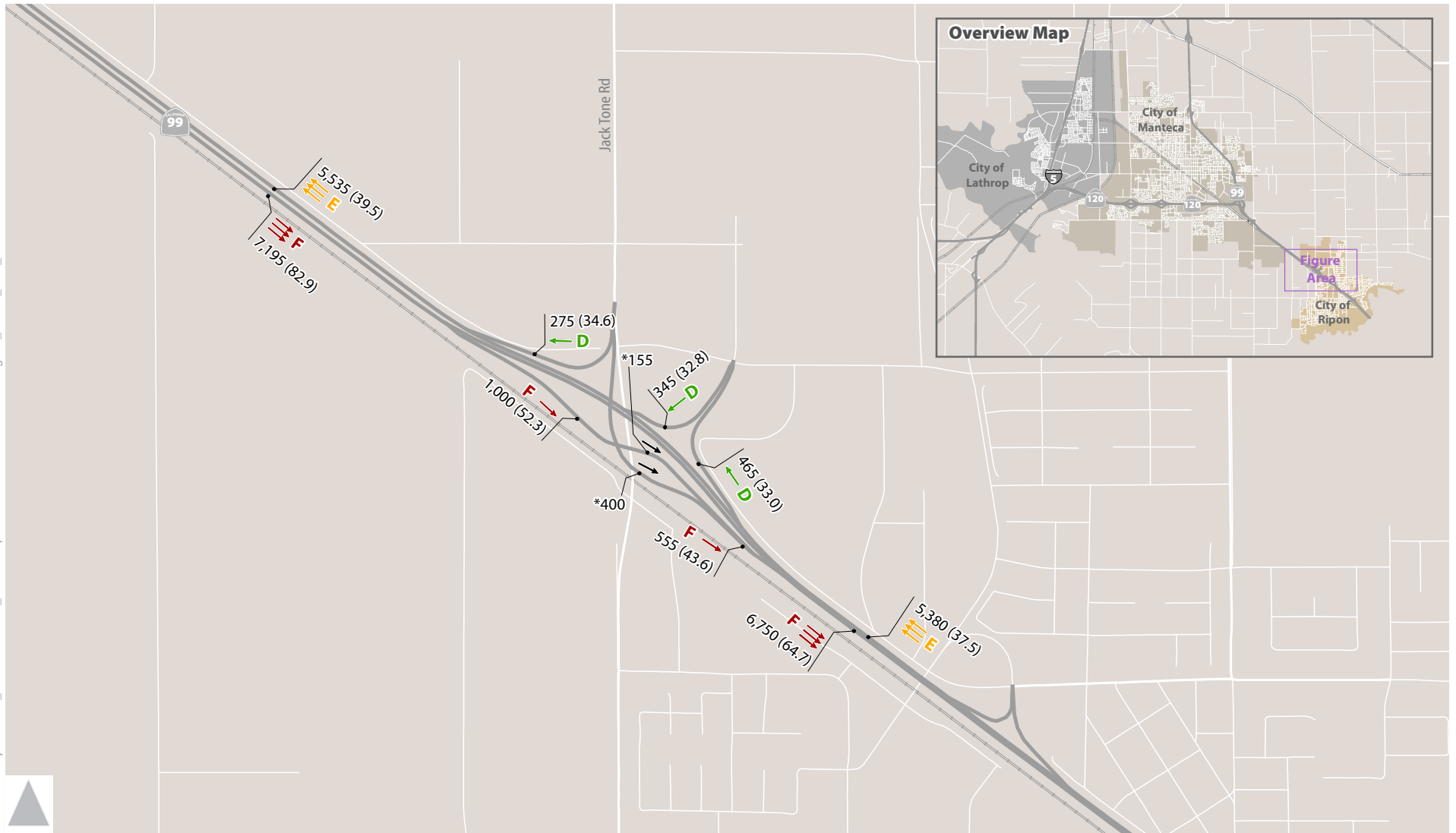
x,xxx Peak Hour Volume
(xx.x) Density

Freeway Lane
Auxillary Lane
Diverted Traffic
(Delta Volume)

Acceptable Level of Service - A, B, C and D
Unacceptable Level of Service - E and F

Figure 11A

PM Peak Hour Freeway Volume and Level of Service -
Construction Year 2023 With Phase 1A Project Conditions



x,xxx Peak Hour Volume
 (xx.x) Density
 ← Freeway Lane

Acceptable Level of Service - **A, B, C** and **D**
 Unacceptable Level of Service - **E** and **F**
 Note: (*) Indicates a non-freeway segment.



Figure 11B

PM Peak Hour Freeway Volume and Level of Service - Construction Year 2023 With Phase 1A Project Conditions

The primary conclusions of the Construction Year 2023 With Phase 1A Project analysis presented in Figure 11A are (Continued):

6. The EB SR 120 freeway mainline segment from the Main Street on-ramp to the SR 99 freeway-to-freeway interchange would improve from LOS F (No Project) to LOS D (With Phase 1A Project) conditions.
7. Elimination of the EB SR 120 congestion and slow travel speeds on SR 120 would result in reduced diversion of traffic onto the eastbound SR 120 off-ramp to Main Street, traveling to Woodward Avenue and accessing the SB SR 99 on-ramp at Austin Road;
8. On the other hand, the closure of the SB SR 99 off-ramp would result in a net increase of 485 vehicles (1,405 versus 920) exiting EB SR 120 at Main Street (LOS D);
9. The closure of the SB SR 99 off-ramp to Moffat Boulevard / Austin Road will result in SB SR 99 between the SR 120 on-ramp and the Austin Road on-ramp to improve from unacceptable LOS E/F conditions to acceptable LOS C / D conditions;
10. Southbound SR 99 is projected to continue to operate at LOS F conditions from south of the Austin Road on-ramp to south of the Jack Tone Road interchange;
11. Northbound SR 99 is projected to continue to operate at LOS E conditions from north of the Jack Tone interchange to the Austin Road off-ramp.
12. Even with the NB SR 99 off-ramp to WB SR 120 remaining a single lane off-ramp, the closure of the NB SR 99 on-ramp and elimination of the on-ramp merge would improve NB SR 99;
13. The NB SR 99 to WB SR 120 freeway-to-freeway ramp is projected to improve from LOS F (No Project) to LOS C (With Phase 1A Project) conditions.
14. The remaining 24 of the 29 study segments (82.7%) are projected to continue to operate at acceptable Level of Service B, C, or D conditions.
15. Compared to the No Project Alternative, this represents a 20.6% improvement with the Phase 1A Project.

The primary conclusions of the Construction Year 2023 With Phase 1A Project analysis presented in Figure 11B are:

1. During the PM peak hour, the directional split on SR 99 is projected to increase slightly southbound, with approximately 57% southbound and 43% northbound.
2. During the evening peak hour, southbound SR 99 will continue to exceed operating capacity based on the HCS analysis and degrade to LOS F conditions from south of the Austin Road interchange to south of the Jack Tone interchange.
3. The Northbound SR 99 mainline is projected to degrade to LOS E conditions from south of the Jack Tone interchange to south of the Austin Road interchange;
4. The remaining three (3) of the nine (9) study segments (33.3%) are projected to continue to operate D conditions.
5. Compared to the No Project Alternative, this represents No Change with the Phase 1A Project.

Table 10 presents the results of the Construction Year 2023 With Phase 1A Project AM and PM Peak Hour Intersection Level of Service Analysis.

Figure 12 presents the Construction Year 2023 With Phase 1A Project AM Peak Hour Traffic Volumes, Delay by Movement and Intersection Configurations and Control. It also shows the intersections operating at acceptable level of service condition A, B, C, or D in green, marginal level of service condition E in yellow and unacceptable level of service condition F in red.

The primary conclusions of the AM peak hour analysis are:

1. During the AM peak hour, six (6) of the seven (7) signalized intersections (85.7%) are projected to continue to operate at acceptable LOS A, C or D conditions;
2. Compared to the No Project Alternative, this represents No Change with the Phase 1A Project.
3. Closure of the SB SR 99 off-ramp would result in a net increase in traffic volumes at the SR 120 / Main Street interchange resulting in the EB SR 120 Off-Ramp / Main Street intersection to degrade from LOS D (No Project) to LOS F (With Phase 1A Project);
4. In order to improve AM peak hour operations at the EB SR 120 Off-Ramp / Main Street intersection, the off-ramp should be widened to provide the following:
 - a. 400 foot eastbound SR 120 off-ramp right-turn lane; and
 - b. 300 foot northbound Main Street right-turn lane.
5. With these improvements, the EB SR 120 Off-Ramp / Main Street intersection would improve from LOS E to LOS D conditions during the AM peak hour;
6. Marginal reductions in traffic volumes at the NB SR 99 Ramps / Yosemite Avenue intersection will result in improved operations from LOS E (No Project) to LOS D (With Phase 1A Project) conditions;
7. Five (5) of the six (6) all-way stop controlled intersections (83.3%) would continue to operate at acceptable LOS B or C conditions;
8. Compared to the No Project Alternative, this represents a 50.0% improvement with the Phase 1A Project;
9. The all-way stop controlled intersection Main Street / Woodward Ave is projected to continue to operate at LOS F conditions;
10. In order to improve AM peak hour operations at the Main Street / Woodward Avenue intersection, the intersection should be signalized;
11. With this improvements, the Moffat Blvd / Woodward Avenue intersection would improve from LOS F to LOS C conditions during the AM peak hour; and
12. The one (1) side street stop controlled intersection is projected to operate at LOS A conditions.

**TABLE 10: INTERSECTION ANALYSIS – CONSTRUCTION YEAR 2023 WITH PHASE 1A PROJECT
AM AND PM PEAK HOUR CONDITIONS**

Intersection	Control	AM Peak Hour		PM Peak Hour	
		Delay / Movement (sec/veh)	LOS	Delay / Movement (sec/veh)	LOS
1. WB SR 120 Ramps / Main Street	Signal	46.3	D	46.6	D
2. EB SR 120 Ramps / Main Street	Signal	110.7	F	>120	F
3. SB SR 99 Ramps / Yosemite Avenue	Signal	24.3	C	21.7	C
4. NB SR 99 Ramps / Yosemite Avenue	Signal	52.9	D	69.1	E
5. NB SR 99 Ramps / Austin Road	All Way Stop Controlled	14.1	B	32.1	D
6. Woodward Avenue / Connector	All Way Stop Controlled	11.1	B	14.2	B
7. Austin Road / Moffat Connector	All Way Stop Controlled	24.1	C	40.4	E
8. Moffat Blvd / Moffat Connector	All Way Stop Controlled	15.9	C	>120	F
9. Frontage Road / Austin Road	Side-Street Stop Controlled	10.6 (WB Left-Turn)	B	17.8 (WB Left-Turn)	C
10. Woodward Avenue / Main Street	All Way Stop Controlled	>120	F	>120	F
11. Yosemite Avenue / Austin Road	Signal	26.3	C	39.4	D
12. NB SR 99 Ramps / Jack Tone Road	Signal	9.8	A	11.8	B
13. SB SR 99 Ramps / Jack Tone Road	Signal	8.8	A	10.0	A
14. NB SR 99 Ramps / Colony Road	All Way Stop Controlled	21.8	C	11.5	B

Source: *Highway Capacity Manual* (Transportation Research Board, 6th Edition).
Results Based on 12 SimTraffic Version 10 Model Runs

BOLD denotes unacceptable Level of Service (LOS)

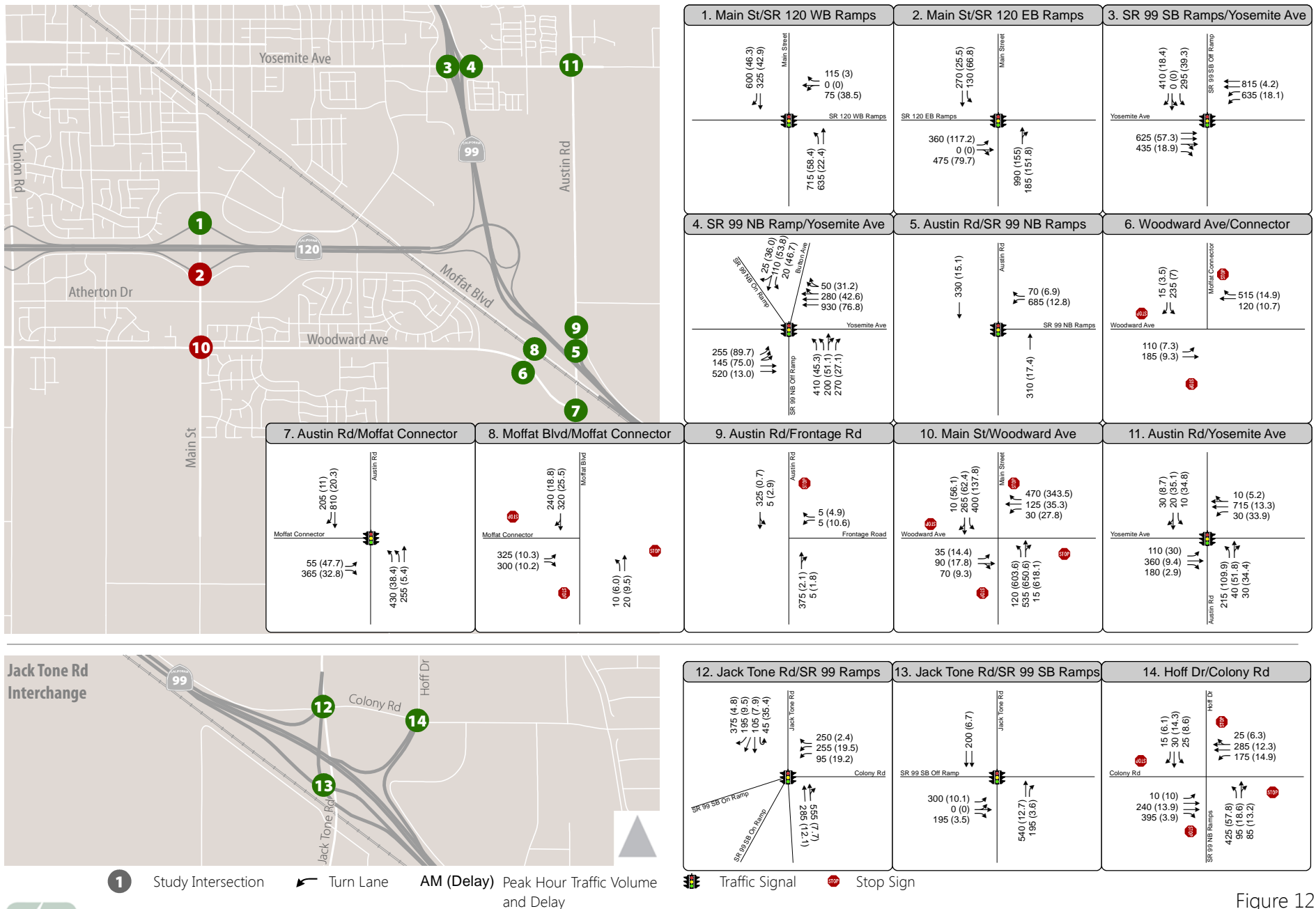


Figure 12
Peak Hour Traffic Volumes and Lane Configurations -
Construction Year 2023 With Phase 1A Project AM Peak Hour Conditions

Figure 13 presents the Construction Year 2023 With Phase 1A Project PM Peak Hour Traffic Volumes, Delay by Movement and Intersection Configurations and Control. It also shows the intersections operating at acceptable level of service condition A, B, C, or D in green, marginal level of service condition E in yellow and unacceptable level of service condition F in red.

The primary conclusions of the PM peak hour analysis are:

1. During the PM peak hour, five (5) of the seven (7) signalized intersections (71.4%) are projected to continue to operate at acceptable LOS A, B, C or D conditions;
2. The following two (2) signalized intersections are projected to degrade to LOS E or F conditions:
 - a. EB SR 120 Off-Ramp / Main Street; and
 - b. NB SR 99 Ramps / Yosemite Avenue.
3. In order to improve PM peak hour operations at the EB SR 120 Off-Ramp / Main Street intersection, the off-ramp should be widened to provide the following:
 - a. 400 foot eastbound SR 120 off-ramp right-turn lane; and
 - b. 300 foot northbound Main Street right-turn lane.
4. With these improvements, the EB SR 120 Off-Ramp / Main Street intersection would improve from LOS F to LOS D conditions during the PM peak hour;
5. With the closure of the Austin Road on-ramp, additional traffic will use the NB SR 99 Ramps / Yosemite Avenue intersection to enter northbound SR 99;
6. In order to improve PM peak hour operations at the NB SR 99 Ramps / Yosemite Avenue intersection, the intersection signal timings should be optimized and coordinated to provide additional green time for the Westbound (WB) Yosemite Avenue right-turn volume onto northbound SR 99;
7. With these improvements, the NB SR 99 Ramps / Yosemite Avenue intersection would improve from LOS E to LOS D conditions during the PM peak hour;
8. Three (3) of the six (6) all-way stop controlled intersections (50.0%) are projected to operate at acceptable LOS B, C or D conditions;
9. Compared to the No Project Alternative, this represents a 33.3% improvement with the Phase 1A Project;
10. The following four all-way stop controlled intersections are projected to operate at LOS F conditions:
 - a. Austin Road / Moffat Connector;
 - b. Woodward Ave / Connector;
 - c. Woodward Avenue / Main Street.
11. In order to improve PM peak hour operations at the Moffat Blvd Connector / Austin Road intersection, the intersection should be signalized;
12. With this improvements, the Moffat Blvd Connector / Austin Road intersection would improve from LOS E to LOS D conditions during the PM peak hour;

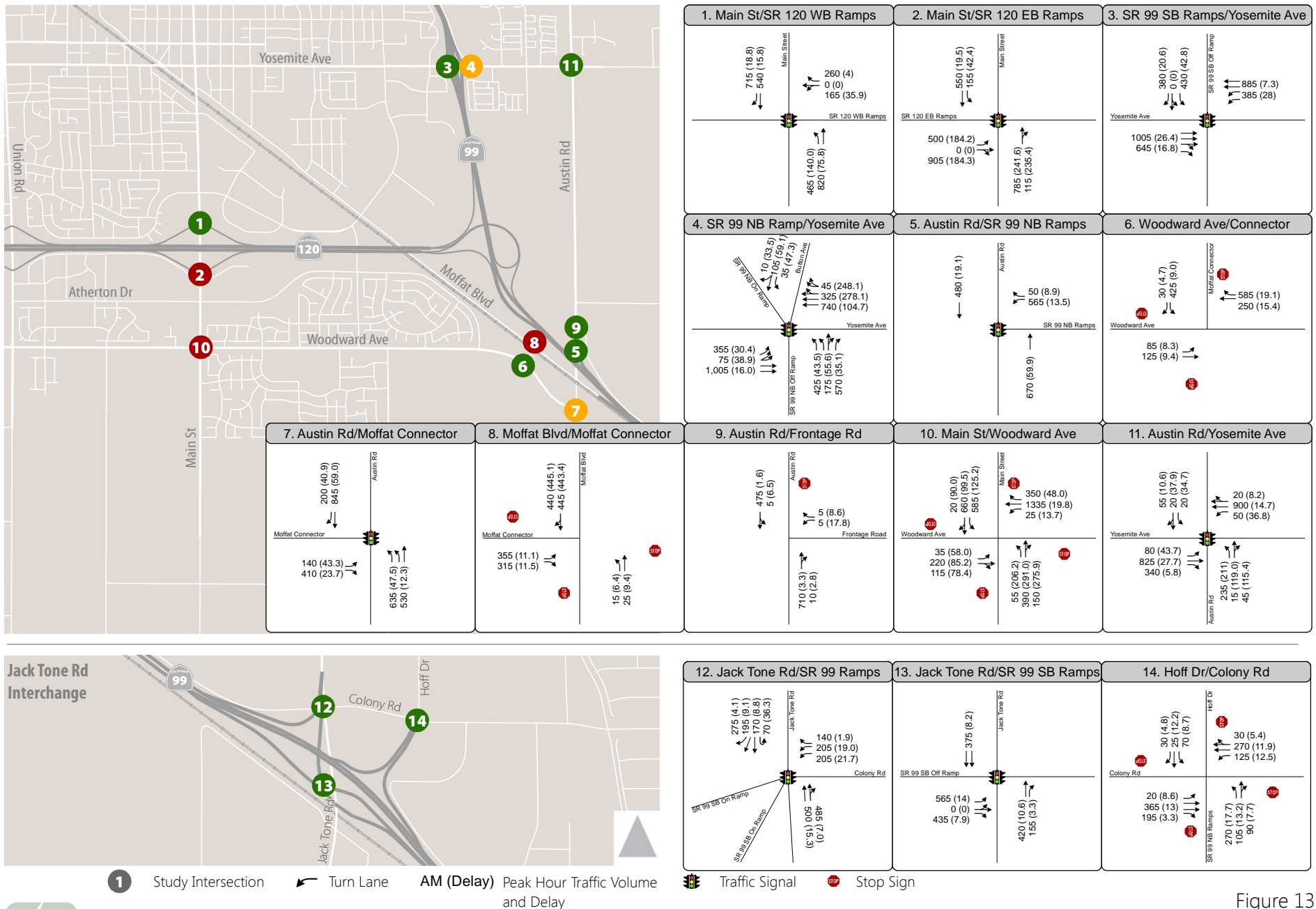


Figure 13

Peak Hour Traffic Volumes and Lane Configurations - Construction Year 2023 With Phase 1A Project PM Peak Hour Conditions

The primary conclusions of the PM peak hour analysis are (continued):

13. In order to improve PM peak hour operations at the Moffat Blvd / Woodward Ave Connector intersection, the intersection should be signalized;
14. With this improvements, the Moffat Blvd / Woodward Ave Connector intersection would improve from LOS F to LOS c conditions during the PM peak hour;
15. In order to improve PM peak hour operations at the Woodward Avenue / Main Street intersection, the intersection should be signalized;
16. With this improvements, the Woodward Avenue / Main Street intersection would improve from LOS F to LOS C conditions during the PM peak hour; and
17. The one (1) side street stop controlled intersection is projected to operate at LOS B conditions.

Table 11 presents the 95th Percentile Queue Length by Movement for the following eleven (11) study intersections. It should be noted that the three study intersections at the SR 99 / Jack Tone interchange were not evaluated since the Phase 1A Project does not close the NB SR 99 off-ramp to Austin Road or the SB SR 99 on-ramp from Austin Road.

- | | |
|--------------------------------------|--|
| 1. SR 120 EB Ramps / Main Street; | 7. Austin Road / Moffat Connector; |
| 2. SR 120 WB Ramps / Main Street; | 8. Moffat Blvd / Moffat Connector; |
| 3. SR 99 NB Ramps / Yosemite Avenue; | 9. Austin Road / Frontage Road; |
| 4. SR 99 SB Ramps / Yosemite Avenue; | 10. Woodward Avenue / Main Street; and |
| 5. SR 99 NB Ramps / Austin Road; | 11. Austin Road / Yosemite Avenue. |
| 6. Woodward Avenue / Connector; | |

The primary results of the Construction Year 2023 With Phase 1A Project AM Peak 95th Percentile Queue Length by Movement analysis are:

- Sixty-seven (67) of the eighty-two (82) movements have 95th Percentile queue lengths less than the available storage; and
- Fifteen (15) of the eighty-two (82) movements (18.3%) have 95th Percentile queue lengths greater than the available storage.
- This represents a decrease in six (6) movements and an 8.3% decrease when compared to Construction Year 2023 No Project AM Peak Hour Conditions.

The primary results of the Construction Year 2023 With Phase 1A Project PM Peak 95th Percentile Queue Length by Movement analysis are:

- Sixty-one (61) of the eighty-two (82) movements have 95th Percentile queue lengths less than the available storage; and
- Twenty-one (21) of the eighty-two (82) movements (25.6%) have 95th Percentile queue lengths greater than the available storage.
- This represents an increase in two (2) movements and a 1.5% increase when compared to Construction Year 2023 No Project PM Peak Hour Conditions.

**TABLE 11: 95TH PERCENTILE QUEUE LENGTH BY MOVEMENT
– CONSTRUCTION YEAR 2023 WITH PHASE 1A PROJECT**

Intersection	Movement	Available Storage (Feet)	AM Peak Hour	PM
				Peak Hour
1. WB SR 120 Ramps / Main Street	WB LT / TH	1,740	107	176
	WB RT	175	0	42
	NB LT	230	362	333
	NB TH	1,451	1,469	1,544
	SB TH	1,920	281	310
	SB RT	1,920	640	391
2. EB SR 120 Ramps / Main Street	EB LT	1,732	1,463	1,995
	EB TH / RT	190	318	254
	NB TH / RT	1,371	1,479	1,529
	SB LT	230	213	189
	SB TH	1,451	281	308
3. SB SR 99 Ramps / Yosemite Avenue	EB TH	1,830	589	296
	EB TH	1,830	393	283
	EB TH / RT	1,830	366	301
	EB RT	365	212	274
	WB TH	335	259	268
	WB TH	335	235	191
	WB RT	335	71	164
	WB RT	335	68	176
	SB LT	350	165	238
	SB LT / RT	1,010	195	273
4. NB SR 99 Ramps / Yosemite Avenue	SB RT	350	236	234
	EB LT	335	370	311
	EB LT	335	415	285
	EB TH	335	311	296
	EB TH	335	213	294
	WB TH	1,667	891	959
	WB TH	1,667	867	1,286
	WB TH / RT	1,667	739	1,489
	WB RT	265	276	378
	NB LT	350	242	240
	NB LT	962	265	272
	NBTH / RT	962	342	403
	NB RT	350	299	355
	SB LT	823	81	102
	SB LT/ TH	170	170	169

**TABLE 11: 95TH PERCENTILE QUEUE LENGTH BY MOVEMENT
– CONSTRUCTION YEAR 2023 WITH PHASE 1A PROJECT (CONTINUED)**

Intersection	Movement	Available Storage (Feet)	AM	PM
			Peak Hour	Peak Hour
5. NB SR 99 Ramps / Austin Road	WB LT	558	267	231
	WB RT	25	108	0
	NB LT / TH	1,718	179	89
	SB TH	433	175	812
	SB RT	25	0	276
6. Woodward Avenue / Connector	EB LT	150	65	65
	EB TH	1,167	82	71
	WB TH	1,672	85	148
	WB RT	1,672	218	269
	SB LT	380	77	108
	SB RT	150	29	38
7. Austin Road / Moffat Connector	EB LT	150	157	184
	EB RT	1,672	338	270
	NB LT	250	203	266
	NB LT	250	223	276
	NB TH	1,222	69	376
	SB TH	1,718	362	1,288
	SB RT	250	199	362
8. Moffat Blvd / Moffat Connector	EB LT	380	160	163
	EB RT	45	76	77
	NB LT	150	31	38
	NB TH	572	48	48
	SB TH / RT	842	304	5,704
9. Frontage Road / Austin Road	WB LT	767	19	26
	WB RT	25	28	29
	NB TH / RT	433	6	7
	SB LT / TH	804	22	55

**TABLE 11: 95TH PERCENTILE QUEUE LENGTH BY MOVEMENT
– CONSTRUCTION YEAR 2023 WITH PHASE 1A PROJECT (CONTINUED)**

Intersection	Movement	Available Storage (Feet)	AM Peak Hour	PM
				Peak Hour
10. Woodward Avenue / Main Street	EB LT	95	53	148
	EB TH / RT	612	95	551
	WB LT	175	51	44
	WB TH	2,096	1,253	120
	WB RT	2,096	2,149	381
	NB LT	250	369	393
	NB TH / RT	6,463	5,863	1,850
	SB LT	250	313	276
	SB TH / RT	522	746	579
11. Yosemite Avenue / Austin Road	EB LT	250	123	233
	EB TH	1,717	179	765
	EB RT	1,717	72	443
	WB LT	470	59	79
	WB TH	1,382	222	259
	WB TH / RT	270	189	241
	NB LT	225	288	306
	NB TH / RT	1,120	539	1,019
	SB LT	225	39	53
	SB TH / RT	1,043	70	86

Results Based on 12 SimTraffic Version 10 Model Runs

BOLD denotes 95th Percentile Queue Length Exceeds Available Storage

Table 12 presents the total network performance measures of effectiveness for the Synchro / SimTraffic Models for Construction Year 2023 With Phase 1A Project AM and PM Peak Hour Conditions.

When compared to Construction Year 2023 No Project Conditions, the following benefits of the SR 120 / SR 99 Interchange With Phase 1A Project were identified for AM Peak Hour Conditions:

- Total Vehicle Hours of Delay (VHD) would decrease by 55.7% from 1,019 to 451. This is a result of elimination of grid-lock conditions within the project study area;
- Total Stops would increase by 8.9% from 19,284 to 20,994. This is a result of additional intersections that would be constructed as part of the Phase 1A Project in addition to the closure of the Northbound SR 99 off-ramp to Austin Road and the closure of the Southbound SR off-ramp to Moffat Boulevard;
- Vehicle Miles Traveled (VMT) would decrease by 3.5% from 12,903 to 12,456. This is a result of elimination of grid-lock conditions and the ability for vehicles to move in the project study area;
- Vehicle Hours Traveled (VHT) would decrease by 30.8% from 1,432 to 991. This is a result of improved mobility within the project study area;
- Fuel Consumption would decrease 14.3%, from 628 to 538 gallons, resulting in 1,710 fewer pounds of vehicle emissions;
- Average speed would increase 66.7% from 9 mph to 15 mph. This is a result of elimination of grid-lock conditions within the project study area;
- Vehicles Entering the Network would increase 9.3%, from 15,274 to 16,688, and Vehicles Exiting the Network would increase 16.8%, from 14,011 to 16,371. This is a result of elimination of grid-lock conditions and improved mobility in the project study area; and
- Percent (%) Demand Served would increase 6.4%, from 91.7% to 98.1%. This shows that the Phase 1A Project is meeting the purpose and need of the SR 120 / SR 99 Interchange Project.

When compared to Construction Year 2023 No Project Conditions, the following benefits of the SR 120 / SR 99 Interchange With Phase 1A Project were identified for PM Peak Hour Conditions:

- Total Vehicle Hours of Delay (VHD) would decrease by 44.4% from 1,235 to 687. This is a result of elimination of grid-lock conditions within the project study area;
- Total Stops would increase by 21.5% from 21,157 to 25,696. This is a result of additional intersections that would be constructed as part of the Phase 1A Project in addition to the closure of the Northbound SR 99 off-ramp to Austin Road and the closure of the Southbound SR off-ramp to Moffat Boulevard;

**TABLE 12: TOTAL NETWORK PERFORMANCE
CONSTRUCTION YEAR 2023 WITH PHASE 1A PROJECT CONDITIONS**

Measure of Effectiveness	Based on 12 SimTraffic Model Runs	
	AM Peak Hour	PM Peak Hour
Total Vehicle Hours of Delay (VHD)	451 (-55.7%)	687 (-44.4%)
Total Stops	20,994 (+8.9%)	25,696 (+21.5%)
Vehicle Miles of Travel (VMT)	12,456 (-3.5%)	15,603 (-21.4%)
Vehicle Hours Travelled (VHT)	991 (-30.8%)	1,668 (-9.1%)
Total Fuel Consumption	538 (-14.3%)	757 (-11.3%)
Total Vehicle Emissions (lbs of CO2)	10,222 (-14.3%)	14,383 (-11.3%)
Average Speed (MPH)	15 (+66.7%)	13 (+18.2%)
Vehicles Entering Network in Peak Hour	16,688 (+9.3%)	19,965 (+7.0%)
Vehicles Entering Network in Peak Hour	16,371 (+16.8%)	19,485 (+14.8%)
Percent (%) Demand Served	98.1% (+6.4%)	97.6% (+6.6%)

Source: Results Based on 12 SimTraffic Version 10 Model Runs

When compared to Construction Year 2023 No Project Conditions, the following benefits of the SR 120 / SR 99 Interchange Project were identified for PM Peak Hour Conditions (continued):

- Vehicle Miles Traveled (VMT) would decrease by 21.4% from 19,845 to 15,603. This is a result of elimination of grid-lock conditions and the ability for vehicles to move in the project study area;
- Vehicle Hours Traveled (VHT) would decrease by 9.1% from 1,835 to 1,668. This is a result of improved mobility within the project study area;
- Fuel Consumption would decrease 11.3%, from 853 to 757 gallons, resulting in 1,824 fewer pounds of vehicle emissions;
- Average speed would increase 18.2% from 11 mph to 13 mph. This is a result of elimination of grid-lock conditions within the project study area;
- Vehicles Entering the Network would increase 7.0%, from 18,653 to 19,965, and Vehicles Exiting the Network would increase 14.8%, from 16,975 to 19,485. This is a result of elimination of grid-lock conditions and improved mobility in the project study area; and
- Percent (%) Demand Served would increase 6.6%, from 91.0% to 97.6%. This shows that the Phase 1A Project is meeting the purpose and need of the SR 120 / SR 99 Interchange Project.

CONSTRUCTION YEAR 2023 WITH IMPROVED PHASE 1A PROJECT

The following Appendices contain the Construction Year 2023 with Improved Phase 1A Project conditions analysis:

- Appendix LL – Construction Year 2023 With Improved Phase 1A Project Conditions – AM Peak Hour Synchro / SimTraffic Input Data and SimTraffic Analysis Results Based on 12 SimTraffic Model Runs; and
- Appendix MM – Construction Year 2023 With Improved Phase 1A Project Conditions – PM Peak Hour Synchro / SimTraffic Input Data and SimTraffic Analysis Results Based on 12 SimTraffic Model Runs.

Figure 14 presents the Construction Year 2023 With Improved Phase 1A Project AM Peak Hour Traffic Volumes, Delay by Movement and Intersection Configurations and Control. It also shows the intersections operating at acceptable level of service condition A, B, C, or D in green, marginal level of service condition E in yellow and unacceptable level of service condition F in red.

Table 13 presents the results of the Construction Year 2023 With Improved Phase 1A Project AM and PM Peak Hour Intersection Level of Service Analysis.

The primary conclusions of the AM peak hour analysis are:

1. During the AM peak hour, all seven (7) signalized intersections (100.0) are projected to continue to operate at acceptable LOS A, C or D conditions;
2. Compared to the No Project Alternative, this represents a 14.3% improvement with the Improved Phase 1A Project.
3. With five (5) of the six (6) all-way stop controlled intersections signalized, they would all operate at acceptable A,B or C conditions:
 - a. NB SR 99 Off-Ramp / Austin Road;
 - b. Woodward Avenue / Connector;
 - c. Austin Road / Moffat Connector;
 - d. Moffat Blvd / Moffat Connector; and
 - e. Woodward Avenue / Main Street.
4. This will result in all twelve (12) signalized intersections operating at acceptable LOS A, B, C or D conditions;
5. The one (1) side street stop controlled intersection is projected to operate at LOS A conditions;
6. The one (1) all way stop controlled intersection is projected to operate at LOS B conditions; and
7. Compared to the No Project Alternative, this represents a 100.0% improvement with the Improved Phase 1A Project.

