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May 5, 2015

Matt Satow, P.E.
Principal Engineer, Drake Haglan & Associates
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Rancho Cordova, CA 95670

10-STA-108-PM R27.5-R45.5
EA: 0S800
North County Corridor

Dear Mr. Satow:

The purpose of this letter is to inform you that the District 10 Traffic Operations Branch has performed a thorough review of the PA&ED FINAL TRAFFIC OPERATIONS REPORT FOR THE NORTH COUNTY CORRIDOR Project dated March 2015 prepared by Fehr & Peers Transportation Consultants. The recommendations contained within said Final Operations Report must be consistent with the project's Geometric Approval Drawings (GADs). We look forward to reviewing the Plans, Specifications, and Estimates to be completed as part of the PS&E phase of this project.

If you have any further questions, please feel free to contact Jaime Q. Quesada at (209) 948 – 7184.

Sincerely,

VU H NGUYEN, P.E., T.E., PTOE
Chief, District – 10 Traffic Operations

cc: Joy Pinne, District 10 – Program Project Manager
Anton Kismetian, District 6 – Design Senior

Final

TRAFFIC OPERATIONS REPORT FOR THE NORTH COUNTY CORRIDOR

March 2015

WC13-3079

TABLE OF CONTENTS

CHAPTER 1. INTRODUCTION 1
1.1 Purpose of Report 1
1.2 Study Area 1
1.3 Project Description 2
1.4 Project Purpose 2

CHAPTER 2. DATA COLLECTION AND ANALYSIS METHODOLOGY 4
2.1 Data Collection 4
2.1.1 Local Street System Traffic Data 4
2.1.2 Field Observations 10
2.2 Roadway System Analysis Methodology 10
2.2.1 Intersections 11
2.2.2 Freeway and Multilane Highway 12
2.2.3 Freeway Weaving Sections 13
2.2.4 Urban Streets 13
2.2.5 Two-Lane Highways 14
2.2.6 Volume-to-Capacity Methodology per County Method 15
2.3 Evaluation Criteria 15

CHAPTER 3. EXISTING CONDITIONS 17
3.1. Roadway System 17
3.1.1 Intersection Traffic Operations 18
3.1.2 Urban Street Analysis 26
3.1.3 Two-Lane Highway Analysis 27
3.1.4 Volume-to-Capacity Analysis 28
3.1.5 Accident Analysis 29
3.2 Goods Movement 30
3.3 Transit System 31
3.3.1 Passenger Bus Service 31
3.4 Bicycle System 34
3.5 Pedestrian System 34

CHAPTER 4. TRAFFIC FORECASTS 36
4.1 Analysis Scenarios 36
4.2 Travel Demand Model 36
4.3 Year 2022 and 2042 Land Use Assumptions 36
4.4 Year 2022 and 2042 Roadway Network Assumptions 37
4.4.1 Year 2022 No Project 37
4.4.2 Year 2022 With Project 37
4.4.3 Year 2042 No Project 38
4.4.4 Year 2042 With Project 38
4.5 Year 2022 and 2042 Traffic Demand Forecasts 38
4.6 Traffic Forecasts Summary 38
4.7 Design Hourly Volumes 39
4.8 Regional Measures of Effectiveness 39
4.9 Travel Times 41
4.10 Caltrans Forecasting Approval 42

CHAPTER 5. YEAR 2022 TRAFFIC OPERATIONS ANALYSIS 85
5.1 Intersection Peak Hour Signal Warrants 85
5.2 Year 2022 Intersection Operations 87
5.3 Urban Street Analysis 110
5.4 Two-Lane Highway Analysis 112

5.5 NCC Freeway/Expressway Analysis 114
5.6 Volume-To-Capacity Analysis 117
5.7 Summary of 2022 Operations Analysis 117

CHAPTER 6. YEAR 2042 TRAFFIC OPERATIONS ANALYSIS 118
6.1 Intersection Control Evaluation (ICE) Summary 118
6.2 Intersection Peak Hour Signal Warrants 120
6.3 Year 2042 Intersection Operations 122
6.4 Urban Street Analysis 147
6.5 Two-Lane Highway Analysis 149
6.6 NCC Freeway/Expressway Analysis 151
6.7 Volume-To-Capacity Analysis 154
6.8 Summary of 2042 Operations Analysis 154