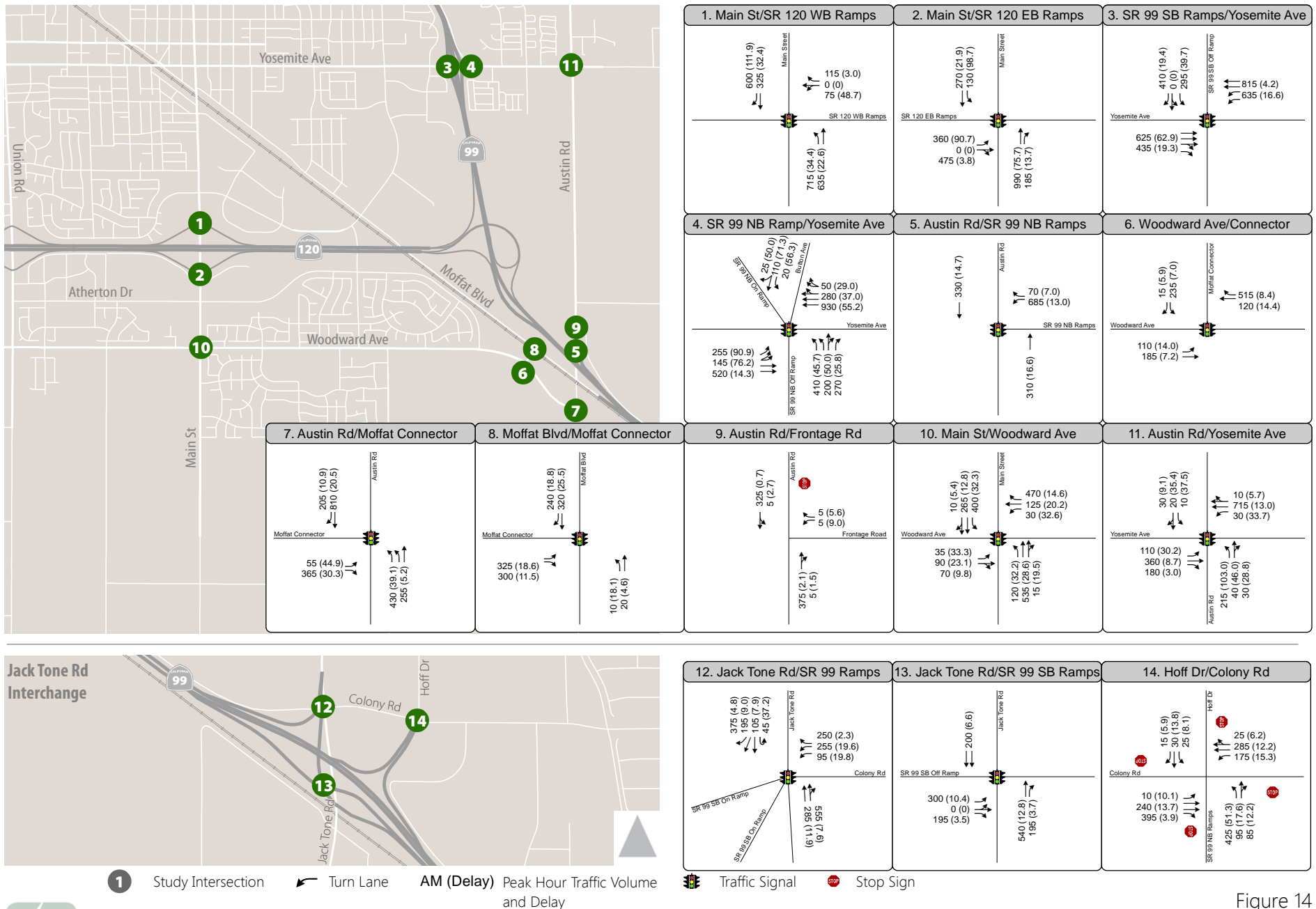


Figure 14

Peak Hour Improved Traffic Volumes and Lane Configurations -

Acceptable Level of Service - **A**, **B**, **C** and **D**

Unacceptable Level of Service - **E** and **F**

Construction Year 2023 With Improved Phase 1A Project AM Peak Hour Conditions

**TABLE 13: INTERSECTION ANALYSIS – CONSTRUCTION YEAR 2023 WITH IMPROVED PHASE 1A PROJECT
AM AND PM PEAK HOUR CONDITIONS**

Intersection	Control	AM Peak Hour		PM Peak Hour	
		Delay / Movement (sec/veh)	LOS	Delay / Movement (sec/veh)	LOS
1. WB SR 120 Ramps / Main Street	Signal	49.0	D	35.3	D
2. EB SR 120 Ramps / Main Street	Signal	54.4	D	49.8	D
3. SB SR 99 Ramps / Yosemite Avenue	Signal	25.4	C	21.9	C
4. NB SR 99 Ramps / Yosemite Avenue	Signal	46.7	D	42.1	D
5. NB SR 99 Ramps / Austin Road	Signal	13.9	B	21.3	C
6. Woodward Avenue / Connector	Signal	9.0	A	19.5	B
7. Austin Road / Moffat Connector	Signal	23.8	C	46.6	D
8. Moffat Blvd / Moffat Connector	Signal	12.3	B	24.6	C
9. Frontage Road / Austin Road	Side-Street Stop Controlled	9.0 (WB Left-Turn)	A	15.6 (WB Left-Turn)	C
10. Woodward Avenue / Main Street	Signal	23.1	C	26.8	C
11. Yosemite Avenue / Austin Road	Signal	24.9	C	41.7	D
12. NB SR 99 Ramps / Jack Tone Road	Signal	9.8	A	12.1	B
13. SB SR 99 Ramps / Jack Tone Road	Signal	8.9	A	9.8	A
14. NB SR 99 Ramps / Colony Road	All Way Stop Controlled	19.9	B	11.0	B

Source: *Highway Capacity Manual* (Transportation Research Board, 6th Edition).
Results Based on 12 SimTraffic Version 10 Model Runs

BOLD denotes unacceptable Level of Service (LOS)

Figure 15 presents the Construction Year 2023 With Improved Phase 1A Project PM Peak Hour Traffic Volumes, Delay by Movement and Intersection Configurations and Control. It also shows the intersections operating at acceptable level of service condition A, B, C, or D in green, marginal level of service condition E in yellow and unacceptable level of service condition F in red.

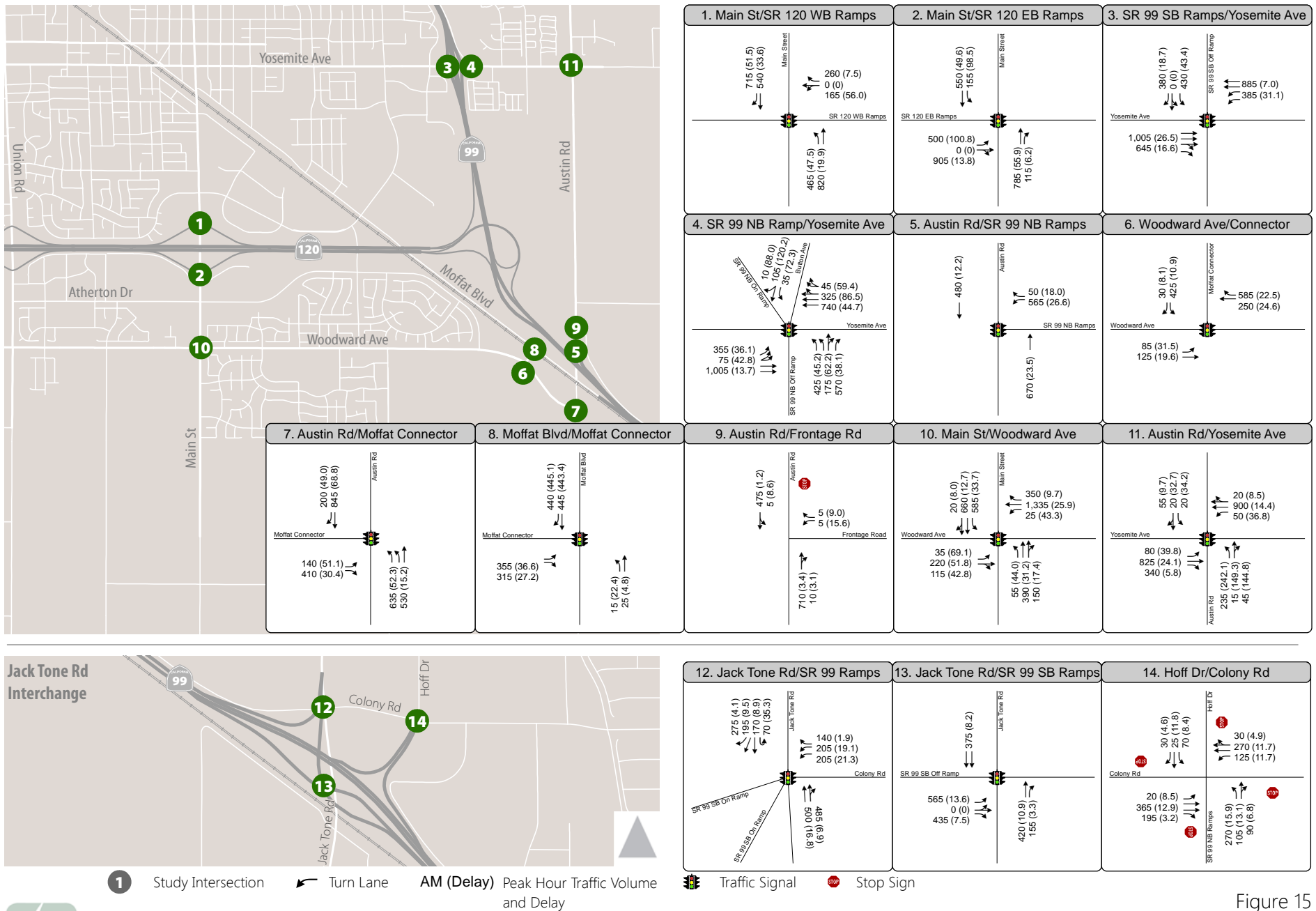


Figure 15

Acceptable Level of Service - **A**, **B**, **C** and **D**

Unacceptable Level of Service - **E** and **F**

Peak Hour Improved Traffic Volumes and Lane Configurations - Construction Year 2023 With Improved Phase 1A Project PM Peak Hour Conditions

The primary conclusions of the PM peak hour analysis are:

1. During the PM peak hour, all seven (7) signalized intersections (100%) are projected to continue to operate at acceptable LOS A, C or D conditions;
2. With five (5) of the six (6) all-way stop controlled intersections signalized, they would all operate at acceptable B, C or D conditions:
 - a. NB SR 99 Off-Ramp / Austin Road;
 - b. Woodward Avenue / Connector;
 - c. Austin Road / Moffat Connector;
 - d. Moffat Blvd / Moffat Connector; and
 - e. Woodward Avenue / Main Street.
3. This will result in all twelve (12) signalized intersections operating at acceptable LOS A, B, C or D conditions;
4. The one (1) side street stop controlled intersection is projected to operate at LOS C conditions;
5. The one (1) all way stop controlled intersection is projected to operate at LOS B conditions; and
6. Compared to the No Project Alternative, this represents a 100.0% improvement with the Improved Phase 1A Project.

Table 14 presents the 95th Percentile Queue Length by Movement for the following eleven (11) study intersections. It should be noted that the three study intersections at the SR 99 / Jack Tone interchange were not evaluated since the Phase 1A Project does not close the NB SR 99 off-ramp to Austin Road or the SB SR 99 on-ramp from Austin Road.

- | | |
|--------------------------------------|---|
| 1. SR 120 EB Ramps / Main Street; | 7. Austin Road / Moffat Connector; |
| 2. SR 120 WB Ramps / Main Street; | 8. Moffat Boulevard / Moffat Connector; |
| 3. SR 99 NB Ramps / Yosemite Avenue; | 9. Austin Road / Frontage Road; |
| 4. SR 99 SB Ramps / Yosemite Avenue; | 10. Woodward Avenue / Main Street; and |
| 5. SR 99 NB Ramps / Austin Road; | 11. Austin Road / Yosemite Avenue. |
| 6. Woodward Avenue / Connector; | |

The primary results of the Construction Year 2023 With Improved Phase 1A Project AM Peak 95th Percentile Queue Length by Movement analysis are:

- Seventy-seven (77) of the eighty-five (85) movements have 95th Percentile queue lengths less than the available storage; and
- Eight (8) of the eighty-five (85) movements (9.4%) have 95th Percentile queue lengths greater than the available storage.
- This represents a decrease in thirteen (13) movements and a 17.2% improvement when compared to Construction Year 2023 No Project AM Peak Hour Conditions.

**TABLE 14: 95TH PERCENTILE QUEUE LENGTH BY MOVEMENT
– CONSTRUCTION YEAR 2023 WITH IMPROVED PHASE 1A PROJECT**

Intersection	Movement	Available Storage (Feet)	AM	PM
			Peak Hour	Peak Hour
1. WB SR 120 Ramps / Main Street	WB LT / TH	1,740	123	309
	WB RT	175	0	106
	NB LT	230	354	355
	NB TH	1,456	890	758
	SB TH	1,920	884	757
	SB RT	1,920	1,333	934
2. EB SR 120 Ramps / Main Street	EB LT	1,736	697	985
	EB TH / RT	1,000	292	406
	NB TH	1,369	1,555	1,018
	NB RT	950	1,058	502
	SB LT	230	245	302
	SB TH	1,456	336	980
3. SB SR 99 Ramps / Yosemite Avenue	EB TH	1,830	622	323
	EB TH	1,830	423	289
	EB TH / RT	1,830	371	304
	EB RT	365	196	273
	WB TH	335	231	262
	WB TH	335	206	205
	WB RT	335	65	149
	WB RT	335	59	164
	SB LT	350	176	238
	SB LT / RT	1,010	203	264
4. NB SR 99 Ramps / Yosemite Avenue	SB RT	350	249	217
	EB LT	335	363	329
	EB LT	335	414	320
	EB TH	335	309	263
	EB TH	335	222	263
	WB TH	1,667	693	372
	WB TH	1,667	628	468
	WB TH / RT	1,667	521	578
	WB RT	265	231	367
	NB LT	350	244	238
	NB LT	962	273	268
	NBTH / RT	962	321	435
	NB RT	350	278	385
	SB LT	823	165	285
	SB LT/ TH	170	198	212

**TABLE 14: 95TH PERCENTILE QUEUE LENGTH BY MOVEMENT
– CONSTRUCTION YEAR 2023 WITH IMPROVED PHASE 1A PROJECT (CONTINUED)**

Intersection	Movement	Available Storage (Feet)	AM	PM
			Peak Hour	Peak Hour
5. NB SR 99 Ramps / Austin Road	WB LT	558	269	423
	WB RT	200	111	169
	NB LT / TH	1,718	170	354
	SB TH	433	174	200
6. Woodward Avenue / Connector	EB LT	150	87	104
	EB TH	1,167	83	123
	WB TH	1,672	99	265
	WB RT	1,672	146	442
	SB LT	380	102	205
	SB RT	150	25	53
7. Austin Road / Moffat Connector	EB LT	150	151	205
	EB RT	1,672	305	397
	NB LT	250	208	279
	NB LT	250	228	289
	NB TH	1,222	78	584
	SB TH	1,718	374	1,465
	SB RT	250	194	356
8. Moffat Blvd / Moffat Connector	EB LT	367	308	448
	EB RT	45	85	82
	NB LT	150	28	36
	NB TH	572	22	27
	SB TH	842	139	235
	SB RT	200	74	176
9. Frontage Road / Austin Road	WB LT	767	22	24
	WB RT	25	27	29
	NB TH / RT	433	4	10
	SB LT / TH	804	17	45

**TABLE 14: 95TH PERCENTILE QUEUE LENGTH BY MOVEMENT
– CONSTRUCTION YEAR 2023 WITH IMPROVED PHASE 1A PROJECT (CONTINUED)**

Intersection	Movement	Available Storage (Feet)	AM Peak Hour	PM
				Peak Hour
10. Woodward Avenue / Main Street	EB LT	95	66	113
	EB TH / RT	600	121	430
	WB LT	175	56	58
	WB TH	2,084	106	130
	WB RT	2,084	217	144
	NB LT	250	116	85
	NB TH	6,464	181	169
	NB TH / RT	6,434	188	159
	SB LT	250	275	315
	SB TH	523	235	517
	SB TH / RT	523	126	316
11. Yosemite Avenue / Austin Road	EB LT	250	117	230
	EB TH	1,717	173	589
	EB RT	1,717	72	210
	WB LT	470	57	81
	WB TH	1,382	218	269
	WB TH / RT	270	193	238
	NB LT	225	284	304
	NB TH / RT	1,120	489	1,133
	SB LT	225	38	56
	SB TH / RT	1,043	75	79

Results Based on 12 SimTraffic Version 10 Model Runs

BOLD denotes 95th Percentile Queue Length Exceeds Available Storage

The primary results of the Construction Year 2023 With Improved Phase 1A Project PM Peak 95th Percentile Queue Length by Movement analysis are:

- Seventy-two (72) of the eighty-five (85) movements have 95th Percentile queue lengths less than the available storage; and
- Thirteen (13) of the eighty-five (85) movements (15.3%) have 95th Percentile queue lengths greater than the available storage.
- This represents a decrease in six (6) movements and an 8.8% improvement when compared to Construction Year 2023 No Project PM Peak Hour Conditions.

Table 15 presents the total network performance measures of effectiveness for the Synchro / SimTraffic Models for Construction Year 2023 With Improved Phase 1A Project AM and PM Peak Hour Conditions.

**TABLE 15: TOTAL NETWORK PERFORMANCE
CONSTRUCTION YEAR 2023 WITH IMPROVED PHASE 1A PROJECT CONDITIONS**

Measure of Effectiveness	Based on 12 SimTraffic Model Runs	
	AM Peak Hour	PM Peak Hour
Total Vehicle Hours of Delay (VHD)	236 (-76.8%)	308 (-75.1%)
Total Stops	18,056 (-6.4%)	22,744 (+7.5%)
Vehicle Miles of Travel (VMT)	13,222 (+2.5%)	16,856 (-15.1%)
Vehicle Hours Travelled (VHT)	655 (-54.3%)	842 (-54.1%)
Total Fuel Consumption	481 (-23.4%)	608 (-28.7%)
Total Vehicle Emissions (lbs of CO ₂)	9,139 (-23.4%)	11,552 (-28.7%)
Average Speed (MPH)	21 (+133.0%)	20 (+81.8%)
Vehicles Entering Network in Peak Hour	16,934 (+10.9%)	20,934 (+12.2%)
Vehicles Entering Network in Peak Hour	16,852 (+20.3%)	20,905 (+23.2%)
Percent (%) Demand Served	99.5 (+7.8%)	99.9 (+8.9%)

Source: Results Based on 12 SimTraffic Version 10 Model Runs

When compared to Construction Year 2023 No Project Conditions, the following benefits of the SR 120 / SR 99 Interchange With Improved Phase 1A Project were identified for AM Peak Hour Conditions:

- Total Vehicle Hours of Delay (VHD) would decrease by 76.8% from 1,019 to 236. This is a result of elimination of grid-lock conditions within the project study area;
- Total Stops would decrease by 6.4% from 19,284 to 18,056. This is a result of additional intersections that would be constructed as part of the Phase 1A Project in addition to the closure of the Northbound SR 99 off-ramp to Austin Road and the closure of the Southbound SR off-ramp to Moffat Boulevard;
- Vehicle Miles Traveled (VMT) would increase by 2.5% from 12,903 to 13,222. This is a result of elimination of grid-lock conditions and the ability for vehicles to move in the project study area;

- Vehicle Hours Traveled (VHT) would decrease by 54.3% from 1,432 to 655. This is a result of improved mobility within the project study area;
- Fuel Consumption would decrease 23.4%, from 628 to 481 gallons, resulting in 2,793 fewer pounds of vehicle emissions;
- Average speed would increase 133.0% from 9 mph to 21 mph. This is a result of elimination of grid-lock conditions within the project study area;
- Vehicles Entering the Network would increase 10.9%, from 15,274 to 16,934, and Vehicles Exiting the Network would increase 20.3%, from 14,011 to 16,852. This is a result of elimination of grid-lock conditions and improved mobility in the project study area; and
- Percent (%) Demand Served would increase 7.8%, from 91.7% to 99.5%. This shows that the Phase 1A Project is meeting the purpose and need of the SR 120 / SR 99 Interchange Project.

When compared to Construction Year 2023 No Project Conditions, the following benefits of the SR 120 / SR 99 Interchange With Improved Phase 1A Project were identified for PM Peak Hour Conditions:

- Total Vehicle Hours of Delay (VHD) would decrease by 75.1% from 1,235 to 308. This is a result of elimination of grid-lock conditions within the project study area;
- Total Stops would increase by 7.5% from 21,157 to 22,744. This is a result of additional intersections that would be constructed as part of the Phase 1A Project in addition to the closure of the Northbound SR 99 off-ramp to Austin Road and the closure of the Southbound SR off-ramp to Moffat Boulevard;
- Vehicle Miles Traveled (VMT) would decrease by 15.1% from 19,845 to 16,856. This is a result of elimination of grid-lock conditions and the ability for vehicles to move in the project study area;
- Vehicle Hours Traveled (VHT) would decrease by 54.1% from 1,835 to 842. This is a result of improved mobility within the project study area;
- Fuel Consumption would decrease 28.7%, from 853 to 608 gallons, resulting in 4,655 fewer pounds of vehicle emissions;
- Average speed would increase 81.8% from 11 mph to 20 mph. This is a result of elimination of grid-lock conditions within the project study area;
- Vehicles Entering the Network would increase 12.2%, from 18,653 to 20,934, and Vehicles Exiting the Network would increase 23.2%, from 16,975 to 20,905. This is a result of elimination of grid-lock conditions and improved mobility in the project study area; and
- Percent (%) Demand Served would increase 8.9%, from 91.0% to 99.9%. This shows that the Phase 1A Project is meeting the purpose and need of the SR 120 / SR 99 Interchange Project.

6. DESIGN YEAR 2043 TRAFFIC OPERATIONS

This chapter presents the traffic operations analysis results for No Build, With Phase 1A and With Ultimate Project alternatives under Design Year 2043 AM and PM Peak Hour conditions.

DESIGN YEAR 2040 NO PROJECT CONDITIONS

The following Appendices contain the Design Year 2043 No Project conditions analysis:

- Appendix S – Design Year 2043 No Project Conditions – AM Peak Hour - Eastbound SR 120 and Southbound SR 99 HCS Freeway Mainline, On-Ramp Merge, Off-Ramp Diverge Analysis and Weaving Section Analysis;
- Appendix T – Design Year 2043 No Project Conditions – AM Peak Hour - Northbound SR 99 and Westbound SR 120 HCS Freeway Mainline, On-Ramp Merge, Off-Ramp Diverge Analysis and Weaving Section Analysis;
- Appendix U – Design Year 2043 No Project Conditions – PM Peak Hour - Eastbound SR 120 and Southbound SR 99 HCS Freeway Mainline, On-Ramp Merge, Off-Ramp Diverge Analysis and Weaving Section Analysis;
- Appendix V – Design Year 2043 No Project Conditions – PM Peak Hour - Northbound SR 99 and Westbound SR 120 HCS Freeway Mainline, On-Ramp Merge, Off-Ramp Diverge Analysis and Weaving Section Analysis;
- Appendix EE – Design Year 2043 No Project Conditions – AM Peak Hour Synchro / SimTraffic Input Data and SimTraffic Analysis Results Based on 12 SimTraffic Model Runs; and
- Appendix FF – Design Year 2043 No Project Conditions – PM Peak Hour Synchro / SimTraffic Input Data and SimTraffic Analysis Results Based on 12 SimTraffic Model Runs.

Figure 16A and 16B present the Design Year 2043 No Project AM Peak Hour Conditions and provide the following information:

- Design Year 2043 No Project AM Peak Hour Volume;
- Design Year 2043 No Project HCS 6th Edition AM Peak Hour Density;
- Freeway Mainline Lanes, Off-Ramp Lane(s) and On-Ramp Lane(s); and
- Design Year 2043 No Project HCS 6th Edition AM Peak Hour HCS 6th Edition Level of Service.
Acceptable Level of Service A through D are shown in Green;
Unacceptable / Marginal Level of Service E is shown in Yellow; and
Unacceptable Level of Service F is shown in Red.

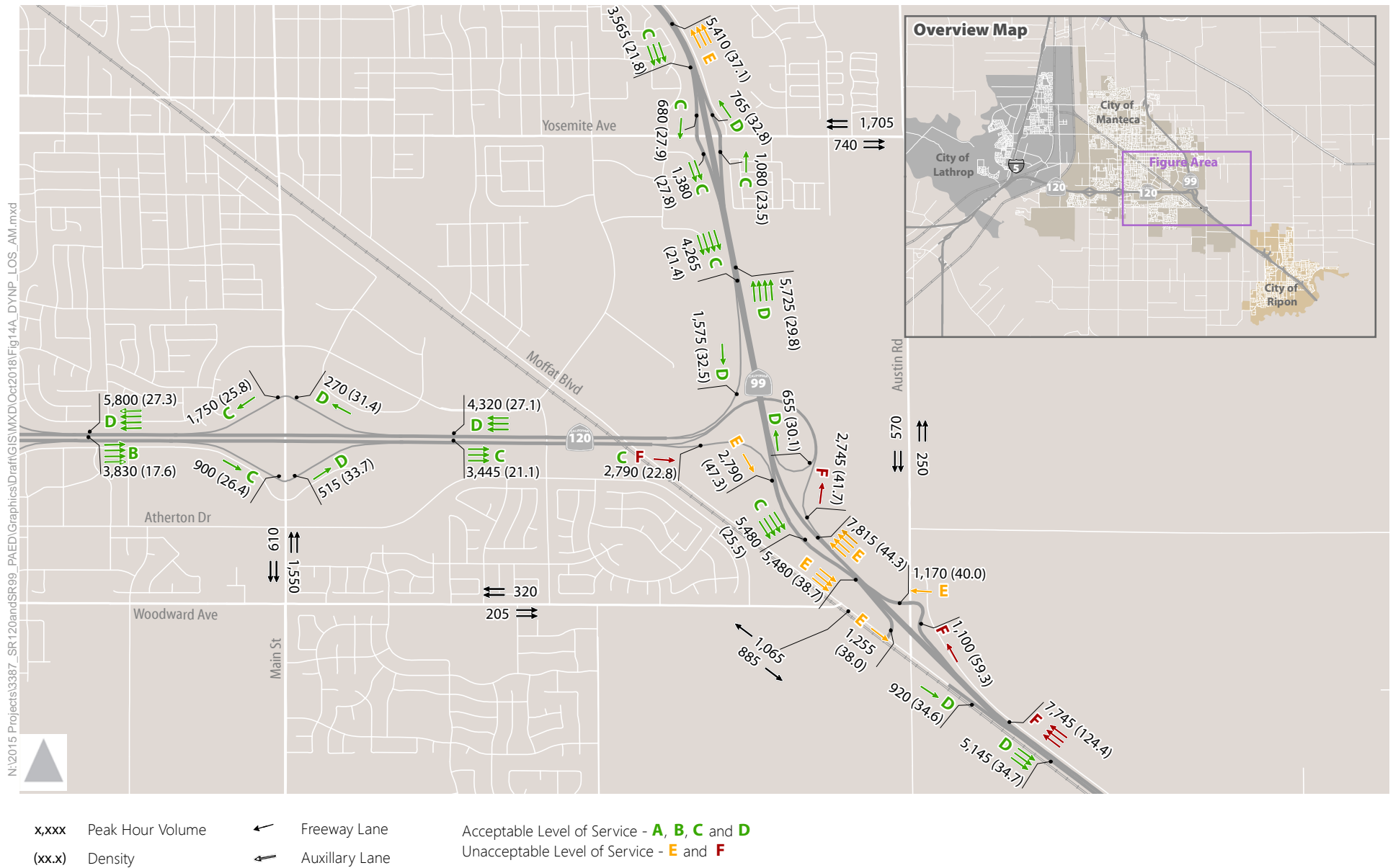
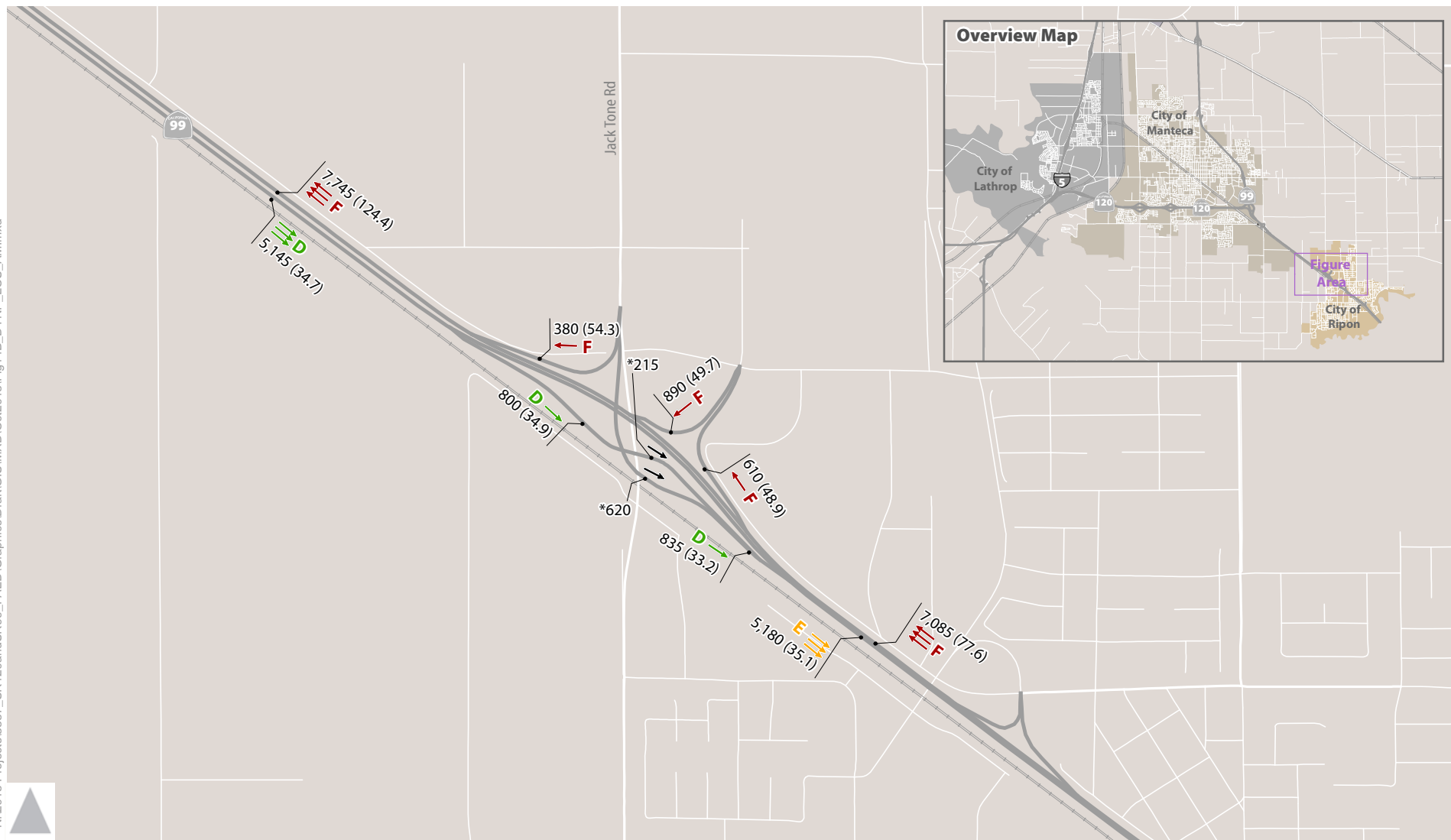


Figure 16A

AM Peak Hour Freeway Volume and Level of Service -
Design Year 2043 No Project Conditions



x,xxx Peak Hour Volume
 (xx.x) Density
 ← Freeway Lane

Acceptable Level of Service - **A, B, C** and **D**
 Unacceptable Level of Service - **E** and **F**

Note: (*) Indicates a non-freeway segment.

Figure 16B
 AM Peak Hour Freeway Volume and Level of Service -
 Design Year 2043 No Project Conditions

The primary conclusions of the Design Year 2043 No Project analysis presented in Figure 16A are:

1. During the AM peak hour, the directional split on SR 120 is projected to continue to be approximately 60% westbound and 40% eastbound;
2. During the morning peak hour, NB SR 99 between Jack Tone Road and SR 120 is projected to degrade to LOS F conditions;
3. The NB SR 99 off-ramp to Austin Road is projected to degrade to LOS F conditions;
4. The NB SR 99 on-ramp from Austin Road is projected to degrade to LOS E conditions;
5. The NB SR 99 to WB SR 120 freeway-to-freeway ramp is projected to continue to operate at LOS F conditions;
6. The EB SR 120 mainline from the Main Street on-ramp to SR 99 is projected to operate at LOS C conditions;
7. It should be noted that with a density of 22.8 pcpmpl, the off-ramp diverge would be LOS C. But because the capacity of the single lane off-ramp (2,100 vehicles) exceeded by the 2,790 vehicles exiting eastbound SR 120 onto southbound SR 99, the single lane off-ramp to southbound SR 99 operates at LOS F conditions.
8. With the heavy on-ramp traffic entering southbound SR 99 from the single lane eastbound SR 99 on-ramp, the SB SR 99 merge section operates at LOS E conditions;
9. The SB SR 99 mainline segment before the Austin Road off-ramp is projected to degrade to LOS E conditions;
10. The SB SR 99 off-ramp to Austin Road is projected to degrade to LOS E conditions; and
11. The remaining 20 of the 30 study segments (66.7%) operates at acceptable Level of Service B, C, or D conditions.

The primary conclusions of the Design Year 2043 No Project analysis presented in Figure 16B are:

1. During the AM peak hour, the directional split on SR 99 is projected to increase to approximately 60% northbound and 40% southbound;
2. During the morning peak hour, all five (100%) NB SR 99 study segments are projected to degrade to LOS F conditions;
3. Four of the five SB SR 99 study segments are projected to continue to operate at acceptable Level of Service D conditions;
4. The SB SR 99 mainline south of the Jack Tone Road on-ramp is projected to degrade to LOS E conditions;
5. Overall, three (3) of the (9) study segments (33.3%) are projected to operate at acceptable Level of Service conditions.

Figures 17A and 17B present the Design Year 2043 No Project PM Peak Hour Conditions and provide the following information:

- Design Year 2043 No Project PM Peak Hour Volume;
 - Design Year 2043 No Project HCS 6th Edition PM Peak Hour Density;
 - Freeway Mainline Lanes, Off-Ramp Lane(s) and On-Ramp Lane(s); and
 - Design Year 2043 No Project HCS 6th Edition PM Peak Hour HCS 6th Edition Level of Service.
- Acceptable Level of Service A through D are shown in Green;
Unacceptable / Marginal Level of Service E is shown in Yellow; and
Unacceptable Level of Service F is shown in Red.

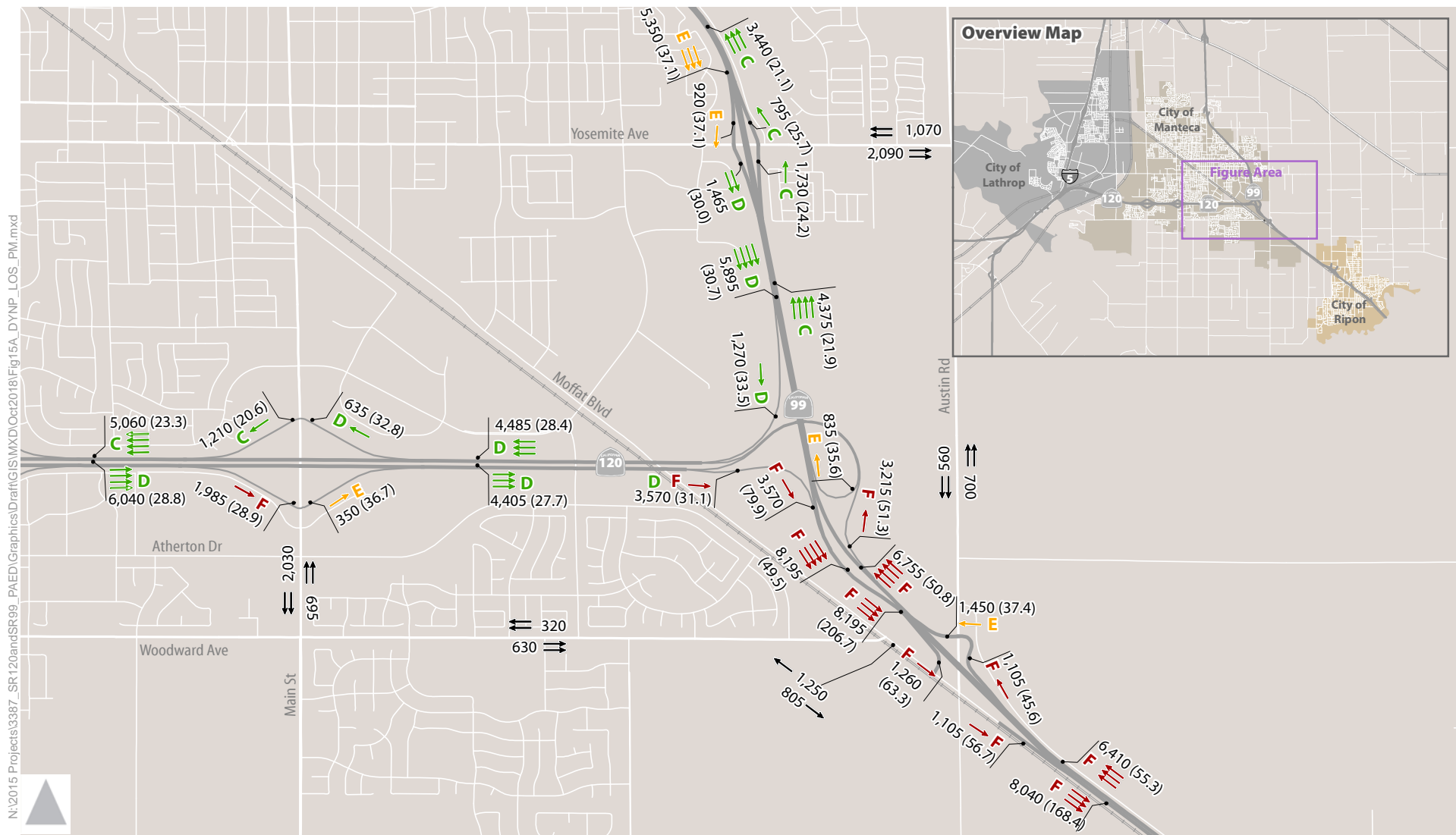
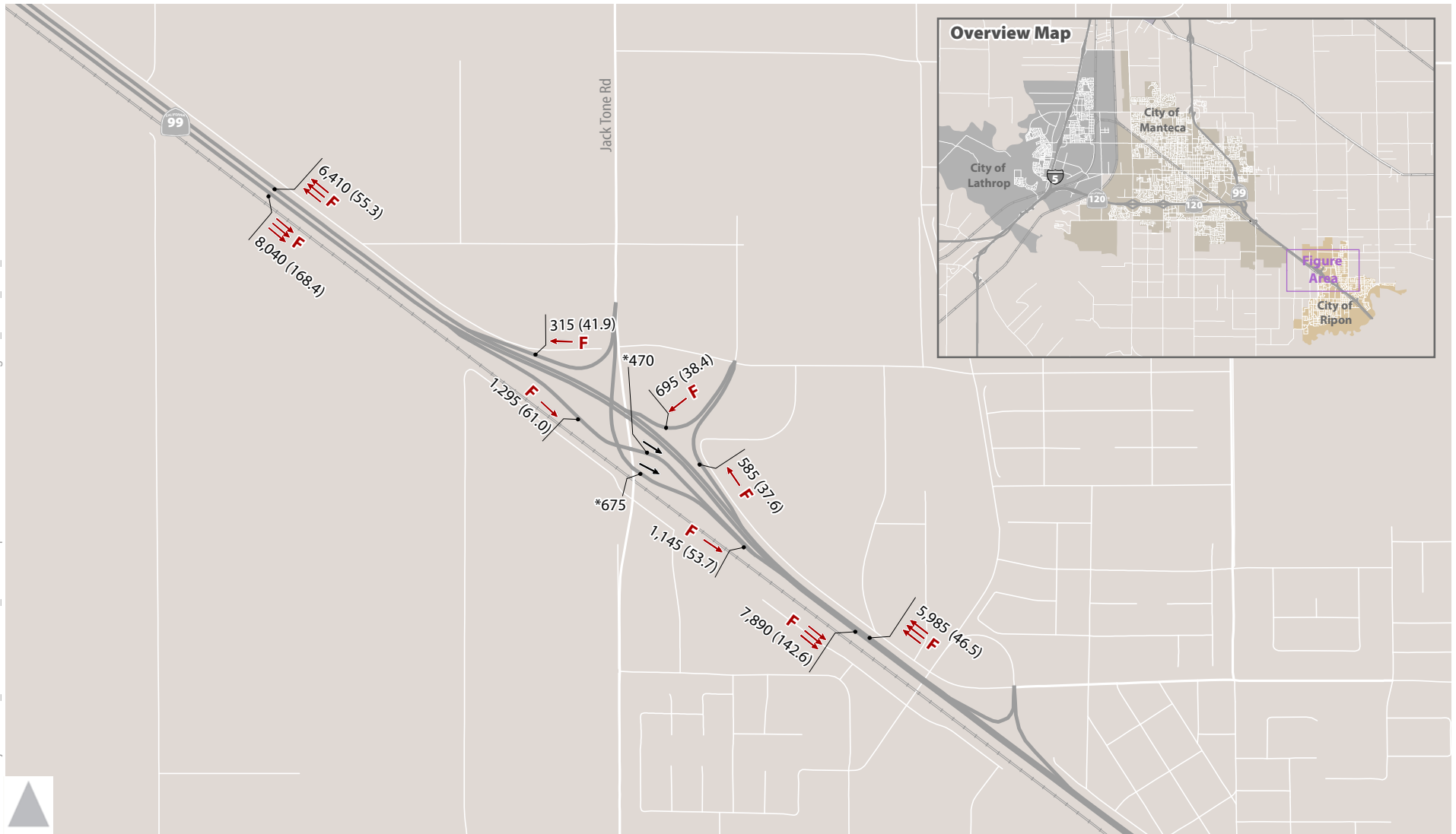


Figure 17A
 PM Peak Hour Freeway Volume and Level of Service -
 Design Year 2043 No Project Conditions

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x,xxx Peak Hour Volume
 (xx.x) Density
 ← Freeway Lane

Acceptable Level of Service - **A, B, C** and **D**
 Unacceptable Level of Service - **E** and **F**
 Note: (*) Indicates a non-freeway segment.

Figure 17B
 PM Peak Hour Freeway Volume and Level of Service -
 Design Year 2043 No Project Conditions



The primary conclusions of the Design Year 2043 No Project analysis presented in Figure 17A are:

1. During the PM peak hour, the directional split on SR 120 is projected to continue to be approximately 54% eastbound and 46% westbound;
2. During the evening peak hour, the construction of the Diverging Diamond Interchange at the SR 120 / Union Road interchange and the eastbound Auxiliary Lane between the Union Road on-ramp and the Main Street on-ramp (2 mixed flow and 1 auxiliary lane) will improve this segment on EB SR 120 to acceptable LOS D conditions;
3. In addition, the construction of third travel lane on both eastbound and westbound SR 120 between Interstate 5 (to the west) and Interstate 99 (to the east) will improve freeway mainline operations;
4. The EB SR 120 off-ramp to Main Street is projected to degrade to unacceptable LOS F conditions;
5. The EB SR 120 on-ramp from Main Street is projected to degrade to unacceptable LOS E conditions;
6. Eastbound SR 120 is projected to operate at LOS D conditions from the Main Street on-ramp to the SR 120 / SR 99 freeway to freeway interchange;
7. Severe congestion and slow travel speeds on SR 120 would result in additional diversion of traffic onto the eastbound SR 120 off-ramp to Main Street, traveling to Woodward Avenue and accessing the SB SR 99 on-ramp at Austin Road;
8. With 81% of the SR 120 traffic (3,570 of the 4,405) exiting SR 120 onto southbound SR 99, the unequal lane utilization results in stop and go conditions on eastbound SR 120;
9. It should be noted that with a density of 31.1 pcpmpl, the off-ramp diverge would be LOS D. But because the capacity of the single lane off-ramp (2,100 vehicles) is exceeded by the 3,570 vehicles exiting eastbound SR 120 onto southbound SR 99, the single lane off-ramp to southbound SR 99 operates at LOS F conditions.
10. With the heavy on-ramp traffic entering southbound SR 99 from the single lane eastbound SR 99 on-ramp, the SB SR 99 merge section would operate at LOS F conditions;
11. Southbound SR 99 between the Lathrop Road on-ramp to the Yosemite Avenue off-ramp is projected to degrade to LOS E conditions;
12. The southbound SR 99 off-ramp to Yosemite Avenue is projected to degrade to LOS E conditions;
13. Southbound SR 99 is projected to degrade to LOS F conditions from the SR 120 EB on-ramp to south of the Austin Road on-ramp;
14. Northbound SR 99 is projected to degrade to LOS F conditions from north of the Jack Tone interchange to the westbound SR 120 off-ramp;
15. The Northbound SR 99 off-ramp to Austin Road is projected to degrade to LOS F conditions;
16. The Northbound SR 99 on-ramp from Austin Road is projected to degrade to LOS E conditions;
17. The Northbound SR 99 off-ramp to WB SR 120 is projected to degrade to LOS F conditions;
18. The Northbound SR 99 on-ramp from EB SR 120 is projected to degrade to LOS E conditions; and
19. The remaining 13 of the 30 study segments (43.3%) are projected to continue to operate at acceptable Level of Service B, C, or D conditions.

The primary conclusions of the Design Year 2043 No Project analysis presented in Figure 17B are:

1. During the PM peak hour, the directional split on SR 99 is projected to increase slightly southbound, with approximately 56% southbound and 44% northbound;
2. During the evening peak hour, southbound SR 99 will exceed operating capacity based on the HCS analysis and degrade to LOS F conditions from south of the Austin Road interchange to south of the Jack Tone interchange;
3. The Northbound SR 99 mainline is projected to degrade to LOS F conditions from south of the Jack Tone interchange to the north of the Jack Tone Road / Colony Road on-ramp;
4. The Northbound SR 99 off-ramp to Jack Tone Road / Colony Road is projected to degrade to LOS F conditions;
5. The Northbound SR 99 on-ramp from Colony Road is projected to degrade to LOS F conditions;
6. The Northbound SR 99 on-ramp from Jack Tone Road is also projected to degrade to LOS F conditions;
7. None (0) of the nine (9) study segments (0%) are projected to continue to operate at D conditions.

Table 16 presents the results of the Design Year 2043 No Project AM and PM Peak Hour Intersection Level of Service Analysis.

Figure 18 presents the Design Year 2043 No Project AM Peak Hour Traffic Volumes, Delay by Movement and Intersection Configurations and Control. It also shows the intersections operating at acceptable level of service condition A, B, C, or D in green, marginal level of service condition E in yellow and unacceptable level of service condition F in red.

The primary conclusions of the AM peak hour analysis are:

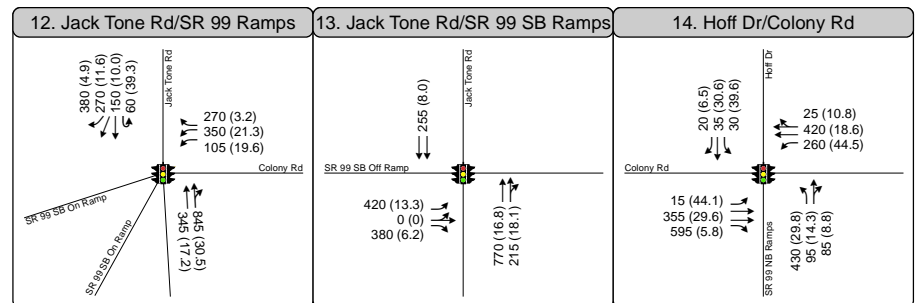
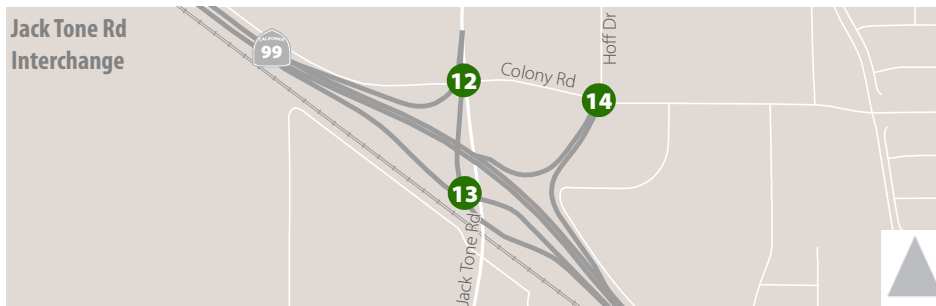
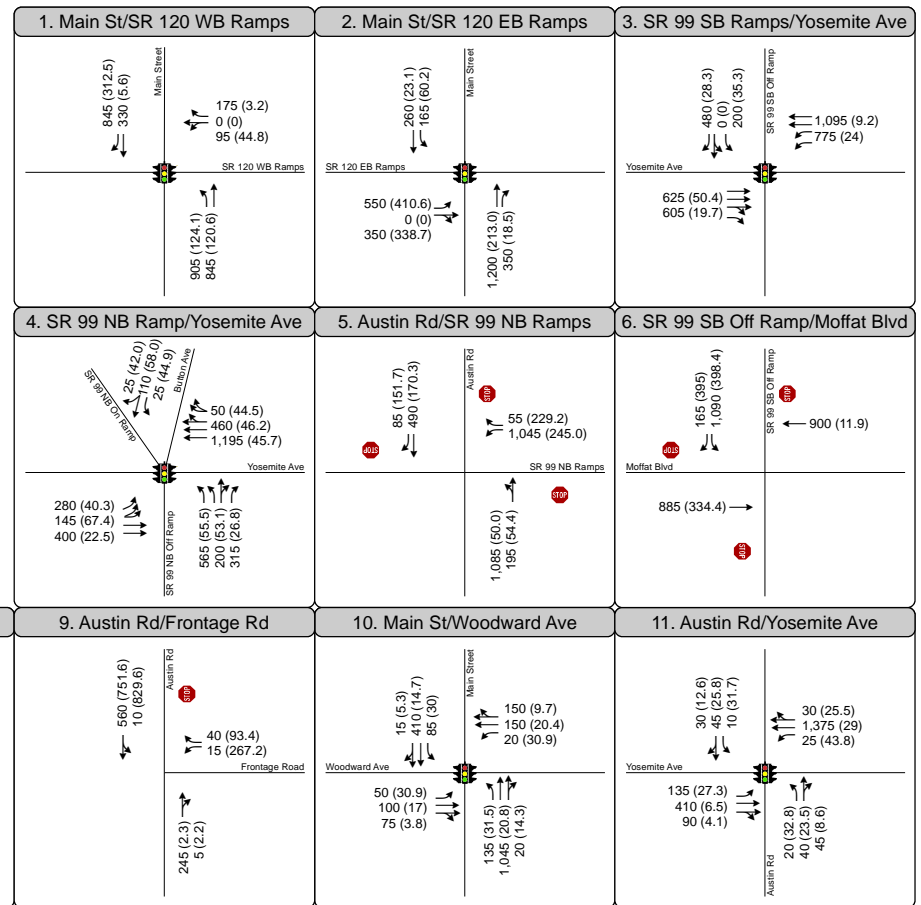
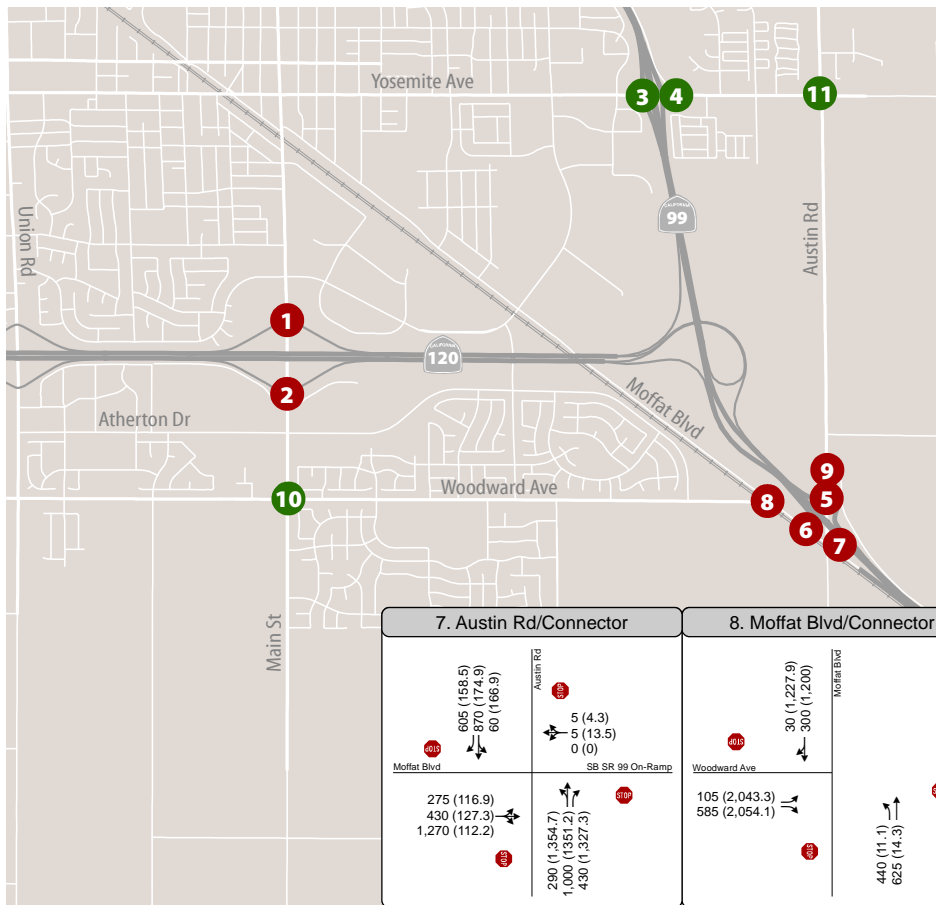
1. During the AM peak hour, seven (7) of the nine (9) signalized intersections (77.8%) are projected to continue to operate at acceptable LOS A, B, C or D conditions;
2. Increased traffic volumes at the EB SR 120 / Main Street ramp terminal intersection will result in this signalized intersection degrading to LOS F conditions;
3. Increased traffic volumes at the WB SR 120 / Main Street ramp terminal intersection will also result in this signalized intersection degrading to LOS F conditions;
4. None (0) of the four (4) all-way stop controlled intersections (0%) would continue to operate at acceptable LOS conditions;
5. The following four all-way stop controlled intersections are projected to degrade to LOS F conditions:
 - a. NB SR 99 Ramps / Austin Road;
 - b. SB SR 99 Off-Ramp / Moffat Blvd;
 - c. Moffat Blvd / Austin Road;
 - d. Moffat Blvd / Woodward Ave.
6. The one (1) side street stop controlled intersection of Frontage Road / Austin Road is also projected to degrade to unacceptable LOS F conditions.

**TABLE 16: INTERSECTION ANALYSIS – DESIGN YEAR 2043 NO PROJECT
AM AND PM PEAK HOUR CONDITIONS**

Intersection	Control	AM Peak Hour		PM Peak Hour	
		Delay / Movement (sec/veh)	LOS	Delay / Movement (sec/veh)	LOS
1. WB SR 120 Ramps / Main Street	Signal	> 120	F	105.1	F
2. EB SR 120 Ramps / Main Street	Signal	> 120	F	> 120	F
3. SB SR 99 Ramps / Yosemite Avenue	Signal	24.6	C	23.0	C
4. NB SR 99 Ramps / Yosemite Avenue	Signal	44.4	D	48.8	D
5. NB SR 99 Ramps / Austin Road	All Way Stop Controlled	> 120	F	> 120	F
6. SB SR 99 Off-Ramp / Moffat Blvd	All Way Stop Controlled	> 120	F	> 120	F
7. Moffat Blvd / Austin Road	All Way Stop Controlled	> 120	F	> 120	F
8. Moffat Blvd / Woodward Ave	All Way Stop Controlled	> 120	F	> 120	F
9. Frontage Road / Austin Road	Side-Street Stop Controlled	> 120 (WB Left-Turn)	F	> 120 (WB Left-Turn)	F
10. Woodward Avenue / Main Street	Signal	19.3	B	24.0	C
11. Yosemite Avenue / Austin Road	Signal	23.2	C	43.2	D
12. NB SR 99 Ramps / Jack Tone Road	Signal	18.3	B	20.1	C
13. SB SR 99 Ramps / Jack Tone Road	Signal	13.1	B	37.9	D
14. NB SR 99 Ramps / Colony Road	Signal	21.9	C	32.8	C

Source: *Highway Capacity Manual* (Transportation Research Board, 6th Edition).
Results Based on 12 SimTraffic Version 10 Model Runs

BOLD denotes unacceptable Level of Service (LOS)



1 Study Intersection
 Turn Lane
 AM (Delay) Peak Hour Traffic Volume and Delay

Traffic Signal
 Stop Sign

Acceptable Level of Service - A, B, C and D

Unacceptable Level of Service - E and F

Figure 18
Peak Hour Traffic Volumes and Lane Configurations -
Design Year 2043 No Project AM Peak Hour Conditions

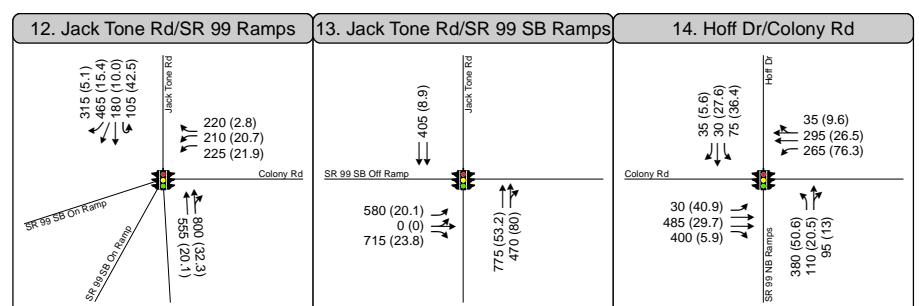
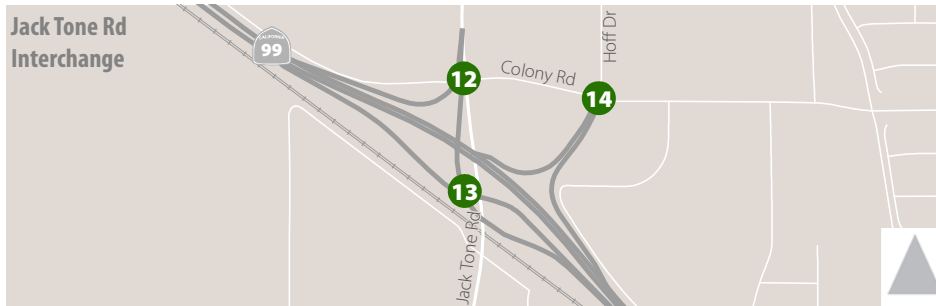
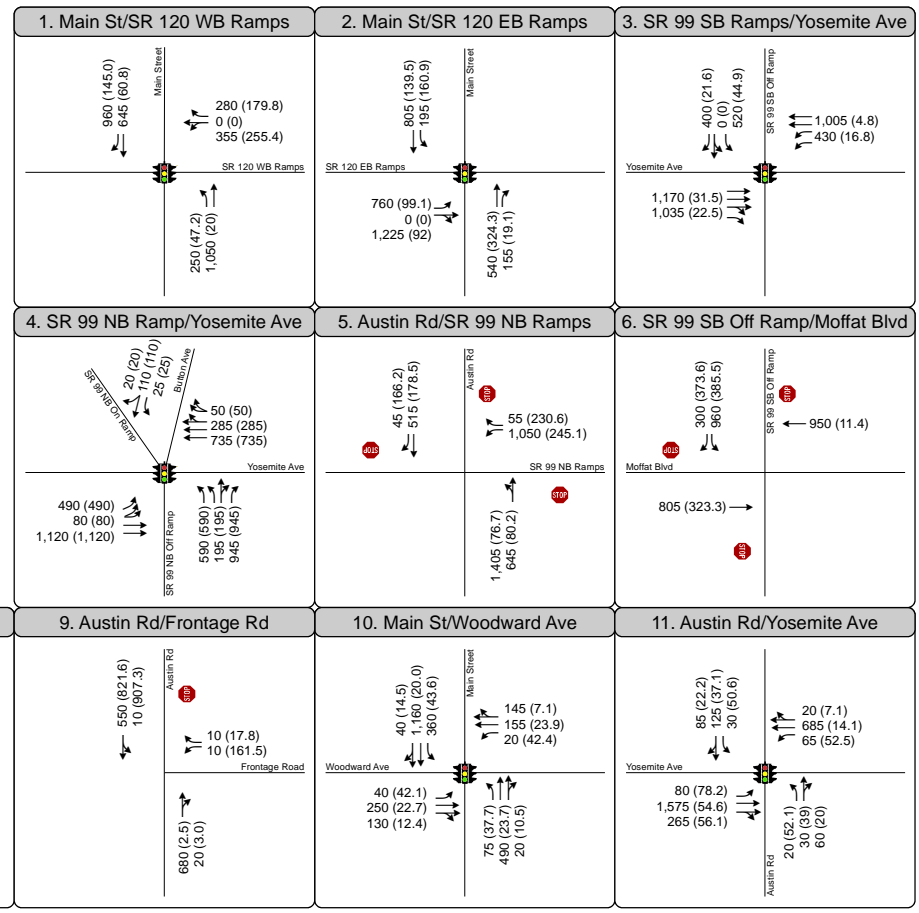
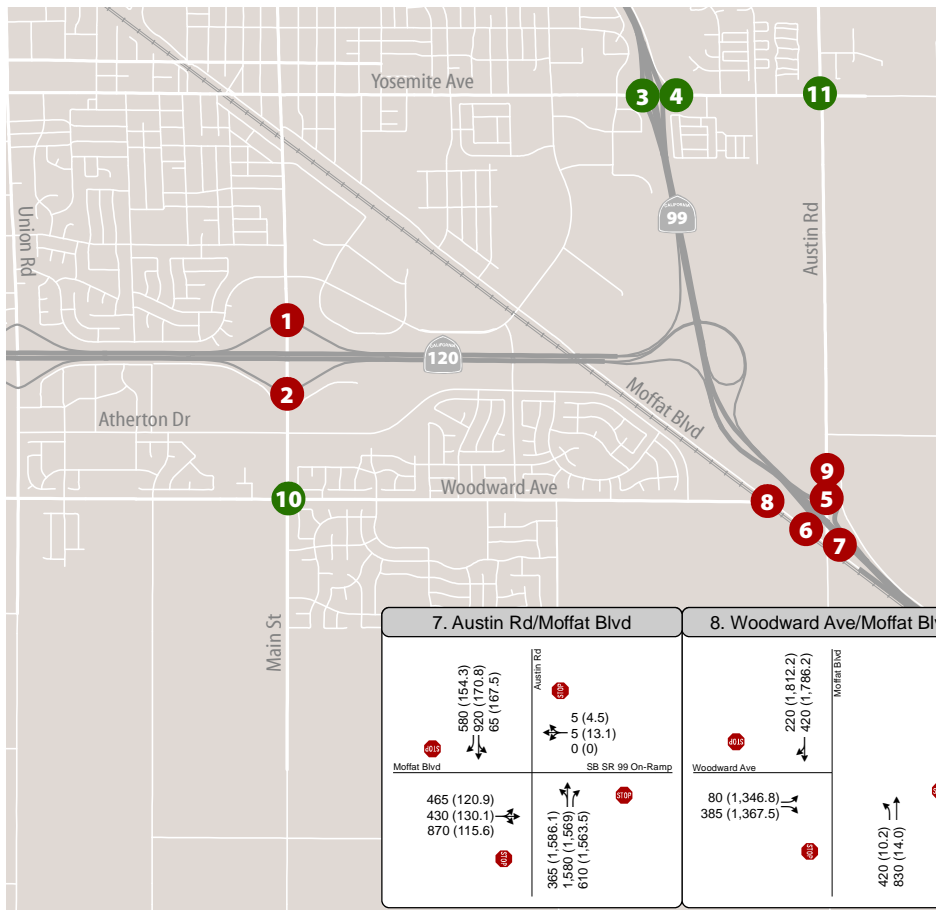
Figure 19 presents the Design Year 2043 No Project PM Peak Hour Traffic Volumes, Delay by Movement and Intersection Configurations and Control. It also shows the intersections operating at acceptable level of service condition A, B, C, or D in green, marginal level of service condition E in yellow and unacceptable level of service condition F in red.

The primary conclusions of the PM peak hour analysis are:

1. During the PM peak hour, seven (7) of the nine (9) signalized intersections (77.8%) are projected to continue to operate at acceptable LOS A, B, C or D conditions;
2. Increased traffic volumes at the EB SR 120 / Main Street ramp terminal intersection will result in this signalized intersection degrading to LOS F conditions;
3. Increased traffic volumes at the WB SR 120 / Main Street ramp terminal intersection will also result in this signalized intersection degrading to LOS F conditions;
4. None (0) of the five (5) all-way stop controlled intersections (0%) would continue to operate at acceptable LOS conditions;
5. The following four all-way stop controlled intersections are projected to degrade to LOS F conditions:
 - a. NB SR 99 Ramps / Austin Road;
 - b. SB SR 99 Off-Ramp / Moffat Blvd;
 - c. Moffat Blvd / Austin Road;
 - d. Moffat Blvd / Woodward Ave.
6. The one (1) side street stop controlled intersection of Frontage Road / Austin Road is also projected to degrade to unacceptable LOS F conditions.

Table 17 presents the 95th Percentile Queue Length by Movement for the following eleven (11) study intersections. It should be noted that the three study intersections at the SR 99 / Jack Tone interchange were not evaluated since the Phase 1A or Ultimate Project does not close the NB SR 99 off-ramp to Austin Road or the SB SR 99 on-ramp from Austin Road.

- | | |
|---------------------------------------|--|
| 1. SR 120 EB Ramps / Main Street; | 7. Austin Road / Moffat Boulevard; |
| 2. SR 120 WB Ramps / Main Street; | 8. Woodward Avenue / Moffat Boulevard; |
| 3. SR 99 NB Ramps / Yosemite Avenue; | 9. Austin Road / Frontage Road; |
| 4. SR 99 SB Ramps / Yosemite Avenue; | 10. Woodward Avenue / Main Street; and |
| 5. SR 99 NB Ramps / Austin Road; | 11. Austin Road / Yosemite Avenue. |
| 6. SR 99 SB Ramps / Moffat Boulevard; | |



1 Study Intersection
 Turn Lane
 AM (Delay) Peak Hour Traffic Volume and Delay

Traffic Signal
 Stop Sign

Acceptable Level of Service - A, B, C and D

Unacceptable Level of Service - E and F

Figure 19
Peak Hour Traffic Volumes and Lane Configurations -
Design Year 2043 No Project PM Peak Hour Conditions

**TABLE 17: 95TH PERCENTILE QUEUE LENGTH BY MOVEMENT
– DESIGN YEAR 2043 NO PROJECT**

Intersection	Movement	Available Storage (Feet)	AM	PM
			Peak Hour	Peak Hour
1. WB SR 120 Ramps / Main Street	WB LT / TH	1,740	129	2,173
	WB RT	175	0	343
	NB LT	230	358	229
	NB TH	1,451	1,817	632
	SB TH	1,920	3,595	1,766
	SB RT	1,920	4,010	2,459
2. EB SR 120 Ramps / Main Street	EB LT	1,732	2,156	1,923
	EB TH / RT	190	333	262
	NB TH	1,376	1,508	1,718
	NB RT	1,376	1,784	1,942
	SB LT	230	230	352
	SB TH	1,451	269	1,769
3. SB SR 99 Ramps / Yosemite Avenue	EB TH	1,830	503	526
	EB TH	1,830	180	429
	EB TH / RT	1,830	228	326
	EB RT	365	212	316
	WB TH	340	266	153
	WB TH	340	276	169
	WB RT	340	269	112
	WB RT	360	217	98
	SB LT	350	128	281
	SB LT / RT	1,010	267	329
4. NB SR 99 Ramps / Yosemite Avenue	SB RT	350	356	256
	EB LT	340	257	320
	EB LT	340	315	328
	EB TH	340	217	350
	EB TH	340	213	341
	WB TH	1,667	401	296
	WB TH	1,667	451	348
	WB TH / RT	1,667	497	387
	WB RT	265	332	306
	NB LT	350	320	288
	NB LT	962	368	1,033
	NBTH / RT	962	348	1,087
	NB RT	350	303	495
	SB LT	823	138	96
	SB LT/ TH	170	191	

**TABLE17: 95TH PERCENTILE QUEUE LENGTH BY MOVEMENT
– DESIGN YEAR 2043 NO PROJECT (CONTINUED)**

Intersection	Movement	Available Storage (Feet)	AM Peak Hour	PM
				Peak Hour
5. NB SR 99 Ramps / Austin Road	WB LT	558	664	666
	WB RT	25	63	60
	NB LT / TH	801	477	727
	SB TH	433	471	466
	SB RT	25	73	69
6. SB SR 99 Off-Ramp / Moffat Blvd	EB TH	521	571	572
	WB TH	384	120	105
	SB LT	778	881	879
	SB RT	25	67	70
7. Moffat Blvd / Austin Road	EB LT / TH / RT	384	399	399
	WB LT / TH / RT	615	28	28
	NB LT / TH	1,012	27,889	38,478
	NB RT	80	122	128
	SB LT / TH	801	841	828
	SB RT	25	60	59
8. Moffat Blvd / Woodward Ave	EB LT	1,723	11,737	8,434
	EB RT	45	79	78
	NB LT	150	74	65
	NBTH	521	115	119
	SB TH / RT	922	5,326	9,186
9. Frontage Road / Austin Road	WB LT	767	282	63
	WB RT	25	63	43
	NB TH / RT	433	2	0
	SB LT / TH	804	6,103	6,041

Results Based on 12 SimTraffic Version 10 Model Runs

BOLD denotes 95th Percentile Queue Length Exceeds Available Storage

**TABLE 17: 95TH PERCENTILE QUEUE LENGTH BY MOVEMENT
– DESIGN YEAR 2043 NO PROJECT (CONTINUED)**

Intersection	Movement	Available Storage (Feet)	AM Peak Hour	PM
				Peak Hour
10. Woodward Avenue / Main Street	EB LT	95	69	79
	EB TH	600	76	144
	EB TH / RT	600	60	121
	WB LT	175	43	47
	WB TH	634	102	110
	WB RT	634	100	96
	NB LT	250	185	96
	NB TH	657	337	199
	NB TH / RT	657	296	172
	SB LT	250	102	302
	SB TH	523	159	468
	SB TH / RT	523	109	389
11. Yosemite Avenue / Austin Road	EB LT	250	134	265
	EB TH	1,717	108	1,333
	EB RT	1,717	114	1,329
	WB LT	470	125	109
	WB TH	1,382	734	227
	WB TH / RT	270	332	215
	NB LT	225	50	54
	NB TH / RT	1,121	90	109
	SB LT	225	34	74
	SB TH / RT	1,043	85	208

Results Based on 12 SimTraffic Version 10 Model Runs

BOLD denotes 95th Percentile Queue Length Exceeds Available Storage

The primary results of the Design Year 2043 No Project AM Peak 95th Percentile Queue Length by Movement analysis are:

- Fifty-Nine (59) of the eighty-three (83) movements have 95th Percentile queue lengths less than the available storage; and
- Twenty-four (24) of the eighty-three (83) movements (28.9%) have 95th Percentile queue lengths greater than the available storage.
- This represents an increase in 18 movements and a 21.2% increase when compared to Existing AM Peak Hour Conditions.