CHAPTER 7. SUMMARY AND CONCLUSIONS 155

APPENDICES (PROVIDED IN ELECTRONIC FORMAT)

Appendix A: Approved Traffic Scope of Work and Approval Letter .....
Appendix B: Traffic Count Data .....
Appendix C: SimTraffic Model Calibration and Validation .....
Appendix D: Existing Intersection Analysis Calculation Worksheets .....
Appendix E: Existing Signal Warrant Analysis Worksheets .....
Appendix F: Existing Urban Street Analysis Calculation Worksheets .....
Appendix G: Existing HCM Two-Lane Highways Analysis Worksheets .....
Appendix H: Existing Roadway Segment Analysis Worksheets .....
Appendix I: Accident History Data .....
Appendix J: Forecast Memos and Approval Letter .....
Appendix K: Route Layouts for Project Alternatives .....
Appendix L: 2022 Signal warrant Analysis WOrksheets .....
Appendix M: 2022 Intersection Analysis Calculation Worksheets .....
Appendix N: 2022 Urban Streets Analysis Worksheets .....
Appendix O: 2022 HCM Two-Lane Analysis Worksheets .....
Appendix P: 2022 NCC HCM Freeway/Expressway Analysis Worksheets .....
Appendix Q: 2022 Roadway Segment Analysis Worksheets .....
Appendix R: Ice Fact Sheet and Supporting Documentation .....
Appendix S: 2042 Signal Warrant Analysis Worksheets .....
Appendix T: 2042 Intersection Analysis Calculation Worksheets .....
Appendix U: 2042 Urban Streets Analysis Worksheets .....
Appendix V: 2042 HCM Two-Lane Analysis Worksheets .....
Appendix W: 2042 NCC HCM Freeway/Expressway Analysis Worksheets .....
Appendix X: 2042 Roadway Segment Analysis Worksheets .....

LIST OF FIGURES

Figure 1-1 Project Vicinity Map ... 3
Figure 2-1 Study Area and Analysis Methodology ... 5
Figure 2-2 Existing Peak Hour Traffic Volumes and Intersection Lane Configurations ... 6
Figure 2-3A Existing AM Peak Hour Roadway Volume and LOS ... 7
Figure 2-3B Existing PM Peak Hour Roadway Volume and LOS ... 8
Figure 2-4 Existing Typical Weekday Average Daily Traffic Volumes ... 9
Figure 3-1 Existing Transit System ... 33
Figure 3-2 Existing and Planned Bicycle Facilities ... 35
Figure 4-1 Year 2022 No Project Peak Hour Intersection Volumes ... 43
Figure 4-2 Year 2022 No Project AM Peak Hour Roadway Volumes ... 44
Figure 4-3 Year 2022 No Project PM Peak Hour Roadway Volumes ... 45
Figure 4-4 2022 No Project Daily Roadway Volumes ... 46
Figure 4-5 2022 Alternative 1A Peak Hour Intersection Volumes ... 47
Figure 4-6 2022 Alternative 1B Peak Hour Intersection Volumes ... 48
Figure 4-7 2022 Alternative 1A AM Peak Hour Roadway Volumes ... 49
Figure 4-8 2022 Alternative 1A PM Peak Hour Roadway Volumes ... 50
Figure 4-9 2022 Alternative 1A Daily Roadway Volumes ... 51
Figure 4-10 2022 1B AM Peak Hour Roadway Volumes ... 52
Figure 4-11 2022 Alternative 1B PM Peak Hour Roadway Volumes ... 53
Figure 4-12 2022 Alternative 1B Daily Roadway Volumes ... 54
Figure 4-13 2022 Alternative 2A Peak Hour Intersection Volumes ... 55
Figure 4-14 2022 Alternative 2B Peak Hour Intersection Volumes ... 56
Figure 4-15 2022 Alternative 2A AM Peak Hour Roadway Volumes ... 57
Figure 4-16 2022 Alternative 2A PM Peak Hour Roadway Volumes ... 58
Figure 4-17 2022 Alternative 2A Daily Roadway Volumes ... 59
Figure 4-18 2022 Alternative 2B AM Peak Hour Roadway Volumes ... 60
Figure 4-19 2022 Alternative 2B PM Peak Hour Roadway Volumes ... 61
Figure 4-20 2022 Alternative 2B Daily Roadway Volumes ... 62
Figure 4-21 Year 2042 No Project Peak Hour Intersection Volumes ... 63
Figure 4-22 Year 2042 No Project AM Peak Hour Roadway Volumes ... 64
Figure 4-23 Year 2042 No Project PM Peak Hour Roadway Volumes ... 65
Figure 4-24 2042 No Project Daily Roadway Volumes ... 66
Figure 4-25 2042 Alternative 1A Peak Hour Intersection Volumes ... 67
Figure 4-26 2042 Alternative 1B Peak Hour Intersection Volumes ... 68