The primary results of the Design Year 2043 No Project PM Peak 95th Percentile Queue Length by Movement analysis are:

- Fifty-Two (55) of the eighty-three (83) movements have 95th Percentile queue lengths less than the available storage; and
- Twenty-eight (28) of the eighty-three (83) movements (33.7%) have 95th Percentile queue lengths greater than the available storage.
- This represents an increase in 19 movements and a 22.6% increase when compared to Existing PM Peak Hour Conditions.

Table 18 presents the total network performance measures of effectiveness for the Synchro / SimTraffic Models for Design Year 2043 No Project AM and PM Peak Hour Conditions. The results of the Total Network Performance sets the baseline conditions for Design Year 2043 No Project AM and PM peak hour conditions and will be used to define baseline conditions to determine the benefits of the proposed SR 120 / SR 99 Interchange Phase 1A and Ultimate Project.

The results of the Total Network Performance (Table 11) set the baseline conditions for Design Year 2043 No Project AM and PM peak hour conditions:

Total Vehicle Hours of Delay (VHD) - During Design Year 2043 No Project AM Peak Hour Conditions (7:15 to 8:15 AM), a total of 2,483 VHD occurs in the project study area. During Design Year 2043 No Project PM Peak Hour Conditions (4:45 to 5:45 PM), a total of 2,636 VHD occurs in the project study area.

Total Stops - During Design Year 2043 No Project AM Peak Hour Conditions (7:15 to 8:15 AM), a total of 26,988 stops occur in the project study area. During Design Year 2043 No Project PM Peak Hour Conditions (4:45 to 5:45 PM), a total of 34,799 stops occur in the project study area.

Vehicle Miles Travelled (VMT) - During Design Year 2043 No Project AM Peak Hour Conditions (7:15 to 8:15 AM), the VMT is 24,540 miles within in the project study area. During Design Year 2043 No Project PM Peak Hour Conditions (4:45 to 5:45 PM), the VMT is 29,310 miles within in the project study area.

**TABLE 18: TOTAL NETWORK PERFORMANCE
DESIGN YEAR 2043 NO PROJECT CONDITIONS**

Measure of Effectiveness	Based on 12 SimTraffic Model Runs	
	AM Peak Hour	PM Peak Hour
Total Vehicle Hours of Delay (VHD)	2,483	2,636
Total Stops	26,988	34,799
Vehicle Miles of Travel (VMT)	24,540	29,310
Vehicle Hours Travelled (VHT)	4,057	4,800
Total Fuel Consumption	1,439	1,734
Total Vehicle Emissions (lbs of CO2)	27,341	32,946
Average Speed (MPH)	8	8
Vehicles Entering Network in Peak Hour	20,758	25,326
Vehicles Entering Network in Peak Hour	18,234	22,864
Percent (%) Demand Served	87.8%	90.3%

Source: Results Based on 12 SimTraffic Version 10 Model Runs

Total Fuel Consumption - During Design Year 2043 No Project AM Peak Hour Conditions (7:15 to 8:15 AM), the total fuel consumption is 1,439 gallons within in the project study area. During Design Year 2043 No Project PM Peak Hour Conditions (4:45 to 5:45 PM), the total fuel consumption is 1,734 gallons within in the project study area.

Total Vehicle Emissions - During Design Year 2043 No Project AM Peak Hour Conditions (7:15 to 8:15 AM), the total emissions is 27,341 lbs within in the project study area. During Design Year 2043 No Project PM Peak Hour Conditions (4:45 to 5:45 PM), the total emissions is 32,946 lbs within in the project study area.

Average Speed - During Design Year 2043 No Project AM Peak Hour Conditions (7:15 to 8:15 AM), the average speed is 8 miles per hour within the project study area. During Design Year 2043 No Project PM Peak Hour Conditions (4:45 to 5:45 PM), the average speed is 8 miles per hour within the project study area.

Percent (%) Demand Served - During Design Year 2043 No Project AM Peak Hour Conditions (7:15 to 8:15 AM), the Percent (%) Demand Served is 87.8%. During Design Year 2043 No Project PM Peak Hour Conditions (4:45 to 5:45PM), the Percent (%) Demand Served is 90.3%.

DESIGN YEAR 2043 WITH PHASE 1A PROJECT

The following Appendices contain the Design Year 2043 With Phase 1A Project conditions analysis:

- Appendix W – Design Year 2043 With Phase 1A Project Conditions – AM Peak Hour - Eastbound SR 120 and Southbound SR 99 HCS Freeway Mainline, On-Ramp Merge, Off-Ramp Diverge Analysis and Weaving Section Analysis;
- Appendix X – Design Year 2043 With Phase 1A Project Conditions – AM Peak Hour - Northbound SR 99 and Westbound SR 120 HCS Freeway Mainline, On-Ramp Merge, Off-Ramp Diverge Analysis and Weaving Section Analysis;
- Appendix Y – Design Year 2043 With Phase 1A Project Conditions – PM Peak Hour - Eastbound SR 120 and Southbound SR 99 HCS Freeway Mainline, On-Ramp Merge, Off-Ramp Diverge Analysis and Weaving Section Analysis;
- Appendix Z – Design Year 2043 With Phase 1A Project Conditions – PM Peak Hour - Northbound SR 99 and Westbound SR 120 HCS Freeway Mainline, On-Ramp Merge, Off-Ramp Diverge Analysis and Weaving Section Analysis;
- Appendix GG – Design Year 2043 With Phase 1A Project Conditions – AM Peak Hour Synchro / SimTraffic Input Data and SimTraffic Analysis Results Based on 12 SimTraffic Model Runs; and
- Appendix HH – Design Year 2043 With Phase 1A Project Conditions – PM Peak Hour Synchro / SimTraffic Input Data and SimTraffic Analysis Results Based on 12 SimTraffic Model Runs.

Figure 20A and 20B present the Design Year 2043 With Phase 1A Project AM Peak Hour Conditions and provide the following information:

- Design Year 2043 With Phase 1A Project AM Peak Hour Volume;
- Design Year 2043 With Phase 1A Project HCS 6th Edition AM Peak Hour Density;
- Freeway Mainline Lanes, Off-Ramp Lane(s) and On-Ramp Lane(s);
- Design Year 2043 With Phase 1A Diverted Trips as a result of closing the NB SR 99 on-ramp and SB SR 99 off-ramp to Austin Road; and
- Design Year 2043 With Phase 1A Project HCS 6th Edition AM Peak Hour HCS 6th Edition Level of Service.

Acceptable Level of Service A through D are shown in Green;

Unacceptable / Marginal Level of Service E is shown in Yellow; and

Unacceptable Level of Service F is shown in Red.

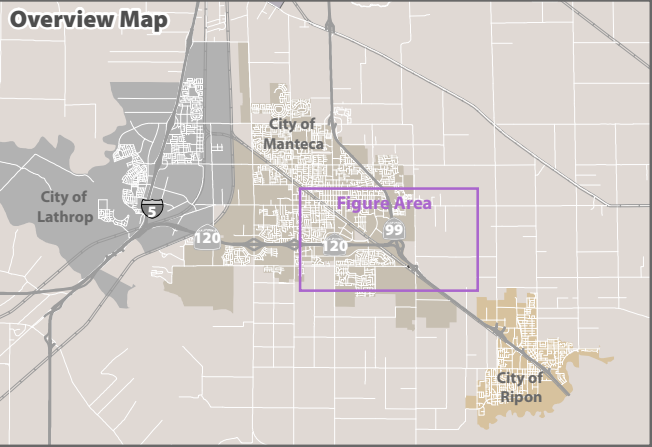
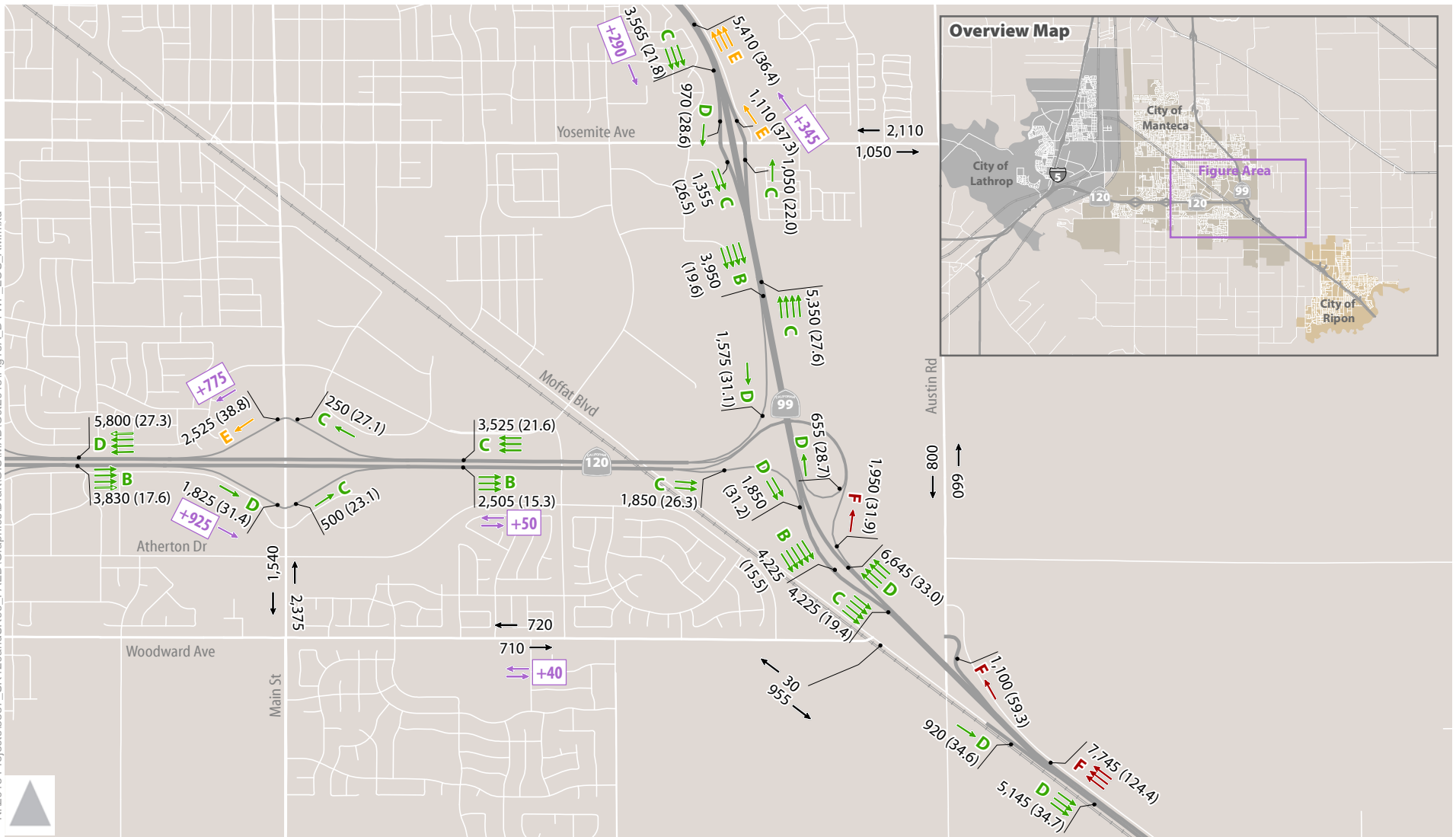


Figure 20A

AM Peak Hour Freeway Volume and Level of Service -
Design Year 2043 With Phase 1A Project Conditions

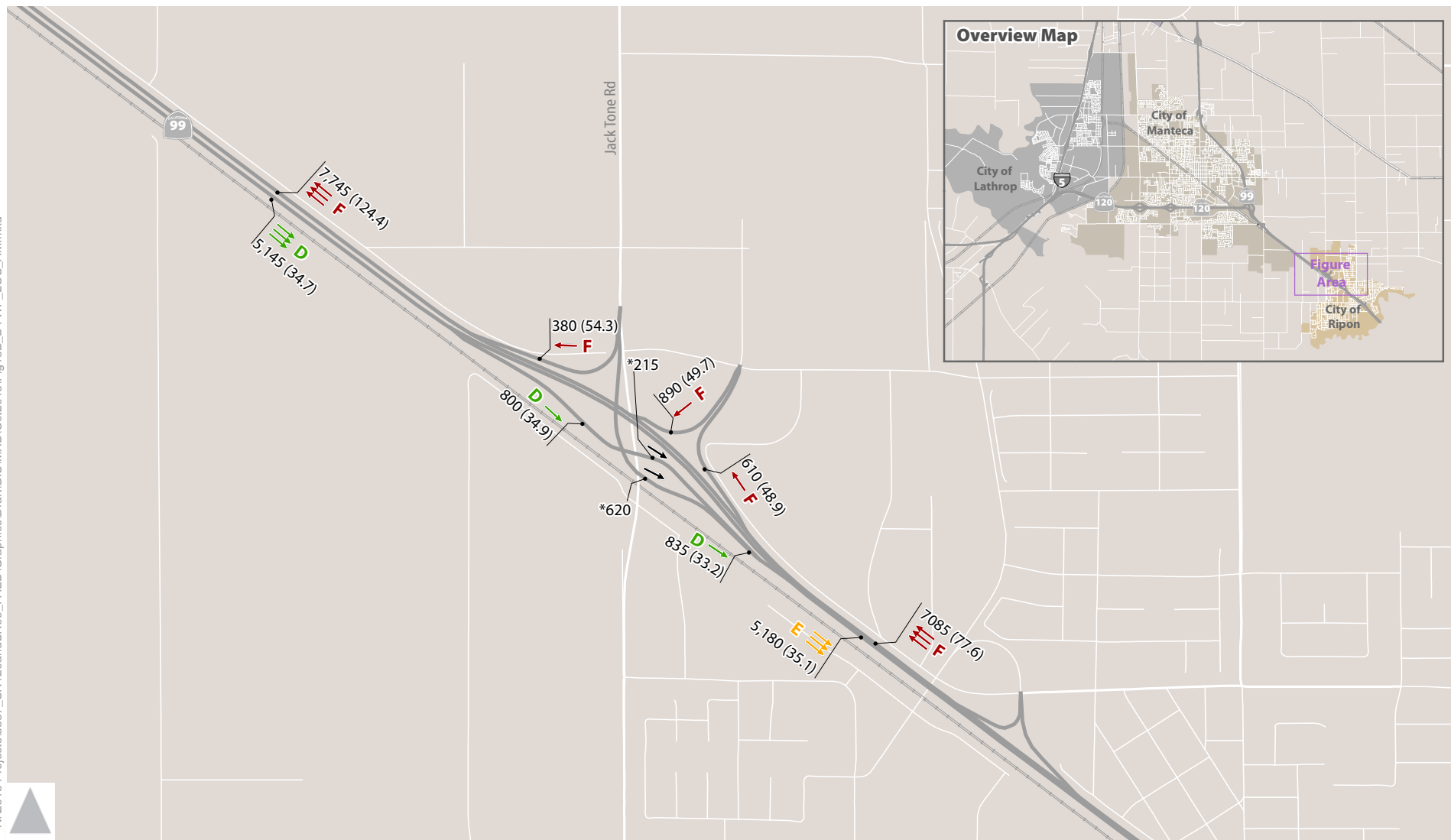


Figure 20B

AM Peak Hour Freeway Volume and Level of Service - Design Year 2043 With Phase 1A Project Conditions

The primary conclusions of the Design Year 2043 With Phase 1A Project presented in Figure 20A are:

1. During the AM peak hour, the directional split on SR 120 is projected to continue to be approximately 60% westbound and 40% eastbound;
2. During the morning peak hour, the construction of the Diverging Diamond Interchange at the SR 120 / Union Road interchange and the eastbound Auxiliary Lane between the Union Road on-ramp and the Main Street on-ramp (2 mixed flow and 1 auxiliary lane) will improve this segment on WB SR 120 to acceptable LOS D conditions;
3. In addition, the construction of third travel lane on both eastbound and westbound SR 120 between Interstate 5 (to the west) and Interstate 99 (to the east) will improve freeway mainline operations;
4. During the morning peak hour, NB SR 99 between Jack Tone Road and Austin Road is projected to continue to operate at LOS F conditions;
5. The NB SR 99 off-ramp to Austin Road is projected to degrade to LOS F conditions;
6. Even with the NB SR 99 off-ramp to WB SR 120 remaining a single lane off-ramp, the closure of the NB SR 99 on-ramp and elimination of the on-ramp merge would not improve the segment of SR 99 between the Austin Road off-ramp and the WB SR 120 off-ramp;
7. The NB SR 99 to WB SR 120 freeway-to-freeway ramp is projected to continue to operate at LOS F (No Project and With Phase 1A Project) conditions;
8. Therefore, before Design Year 2043 Conditions, the Phase 1B Project should be constructed by Year 2033 conditions. A design period exception for the SR 99 / SR 120 Interchange Project was prepared by the Project Development Team.
9. The construction of the two-lane EB SR 120 to SB SR 99 freeway-to-freeway ramp would improve EB SR 120 to SB SR 99 operations;
10. The EB SR 120 to SB SR 99 freeway-to-freeway ramp is projected to improve from LOS E (No Project) to LOS D (With Phase 1A Project) conditions;
11. The closure of the SB SR 99 off-ramp to Austin Road would improve SB SR 99 from LOS E (No Project) to LOS C (With Phase 1A);
12. With the Phase 1A Project 23 of the 28 study segments (82.1%) are projected to operate at acceptable Level of Service B, C, or D conditions; and
13. Compared to the No Project Alternative, this represents a 16.8% improvement with the Phase 1A Project.

The primary conclusions of the Design Year 2043 With Phase 1A Project analysis presented in Figure 20B are:

1. During the AM peak hour, the directional split on SR 99 is projected to increase to approximately 60% northbound and 40% southbound;
2. During the morning peak hour, all five (100%) NB SR 99 study segments are projected to continue to operate at LOS F conditions;
3. Three (3) of the four (4) (75%) SB SR 99 study segments (100%) are projected to continue to operate at acceptable Level of Service D conditions;

The primary conclusions of the Design Year 2043 With Phase 1A Project analysis presented in Figure 20B are (continued):

4. Overall, four (4) of the (9) study segments (44.4%) are projected to operate at acceptable Level of Service conditions; and
5. Compared to the No Project Alternative, this represents No Change with the Phase 1A Project.

Figures 21A and 21B present the Design Year 2043 With Phase 1A Project PM Peak Hour Conditions and provide the following information:

- Design Year 2043 With Phase 1A Project PM Peak Hour Volume;
 - Design Year 2043 With Phase 1A Project HCS 6th Edition PM Peak Hour Density;
 - Freeway Mainline Lanes, Off-Ramp Lane(s) and On-Ramp Lane(s);
 - Design Year 2043 With Phase 1A Diverted Trips as a result of closing the NB SR 99 on-ramp and SB SR 99 off-ramp to Austin Road; and
 - Design Year 2043 With Phase 1A Project HCS 6th Edition PM Peak Hour HCS 6th Edition Level of Service.
- Acceptable Level of Service A through D are shown in Green;
Unacceptable / Marginal Level of Service E is shown in Yellow; and
Unacceptable Level of Service F is shown in Red.

The primary conclusions of the Design Year 2043 With Phase 1A Project analysis presented in Figure 21A are:

1. During the PM peak hour, the directional split on SR 120 is projected to continue to be approximately 54% eastbound and 46% westbound;
2. During the evening peak hour, the construction of the Diverging Diamond Interchange at the SR 120 / Union Road interchange and the eastbound Auxiliary Lane between the Union Road on-ramp and the Main Street on-ramp (2 mixed flow and 1 auxiliary lane) will improve this segment on EB SR 120 to acceptable LOS C conditions;
3. In addition, the construction of third travel lane on both eastbound and westbound SR 120 between Interstate 5 (to the west) and Interstate 99 (to the east) will improve freeway mainline operations;
4. With the closure of the southbound SR 99 off-ramp to Austin Road, additional traffic would use the EB SR 120 off-ramp to Main Street, resulting in the off-ramp continuing to operate at LOS F conditions;
5. The construction of the two-lane EB SR 120 to SB SR 99 freeway-to-freeway ramp would improve EB SR 120 to SB SR 99 operations;
6. The EB SR 120 mainline between the Main Street on-ramp and the SR 99 freeway-to-freeway ramp is projected to improve from LOS F (No Project) to LOS C / D (With Phase 1A Project) conditions;

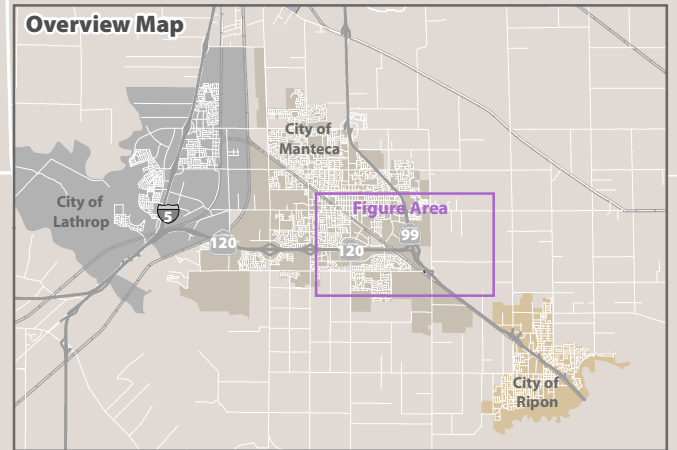
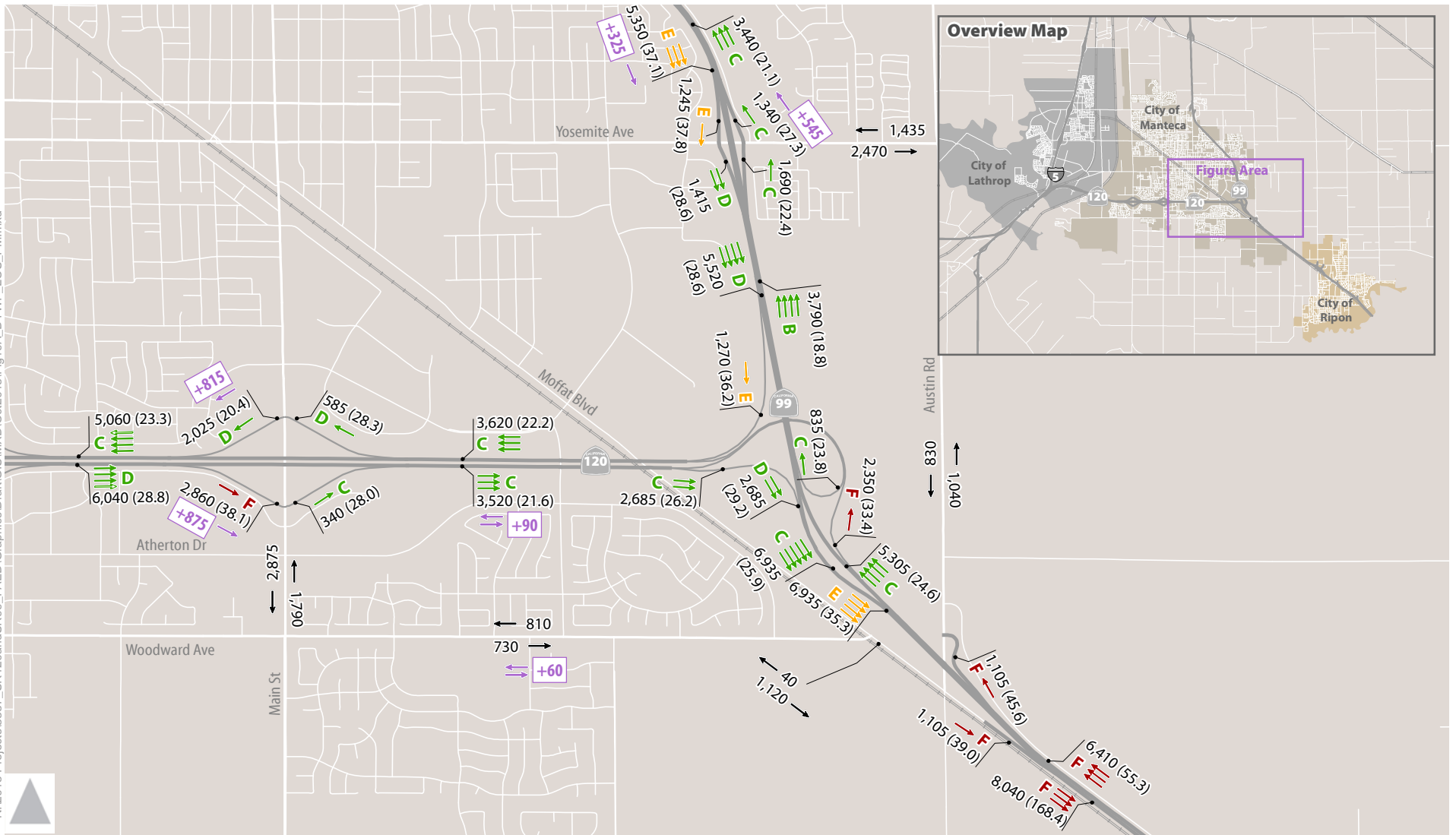
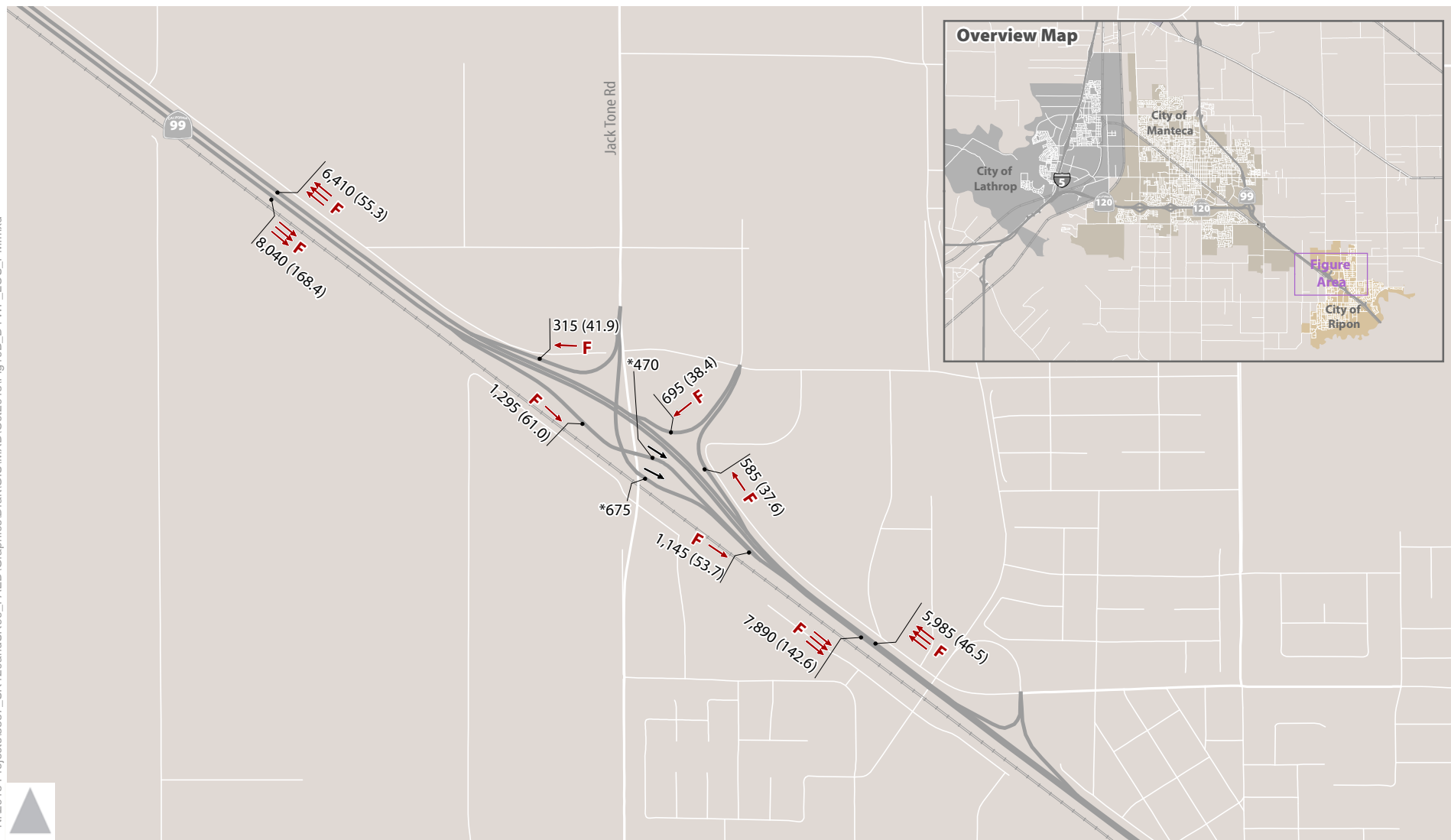


Figure 21A

PM Peak Hour Freeway Volume and Level of Service - Design Year 2043 With Phase 1A Project Conditions



x,xxx Peak Hour Volume
 (xx.x) Density
 ← Freeway Lane

Acceptable Level of Service - **A, B, C** and **D**
 Unacceptable Level of Service - **E** and **F**
 Note: (*) Indicates a non-freeway segment.



Figure 21B
 PM Peak Hour Freeway Volume and Level of Service -
 Design Year 2043 With Phase 1A Project Conditions

The primary conclusions of the Design Year 2043 With Phase 1A Project analysis presented in Figure 21A are (Continued):

7. The EB SR 120 to SB SR 99 freeway-to-freeway ramp is projected to improve from LOS F (No Project) to LOS D (With Phase 1A Project) conditions;
8. Elimination of the EB SR 120 congestion and slow travel speeds on SR 120 would reduce diversion of traffic onto the eastbound SR 120 off-ramp to Main Street, traveling to Woodward Avenue and accessing the SB SR 99 on-ramp at Austin Road;
9. On the other hand, the closure of the SB SR 99 off-ramp to Austin Road would result in a net increase of 875 vehicles (2,860 versus 1,985) exiting EB SR 120 at Main Street (LOS D);
10. The closure of the SB SR 99 off-ramp to Moffat Boulevard / Austin Road will result in SB SR 99 between the SR 120 on-ramp and the Austin Road on-ramp to improve from LOS F (No Project) to LOS C (With Phase 1A) conditions;
11. At the SB SR 99 Austin Road on-ramp, the freeway mainline would improve marginally from LOS F (No Project) to LOS E (With Phase 1A)';
12. Southbound SR 99 is projected to continue to operate at LOS F conditions from south of the Austin Road on-ramp to south of the Jack Tone Road interchange;
13. Northbound SR 99 is projected to continue to operate at LOS F conditions from north of the Jack Tone interchange to the Austin Road off-ramp;
14. The NB SR 99 off-ramp to Austin Road would continue to operate at LOS F conditions (No Project and With Phase 1A);
15. Even with the NB SR 99 off-ramp to WB SR 120 remaining a single lane off-ramp, the closure of the NB SR 99 on-ramp and elimination of the on-ramp merge would operate at LOS F (No Project and With Phase 1A Project) conditions;
16. The remaining 18 of the 28 study segments (64.3%) are projected to continue to operate at acceptable Level of Service B, C, or D conditions; and
17. Compared to the No Project Alternative, this represents a 22.9% improvement with the Phase 1A Project.

The primary conclusions of the Design Year 2043 With Phase 1A Project analysis presented in Figure 21B are:

1. During the PM peak hour, the directional split on SR 99 is projected to increase slightly southbound, with approximately 56% southbound and 44% northbound;
2. During the evening peak hour, southbound SR 99 will continue to exceed operating capacity based on the HCS analysis and degrade to LOS F conditions from south of the Austin Road interchange to south of the Jack Tone interchange;
3. The Northbound SR 99 mainline is projected to continue to operate at LOS F conditions from south of the Jack Tone interchange to the Jack Tone Road / Colony Road off-ramp;
4. The Northbound SR 99 off-ramp to Jack Tone Road / Colony Road is projected to continue to operate at LOS F conditions;

The primary conclusions of the Design Year 2043 With Phase 1A Project analysis presented in Figure 21B are (continued):

5. The Northbound SR 99 on-ramp from Colony Road is projected to continue to operate at LOS F conditions;
6. The Northbound SR 99 on-ramp from Jack Tone Road is also projected continue to operate at LOS F conditions;
7. None (0) of the nine (9) study segments (0%) are projected to continue to operate D conditions.
8. Compared to the No Project Alternative, this represents No Change with the Phase 1A Project.

Table 19 presents the results of the Design Year 2043 With Phase 1A Project AM and PM Peak Hour Intersection Level of Service Analysis.

Figure 22 presents the Design Year 2043 With Phase 1A Project AM Peak Hour Traffic Volumes, Delay by Movement and Intersection Configurations and Control. It also shows the intersections operating at acceptable level of service condition A, B, C, or D in green, marginal level of service condition E in yellow and unacceptable level of service condition F in red.

The primary conclusions of the AM peak hour analysis are:

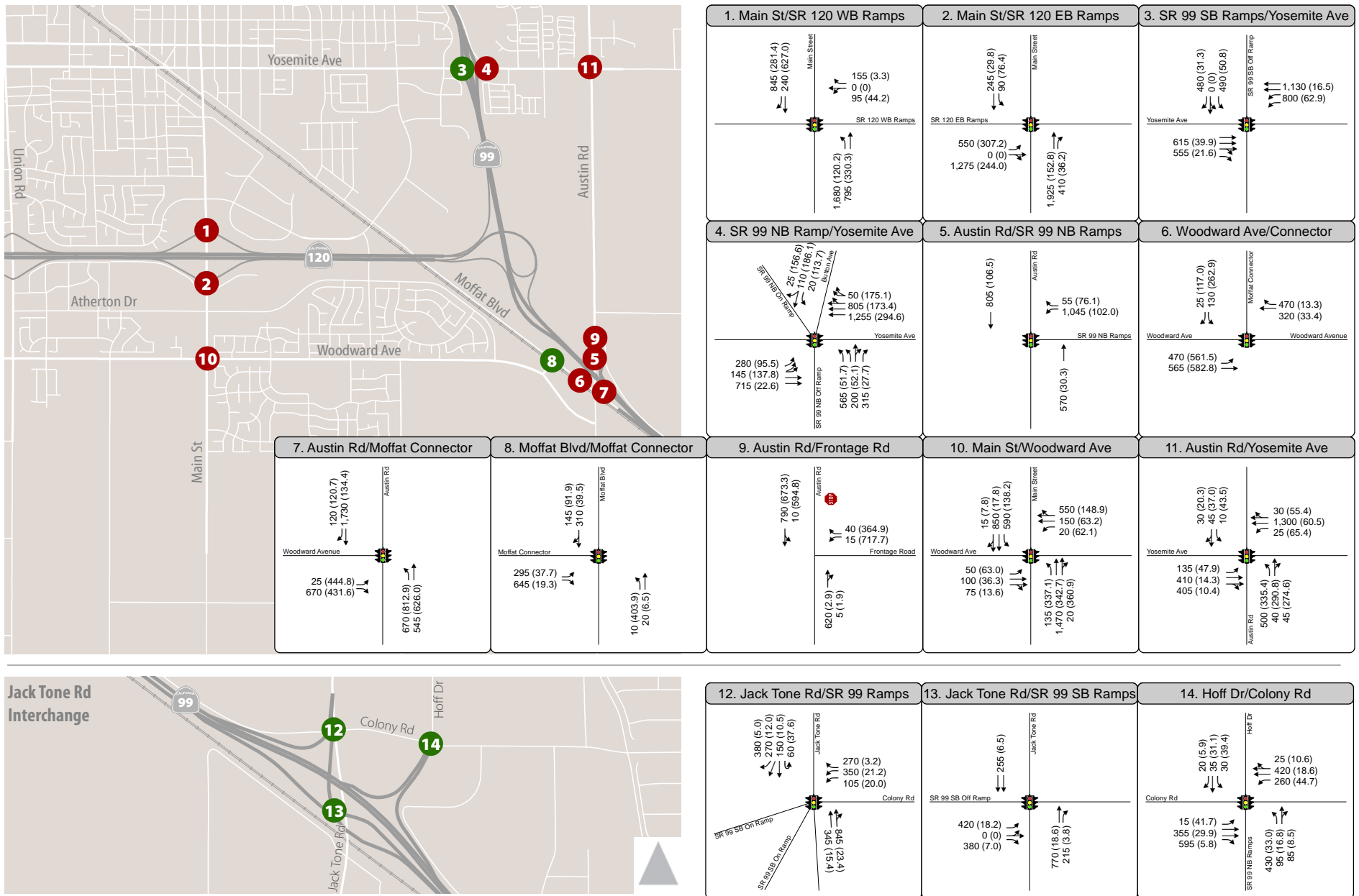
1. During the AM peak hour, five (5) of the thirteen (13) signalized intersections (38.5%) are projected to continue to operate at acceptable LOS A, C or D conditions;
2. The following eight (8) signalized intersections are projected to degrade to LOS E or F conditions:
 - a. WB SR 120 Off-Ramp / Main Street;
 - b. EB SR 120 Off-Ramp / Main Street;
 - c. NB SR 99 Ramps / Yosemite Avenue;
 - d. NB SR 99 Off-Ramp / Austin Road;
 - e. Woodward Avenue / Connector;
 - f. Austin Road / Moffat Connector;
 - g. Woodward / Main Street; and
 - h. Yosemite Avenue / Austin Road.
3. Compared to the No Project Alternative, this represents an 11.5% decrease with the Phase 1A Project.
4. Closure of the SB SR 99 off-ramp would result in a net increase in traffic volumes at the SR 120 / Main Street interchange resulting in the SR 120 Off-Ramp / Main Street interchange to continue to operate at LOS F Conditions (With Phase 1A Project);
5. In order to improve AM peak hour operations at the EB SR 120 Off-Ramp / Main Street interchange, the interchange would need to be re-constructed based on SJCOG RTP/SCS Interchange Project List. This improvement would be constructed by SJCOG and the City of Manteca before Design Year 2043 Conditions.

**TABLE 19: INTERSECTION ANALYSIS – DESIGN YEAR 2043 WITH PHASE 1A PROJECT
AM AND PM PEAK HOUR CONDITIONS**

Intersection	Control	AM Peak Hour		PM Peak Hour	
		Delay / Movement (sec/veh)	LOS	Delay / Movement (sec/veh)	LOS
1. WB SR 120 Ramps / Main Street	Signal	>120	F	>120	F
2. EB SR 120 Ramps / Main Street	Signal	>120	F	>120	F
3. SB SR 99 Ramps / Yosemite Avenue	Signal	35.3	D	82.8	F
4. NB SR 99 Ramps / Yosemite Avenue	Signal	>120	F	>120	F
5. NB SR 99 Ramps / Austin Road	Signal	87.3	F	>120	F
6. Woodward Avenue / Connector	Signal	>120	F	>120	F
7. Austin Road / Moffat Connector	Signal	>120	F	>120	F
8. Moffat Blvd / Moffat Connector	Signal	41.3	D	21.3	C
9. Frontage Road / Austin Road	Side-Street Stop Controlled	>120 (WB Left-Turn)	F	>120 (WB Left-Turn)	F
10. Woodward Avenue / Main Street	Signal	>120	F	84.4	F
11. Yosemite Avenue / Austin Road	Signal	95.9	F	>120	F
12. NB SR 99 Ramps / Jack Tone Road	Signal	16.0	B	16.3	B
13. SB SR 99 Ramps / Jack Tone Road	Signal	13.3	B	25.7	C
14. NB SR 99 Ramps / Colony Road	Signal	22.6	C	23.6	C

Source: *Highway Capacity Manual* (Transportation Research Board, 6th Edition).
Results Based on 12 SimTraffic Version 10 Model Runs

BOLD denotes unacceptable Level of Service (LOS)



1 Study Intersection Turn Lane AM (Delay) Peak Hour Traffic Volume and Delay Traffic Signal Stop Sign

Acceptable Level of Service - **A**, **B**, **C** and **D**

Unacceptable Level of Service - **E** and **F**

Figure 22
Peak Hour Traffic Volumes and Lane Configurations -
Design Year 2043 With Phase 1A Project AM Peak Hour Conditions

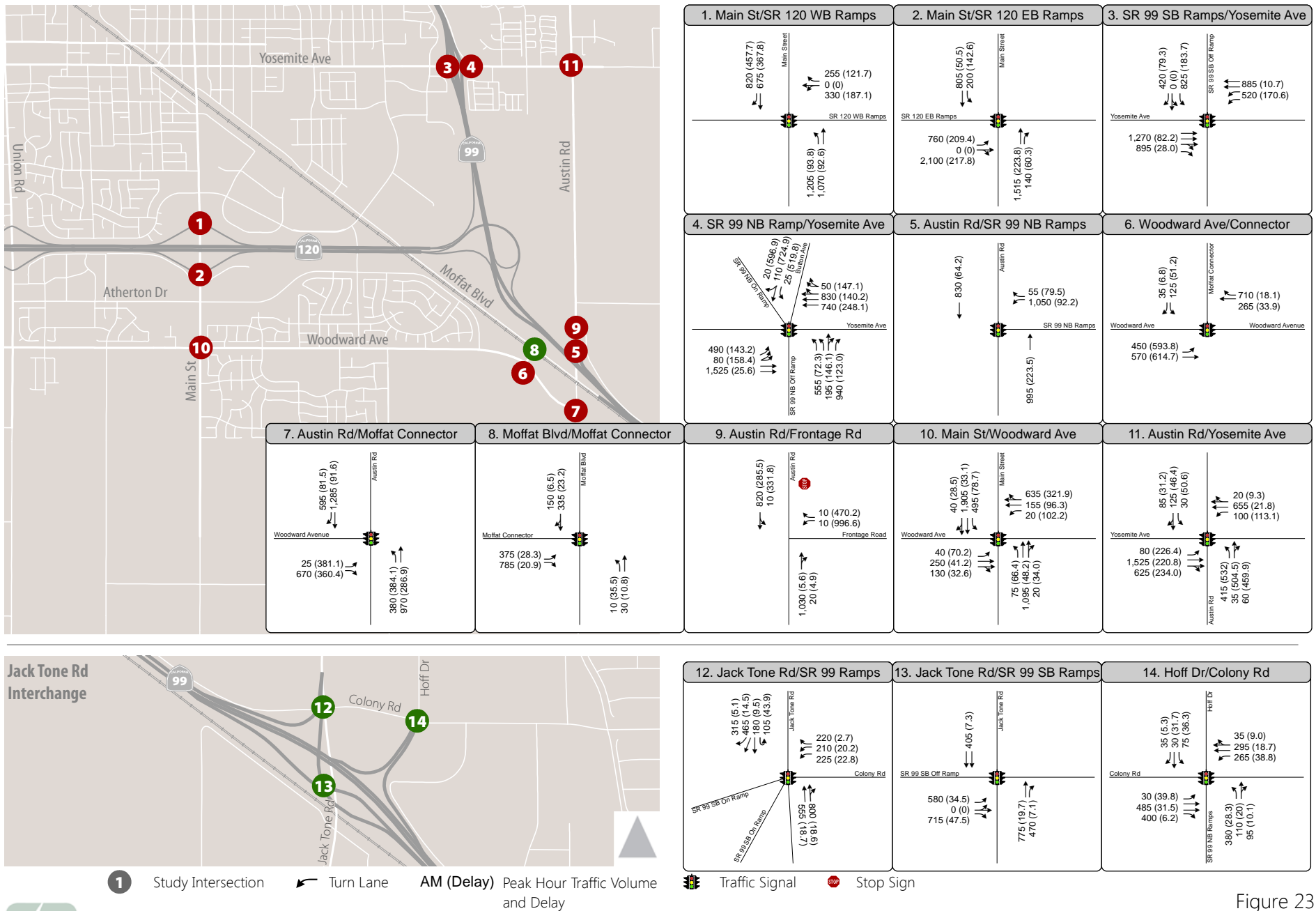
The primary conclusions of the AM peak hour analysis are (continued):

6. With the interchange improvements, the EB SR 120 Off-Ramp / Main Street interchange would improve from LOS F to LOS B / C conditions during the AM peak hour;
7. Increases in traffic volumes at the NB SR 99 Ramps / Yosemite Avenue intersection will result in the intersection degrading from LOS D (No Project) to LOS F (With Phase 1A Project) conditions;
8. The side street stop controlled intersection of Austin Road / Frontage Road is projected to operate at LOS F conditions.

Figure 23 presents the Design Year 2043 With Phase 1A Project PM Peak Hour Peak Hour Traffic Volumes, Delay by Movement and Intersection Configurations and Control. It also shows the intersections operating at acceptable level of service condition A, B, C, or D in green, marginal level of service condition E in yellow and unacceptable level of service condition F in red.

The primary conclusions of the PM peak hour analysis are:

1. During the PM peak hour, four (4) of the thirteen (13) signalized intersections (38.5%) are projected to continue to operate at acceptable LOS A, B, C or D conditions;
2. The following eight (8) signalized intersections are projected to degrade to LOS E or F conditions:
 - a. WB SR 120 Off-Ramp / Main Street;
 - b. EB SR 120 Off-Ramp / Main Street;
 - c. SB SR 99 Ramps / Yosemite Avenue;
 - d. NB SR 99 Ramps / Yosemite Avenue;
 - e. NB SR 99 Off-Ramp / Austin Road;
 - f. Woodward Avenue / Connector;
 - g. Austin Road / Moffat Connector;
 - h. Woodward / Main Street; and
 - i. Yosemite Avenue / Austin Road.
3. Compared to the No Project Alternative, this represents a 19.2% decrease with the Phase 1A Project.
4. Closure of the SB SR 99 off-ramp would result in a net increase in traffic volumes at the SR 120 / Main Street interchange resulting in the SR 120 Off-Ramp / Main Street interchange to continue to operate at LOS F Conditions (With Phase 1A Project);
5. In order to improve AM peak hour operations at the SR 120 Off-Ramp / Main Street interchange, the interchange would need to be re-constructed based on SJCOG RTP/SCS Interchange Project List. This improvement would be constructed by SJCOG and the City of Manteca before Design Year 2043 Conditions.
6. With the interchange improvements, the SR 120 Off-Ramp / Main Street interchange would improve from LOS F to LOS B / D conditions during the PM peak hour;
7. Increases in traffic volumes at the SR 99 Ramps / Yosemite Avenue interchange will result in the intersection degrading from LOS C / D (No Project) to LOS F (With Phase 1A Project) conditions;
8. The side street stop controlled intersection of Austin Road / Frontage Road is projected to operate at LOS F conditions.



Acceptable Level of Service - **A**, **B**, **C** and **D**

Unacceptable Level of Service - **E** and **F**

Figure 23
Peak Hour Traffic Volumes and Lane Configurations -
Design Year 2043 With Phase 1A Project PM Peak Hour Conditions

Table 20 presents the 95th Percentile Queue Length by Movement for the following eleven (11) study intersections. It should be noted that the three study intersections at the SR 99 / Jack Tone interchange were not evaluated since the Phase 1A Project does not close the NB SR 99 off-ramp to Austin Road or the SB SR 99 on-ramp from Austin Road.

- | | |
|--------------------------------------|---|
| 1. SR 120 EB Ramps / Main Street; | 7. Austin Road / Moffat Connector; |
| 2. SR 120 WB Ramps / Main Street; | 8. Moffat Boulevard / Moffat Connector; |
| 3. SR 99 NB Ramps / Yosemite Avenue; | 9. Austin Road / Frontage Road; |
| 4. SR 99 SB Ramps / Yosemite Avenue; | 10. Woodward Avenue / Main Street; and |
| 5. SR 99 NB Ramps / Austin Road; | 11. Austin Road / Yosemite Avenue. |
| 6. Woodward Avenue / Connector; | |

The primary results of the Design Year 2043 With Phase 1A Project AM Peak 95th Percentile Queue Length by Movement analysis are:

- Thirty-seven (37) of the eighty-five (85) movements have 95th Percentile queue lengths less than the available storage; and
- Forty-eight (48) of the eighty-five (85) movements (56.5%) have 95th Percentile queue lengths greater than the available storage.
- This represents an increase in 24 movements and a 27.6% increase when compared to Design Year 2043 No Project AM Peak Hour Conditions.

The primary results of the Design Year 2043 With Phase 1A Project PM Peak 95th Percentile Queue Length by Movement analysis are:

- Twenty-four (24) of the eighty-five (85) movements have 95th Percentile queue lengths less than the available storage; and
- Sixty-one (61) of the eighty-five (85) movements (71.8%) have 95th Percentile queue lengths greater than the available storage.
- This represents an increase in 30 movements and a 34.5% increase when compared to Design Year 2043 No Project PM Peak Hour Conditions.

**TABLE 20: 95TH PERCENTILE QUEUE LENGTH BY MOVEMENT
– DESIGN YEAR 2043 WITH PHASE 1A PROJECT**

Intersection	Movement	Available Storage (Feet)	AM	PM
			Peak Hour	Peak Hour
1. WB SR 120 Ramps / Main Street	WB LT / TH	1,740	132	1,665
	WB RT	175	0	342
	NB LT	230	318	362
	NB TH	1,451	1,637	1,596
	SB TH	1,920	3,359	4,585
	SB RT	1,920	3,132	4,443
2. EB SR 120 Ramps / Main Street	EB LT	1,704	1,815	1,817
	EB TH / RT	190	13,927	11,330
	NB TH	1,371	1,460	1,425
	NB RT	1,000	1,466	1,518
	SB LT	230	125	332
	SB TH	1,451	232	1,069
3. SB SR 99 Ramps / Yosemite Avenue	EB TH	782	359	1,142
	EB TH	782	229	1,115
	EB TH / RT	782	289	1,011
	EB RT	365	258	400
	WB TH	335	325	374
	WB TH	335	352	391
	WB RT	335	340	340
	WB RT	335	360	318
	SB LT	350	283	441
	SB LT / RT	1,010	383	1,248
4. NB SR 99 Ramps / Yosemite Avenue	SB RT	350	365	555
	EB LT	335	317	376
	EB LT	335	362	387
	EB TH	335	403	424
	EB TH	335	317	396
	WB TH	1,667	3,033	1,773
	WB TH	1,667	3,041	1,862
	WB TH / RT	1,667	3,031	1,908
	WB RT	265	331	347
	NB LT	350	308	346
	NB LT	962	346	1,316
	NBTH / RT	962	342	1,194
	NB RT	350	305	470
	SB LT	823	542	1,072
	SB LT/ TH	170	232	233

**TABLE 20: 95TH PERCENTILE QUEUE LENGTH BY MOVEMENT
– DESIGN YEAR 2043 WITH PHASE 1A PROJECT (CONTINUED)**

Intersection	Movement	Available Storage (Feet)	AM	PM
			Peak Hour	Peak Hour
5. NB SR 99 Ramps / Austin Road	WB LT	558	678	661
	WB RT	200	252	191
	NB LTH	1,730	351	2,007
	SB TH	433	453	472
6. Woodward Avenue / Connector	EB LT	150	197	195
	EB TH	1,167	6,779	8,468
	WB TH	1,674	184	197
	WB RT	600	185	302
	SB LT	355	487	200
	SB RT	150	169	68
7. Austin Road / Moffat Connector	EB LT	150	148	144
	EB RT	1,674	1,960	2,096
	NB LT	250	1,050	1,271
	NB TH	1,500	7,986	7,278
	SB TH	1,730	1,791	2,036
	SB RT	250	296	361
8. Moffat Blvd / Moffat Connector	EB LT	366	400	466
	EB RT	45	83	77
	NB LT	150	94	31
	NB TH	572	52	43
	SB TH	583	544	221
	SB RT	200	245	115
9. Frontage Road / Austin Road	WB LT	767	546	308
	WB RT	25	59	43
	NB TH / RT	433	5	165
	SB LT / TH	804	6,068	4,210

**TABLE 20: 95TH PERCENTILE QUEUE LENGTH BY MOVEMENT
– DESIGN YEAR 2043 WITH PHASE 1A PROJECT (CONTINUED)**

Intersection	Movement	Available Storage (Feet)	AM Peak Hour	PM
				Peak Hour
10. Woodward Avenue / Main Street	EB LT	95	88	108
	EB TH	600	115	210
	EB TH / RT	500	98	202
	WB LT	175	56	74
	WB TH	782	1,077	2,460
	WB RT	782	994	2,571
	NB LT	250	341	280
	NB TH	2,509	3,125	580
	NB TH / RT	2,509	3,121	525
	SB LT	250	276	289
	SB TH	523	571	567
	SB TH / RT	523	613	598
11. Yosemite Avenue / Austin Road	EB LT	250	169	292
	EB TH	1,717	200	1,815
	EB RT	1,717	273	1,815
	WB LT	470	272	245
	WB TH	1,223	1,385	294
	WB TH / RT	270	335	270
	NB LT	225	256	267
	NB TH / RT	1,120	2,209	2,920
	SB LT	225	36	73
	SB TH / RT	619	95	243

Results Based on 12 SimTraffic Version 10 Model Runs

BOLD denotes 95th Percentile Queue Length Exceeds Available Storage

Table 21 presents the total network performance measures of effectiveness for the Synchro / SimTraffic Models for Design Year 2043 With Phase 1A Project AM and PM Peak Hour Conditions.

**TABLE 21: TOTAL NETWORK PERFORMANCE
DESIGN YEAR 2043 WITH PHASE 1A PROJECT CONDITIONS**

Measure of Effectiveness	Based on 12 SimTraffic Model Runs	
	AM Peak Hour	PM Peak Hour
Total Vehicle Hours of Delay (VHD)	1,966 (-20.8%)	1,971 (-25.2%)
Total Stops	37,690 (+39.7%)	47,062 (+35.2%)
Vehicle Miles of Travel (VMT)	20,619 (-16.0%)	24,873 (-15.1%)
Vehicle Hours Travelled (VHT)	4,291 (+5.8%)	5,065 (+5.5%)
Total Fuel Consumption	1,445 (+0.4%)	1,726 (-0.5%)
Total Vehicle Emissions (lbs of CO2)	27,455 (+0.4%)	32,794 (-0.5%)
Average Speed (MPH)	8 (No Change)	9 (+12.5%)
Vehicles Entering Network in Peak Hour	23,026 (+10.9%)	27,306 (+7.8%)
Vehicles Entering Network in Peak Hour	21,453 (+17.7%)	25,729 (+12.5%)
Percent (%) Demand Served	93.2% (+5.4%)	94.2% (+3.8%)

Source: Results Based on 12 SimTraffic Version 10 Model Runs

When compared to Design Year 2043 No Project Conditions, the following benefits of the SR 120 / SR 99 Interchange Phase 1A Project were identified for AM Peak Hour Conditions:

- Total Vehicle Hours of Delay (VHD) would decrease by 20.8% from 2,483 to 1,966.
- Total Stops would increase by 39.1% from 26,988 to 37,690.
- Vehicle Miles Traveled (VMT) would decrease by 16.0% from 24,540 to 20,619.
- Vehicle Hours Traveled (VHT) would increase by 5.8% from 4,057 to 4,291.
- Fuel Consumption would increase by 0.4%, from 1,439 to 1,445 gallons, resulting in 104 additional pounds of vehicle emissions;
- Average travel speed would not change and remain at eight (8) miles per hour;

When compared to Design Year 2043 No Project Conditions, the following benefits of the SR 120 / SR 99 Interchange Phase 1A Project were identified for AM Peak Hour Conditions (continued):

- Vehicles Entering the Network would increase by 10.9%, from 20,758 to 23,026;
- Vehicles Exiting the Network would increase by 17.7%, from 18,234 to 21,453;
- Percent (%) Demand Served would increase by 5.4%, from 87.8% to 93.2%.
- These results shows that Phase 1A does not provide an improvement when compared to No Project Conditions and is not acceptable for Design Year 2043 AM Peak Hour Conditions.

When compared to Design Year 2043 No Project Conditions, the following benefits of the SR 120 / SR 99 Interchange Phase 1A Project were identified for PM Peak Hour Conditions:

- Total Vehicle Hours of Delay (VHD) would decrease by 25.2% from 2,636 to 1,971.
- Total Stops would increase by 35.2% from 34,799 to 47,062.
- Vehicle Miles Traveled (VMT) would decrease by 15.1% from 29,310 to 24,873.
- Vehicle Hours Traveled (VHT) would increase by 5.5% from 4,800 to 5,065.
- Fuel Consumption would decrease by 0.5%, from 1,734 to 1,726 gallons, resulting in 152 fewer pounds of vehicle emissions;
- Average travel speed would increase 12.5% from 8 to 9 miles per hour;
- Vehicles Entering the Network would increase by 7.8%, from 25,326 to 27,306;
- Vehicles Exiting the Network would increase by 12.5%, from 22,864 to 25,729;
- Percent (%) Demand Served would increase by 3.8%, from 90.3% to 94.2%.
- These results shows that Phase 1A does not provide an improvement when compared to No Project Conditions and is not acceptable for Design Year 2043 PM Peak Hour Conditions.

DESIGN YEAR 2043 WITH ULTIMATE PROJECT

The following Appendices contain the Design Year 2043 With Ultimate Project conditions analysis:

- Appendix AA – Design Year 2043 With Ultimate Project Conditions – AM Peak Hour - Eastbound SR 120 and Southbound SR 99 HCS Freeway Mainline, On-Ramp Merge, Off-Ramp Diverge Analysis and Weaving Section Analysis;
- Appendix BB – Design Year 2043 With Ultimate Project Conditions – AM Peak Hour - Northbound SR 99 and Westbound SR 120 HCS Freeway Mainline, On-Ramp Merge, Off-Ramp Diverge Analysis and Weaving Section Analysis;
- Appendix CC – Design Year 2043 With Ultimate Project Conditions – PM Peak Hour - Eastbound SR 120 and Southbound SR 99 HCS Freeway Mainline, On-Ramp Merge, Off-Ramp Diverge Analysis and Weaving Section Analysis;
- Appendix DD – Design Year 2043 With Ultimate Project Conditions – PM Peak Hour - Northbound SR 99 and Westbound SR 120 HCS Freeway Mainline, On-Ramp Merge, Off-Ramp Diverge Analysis and Weaving Section Analysis;
- Appendix II – Design Year 2043 With Ultimate Project Conditions – AM Peak Hour Synchro / SimTraffic Input Data and SimTraffic Analysis Results Based on 12 SimTraffic Model Runs; and
- Appendix JJ – Design Year 2043 With Ultimate Project Conditions – PM Peak Hour Synchro / SimTraffic Input Data and SimTraffic Analysis Results Based on 12 SimTraffic Model Runs.

Figure 24A and 24B present the Design Year 2043 With Ultimate Project AM Peak Hour Conditions and provide the following information:

- Design Year 2043 With Ultimate Project AM Peak Hour Volume;
- Design Year 2043 With Ultimate Project HCS 6th Edition AM Peak Hour Density;
- Freeway Mainline Lanes, Off-Ramp Lane(s) and On-Ramp Lane(s); and
- Design Year 2043 With Ultimate Project HCS 6th Edition AM Peak Hour Level of Service.
Acceptable Level of Service A through D are shown in Green;
Unacceptable / Marginal Level of Service E is shown in Yellow; and
Unacceptable Level of Service F is shown in Red.

The primary conclusions of the Design Year 2043 With Ultimate Project presented in Figure 24A are:

1. During the AM peak hour, the directional split on SR 120 is projected to continue to be approximately 60% westbound and 40% eastbound;
2. During the morning peak hour, NB SR 99 between Jack Tone Road and the Austin Road off-ramp is projected to continue to operate at LOS F conditions when compared to No Project Conditions;
3. The NB SR 99 off-ramp to Austin Road is projected to improve marginally from LOS F (No Project) to LOS E conditions (With Ultimate Project) Conditions;

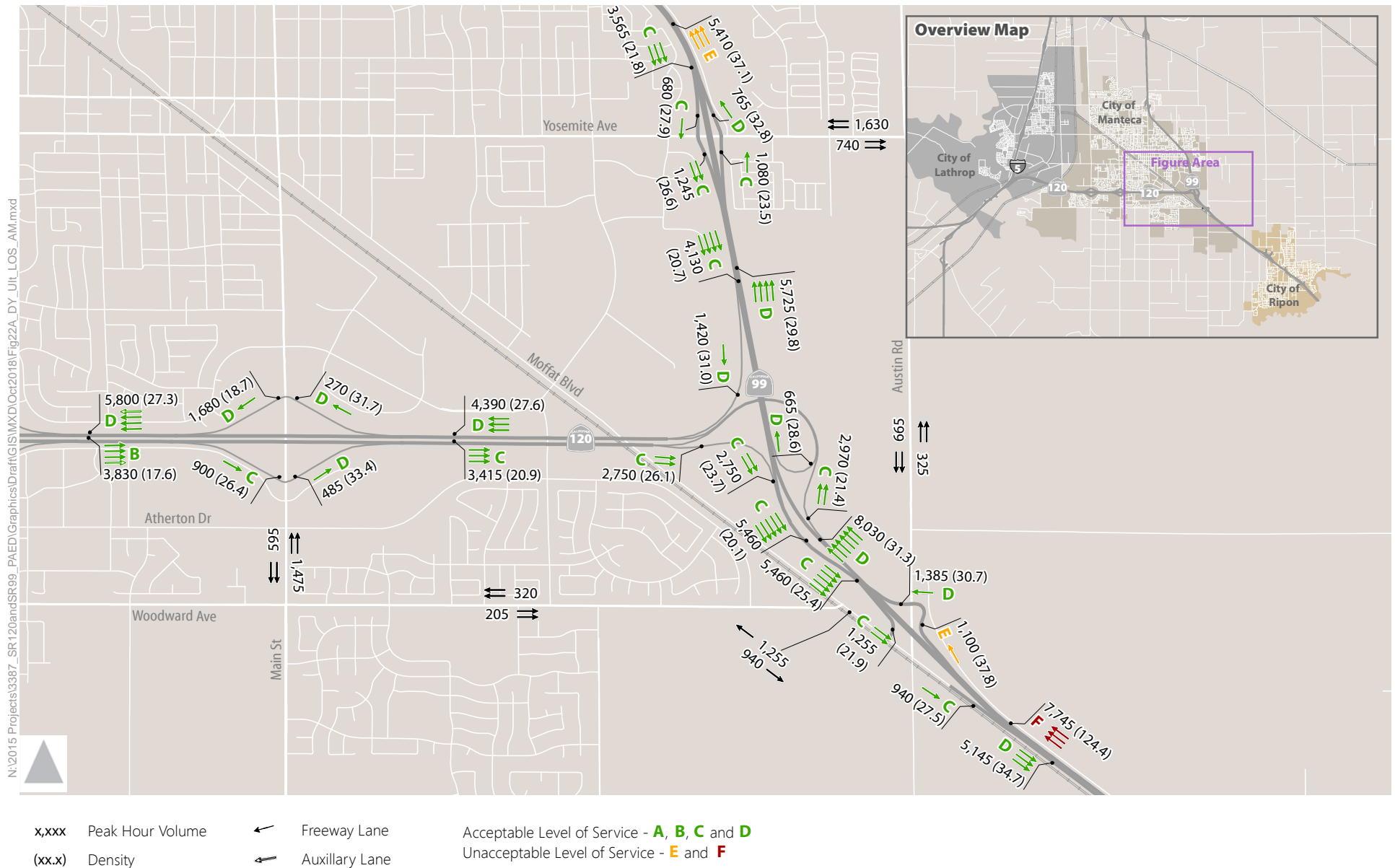
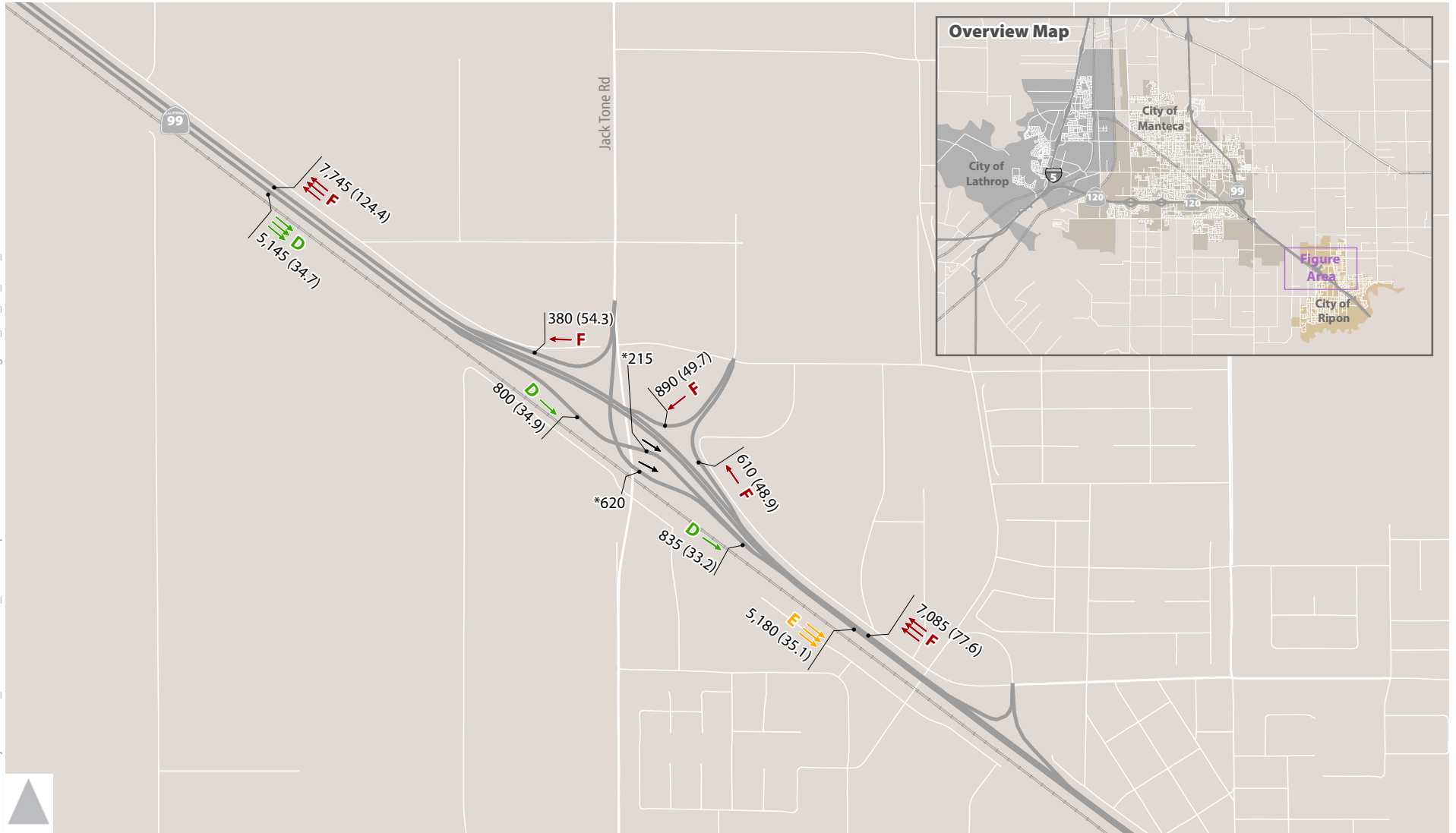


Figure 24A

AM Peak Hour Freeway Volume and Level of Service -
Design Year 2043 With Ultimate Project Conditions

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x,xxx Peak Hour Volume
 (xx.x) Density
 ← Freeway Lane

Acceptable Level of Service - **A, B, C** and **D**
 Unacceptable Level of Service - **E** and **F**
 Note: (*) Indicates a non-freeway segment.

Figure 24B
 AM Peak Hour Freeway Volume and Level of Service -
 Design Year 2043 With Ultimate Project Conditions

The primary conclusions of the Design Year 2043 With Ultimate Project presented in Figure 24A are (continued):

4. The construction of the ultimate improvements will significantly improve NB SR 99 operations when compared to No Project Conditions;
5. With the construction of the NB SR 99 braided ramps, the NB SR 99 on-ramp from Austin Road will improve from unacceptable LOS E (No Project) to acceptable LOS D (With Ultimate Project) Conditions;
6. With the construction of the NB SR 99 braided ramps, the NB SR 99 mainline segment between the Austin Road overcrossing and the SR 120 overcrossing will improve from unacceptable LOS E (No Project) to acceptable LOS D (With Ultimate Project) Conditions;
7. With the construction of the NB SR 99 braided ramps, the two-lane NB SR 99 off-ramp to WB SR 120 will improve from unacceptable LOS F (No Project) to acceptable LOS C (With Ultimate Project) Conditions;
8. Therefore, for Design Year 2043 Conditions, the Ultimate Project would construct sufficient capacity to serve projected demand volumes for the NB SR 99 off-ramp to WB SR 120;
9. The construction of the two-lane EB SR 120 to SB SR 99 freeway-to-freeway ramp would improve EB SR 120 to SB SR 99 operations;
10. The EB SR 120 to SB SR 99 to SB SR 99 freeway-to-freeway ramp will improve from unacceptable LOS E (No Project) to acceptable LOS C (With Ultimate Project) Conditions;
11. Eastbound SR 120 from the Main Street on-ramp to SR 99 will improve from unacceptable LOS E (No Project) to acceptable LOS C (With Ultimate Project)
12. With the construction of the SB SR 99 braided ramps, the SB SR 99 mainline segment between the SR 120 overcrossing and the Austin Road overcrossing will improve from unacceptable LOS E (No Project) to acceptable LOS C (With Ultimate Project) Conditions;
13. With the construction of the SB SR 99 braided ramps, the SB SR 99 off-ramp to Austin Road will improve from unacceptable LOS E (No Project) to acceptable LOS C (With Ultimate Project) Conditions;
14. With the construction of the SB SR 99 braided ramps and additional lanes on SB SR 99 between SR 120 and the Austin Road overcrossing, the SB SR 99 on-ramp from Austin Road will marginally improve from acceptable LOS D (No Project) to acceptable LOS C (With Ultimate Project) Conditions;
15. With the Ultimate Project 27 of the 30 study segments (90.0%) are projected to operate at acceptable Level of Service B, C, or D conditions; and
16. Compared to the No Project Alternative, this represents a 24.5% improvement with the Phase 1A Project.
17. Based on the results of the AM Peak Hour Freeway mainline, off-ramp diverge, on-ramp merge and weaving sections analysis, the Ultimate Project meets the purpose and need of the SR 120 / SR 99 Interchange Project.

The primary conclusions of the Design Year 2043 With Ultimate Project analysis presented in Figure 24B are:

1. During the AM peak hour, the directional split on SR 99 is projected to increase to approximately 60% northbound and 40% southbound;
2. During the morning peak hour, all five (100%) NB SR 99 study segments are projected to continue to operate at LOS F conditions when compared to No Project Conditions;
3. Three (3) of the four (4) (75%) SB SR 99 study segments (100%) are projected to continue to operate at acceptable Level of Service D conditions when compared to No Project Conditions;
4. Overall, three (3) of the (9) study segments (33.3%) are projected to operate at acceptable Level of Service conditions; and
5. Compared to the No Project Alternative, this represents No Change with the Ultimate Project.

Figures 25A and 25B present the Design Year 2043 With Phase 1A Project PM Peak Hour Conditions and provide the following information:

- Design Year 2043 With Ultimate Project PM Peak Hour Volume;
 - Design Year 2043 With Ultimate Project HCS 6th Edition PM Peak Hour Density;
 - Freeway Mainline Lanes, Off-Ramp Lane(s) and On-Ramp Lane(s); and
 - Design Year 2043 With Ultimate Project HCS 6th Edition PM Peak Hour Level of Service.
- Acceptable Level of Service A through D are shown in Green;
Unacceptable / Marginal Level of Service E is shown in Yellow; and
Unacceptable Level of Service F is shown in Red.

The primary conclusions of the Design Year 2043 With Ultimate Project analysis presented in Figure 25A are:

1. During the PM peak hour, the directional split on SR 120 is projected to continue to be approximately 54% eastbound and 46% westbound;
2. During the evening peak hour, the construction of the Diverging Diamond Interchange at the SR 120 / Union Road interchange and the eastbound Auxiliary Lane between the Union Road on-ramp and the Main Street off-ramp (2 mixed flow and 1 auxiliary lane) will improve this segment on EB SR 120 and will continue to operate at acceptable LOS D conditions when compared to No Project Conditions;
3. In addition, the construction of third travel lane on both eastbound and westbound SR 120 between Interstate 5 (to the west) and Interstate 99 (to the east) will improve freeway mainline operations;
4. The EB SR 120 off-ramp to Main Street will continue to operate at unacceptable LOS F conditions when compared to No Project Conditions;
5. The EB SR 120 on-ramp from Main Street will continue to operate at unacceptable LOS E conditions when compared to No Project Conditions;

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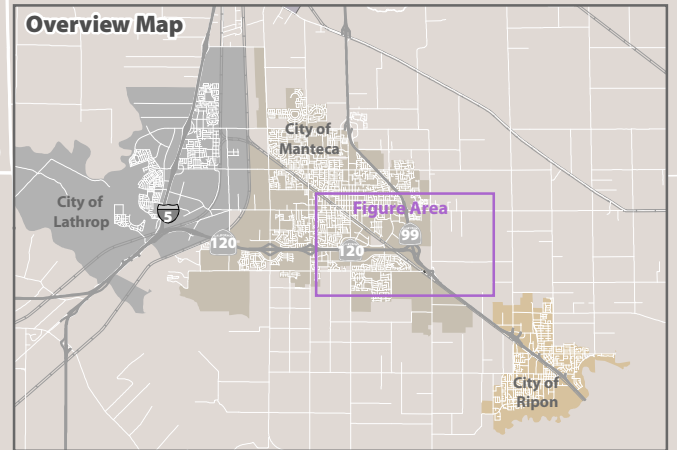
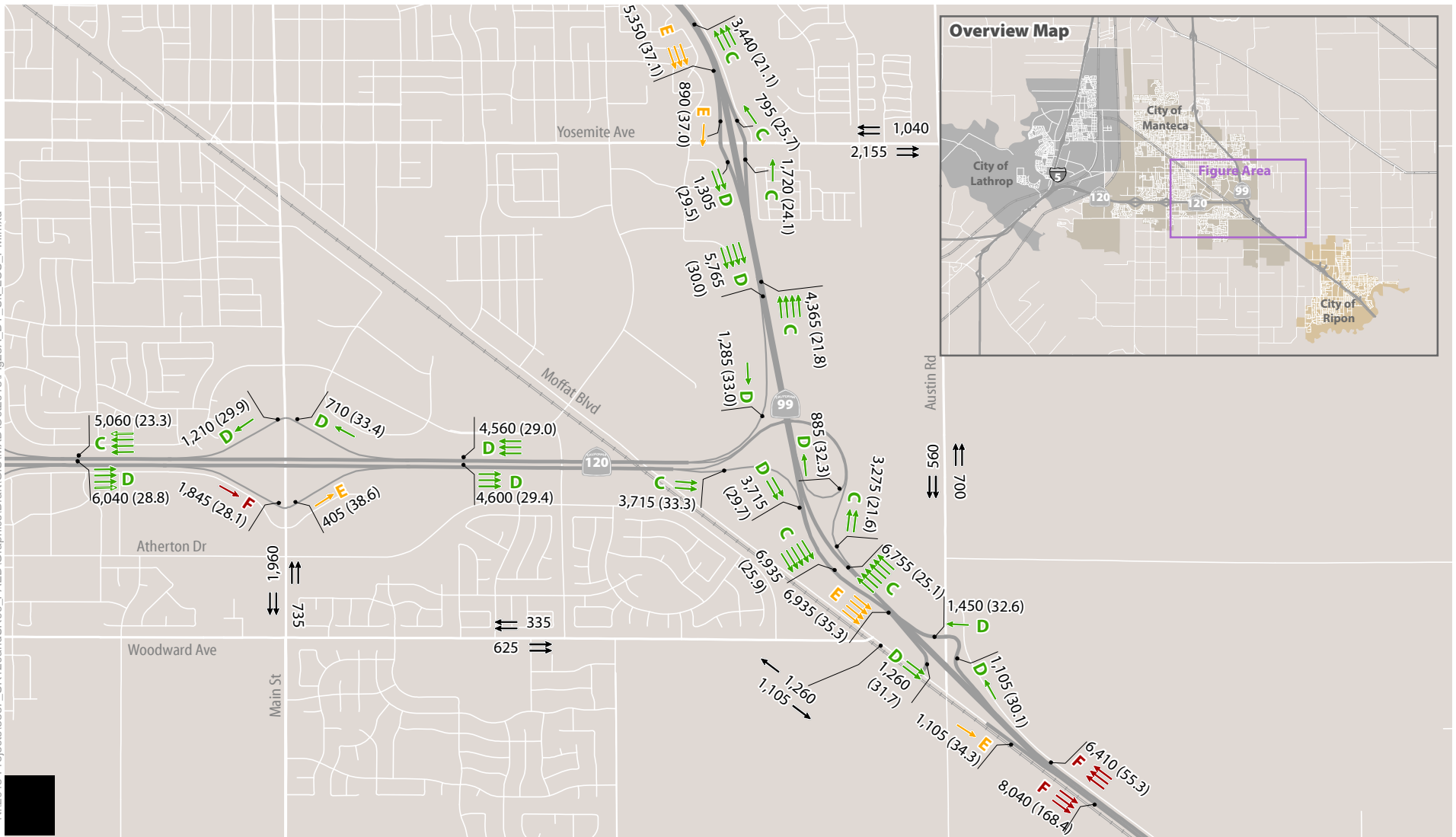
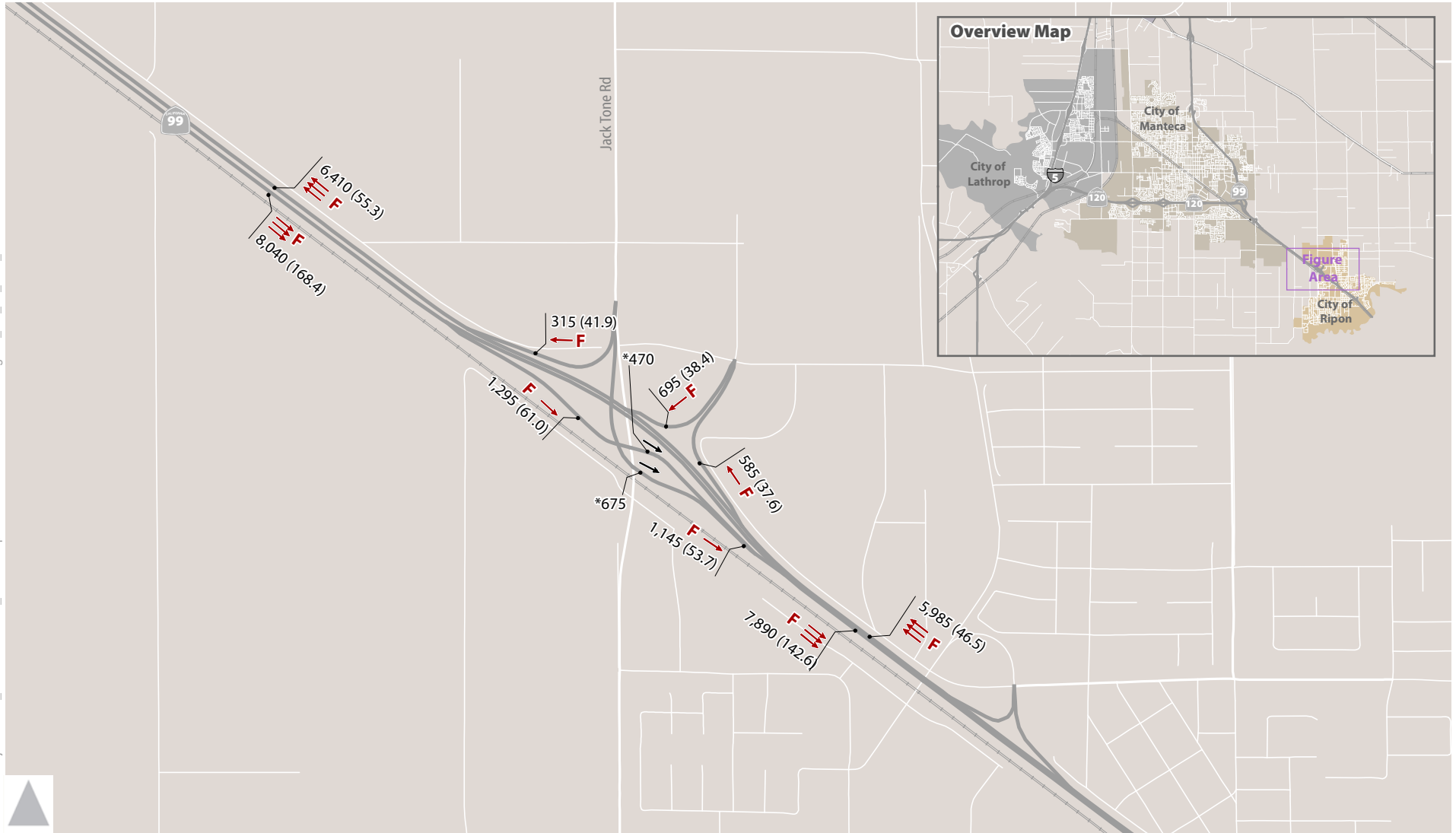


Figure 25A

PM Peak Hour Freeway Volume and Level of Service -
Design Year 2043 With Ultimate Project Conditions



x,xxx Peak Hour Volume
 (xx.x) Density
 ← Freeway Lane

Acceptable Level of Service - **A, B, C** and **D**
 Unacceptable Level of Service - **E** and **F**
 Note: (*) Indicates a non-freeway segment.

Figure 25B
 PM Peak Hour Freeway Volume and Level of Service -
 Design Year 2043 With Ultimate Project Conditions

The primary conclusions of the Design Year 2043 With Ultimate Project analysis presented in Figure 25A are (continued):

6. The EB SR 120 mainline between the Main Street on-ramp and the SR 99 off-ramp will improve from unacceptable LOS F (No Project) to acceptable LOS D (With Ultimate Project) Conditions;
7. The two-lane EB SR 120 to SB SR 99 freeway-to-freeway ramp is projected to improve from LOS F (No Project) to LOS D (With Ultimate Project) conditions;
8. Elimination of the EB SR 120 congestion and slow travel speeds on SR 120 would result in reduced diversion of traffic onto the eastbound SR 120 off-ramp to Main Street, traveling to Woodward Avenue and accessing the SB SR 99 on-ramp at Austin Road;
9. With the construction of the SB SR 99 braided ramps, the SB SR 99 mainline segment between the SR 120 overcrossing and the Austin Road overcrossing will improve from unacceptable LOS F (No Project) to acceptable LOS D (With Ultimate Project) Conditions;
10. With the construction of the SB SR 99 braided ramps, the SB SR 99 off-ramp to Austin Road will improve from unacceptable LOS F (No Project) to acceptable LOS C (With Ultimate Project) Conditions;
11. With the construction of the SB SR 99 braided ramps and additional lanes on SB SR 99 between SR 120 and the Austin Road overcrossing, SB SR 99 will marginally improve from unacceptable LOS F (No Project) to LOS E (With Ultimate Project);
12. With the construction of the SB SR 99 braided ramps and additional lanes on SB SR 99 between SR 120 and the Austin Road overcrossing, the SB SR 99 on-ramp from Austin Road will marginally improve from unacceptable LOS F (No Project) to unacceptable LOS E (With Ultimate Project) Conditions;
13. Southbound SR 99 is projected to continue to operate at LOS F conditions from south of the Austin Road on-ramp to south of the Jack Tone Road interchange when compared to No Project Conditions;
14. Northbound SR 99 is projected to continue to operate at LOS F conditions from north of the Jack Tone interchange to the Austin Road off-ramp when compared to No Project Conditions;
15. With the construction of the additional NB travel lane before the Austin Road off-ramp, the NB SR 99 off-ramp to Austin Road will improve from unacceptable LOS F (No Project) to acceptable LOS D (With Ultimate Project) Conditions;
16. With the construction of the NB SR 99 braided ramps, the NB SR 99 on-ramp from Austin Road will improve from unacceptable LOS E (No Project) to acceptable LOS D (With Ultimate Project) Conditions;
17. With the construction of the NB SR 99 braided ramps, the NB SR 99 mainline segment between the Austin Road overcrossing and the SR 120 overcrossing will improve from unacceptable LOS F (No Project) to acceptable LOS C (With Ultimate Project) Conditions;

The primary conclusions of the Design Year 2043 With Ultimate Project analysis presented in Figure 25A are (continued):

18. With the construction of the NB SR 99 braided ramps, the two-lane NB SR 99 off-ramp to WB SR 120 will improve from unacceptable LOS F (No Project) to acceptable LOS C (With Ultimate Project) Conditions;
19. The EB SR 120 on-ramp onto NB SR 99 would also improve from unacceptable LOS E (No Project) to acceptable LOS D (With Ultimate Project) Conditions;
20. Therefore, for Design Year 2043 Conditions, the Ultimate Project would construct sufficient capacity to serve projected demand volumes for the NB SR 99 off-ramp to WB SR 120;
21. The remaining 23 of the 30 study segments (80.0%) are projected to continue to operate at acceptable Level of Service B, C, or D conditions; and
22. Compared to the No Project Alternative, this represents a 35.3% improvement with the Ultimate Project.

The primary conclusions of the Design Year 2043 With Ultimate Project analysis presented in Figure 25B are:

1. During the PM peak hour, the directional split on SR 99 is projected to increase slightly southbound, with approximately 56% southbound and 44% northbound;
2. During the evening peak hour, southbound SR 99 will continue to exceed operating capacity based on the HCS analysis and degrade to LOS F conditions from south of the Austin Road interchange to south of the Jack Tone interchange when compared to No Project Conditions;
3. The Northbound SR 99 mainline is projected to continue to operate at LOS F conditions from south of the Jack Tone interchange to the Jack Tone Road / Colony Road off-ramp when compared to No Project Conditions;
4. The Northbound SR 99 off-ramp to Jack Tone Road / Colony Road is projected to continue to operate at LOS F condition when compared to No Project Conditions;
5. The Northbound SR 99 on-ramp from Colony Road is projected to continue to operate at LOS F conditions when compared to No Project Conditions;
6. The Northbound SR 99 on-ramp from Jack Tone Road is also projected to continue to operate at LOS F conditions when compared to No Project Conditions;
7. None (0) of the nine (9) study segments (0%) are projected to continue to operate D conditions.
8. Compared to the No Project Alternative, this represents No Change with the Ultimate Project.

Table 22 presents the results of the Design Year 2043 With Ultimate Project AM and PM Peak Hour Intersection Level of Service Analysis.

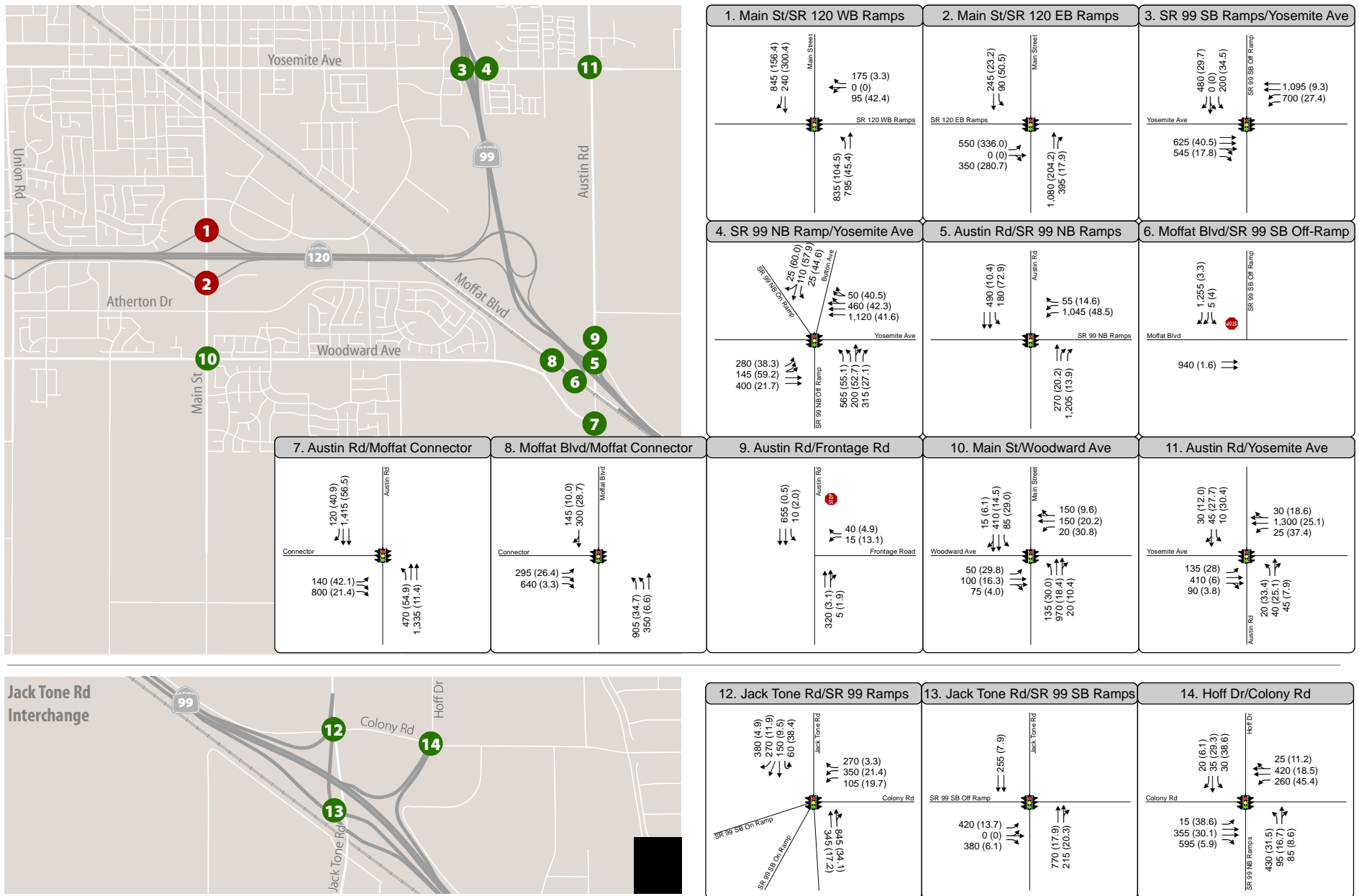
Figure 26 presents the Design Year 2043 With Ultimate Project AM Peak Hour Traffic Volumes, Delay by Movement and Intersection Configurations and Control. It also shows the intersections operating at acceptable level of service condition A, B, C, or D in green, marginal level of service condition E in yellow and unacceptable level of service condition F in red.

**TABLE 22: INTERSECTION ANALYSIS – DESIGN YEAR 2043 WITH ULTIMATE PROJECT
AM AND PM PEAK HOUR CONDITIONS**

Intersection	Control	AM Peak Hour		PM Peak Hour	
		Delay / Movement (sec/veh)	LOS	Delay / Movement (sec/veh)	LOS
1. WB SR 120 Ramps / Main Street	Signal	> 120	F	> 120	F
2. EB SR 120 Ramps / Main Street	Signal	> 120	F	> 120	F
3. SB SR 99 Ramps / Yosemite Avenue	Signal	23.4	C	25.2	C
4. NB SR 99 Ramps / Yosemite Avenue	Signal	42.1	D	47.2	D
5. NB SR 99 Ramps / Austin Road	Signal	28.4	C	28.3	C
6. SB SR 99 Off-Ramp / Moffat Blvd	Side-Street Stop Controlled	2.7	A	2.8	A
7. Austin Road / Moffat Connector	Signal	34.7	C	38.9	D
8. Moffat Blvd / Moffat Connector	Signal	20.3	C	13.9	B
9. Frontage Road / Austin Road	Side-Street Stop Controlled	13.1 (WB Left-Turn)	B	17.4 (WB Left-Turn)	C
10. Woodward Avenue / Main Street	Signal	17.9	B	23.7	C
11. Yosemite Avenue / Austin Road	Signal	20.6	C	65.1	E
12. NB SR 99 Ramps / Jack Tone Road	Signal	19.4	B	20.4	C
13. SB SR 99 Ramps / Jack Tone Road	Signal	13.8	B	39.3	D
14. NB SR 99 Ramps / Colony Road	Signal	22.4	C	25.2	C
15. Woodward Avenue / Moffat Boulevard	Signal	14.8	B	11.3	B

Source: *Highway Capacity Manual* (Transportation Research Board, 6th Edition).
Results Based on 12 SimTraffic Version 10 Model Runs

BOLD denotes unacceptable Level of Service (LOS)



1 Study Intersection Turn Lane AM (Delay) Peak Hour Traffic Volume and Delay

Traffic Signal Stop Sign

Acceptable Level of Service - A, B, C and D

Unacceptable Level of Service - E and F

Figure 26
Peak Hour Traffic Volumes and Lane Configurations -
Design Year 2043 With Ultimate Project AM Peak Hour Conditions

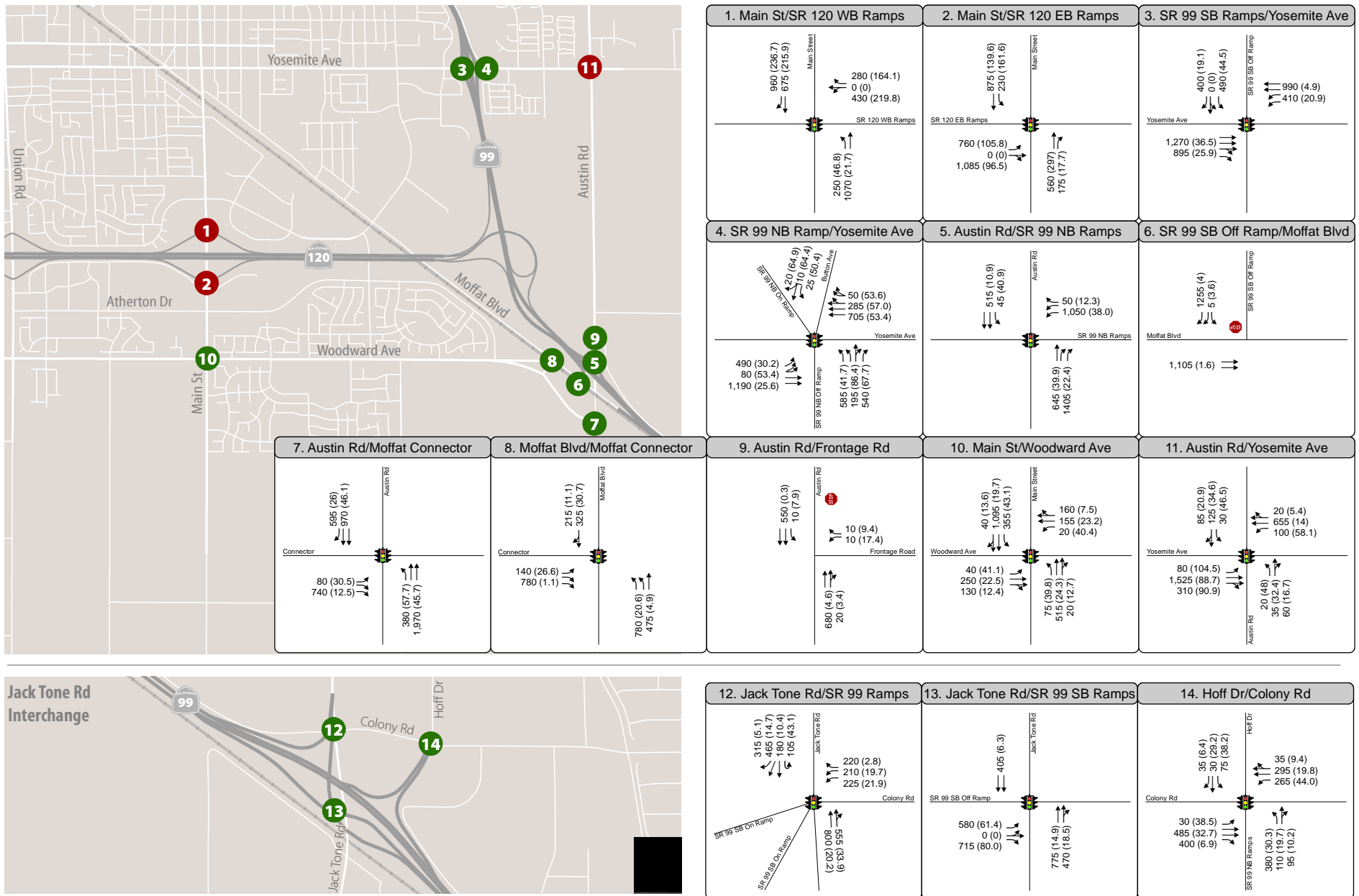
The primary conclusions of the AM peak hour analysis are:

1. During the AM peak hour, eleven (11) of the thirteen (13) signalized intersections (84.6%) are projected to continue to operate at acceptable LOS A, B, C or D conditions;
2. Similar to Design Year 2043 No Project Conditions, the following two (2) signalized intersections are projected to continue to operate at LOS F conditions:
 - a. WB SR 120 Off-Ramp / Main Street; and
 - b. EB SR 120 Off-Ramp / Main Street.
3. In order to improve AM peak hour operations at the SR 120 / Main Street intersections, the interchange would need to be re-constructed based on SJCOG RTP/SCS Interchange Project List. This improvement would be constructed by SJCOG and the City of Manteca before Design Year 2043 Conditions.
4. With the interchange improvements, the SR 120 / Main Street intersections would improve from unacceptable LOS F to acceptable LOS B / C conditions during the AM peak hour;
5. Both (2 of 2) side street stop controlled intersections are projected to operate at acceptable LOS A or LOS B conditions;
6. Overall thirteen (13) of the fifteen (15) study intersections (86.7%) are projected to operate at acceptable LOS A, B, C, or D Conditions with the Ultimate Project;
7. Compared to the No Project Alternative, this represents 36.7% improvements during Design Year 2043 With Ultimate Project AM peak hour conditions; and
8. Therefore, for Design Year 2043 Conditions, with the planned SJCOG / City of Manteca improvements at the SR 120 / Main Street interchange, the Ultimate Project would construct sufficient capacity to serve projected AM Peak hour demand volumes for all 15 (100%) study intersections.

Figure 27 presents the Design Year 2043 With Ultimate Project PM Peak Hour Traffic Volumes, Delay by Movement and Intersection Configurations and Control. It also shows the intersections operating at acceptable level of service condition A, B, C, or D in green, marginal level of service condition E in yellow and unacceptable level of service condition F in red.

The primary conclusions of the PM peak hour analysis are:

1. During the PM peak hour, ten (10) of the thirteen (13) signalized intersections (76.9%) are projected to continue to operate at acceptable LOS A, B, C or D conditions;
2. Similar to Design Year 2043 No Project Conditions, the following two (2) signalized intersections are projected to continue to operate at LOS F conditions:
 - a. WB SR 120 Off-Ramp / Main Street; and
 - b. EB SR 120 Off-Ramp / Main Street.



1 Study Intersection Turn Lane AM (Delay) Peak Hour Traffic Volume and Delay

Traffic Signal Stop Sign

Acceptable Level of Service - **A**, **B**, **C** and **D**

Unacceptable Level of Service - **E** and **F**

Figure 27
Peak Hour Traffic Volumes and Lane Configurations -
Design Year 2043 With Ultimate Project PM Peak Hour Conditions

The primary conclusions of the PM peak hour analysis are (continued):

1. In order to improve PM peak hour operations at the SR 120 / Main Street intersections, the interchange would need to be re-constructed based on SJCOG RTP/SCS Interchange Project List. This improvement would be constructed by SJCOG and the City of Manteca before Design Year 2043 Conditions.
2. With the interchange improvements, the SR 120 / Main Street intersections would improve from unacceptable LOS F to acceptable LOS B / D conditions during the AM peak hour;
3. Similar to Design Year 2043 No Project Conditions, the signalized intersection of Yosemite Avenue / Austin Road is projected to operate at unacceptable LOS F (No Project) and LOS E (With Ultimate Project);
4. Both (2 of 2) side street stop controlled intersections are projected to operate at acceptable LOS A or LOS C conditions;
5. Overall twelve (12) of the fifteen (15) study intersections (80.0%) are projected to operate at acceptable LOS A, B, C, or D Conditions with the Ultimate Project;
6. Compared to the No Project Alternative, this represents 30.0% improvements during Design Year 2043 With Ultimate Project PM peak hour conditions; and
7. Therefore, for Design Year 2043 Conditions, with the planned SJCOG / City of Manteca improvements at the SR 120 / Main Street interchange, the Ultimate Project would construct sufficient capacity to serve projected PM Peak hour demand volumes for all 15 (100%) study intersections.

Table 23 presents the 95th Percentile Queue Length by Movement for the following eleven (11) study intersections. It should be noted that the three study intersections at the SR 99 / Jack Tone interchange were not evaluated since the Phase 1A Project does not close the NB SR 99 off-ramp to Austin Road or the SB SR 99 on-ramp from Austin Road.

- | | |
|---------------------------------------|---|
| 1. SR 120 EB Ramps / Main Street; | 7. Austin Road / Moffat Boulevard; |
| 2. SR 120 WB Ramps / Main Street; | 8. Moffat Boulevard / Moffat Connector; |
| 3. SR 99 NB Ramps / Yosemite Avenue; | 9. Austin Road / Frontage Road; |
| 4. SR 99 SB Ramps / Yosemite Avenue; | 10. Woodward Avenue / Main Street; and |
| 5. SR 99 NB Ramps / Austin Road; | 11. Austin Road / Yosemite Avenue. |
| 6. SR 99 SB Ramps / Moffat Boulevard; | |

**23TABLE 23: 95TH PERCENTILE QUEUE LENGTH BY MOVEMENT
– DESIGN YEAR 2043 WITH ULTIMATE PROJECT**

Intersection	Movement	Available Storage (Feet)	AM Peak Hour	PM
				Peak Hour
1. WB SR 120 Ramps / Main Street	WB LT / TH	1,740	126	2,120
	WB RT	175	0	342
	NB LT	230	353	235
	NB TH	1,451	1,878	566
	SB TH	1,920	3,226	3,723
	SB RT	1,920	3,803	3,942
2. EB SR 120 Ramps / Main Street	EB LT	1,706	2,196	2,127
	EB TH / RT	190	5,619	263
	NB TH	1,371	1,668	4,087
	NB RT	1,000	1,906	1,872
	SB LT	230	151	352
	SB TH	1,451	241	1,730
3. SB SR 99 Ramps / Yosemite Avenue	EB TH	782	367	393
	EB TH	782	176	548
	EB TH / RT	782	213	613
	EB RT	365	201	362
	WB TH	340	294	145
	WB TH	340	306	162
	WB RT	340	276	103
	WB RT	360	216	92
	SB LT	350	109	254
	SB LT / RT	1,010	343	284
4. NB SR 99 Ramps / Yosemite Avenue	SB RT	350	373	242
	EB LT	340	234	295
	EB LT	340	286	309
	EB TH	340	176	386
	EB TH	340	201	384
	WB TH	1,667	354	265
	WB TH	1,667	401	307
	WB TH / RT	1,667	439	332
	WB RT	265	327	293
	NB LT	350	328	271
	NB LT	962	370	887
	NBTH / RT	962	329	994
	NB RT	350	295	500
	SB LT	823	145	151
	SB LT/ TH	170	193	190

**TABLE 23: 95TH PERCENTILE QUEUE LENGTH BY MOVEMENT
– DESIGN YEAR 2043 WITH ULTIMATE PROJECT (CONTINUED)**

Intersection	Movement	Available Storage (Feet)	AM	PM
			Peak Hour	Peak Hour
5. NB SR 99 Ramps / Austin Road	WB LT	450	369	364
	WB LT	1,500	725	598
	WB RT	300	223	174
	NB TH	1,880	171	471
	NB RT	1,880	142	181
	NB RT	300	173	140
	SB LT	250	261	78
	SB TH	629	251	126
	SB TH	629	204	131
6. SB SR 99 Off-Ramp / Moffat Blvd.	SB RT	750	46	17
	SB RT	750	51	0
7. Austin Road / Moffat Connector	EB LT	275	181	118
	EB RT	1,607	269	185
	EB RT	1,607	269	195
	NB LT	450	418	410
	NB TH	2,261	468	1,230
	NB TH	2,261	367	1,190
	SB TH	1,880	791	389
	SB TH	1,880	821	437
	SB RT	350	302	312
8. Moffat Blvd / Moffat Connector	EB LT	328	255	133
	EB RT	328	68	93
	EB RT	328	87	112
	NB LT	485	380	233
	NB LT	485	387	273
	NB TH	485	217	147
	SB TH	1,266	220	275
	SB RT	200	131	174

**TABLE 23: 95TH PERCENTILE QUEUE LENGTH BY MOVEMENT
– DESIGN YEAR 2043 WITH ULTIMATE PROJECT (CONTINUED)**

Intersection	Movement	Available Storage (Feet)	AM Peak Hour	PM
				Peak Hour
9. Frontage Road / Austin Road	WB LT	749	44	32
	WB RT	25	59	44
	NB TH	629	5	3
	NB TH / RT	629	6	9
	SB LT	100	17	24
	SB TH	803	2	0
10. Woodward Avenue / Main Street	EB LT	95	70	81
	EB TH	600	78	147
	EB TH / RT	500	65	129
	WB LT	175	46	49
	WB TH	634	104	113
	WB RT	634	112	106
	NB LT	250	164	107
	NB TH	2,509	278	211
	NB TH / RT	2,509	242	180
	SB LT	250	93	300
	SB TH	523	150	431
	SB TH / RT	523	103	354
11. Yosemite Avenue / Austin Road	EB LT	250	135	279
	EB TH	1,717	97	1,814
	EB RT	1,717	106	1,805
	WB LT	470	76	151
	WB TH	1,382	550	219
	WB TH / RT	270	328	201
	NB LT	225	53	51
	NB TH / RT	1,121	89	105
	SB LT	225	35	67
	SB TH / RT	1,043	86	201

Results Based on 12 SimTraffic Version 10 Model Runs

BOLD denotes 95th Percentile Queue Length Exceeds Available Storage

The primary results of the Design Year With Ultimate Project AM Peak 95th Percentile Queue Length by Movement analysis are:

- Seventy-nine (79) of the ninety-three (93) movements have 95th Percentile queue lengths less than the available storage; and
- Fourteen (14) of the ninety-three (93) movements (15.1%) have 95th Percentile queue lengths greater than the available storage.
- This represents a decrease in ten (10) movements and a 13.8% decrease when compared to Existing AM Peak Hour Conditions.

The primary results of the Design Year With Ultimate Project PM Peak 95th Percentile Queue Length by Movement analysis are:

- Seventy-one (71) of the ninety-three (93) movements have 95th Percentile queue lengths less than the available storage; and
- Twenty-two (22) of the ninety-three (93) movements (23.7%) have 95th Percentile queue lengths greater than the available storage.
- This represents a decrease in nine (9) movements and a 13.6% decrease when compared to Existing AM Peak Hour Conditions.

Table 24 presents the total network performance measures of effectiveness for the Synchro / SimTraffic Models for Design Year 2043 With Ultimate Project AM and PM Peak Hour Conditions.

When compared to Design Year 2043 No Project Conditions, the following benefits of the SR 120 / SR 99 Interchange Ultimate Project were identified for AM Peak Hour Conditions:

- Total Vehicle Hours of Delay (VHD) would decrease by 77.2% from 2,483 to 569. This is a result of elimination of grid-lock conditions within the project study area;
- Total Stops would decrease by 3.4% from 26,988 to 26,067. This is a result of additional intersections that would be constructed as part of the Ultimate Project in addition to the construction of the NB and SB SR 99 braided ramps between SR 120 and the reconstructed SR 99 / Austin Road interchange;
- Vehicle Miles Traveled (VMT) would decrease by 26.9% from 24,540 to 17,945. This is a result of elimination of grid-lock conditions and the ability for vehicles to move in the project study area;
- Vehicle Hours Traveled (VHT) would decrease by 65.3% from 4,057 to 1,407. This is a result of improved mobility within the project study area;

**TABLE 24: TOTAL NETWORK PERFORMANCE
DESIGN YEAR 2043 WITH ULTIMATE PROJECT CONDITIONS**

Measure of Effectiveness	Based on 12 SimTraffic Model Runs	
	AM Peak Hour	PM Peak Hour
Total Vehicle Hours of Delay (VHD)	569 (-77.2%)	749 (-71.6%)
Total Stops	26,067 (-3.4%)	36,862 (+5.9%)
Vehicle Miles of Travel (VMT)	17,945 (-26.9%)	22,935 (-21.8%)
Vehicle Hours Travelled (VHT)	1,407 (-65.3%)	1,695 (-64.7%)
Total Fuel Consumption	772 (-46.4%)	972 (-43.9%)
Total Vehicle Emissions (lbs of CO2)	14,668 (-46.4%)	18,468 (-43.9%)
Average Speed (MPH)	16 (+100.0%)	16 (+100.0%)
Vehicles Entering Network in Peak Hour	22,207 (+7.0%)	27,420 (+8.3%)
Vehicles Entering Network in Peak Hour	21,922 (+20.2%)	27,042 (+18.3%)
Percent (%) Demand Served	98.7% (+10.9%)	98.6% (+8.3%)

Source: Results Based on 12 SimTraffic Version 10 Model Runs

When compared to Design Year 2043 No Project Conditions, the following benefits of the SR 120 / SR 99 Interchange Ultimate Project were identified for AM Peak Hour Conditions (continued):

- Fuel Consumption would decrease by 46.4%, from 1,439 to 772 gallons, resulting in 12,673 fewer pounds of vehicle emissions;
- Average travel speed would increase 100.0% from 8 to 16 miles per hour. This a result of reducing congestion and delay in the project study area;
- Vehicles Entering the Network would increase by 7.0%, from 20,758 to 22,207, and Vehicles Exiting the Network would increase 20.2%, from 18,234 to 21,922 This is a result of elimination of grid-lock conditions and improved mobility in the project study area;
- Percent (%) Demand Served would increase by 10.9%, from 87.8% to 98.7%. This shows that the Ultimate Project is meeting the purpose and need of the SR 120 / SR 99 Interchange Project;
- These results shows that Ultimate Project provides an improvement when compared to No Project Conditions Design Year 2043 AM Peak Hour Conditions, and meets the purpose and need of the SR 120 / SR 99 Interchange Project.

When compared to Design Year 2043 No Project Conditions, the following benefits of the SR 120 / SR 99 Ultimate Interchange Project were identified for PM Peak Hour Conditions:

- Total Vehicle Hours of Delay (VHD) would decrease by 71.6% from 2,636 to 749. This is a result of elimination of grid-lock conditions within the project study area;
- Total Stops would increase by 5.9% from 34,799 to 36,862. This is a result of additional intersections that would be constructed as part of the Ultimate Project in addition to the construction of the NB and SB SR 99 braided ramps between SR 120 and the reconstructed SR 99 / Austin Road interchange;
- Vehicle Miles Traveled (VMT) would decrease by 21.8% from 29,310 to 22,935. This is a result of elimination of grid-lock conditions and the ability for vehicles to move in the project study area;
- Vehicle Hours Traveled (VHT) would decrease by 64.7% from 4,800 to 1,695. This is a result of improved mobility within the project study area;
- Fuel Consumption would decrease by 43.9%, from 1,734 to 972 gallons, resulting in 14,478 fewer pounds of vehicle emissions;
- Average travel speed would increase 100.0% from 8 to 16 miles per hour; This a result of reducing congestion and delay in the project study area;
- Vehicles Entering the Network would increase by 8.3%, from 25,326 to 27,420, and Vehicles Exiting the Network would increase 18.3%, from 22,864 to 27,042. This is a result of elimination of grid-lock conditions and improved mobility in the project study area;
- Percent (%) Demand Served would increase 8.3%, from 90.3% to 98.6%. This shows that the Phase 1A Project is meeting the purpose and need of the SR 120 / SR 99 Interchange Project;
- These results shows that Ultimate Project provides an improvement when compared to No Project Conditions Design Year 2043 PM Peak Hour Conditions, and meets the purpose and need of the SR 120 / SR 99 Interchange Project.

INTERIM YEAR 2033 WITH PHASE 1B PROJECT

The following Appendices contain the Design Year 2043 With Phase 1B Project conditions analysis:

- Appendix NN – Interim Year 2033 With Phase 1B Project Conditions – AM Peak Hour - Eastbound SR 120 and Southbound SR 99 HCS Freeway Mainline, On-Ramp Merge, Off-Ramp Diverge Analysis and Weaving Section Analysis;
- Appendix OO – Interim Year 2033 With Phase 1B Project Conditions – AM Peak Hour - Northbound SR 99 and Westbound SR 120 HCS Freeway Mainline, On-Ramp Merge, Off-Ramp Diverge Analysis and Weaving Section Analysis;
- Appendix PP – Interim Year 2033 With Phase 1B Project Conditions – PM Peak Hour - Eastbound SR 120 and Southbound SR 99 HCS Freeway Mainline, On-Ramp Merge, Off-Ramp Diverge Analysis and Weaving Section Analysis;
- Appendix QQ – Interim Year 2033 With Phase 1B Project Conditions – PM Peak Hour - Northbound SR 99 and Westbound SR 120 HCS Freeway Mainline, On-Ramp Merge, Off-Ramp Diverge Analysis and Weaving Section Analysis;
- Appendix RR – Interim Year 2033 With Phase 1B Project Conditions – AM Peak Hour Synchro / SimTraffic Input Data and SimTraffic Analysis Results Based on 12 SimTraffic Model Runs; and
- Appendix SS – Interim Year 2033 With Phase 1B Project Conditions – PM Peak Hour Synchro / SimTraffic Input Data and SimTraffic Analysis Results Based on 12 SimTraffic Model Runs.

Figure 28A and 28B present the Interim Year 2033 With Phase 1B Project AM Peak Hour Conditions and provide the following information:

- Interim Year 2033 With Phase 1B Project AM Peak Hour Volume;
- Interim Year 2033 With Phase 1B Project HCS 6th Edition AM Peak Hour Density;
- Freeway Mainline Lanes, Off-Ramp Lane(s) and On-Ramp Lane(s); and
- Interim Year 2033 With Phase 1B Project HCS 6th Edition AM Peak Hour Level of Service.
Acceptable Level of Service A through D are shown in Green;
Unacceptable / Marginal Level of Service E is shown in Yellow; and
Unacceptable Level of Service F is shown in Red.

The primary conclusions of the Interim Year 2033 With Phase 1B Project presented in Figure 28A are:

1. During the AM peak hour, the directional split on SR 120 is projected to continue to be approximately 60% westbound and 40% eastbound;
2. During the morning peak hour, the construction of the Diverging Diamond Interchange at the SR 120 / Union Road interchange and the eastbound Auxiliary Lane between the Union Road on-ramp and the Main Street on-ramp (2 mixed flow and 1 auxiliary lane) will improve this segment on WB SR 120 to acceptable LOS D conditions;

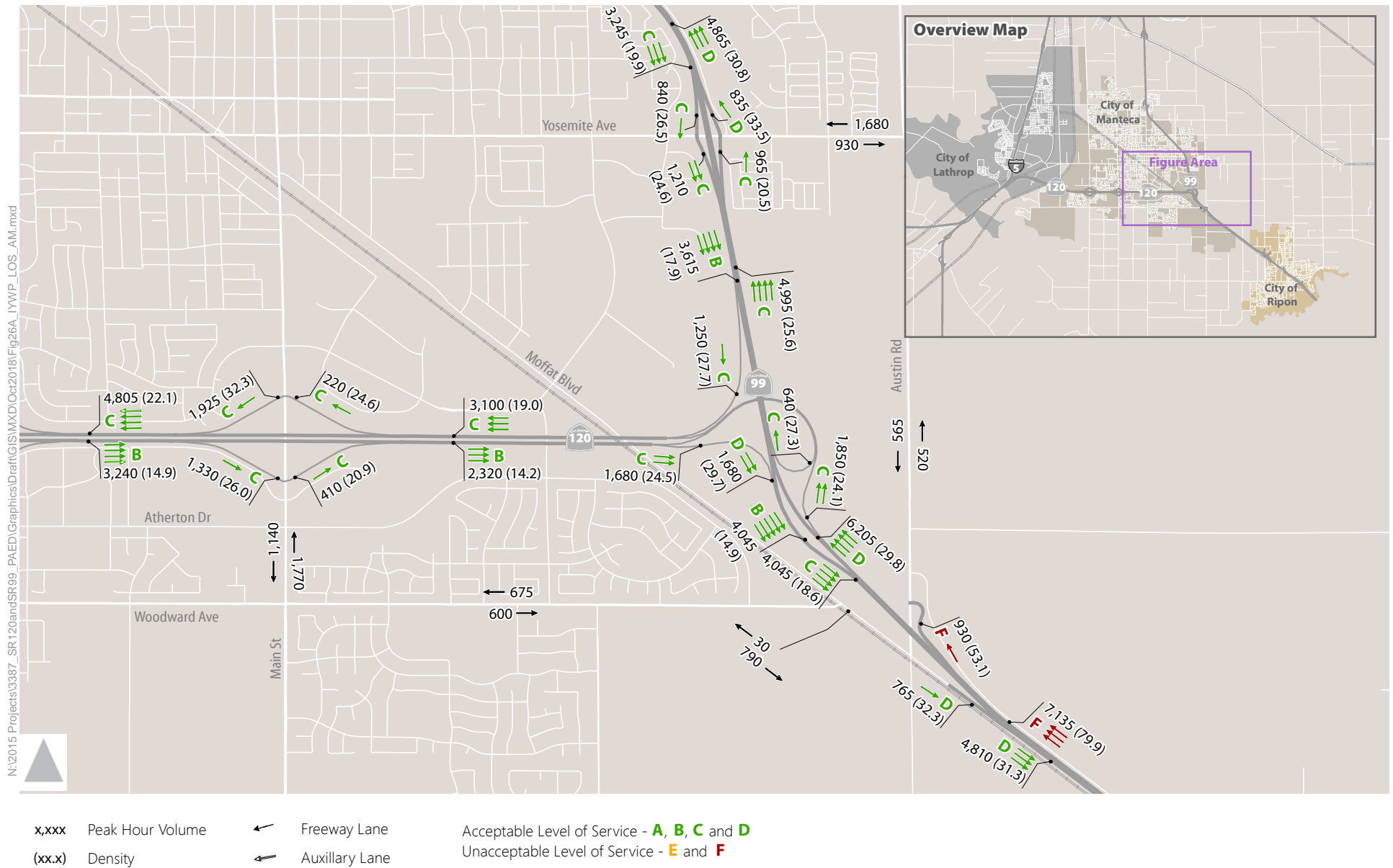
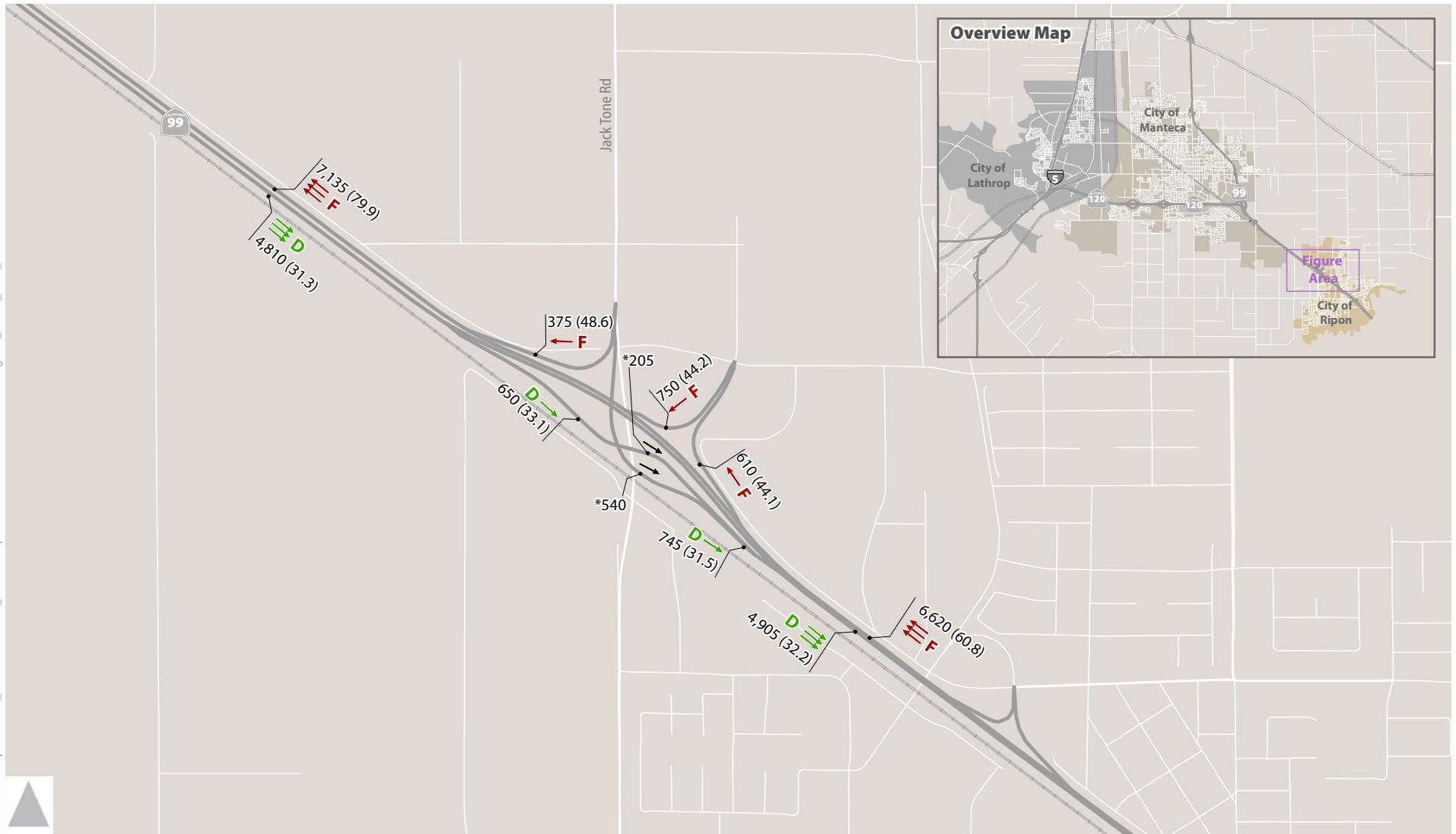


Figure 28A

AM Peak Hour Freeway Volume and Level of Service -
Interim Year 2033 With Phase 1B Project Conditions

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x,xxx Peak Hour Volume
(xx.x) Density
↖ Freeway Lane

Acceptable Level of Service - **A, B, C** and **D**
Unacceptable Level of Service - **E** and **F**

Note: (*) Indicates a non-freeway segment.

AM Peak Hour Freeway Volume and Level of Service -
Interim Year 2033 With Phase 1B Project Conditions

Figure 28B

The primary conclusions of the Interim Year 2033 With Phase 1B Project presented in Figure 28A are:

3. In addition, the construction of third travel lane on both eastbound and westbound SR 120 between Interstate 5 (to the west) and Interstate 99 (to the east) will improve freeway mainline operations;
4. During the morning peak hour, NB SR 99 between Jack Tone Road and Austin Road is projected to continue to operate at LOS F conditions;
5. The NB SR 99 off-ramp to Austin Road is projected to continue to operate at LOS F conditions;
6. With the NB SR 99 off-ramp to WB SR 120 widened to two lanes and the continued closure of the NB SR 99 on-ramp and elimination of the on-ramp merge would not improve the segment of SR 99 between the Austin Road off-ramp and the WB SR 120 off-ramp;
7. The NB SR 99 to WB SR 120 freeway-to-freeway ramp is projected to operate at acceptable LOS C (With Phase 1B Project) conditions;
8. Therefore, the Phase 1B Project should be constructed by Year 2033 conditions. A design period exception for the SR 99 / SR 120 Interchange Project was prepared by the Project Development Team.
9. The construction of the two-lane EB SR 120 to SB SR 99 freeway-to-freeway ramp would improve EB SR 120 to SB SR 99 operations;
10. The two-lane EB SR 120 to SB SR 99 freeway-to-freeway ramp is projected to operate at LOS C (With Phase 1B Project) conditions;
11. With the on-ramp traffic entering southbound SR 99 from the single lane eastbound SR 99 on-ramp, the SB SR 99 merge section would operate at LOS D conditions;
12. The closure of the SB SR 99 off-ramp to Austin Road would result in LOS B / C (With Phase 1B) conditions between SR 120 and the Austin Road on-ramp;
13. With the Phase 1B Project 25 of the 27 study segments (92.6%) are projected to operate at acceptable Level of Service B, C, or D conditions; and
14. Compared to the Construction Year 2023 No Project Alternative, this represents a 9.8% improvement with the Phase 1B Project.

The primary conclusions of the Interim Year 2033 With Phase 1B Project analysis presented in Figure 28B are:

1. During the AM peak hour, the directional split on SR 99 is projected to increase to approximately 60% northbound and 40% southbound;
2. During the morning peak hour, all five (100%) NB SR 99 study segments are projected to continue to operate at LOS F conditions;
3. Three (3) of the four (4) (75%) SB SR 99 study segments (100%) are projected to continue to operate at acceptable Level of Service D conditions;
4. Overall, four (4) of the (9) study segments (44.4%) are projected to operate at acceptable Level of Service conditions; and
5. Compared to the Construction Year 2023 No Project Alternative, this represents No Change with the Phase 1B Project.

Figures 29A and 29B present the Interim Year 2033 With Phase 1B Project PM Peak Hour Conditions and provide the following information:

- Interim Year 2033 With Phase 1B Project PM Peak Hour Volume;
- Interim Year 2033 With Phase 1B Project HCS 6th Edition PM Peak Hour Density;
- Freeway Mainline Lanes, Off-Ramp Lane(s) and On-Ramp Lane(s);
- Interim Year 2033 With Phase 1B Project HCS 6th Edition PM Peak Hour HCS 6th Edition Level of Service.

Acceptable Level of Service A through D are shown in Green;

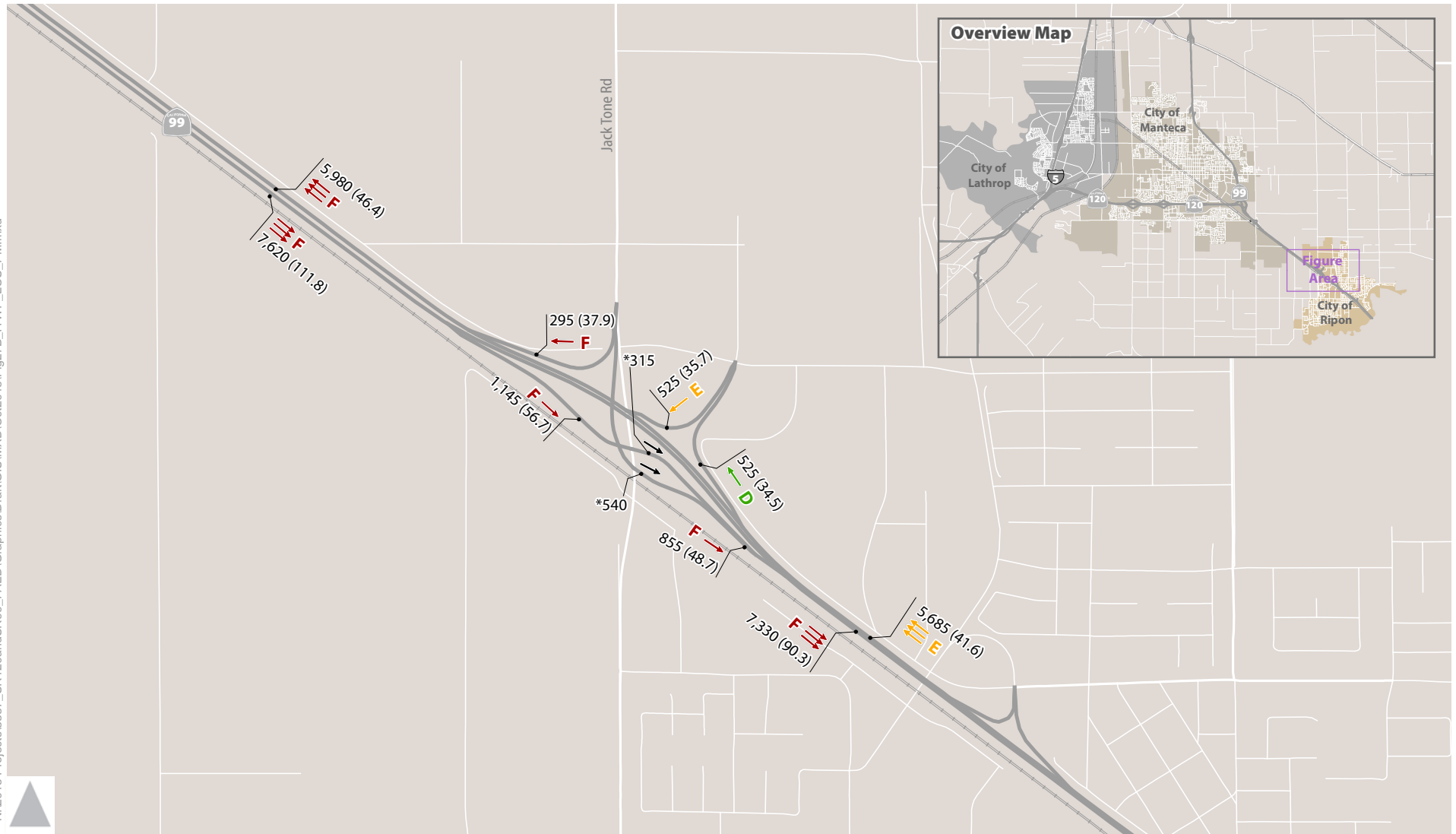
Unacceptable / Marginal Level of Service E is shown in Yellow; and

Unacceptable Level of Service F is shown in Red.

The primary conclusions of the Interim Year 2033 With Phase 1B Project analysis presented in Figure 29A are:

1. During the PM peak hour, the directional split on SR 120 is projected to continue to be approximately 54% eastbound and 46% westbound;
2. During the evening peak hour, the construction of the Diverging Diamond Interchange at the SR 120 / Union Road interchange and the eastbound Auxiliary Lane between the Union Road on-ramp and the Main Street on-ramp (2 mixed flow and 1 auxiliary lane) will improve this segment on EB SR 120 to acceptable LOS C conditions;
3. In addition, the construction of third travel lane on both eastbound and westbound SR 120 between Interstate 5 (to the west) and Interstate 99 (to the east) will improve freeway mainline operations;
4. With the closure of the southbound SR 99 off-ramp to Austin Road, additional traffic would use the EB SR 120 off-ramp to Main Street. With the SR 120 / Main Street interchange improvements, the EB SR 120 off-ramp to Main Street would operate at LOS C (With Phase 1B).
5. The construction of the two-lane EB SR 120 to SB SR 99 freeway-to-freeway ramp would improve EB SR 120 to SB SR 99 operations;
6. The EB SR 120 mainline between the Main Street on-ramp and the SR 99 freeway-to-freeway ramp is projected to operate at LOS C (With Phase 1B Project) conditions;
7. The two-lane EB SR 120 to SB SR 99 freeway-to-freeway ramp is projected to improve to acceptable LOS C (With Phase 1B Project) conditions;
8. With the heavy on-ramp traffic entering southbound SR 99 from the single lane eastbound SR 99 on-ramp, the SB SR 99 merge section operates at LOS C conditions;
9. Elimination of the EB SR 120 congestion and slow travel speeds on SR 120 would reduce diversion of traffic onto the eastbound SR 120 off-ramp to Main Street, traveling to Woodward Avenue and accessing the SB SR 99 on-ramp at Austin Road;
10. The closure of the SB SR 99 off-ramp to Moffat Boulevard / Austin Road will result in SB SR 99 between the SR 120 on-ramp and the Austin Road on-ramp to operate at acceptable LOS C / LOS D (With Phase 1B) conditions;

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x,xxx Peak Hour Volume
(xx.x) Density
↖ Freeway Lane

Acceptable Level of Service - **A, B, C** and **D**
Unacceptable Level of Service - **E** and **F**

Note: (*) Indicates a non-freeway segment.

Figure 29B
PM Peak Hour Freeway Volume and Level of Service -
Interim Year 2033 With Phase 1B Project Conditions

The primary conclusions of the Interim Year 2033 With Phase 1B Project analysis presented in Figure 29A are (Continued):

11. At the SB SR 99 Austin Road on-ramp, the freeway mainline would improve marginally and operate to LOS E (With Phase 1B);
12. Southbound SR 99 is projected to continue to operate at LOS F conditions from south of the Austin Road on-ramp to south of the Jack Tone Road interchange;
13. Northbound SR 99 is projected to continue to operate at LOS F conditions from north of the Jack Tone interchange to the Austin Road off-ramp;
14. The NB SR 99 off-ramp to Austin Road would continue to operate at LOS F conditions (No Project and With Phase 1B);
15. With the NB SR 99 off-ramp to WB SR 120 widened to a two-lane off-ramp, closure of the NB SR 99 on-ramp, and elimination of the on-ramp merge, the NB SR 99 off-ramp to WB SR 120 would operate at LOS C (With Phase 1B Project) conditions;
16. The remaining 12 of the 27 study segments (81.5%) are projected to continue to operate at acceptable Level of Service B, C, or D conditions; and
17. Compared to the Construction Year 2023 No Project Alternative, this represents a 19.4% improvement with the Phase 1A Project.

The primary conclusions of the Interim Year 2033 With Phase 1B Project analysis presented in Figure 29B are:

1. During the PM peak hour, the directional split on SR 99 is projected to increase slightly southbound, with approximately 56% southbound and 44% northbound;
2. During the evening peak hour, southbound SR 99 will continue to exceed operating capacity based on the HCS analysis and degrade to LOS F conditions from south of the Austin Road interchange to south of the Jack Tone interchange;
3. The Northbound SR 99 mainline is projected to continue to operate at LOS F conditions from south of the Jack Tone interchange to the Jack Tone Road / Colony Road off-ramp;
4. The Northbound SR 99 off-ramp to Jack Tone Road / Colony Road is projected to continue to operate at LOS D conditions;
5. The Northbound SR 99 on-ramp from Colony Road is projected to continue to operate at LOS E conditions;
6. The Northbound SR 99 on-ramp from Jack Tone Road is also projected to continue to operate at LOS F conditions;
7. One (1) of the nine (9) study segments (11.1%) are projected to continue to operate D conditions.
8. Compared to the Construction Year 2023 No Project Alternative, this represents an 11.1% improvement with the Phase 1B Project.

Figure 30 presents the Interim Year 2033 With Phase 1B Project AM Peak Hour Traffic Volumes, Delay by Movement and Intersection Configurations and Control. It also shows the intersections operating at acceptable level of service condition A, B, C, or D in green, marginal level of service condition E in yellow and unacceptable level of service condition F in red.

Table 25 presents the results of the Interim Year 2033 With Phase 1B Project AM and PM Peak Hour Intersection Level of Service Analysis.

The primary conclusions of the AM peak hour analysis are:

1. During the AM peak hour, five (5) of the thirteen (13) signalized intersections (38.5%) are projected to continue to operate at acceptable LOS A, C or D conditions;
2. The following eight (8) signalized intersections are projected to degrade to LOS E or F conditions:
 - a. WB SR 120 Off-Ramp / Main Street;
 - b. EB SR 120 Off-Ramp / Main Street;
 - c. NB SR 99 Ramps / Yosemite Avenue;
 - d. NB SR 99 Off-Ramp / Austin Road;
 - e. Woodward Avenue / Connector;
 - f. Austin Road / Moffat Connector;
 - g. Woodward / Main Street; and
 - h. Yosemite Avenue / Austin Road.
3. Compared to the No Project Alternative, this represents an 11.5% decrease with the Phase 1A Project.
4. Closure of the SB SR 99 off-ramp would result in a net increase in traffic volumes at the SR 120 / Main Street interchange resulting in the SR 120 Off-Ramp / Main Street interchange to continue to operate at LOS F Conditions (With Phase 1B Project);
5. In order to improve AM peak hour operations at the EB SR 120 Off-Ramp / Main Street interchange, the interchange would need to be re-constructed based on SJCOG RTP/SCS Interchange Project List. This improvement would be constructed by SJCOG and the City of Manteca before Design Year 2043 Conditions.
6. With the interchange improvements, the EB SR 120 Off-Ramp / Main Street interchange would improve from LOS F to LOS B / C conditions during the AM peak hour;
7. Increases in traffic volumes at the NB SR 99 Ramps / Yosemite Avenue intersection will result in the intersection degrading from LOS D (No Project) to LOS F (With Phase 1B Project) conditions;
8. The side street stop controlled intersection of Austin Road / Frontage Road is projected to operate at LOS F conditions.

The primary conclusions of the PM peak hour analysis are:

1. During the PM peak hour, four (4) of the thirteen (13) signalized intersections (38.5%) are projected to continue to operate at acceptable LOS A, B, C or D conditions;

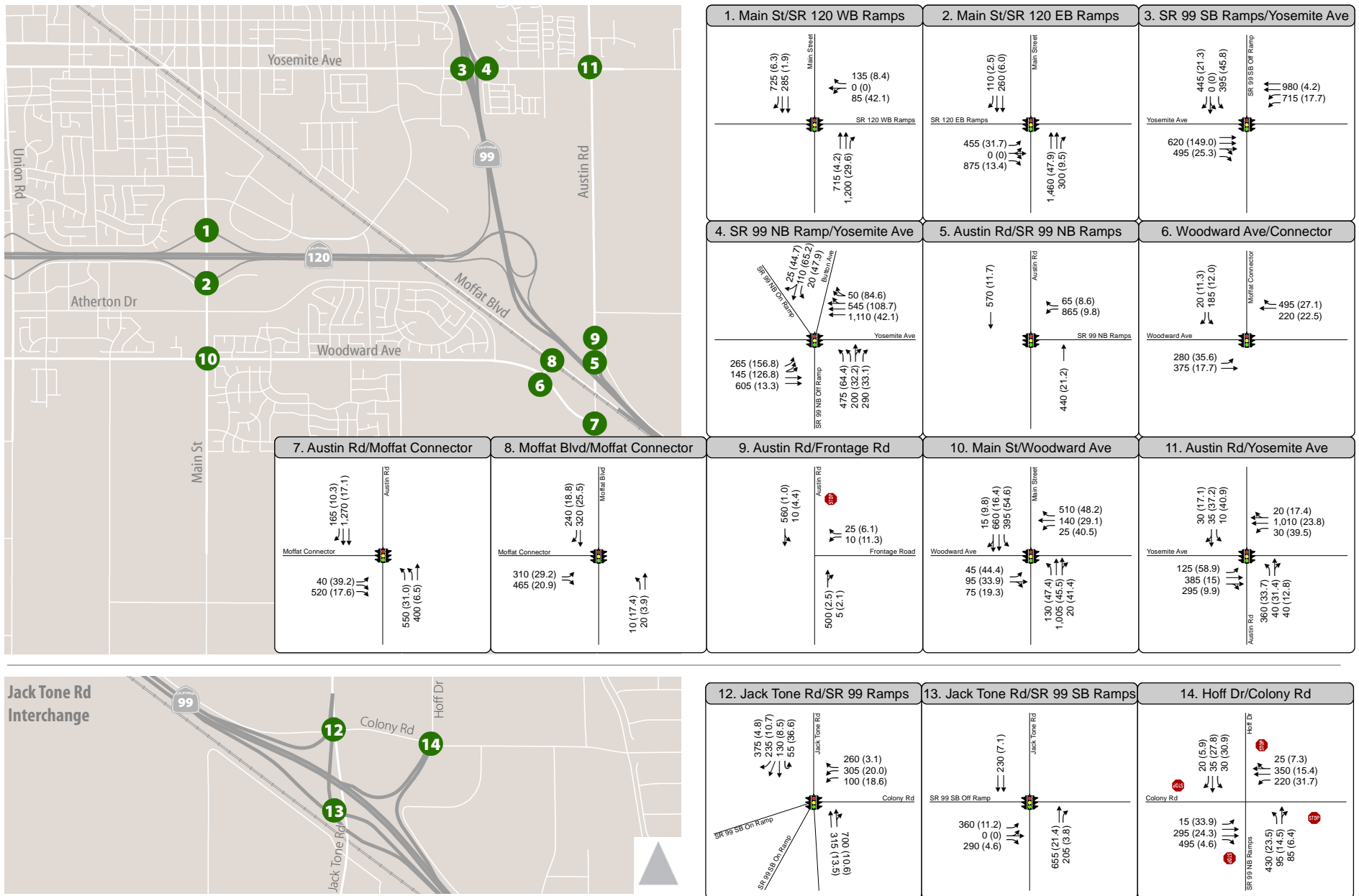


Figure 30

Peak Hour Improved Traffic Volumes and Lane Configurations - Interim Year 2033 With Phase 1B Project AM Peak Hour Conditions

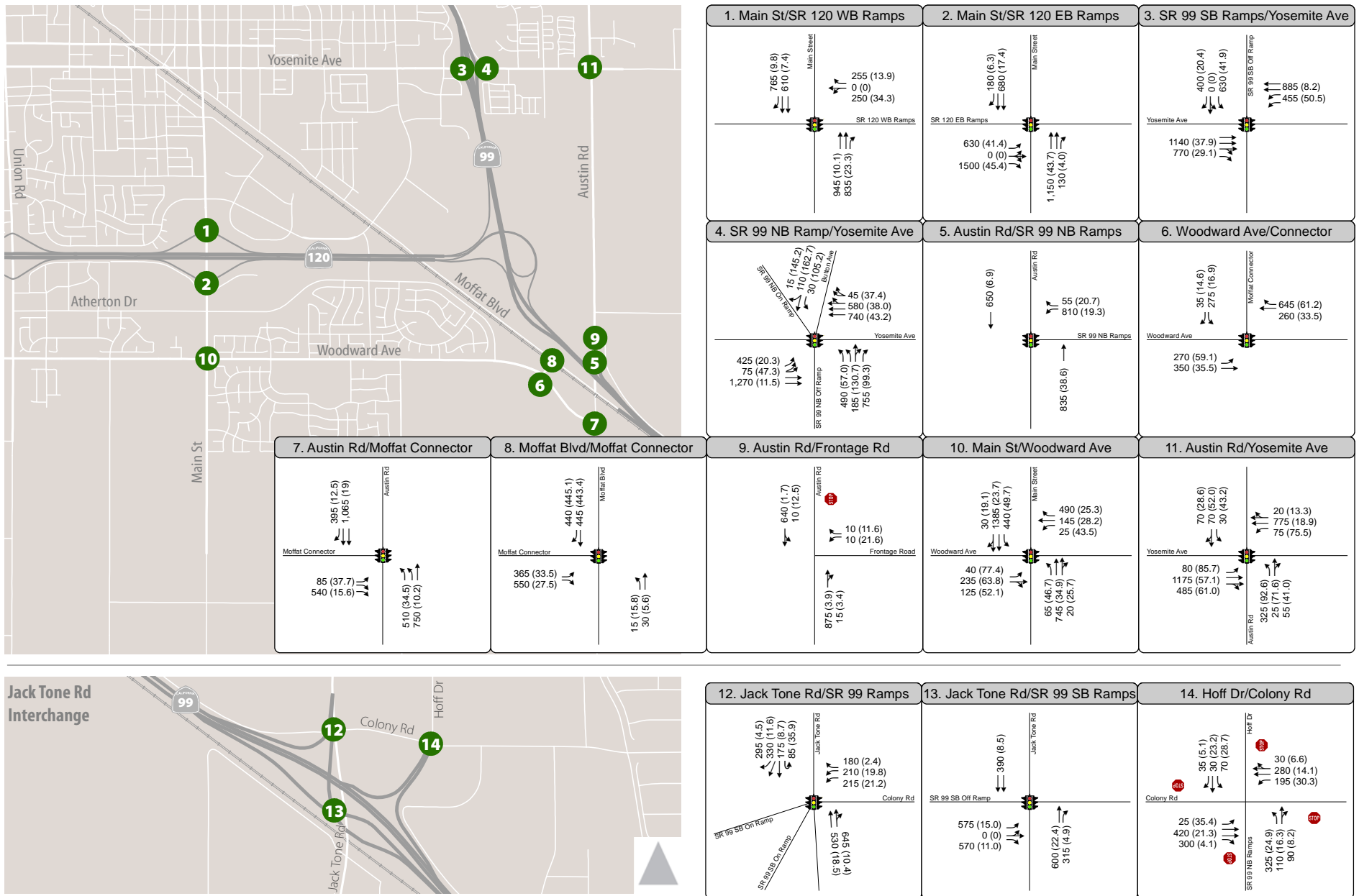
**TABLE 25: INTERSECTION ANALYSIS – INTERIM YEAR 2033 WITH IMPROVED PHASE 1B PROJECT
AM AND PM PEAK HOUR CONDITIONS**

Intersection	Control	AM Peak Hour		PM Peak Hour	
		Delay / Movement (sec/veh)	LOS	Delay / Movement (sec/veh)	LOS
1. WB SR 120 Ramps / Main Street	Signal	15.3	B	14.6	B
2. EB SR 120 Ramps / Main Street	Signal	29.2	C	37.1	D
3. SB SR 99 Ramps / Yosemite Avenue	Signal	41.5	D	30.6	C
4. NB SR 99 Ramps / Yosemite Avenue	Signal	62.0	E	49.6	D
5. NB SR 99 Ramps / Austin Road	Signal	12.9	B	22.9	C
6. Woodward Avenue / Connector	Signal	23.7	C	44.5	D
7. Austin Road / Moffat Connector	Signal	18.3	B	18.5	B
8. Moffat Blvd / Woodward Connector	Signal	18.8	B	24.4	C
9. Frontage Road / Austin Road	Side-Street Stop Controlled	11.3 (WB Left-Turn)	B	21.6 (WB Left-Turn)	C
10. Woodward Avenue / Main Street	Signal	39.1	D	33.9	C
11. Yosemite Avenue / Austin Road	Signal	24.3	C	51.9	D
12. NB SR 99 Ramps / Jack Tone Road	Signal	11.3	B	13.3	B
13. SB SR 99 Ramps / Jack Tone Road	Signal	12.6	B	13.6	B
14. NB SR 99 Ramps / Colony Road	Signal	17.4	B	18.1	B

Source: *Highway Capacity Manual* (Transportation Research Board, 6th Edition).
Results Based on 12 SimTraffic Version 10 Model Runs

BOLD denotes unacceptable Level of Service (LOS)

Figure 31 presents the Interim Year 2033 With Phase 1B Project PM Peak Hour Traffic Volumes, Delay by Movement and Intersection Configurations and Control. It also shows the intersections operating at acceptable level of service condition A, B, C, or D in green, marginal level of service condition E in yellow and unacceptable level of service condition F in red.



1 Study Intersection Turn Lane AM (Delay) Peak Hour Traffic Volume and Delay Traffic Signal Stop Sign

Acceptable Level of Service - **A**, **B**, **C** and **D**

Unacceptable Level of Service - **E** and **F**

Peak Hour Improved Traffic Volumes and Lane Configurations - Interim Year 2033 With Phase 1B Project PM Peak Hour Conditions

Figure 31

The primary conclusions of the PM peak hour analysis are (continued):

1. The following eight (8) signalized intersections are projected to degrade to LOS E or F conditions:
 - a. WB SR 120 Off-Ramp / Main Street;
 - b. EB SR 120 Off-Ramp / Main Street;
 - c. SB SR 99 Ramps / Yosemite Avenue;
 - d. NB SR 99 Ramps / Yosemite Avenue;
 - e. NB SR 99 Off-Ramp / Austin Road;
 - f. Woodward Avenue / Connector;
 - g. Austin Road / Moffat Connector;
 - h. Woodward / Main Street; and
 - i. Yosemite Avenue / Austin Road.
2. Compared to the No Project Alternative, this represents a 19.2% decrease with the Phase 1B Project.
3. Closure of the SB SR 99 off-ramp would result in a net increase in traffic volumes at the SR 120 / Main Street interchange resulting in the SR 120 Off-Ramp / Main Street interchange to continue to operate at LOS F Conditions (With Phase 1B Project);
4. In order to improve AM peak hour operations at the SR 120 Off-Ramp / Main Street interchange, the interchange would need to be re-constructed based on SJCOG RTP/SCS Interchange Project List. This improvement would be constructed by SJCOG and the City of Manteca before Design Year 2043 Conditions.
5. With the interchange improvements, the SR 120 Off-Ramp / Main Street interchange would improve from LOS F to LOS B / D conditions during the PM peak hour;
6. Increases in traffic volumes at the SR 99 Ramps / Yosemite Avenue interchange will result in the intersection degrading from LOS C / D (No Project) to LOS F (With Phase 1A Project) conditions;
7. The side street stop controlled intersection of Austin Road / Frontage Road is projected to operate at LOS F conditions.

Table 26 presents the 95th Percentile Queue Length by Movement for the following eleven (11) study intersections. It should be noted that the three study intersections at the SR 99 / Jack Tone interchange were not evaluated since the Phase 1A Project does not close the NB SR 99 off-ramp to Austin Road or the SB SR 99 on-ramp from Austin Road.

1. SR 120 EB Ramps / Main Street;
2. SR 120 WB Ramps / Main Street;
3. SR 99 NB Ramps / Yosemite Avenue;
4. SR 99 SB Ramps / Yosemite Avenue;
5. SR 99 NB Ramps / Austin Road;
6. Woodward Avenue / Connector;
7. Austin Road / Moffat Connector;
8. Moffat Boulevard / Moffat Connector;
9. Austin Road / Frontage Road;
10. Woodward Avenue / Main Street; and
11. Austin Road / Yosemite Avenue.

**TABLE 26: 95TH PERCENTILE QUEUE LENGTH BY MOVEMENT
– INTERIM YEAR 2033 WITH IMPROVED PHASE 1B PROJECT**

Intersection	Movement	Available Storage (Feet)	AM Peak Hour	PM
				Peak Hour
1. WB SR 120 Ramps / Main Street	WB LT / TH	1,706	98	228
	WB RT	175	63	162
	NB TH	1,394	139	165
	NB TH	1,394	434	249
	NB RT	500	490	327
	SB TH	3,168	17	94
	SB TH	3,168	41	128
	SB RT	3,168	119	208
2. EB SR 120 Ramps / Main Street	EB LT	207	207	531
	EB LT / TH / RT	1,699	246	715
	EB RT	1,699	230	664
	NB TH	1,362	1,128	656
	NB TH	1,362	1,221	705
	NB RT	950	654	113
	SB TH	1,394	40	143
	SB TH	1,394	56	160
3. SB SR 99 Ramps / Yosemite Avenue	SB RT	500	52	82
	EB TH	1,830	1,327	392
	EB TH	1,830	1,204	422
	EB TH / RT	1,830	1,014	474
	EB RT	365	250	379
	WB TH	335	207	340
	WB TH	335	168	361
	WB RT	335	80	175
	WB RT	335	73	183
	SB LT	350	228	300
	SB LT / RT	1,010	265	345
	SB RT	350	278	245

**TABLE 26: 95TH PERCENTILE QUEUE LENGTH BY MOVEMENT
– INTERIM YEAR 2033 WITH IMPROVED PHASE 1B PROJECT (CONTINUED)**

Intersection	Movement	Available Storage (Feet)	AM	PM
			Peak Hour	Peak Hour
4. NB SR 99 Ramps / Yosemite Avenue	EB LT	335	381	191
	EB LT	335	443	225
	EB TH	335	432	260
	EB TH	335	253	264
	WB TH	1,667	655	476
	WB TH	1,667	892	429
	WB TH / RT	1,667	1,089	436
	WB RT	265	391	294
	NB LT	350	308	280
	NB LT	962	353	985
	NBTH / RT	962	364	1,053
	NB RT	350	314	495
5. NB SR 99 Ramps / Austin Road	SB LT	823	119	446
	SB LT/ TH	170	186	227
	WB LT	558	148	208
	WB LT / RT	558	167	237
	NB TH	1,712	265	683
6. Woodward Avenue / Connector	SB TH	439	132	103
	SB TH	439	135	116
	EB LT	150	180	205
	EB TH	1,167	537	688
	WB TH	1,660	249	583
	WB RT	1,660	474	1,005
7. Austin Road / Moffat Connector	SB LT	367	107	179
	SB RT	150	33	78
	EB LT	150	75	120
	EB RT	1,660	155	161
	EB RT	1,660	166	169
	NB LT	250	203	204
	NB LT	250	223	222
	NB TH	1,210	106	169
	SB TH	1,712	245	234
	SB TH	1,712	251	249
	SB RT	250	126	179

**TABLE 26: 95TH PERCENTILE QUEUE LENGTH BY MOVEMENT
– INTERIM YEAR 2033 WITH IMPROVED PHASE 1B PROJECT (CONTINUED)**

Intersection	Movement	Available Storage (Feet)	AM Peak Hour	PM
				Peak Hour
8. Moffat Blvd / Moffat Connector	EB LT	367	431	466
	EB RT	45	75	72
	NB LT	150	31	33
	NB TH	572	21	34
	SB TH	842	152	270
	SB RT	200	64	165
9. Frontage Road / Austin Road	WB LT	767	36	36
	WB RT	25	54	36
	NB TH / RT	439	7	7
	SB LT / TH	804	37	102
10. Woodward Avenue / Main Street	EB LT	95	87	121
	EB TH / RT	600	172	489
	WB LT	175	70	56
	WB TH	2,084	185	150
	WB RT	2,084	604	338
	NB LT	250	253	121
	NB TH	6,464	462	259
	NB TH / RT	6,464	466	269
	SB LT	250	314	318
	SB TH	523	519	568
11. Yosemite Avenue / Austin Road	SB TH / RT	523	383	474
	EB LT	250	191	273
	EB TH	1,717	193	1,118
	EB RT	1,717	222	1,154
	WB LT	470	59	141
	WB TH	1,382	337	262
	WB TH / RT	1,382	330	254
	NB LT	225	266	292
	NB TH / RT	1,120	260	690
	SB LT	225	33	64
	SB TH / RT	1,043	96	170

The primary results of the Interim Year 2033 With Phase 1B Project AM Peak 95th Percentile Queue Length by Movement analysis are:

- Eighty-one (81) of the ninety-three (93) movements have 95th Percentile queue lengths less than the available storage; and
- Twelve (12) of the ninety-three (93) movements (12.9%) have 95th Percentile queue lengths greater than the available storage.
- It should be noted that an Interim Year 2033 No Project analysis was completed for this Final Traffic Operations Analysis Report.
- Therefore, the results of the Interim Year 2033 With Phase 1B Project was compared to Design Year 2043 No Project Conditions.
- This represents a decrease in 12 movement and a 16.0% decrease when compared to Design Year 2043 No Project AM Peak Hour Conditions.

The primary results of the Interim Year 2033 With Phase 1B Project PM Peak 95th Percentile Queue Length by Movement analysis are:

- Seventy-five (75) of the ninety-three (93) movements have 95th Percentile queue lengths less than the available storage; and
- Eighteen (18) of the ninety-three (93) movements (19.4%) have 95th Percentile queue lengths greater than the available storage.
- It should be noted that an Interim Year 2033 No Project analysis was completed for this Final Traffic Operations Analysis Report.
- Therefore, the results of the Interim Year 2033 With Phase 1B Project was compared to Design Year 2043 No Project Conditions.
- This represents a decrease in 10 movements and a 14.3% decrease when compared to Design Year 2043 No Project AM Peak Hour Conditions.

Table 27 presents the total network performance measures of effectiveness for the Synchro / SimTraffic Models for Interim Year 2033 With Phase 1B Project AM and PM Peak Hour Conditions.

It should be noted that an Interim Year 2033 No Project analysis was not completed for this Final Traffic Operations Analysis Report. Therefore, based on agreement with Caltrans and the Project Development Team, the results of the Interim Year 2033 With Phase 1B Project will not be compared to No Project Conditions.

**TABLE 27: TOTAL NETWORK PERFORMANCE
INTERIM YEAR 2033 WITH IMPROVED PHASE 1B PROJECT CONDITIONS**

Measure of Effectiveness	Based on 12 SimTraffic Model Runs	
	AM Peak Hour	PM Peak Hour
Total Vehicle Hours of Delay (VHD)	290	375
Total Stops	22,245	28,801
Vehicle Miles of Travel (VMT)	17,408	21,079
Vehicle Hours Travelled (VHT)	828	1,031
Total Fuel Consumption	627	759
Total Vehicle Emissions (lbs of CO2)	11,913	14,421
Average Speed (MPH)	21	21
Vehicles Entering Network in Peak Hour	21,920	26,419
Vehicles Entering Network in Peak Hour	21,860	26,390
Percent (%) Demand Served	99.7%	99.9%

Source: Results Based on 12 SimTraffic Version 10 Model Runs

7. SUMMARY & CONCLUSIONS

This Summary & Conclusions Chapter documents the results of the Final Traffic Operations Analysis Report (TOAR) conducted for the State Route 120 (SR 120) / State Route 99 (SR 99) interchange in San Joaquin County, California. Based on review comments from Caltrans District 10 – Freeway and Highway Operations Branch, this Final TOAR (FTOAR) was completed that incorporates Caltrans' comments and includes an Executive Summary for use in the Environmental Document.

In the Final Draft Regional Transportation Plan / Sustainable Communities Strategy (RTP/SCS), the San Joaquin Council of Governments (SJCOG) identified the need for an improved interchange at the SR 120 / SR 99 interchange. This study area extends along SR 120 from the Main Street interchange (to the west), along SR 99 from the Yosemite Avenue interchange (to the north) and the Jack Tone Road interchange (to the south). In addition to the freeway corridors, local street intersections in close proximity to the interchanges have been evaluated.

The interchange project would be designed to provide sufficient capacity and acceptable levels of service to serve the projected increase in traffic volumes along SR 99 and SR 120 for the following two major movements to and from Stanislaus County.

- Eastbound SR 120 to SB SR 99 during the evening peak period; and
- Northbound SR 99 to westbound SR 120 during the morning peak period.

PURPOSE AND NEED

The primary objectives of the SR 120 / SR 99 Interchange Project are:

- Relieve congestion and improve regional mobility by increasing capacity at the SR 120 / SR 99 interchange;
- Improve local traffic circulation and reduce cut-through traffic by providing additional capacity at the State Route 120 and SR 99 interchange;
- Enhance traffic safety for eastbound SR 120 by constructing a two-lane off-ramp onto southbound SR 99.

The need for the project is related to declining level of service on State Route 120, increasing wait times at local intersections near the SR 120 / SR 99 interchange, difficulty in accessing local areas, and impaired safety of motorists traveling along eastbound SR 120 during evening peak travel periods. The San Joaquin Council of Governments retained Mark Thomas & Company and Fehr & Peers to develop geometric designs, travel demand forecasting, and operations analysis for the PA/ED. The travel demand forecasts were documented for review and comment by Caltrans District 10 Office of Advanced Planning. The Travel Demand Forecasts were formally approved by Caltrans District 10 Office of Advanced Planning for use in the operations analysis in May 2018.

PROJECT DESCRIPTION

The California Department of Transportation (Caltrans) District 10 with the cooperation of the City of Manteca and the San Joaquin Council of Governments (SJCOG) proposes to reconstruct the existing State Route (SR) 99/120 interchange. This project will add an additional lane to increase capacity on two connector ramps (eastbound SR 120 to southbound SR 99 and from northbound SR 99 to westbound SR 120), add auxiliary lanes on SR 99 and 120 to improve merging traffic movements, upgrade the existing interchange ramps at Austin Road, replace the Austin Road structure over SR 99 with a four-lane structure over both SR 99 and Union Pacific Railroad (UPRR), remove the existing at-grade crossing of the UPRR tracks at Austin Road and construct a new connector road from Austin Road to Woodward to Moffat Boulevard and widen the existing Woodward Avenue gated railroad crossing, relocate the SR 99 Frontage Road along the east side of SR 99 from Austin Road for approximately 0.8 miles and install new signing/signals/lighting improvements. Relocation of some existing utility poles, sewer and water lines.

This project will provide traffic congestion relief and improved operations of the interchange. Foundations will be driven piles, either steel or concrete. Excavation for structure footings will be up to 15 feet deep. Excavation for new drainage culverts would be up to 6 feet deep. Other roadway excavation will be up to 2 feet deep. No dewatering is expected as part of the project. The project will be importing fill, no export.

PROJECT DESIGN ELEMENTS

The proposed project includes the following elements:

- Widen the eastbound SR 120 to southbound SR 99 connector ramp from one-lane to two-lanes;
- Widen the northbound SR 99 to westbound SR 120 connector ramp from one-lane to two-lanes
- Construct a new structure over SR 99 to serve eastbound SR 120 to southbound SR 99 traffic and modify the existing structure over SR 99 to serve westbound SR 120 traffic ;
- Add an auxiliary lane in the median in each direction of SR 120 from Main Street to SR 99;
- Add an auxiliary lane in each direction on SR 99 from SR 120 to approximately one mile south. This includes widening the Moffat Overhead and Spreckles Underpass structures;
- Remove the Austin Road overcrossing and replace with a longer and wider structure spanning SR 99 and UPRR (removal consists of removing the structure and the fill located between SR 99 and Moffat Boulevard);
- Convert the Austin Road on-ramp to northbound SR 99 and to westbound SR 120 to a loop ramp that will provide separate traffic movements to SR 99 and SR 120;
- Replace the southbound exit ramp from SR 99 to Austin Road with a grade separated (braided) ramp to eliminate the weaving with SR 120 merging traffic;
- Add a new connector road from Austin Road to Woodward Avenue to Moffat Boulevard and widen the existing UPRR Woodward Avenue gated crossing; and
- Relocate the northbound SR 99 exit ramp to Austin Road to accommodate the loop on ramp and relocate the adjacent SR 99 Frontage Road for approximately 0.8 miles.

There are three proposed phases of construction. The Phase 1A project would be as follows:

- Widen the eastbound SR 120 to southbound SR 99 connector ramp from one-lane to two-lanes;
- Remove the Austin Road overcrossing and replace with a longer structure spanning SR 99 and UPRR;
- Add a new connecting road from Austin Road to East Woodward Avenue and Moffat Boulevard and modify the existing UPRR gated crossing at East Woodward Avenue to conform to the new connector road;
- Modify the existing northbound Austin Road exit ramp to conform to the higher overcrossing profile grade;
- Temporarily close the Austin Road northbound entrance and southbound exit ramps, resulting in a partial interchange.

The Phase 1B project would be constructed after the Phase 1A project:

- Widen the northbound SR 99 to westbound SR 120 connector ramp from one-lane to two-lanes;
- Add an auxiliary lane in the existing median of westbound SR 120 from Main Street to SR 99;
- Convert the existing 99/120 separation structure to two lanes and construct a new separation structure to serve the eastbound 120 to northbound 99 connector ramp.

Phase 1C would complete the project as planned by:

- Add the southbound exit ramp from SR 99 to Austin Road by constructing a grade separated braided ramp to eliminate the weaving with SR 120 merging traffic;
- Convert the entrance ramp from Austin Road to northbound SR 99 and to westbound SR 120 to a loop ramp that will provide separate traffic movements to SR 99 and SR 120;
- Relocate the northbound SR 99 exit ramp to Austin Road to accommodate the loop on ramp;
- Relocate the SR 99 frontage road for approximately 0.8 miles to accommodate the loop on ramp;
- Add an auxiliary lane in the existing median of eastbound SR 120 from Main Street to SR 99;
- Add an auxiliary lane in each direction on SR 99 from SR 120 to approximately 1.7 mile south of the Austin Road overhead by shifting the median away from the UPRR ROW and relocating portions of the frontage road.

In the proposed first phase of construction, the NB entrance and the SB exits ramps at Austin Road would be temporarily closed, resulting in a partial interchange. Closing the NB entrance ramp provides the following benefits.

- Eliminates the traffic from Austin Road that either uses the SR 120 connector or merges onto NB SR 99.
- Allows the existing auxiliary lane serving the SR 120 connector to be extended approximately 800-feet

Closing the SB exit ramp provides the following benefits.

- Eliminates the weaving section between SR 120 and the Austin Road interchange;
- Allows the eastbound SR 120 on-ramp onto southbound SR 99 connector merge section to be extended approximately 3,000 feet

SR 120 / Union Road Interchange:

- By Year 2020 Conditions, the interchange will be reconstructed to a Diverging Diamond interchange to serve projected Manteca General Plan AM and PM peak hour demand volumes;
- Auxiliary lanes will be constructed on eastbound SR 120 from the Airport Way on-ramp to the Union Road off-ramp and the Union Road on-ramp to the Main Street off-ramp; and
- Auxiliary lanes will be constructed on westbound SR 120 from the Main Street on-ramp to the Union Road off-ramp and the Union Road on-ramp to the Airport Way off-ramp.

SR 120 / Main Street Interchange:

- Based on the SJCOG 2018 RTP/SCS Appendix F – Table 6-2, the interchange will be reconstructed by the Year 2033 to serve projected Manteca General Plan AM and PM peak hour demand volumes;
- Based on the results of the With Phase 1A Project analysis contained in the Traffic Operation Analysis Report, a PSR /PDS will be needed to determine the required interchange design. It should be noted that with the current spread diamond interchange, the footprint of the future interchange should not require additional right-of-way.

SR 120 Mainline

- Based on the SJCOG 2018 RTP/SCS Appendix F – Table 6-1, the freeway mainline will be widened from four to six lanes between SR 120 (to the west) and SR 99 (to the east) by the Year 2030 to serve projected San Joaquin County, Stanislaus County and Merced County AM and PM peak hour demand volumes.

DESIGN PERIOD EXCEPTION FOR THE SR 99 / SR 120 IMPROVEMENT PROJECT

The Project Development Team (PDT) for the State Route 99/ 120 Interchange Improvement Project (EA 10-1E740) has requested an exception to the 20-year Design Period Policy for the proposed Phase 1A project improvements.

Index 103.2 Design Period of the Highway Design Manual states:

“Geometric design of new facilities and reconstruction projects should normally be based on estimated traffic 20 years after completion of construction. With justification, design periods other than 20 years may be approved by the District Director with concurrence by the Project Delivery Coordinator.

Specifically, the PDT requested the design year period exception for the northbound SR 99 to westbound SR 120 connector because the work on this connector will be deferred until funding is available. The remainder of the project, to improve the eastbound (EB) SR 120 to southbound (SB) SR 99 connector, meets or exceeds the 20-year design period policy.

In December 2015, the Department of Transportation (Caltrans) approved a Project Study Report-Project Development Support (PSR-PDS) to reconstruct the SR 99 / SR 120 Interchange (Project). The project proposed to make improvements to the two major connector ramps to improve the operations and safety. During the development of the Project Report, the traffic study determined the EB SR 120 to SB SR 99 and the northbound (NB) SR 99 to westbound (WB) SR 120 connector ramps needed two lane exits to provide adequate level of service, rather than the single lane exit, widening to two lanes past the gore nose. The Austin Road Overcrossing was identified in the PSR-PDS to be replaced to allow additional lanes on SR 99, however it was determined that the profile grade of Austin Road could not touch down on the east side of the Union Pacific Railroad (UPRR) and needed to be extended easterly over UPRR. These changes to provide two lane exits for the major freeway connector movements, provide auxiliary lanes for these connector ramps, lengthen the Austin Road Overcrossing and the additional work to reconnect the local roadway network on the east side of UPRR resulted in the PSR-PDS estimated project construction cost to more than double to over \$90 million.

A Value Analysis (VA) study was conducted in September 2017. The study found the proposed geometric improvements identified by the project were needed to provide for the forecasted traffic, however, due to a shortfall in funding, that the proposed improvements should be staged to address the worst traffic conditions first. Although both the EB SR 120 to SB SR 99 and the NB SR 99 to WB SR 120 connector ramps currently operate at Level of Service (LOS) F in their respective peak flow direction, the EB SR 120 to SB SR 99 currently has greater operational and safety issues. There are only two lanes on EB SR 120, with one lane is dedicated to each connector ramp direction to SR 99. Because the directional distribution of traffic is 80% to SB SR 99, this results in unequal lane distribution and queuing of the # 2 lane. Impatient drivers use the #1 lane to jump the queue and cut into the #2 lane or unexpectedly slow in the otherwise free flowing #1 lane, resulting in a collision rate that is more than double statewide average. The City of Manteca and the Manteca Fire Department have expressed concerns over the frequency and severity of the collisions along EB SR 120. They also note that some drivers are exiting the freeway and using city streets to bypass the queued traffic. The NB SR 99 to WB SR 120 connector also currently operates at LOS F in the AM peak, however this movement does not have the queue jumping and collision problem that the EB SR 120 to SB SR 99 connector exhibits. There are three NB through lanes on SR 99 (widening to four lanes at the connector), allowing the through traffic the opportunity to use the #1 and #2 lanes to avoid the traffic queued to the connector. In addition, the lane distribution is better because 55% of the traffic remains on SR 99 and 45% uses the connector ramp. The existing three lane NB freeway section through Ripon acts as to constrain the traffic before it approaches the 99/120 connector.

Construct Phase 1B- Phase 1B should be budgeted to be completed by 2032 to keep the LOS above LOS E. The un-escalated construction cost of Phase 1B is \$16 million and assumes that the widening of SR 120 to 6-lanes has not been completed. If SR 120 is widened to 6-lanes prior to or concurrently with Phase 1B, the cost of Phase 1B decreases to approximately \$11 million because an auxiliary lane between SR 99 and the Main Street interchange would be constructed with that project.

The following table compares the project to the no-build condition and shows how traffic is improved over the no-build condition.

AM Peak Hour Traffic Northbound SR 99 to Westbound SR 120 Connector				
Alternative	Year	LOS	VPH	Density
Existing Condition	2017	C / F	2,090	23.1
No Project	2023	D / F	2,210	32.2
Phase 1A Project	2023	C / C	1,755	26.7
Phase 1A Project	2032	D / F	1,845	29.1
No Project	2043	F / F	2,745	41.7
Phase 1A Project	2043	D / F	1,950	31.9

Note: The Level of Service (LOS) is defined in density (passenger cars per mile per lane). It should be noted that when the off-ramp volume exceeds the capacity of a single lane off-ramp, LOS F is identified per the Highway Capacity Manual.

The Phase 1A project improves the existing condition from unacceptable LOS F to acceptable LOS C. This improvement is a combination of removing the NB SR 99 on-ramp from Austin Road, eliminating the existing merge / weave movement and constructing an additional 800 feet of deceleration lane for NB SR 99 traffic existing onto the single lane off-ramp to WB SR 120. This improvement is projected to provide acceptable level of service conditions for ten (10) years assuming a straight line traffic growth between Construction Year 2023 and Design Year 2043. It should be noted that northbound SR 99 peak hour traffic cannot grow in a continuous straight line because SR 99 across the Stanislaus River and through Ripon will be constrained during a single peak hour. This will result in peak hour spreading and multiple hours of congestion on northbound SR 99 between the Stanislaus River and the SR 99 / SR 120 freeway-to-freeway interchange. The projected straight line growth in traffic on northbound SR 99 will not occur until the Stanislaus River Bridge is widened from 3 to 4 travel lanes in each direction (8 total).

STUDY AREA

The SR 120 / SR 99 interchange will be constructed at the location of the existing SR 120 / SR 99 Interchange (PM 5.822). The interchange will provide improved access to and from SR 99 (south) and SR 120 (west) to serve the increased traffic demand due to existing and future planned development in the southern San Joaquin County (Ripon, Manteca, and San Joaquin County) and the significant growth projected in Stanislaus and Merced Counties. The interchange will include two travel lanes of the eastbound SR 120 to southbound SR 99 ramp and two lanes on the northbound SR 99 to westbound SR 120 ramp. The project contains additional features that were described in detail in the previous section. The project study area and includes the following freeway study area:

- Eastbound SR 120 from west of Main Street to SR 99;
- Westbound SR 120 from SR 99 to west of Main Street;
- Northbound SR 99 from south of Jack Tone Road to north of Yosemite Avenue; and
- Southbound SR from north of Yosemite Avenue to south of Jack Tone Road.

The following fourteen (14) intersections were selected in coordination with the Project Development Team (PDT) that included the San Joaquin Council of Governments (SJCOG), Caltrans District 10, City of Manteca, and Mark Thomas for analysis during the weekday AM and PM peak hours:

- | | |
|---------------------------------------|--|
| 1. SR 120 EB Ramps / Main Street; | 8. Woodward Avenue / Moffat Boulevard; |
| 2. SR 120 WB Ramps / Main Street; | 9. Austin Road / Frontage Road; |
| 3. SR 99 NB Ramps / Yosemite Avenue; | 10. Woodward Avenue / Main Street; |
| 4. SR 99 SB Ramps / Yosemite Avenue; | 11. Austin Road / Yosemite Avenue; |
| 5. SR 99 NB Ramps / Austin Road; | 12. SR 99 Ramps / Jack Tone Road; |
| 6. SR 99 SB Ramps / Moffat Boulevard; | 13. SR 99 SB Ramps / Jack Tone Road; and |
| 7. Austin Road / Moffat Boulevard; | 14. Hoff Drive / Colony Road. |

PRIMARY CONCLUSIONS

Based on the results of the Design Year 2043 AM and PM Peak Hour freeway mainline, on-ramp merge, off-ramp diverge, and intersection level of service operations analysis and geometric design review, the following conclusions were determined for the Traffic Section of the PA & ED:

- 1) Based on the results of the traffic operations analysis, the existing SR 120 / SR 99 interchange would not provide sufficient capacity to serve projected Construction Year 2023 traffic volumes. Therefore, the No Project Alternative was determined to be unacceptable based on Traffic Operations.
- 2) Based on the results of the Construction Year 2023 Traffic Operations Analysis, the With Phase 1A Project provides benefits to State Route 120, State Route 99, the majority of Caltrans right-of-way intersections, and the majority of local City of Manteca and City of Ripon intersections. Therefore, the With Phase 1A Project was determined to provide sufficient capacity to serve the projected Construction Year 2023 AM and PM Peak Hour Demand Volumes.
- 3) In order to improve AM and PM peak hour operations at the EB SR 120 Off-Ramp / Main Street intersection, the off-ramp shall be widened by Opening Year 2023 and a PSR/PDS prepared based on SJCOG RTP/SCS Interchange Project List.
- 4) In order to improve AM and PM peak hour operations at the Main Street / Woodward Avenue intersection, the intersection shall be signalized. The intersection is included in the City of Manteca Public Facilities Improvement Project, and shall be signalized no later than Opening Year 2023.
- 5) In order to improve PM Peak hour operations at the NB SR-99 ramps/Yosemite Ave, the intersection signal timings shall be optimized no later than Opening Year 2023 and coordinated to provide additional green time for the EB Yosemite Ave right-turn volume onto NB SR-99.
- 6) Install a traffic signal at Woodward Avenue / Connector;
- 7) Install a traffic signal at Austin Road / Moffat Connector;
- 8) Install a traffic signal at Moffat Blvd / Moffat Connector;

- 9) The results of the Network Wide Measures of Effectiveness (MOEs) shows that the P Project provides an improvement when compared to No Project Conditions Construction Year 2023 AM and PM Peak Hour Conditions, and meets the purpose and need of the SR 120 / SR 99 Interchange Project.
- 10) Based on the results of the traffic operations analysis, the existing SR 120 / SR 99 interchange would not provide sufficient capacity to serve projected Design Year 2043 traffic volumes. Therefore, the No Project Alternative was determined to be unacceptable based on Traffic Operations.
- 11) Based on the results of the Design Year 2043 Traffic Operations Analysis, the With Phase 1A Project would not provide sufficient benefits to State Route 120, State Route 99, Caltrans right-of-way intersections, and local City of Manteca and City of Ripon intersections. Under Design Year 2043 AM peak hour conditions, the NB SR 99 to WB SR 120 freeway-to-freeway ramp is projected to continue to operate at LOS F (No Project and With Phase 1A Project) conditions. Therefore, the Phase 1B Project should be constructed by Year 2033 conditions. A design period exception for the SR 99 / SR 120 Interchange Project was prepared by the Project Development Team.
- 12) In addition, based on the results of the traffic operations analysis, the With Phase 1A Project was determined to be unacceptable for Design Year 2043 Conditions.
- 13) With the Phase 1B Project, the NB SR 99 to WB SR 120 freeway-to-freeway ramp is projected to improve to LOS C conditions. Therefore, the Phase 1B Project was determined to provide sufficient capacity to serve the projected Interim Year 2033 AM and PM Peak Hour Demand Volumes.
- 14) The Ultimate (Phases 1A+1B+1C) Project should be built when development in the area requires the construction of the NB and SB SR 99 braided ramps, NB SR 99 on-ramp from Austin Road and SB SR 99 off-ramp to Austin Road.
- 15) Based on the results of the Design Year 2043 Traffic Operations Analysis, the With Ultimate Project would provide sufficient benefits to State Route 120, State Route 99, the majority of Caltrans right-of-way intersections, and the majority of local City of Manteca and City of Ripon intersections. Therefore, the With Ultimate Project was determined to be acceptable based on Traffic Operations.
- 16) In order to improve PM peak hour operations at the SR 120 / Main Street intersections, the interchange would need to be re-constructed based on SJCOG RTP/SCS Interchange Project List. This improvement would be constructed by SJCOG and the City of Manteca before Interim Year 2033 With Phase 1B Conditions. With the interchange improvements, the SR 120 / Main Street intersections would improve from unacceptable LOS F to acceptable LOS B, C, and D conditions during both AM and PM peak hours;
- 17) Therefore, with the planned SJCOG / City of Manteca improvements at the SR 120 / Main Street interchange, the Ultimate (Phases 1A+1B+1C) Project would construct sufficient capacity to serve projected Design Year 2043 AM and PM Peak Hour Demand Volumes.
- 18) The results of the Network Wide Measures of Effectiveness (MOEs) shows that the Ultimate Project provides an improvement when compared to No Project Conditions Design Year 2043 AM and PM Peak Hour Conditions, and meets the purpose and need of the SR 120 / SR 99 Interchange Project.