Figure 4-27 2042 Alternative 1A AM Peak Hour Roadway Volumes 69
Figure 4-28 2042 Alternative 1A PM Peak Hour Roadway Volumes 70
Figure 4-29 2042 Alternative 1A Daily Roadway Volumes 71
Figure 4-30 2042 1B AM Peak Hour Roadway Volumes 72
Figure 4-31 2042 Alternative 1B PM Peak Hour Roadway Volumes 73
Figure 4-32 2042 Alternative 1B Daily Roadway Volumes 74
Figure 4-33 2042 Alternative 2A Peak Hour Intersection Volumes 75
Figure 4-34 2042 Alternative 2B Peak Hour Intersection Volumes 76
Figure 4-35 2042 Alternative 2A AM Peak Hour Roadway Volumes 77
Figure 4-36 2042 Alternative 2A PM Peak Hour Roadway Volumes 78
Figure 4-37 2042 Alternative 2A Daily Roadway Volumes 79
Figure 4-38 2042 Alternative 2B AM Peak Hour Roadway Volumes 80
Figure 4-39 2042 Alternative 2B PM Peak Hour Roadway Volumes 81
Figure 4-40 2042 Alternative 2B Daily Roadway Volumes 82
Figure 4-41 2022 and 2042 NCC Mainline and Ramp Peak Hour Volumes for Alternative 1A and 1B 83
Figure 4-42 2022 and 2042 NCC Mainline and Ramp Peak Hour Volumes for Alternative 2A and 2B 84

LIST OF TABLES

Table 2-1 Intersection Level of Service Thresholds 11
Table 2-2 Existing Peak Hour Truck Percentages 12
Table 2-3 Freeway LOS Criteria 13
Table 2-4 Urban Street LOS Criteria 14
Table 2-5 Two-Lane Highway LOS Criteria 14
Table 2-6 Two-Lane Highway Analysis Assumptions 15
Table 2-7 Roadway Segment Level of Service Criteria 15
Table 2-8 Level of Service Standards 16
Table 3-1 Existing Peak Hour Intersection Analysis 20
Table 3-2 Existing Peak Hour Queuing Analysis 22
Table 3-3 Existing Peak Hour Signal Warrant Analysis 26
Table 3-4 Existing Urban Street LOS 27
Table 3-5 Existing Two-Lane Highway LOS 28
Table 3-6 Accident History Data by Type 29
Table 3-7 Accident Rate Comparison 30
Table 3-8 Existing Bus Routes in Project Study Area 32
Table 4-1 Countywide Land Use Projections 37
Table 4-2 Estimated Average Year 2042 Daily Demand Volume Reduction on SR 108 Between McHenry Avenue and Stearns Avenue After Project Implementation 39
Table 4-3 Year 2042 Average Daily and Peak Hour Traffic Demand Volume Comparison 40
Table 4-4 Regional Measures of Effectiveness for project area 41
Table 4-4 Travel Times in Minutes Between Kiernan Avenue/Tully Intersection and Stanislaus County/Tuolumne County Border 41
Table 6-1 2022 Peak Hour Signal Warrant Analysis 86
Table 6-2 2022 Peak Hour Intersection Analysis 89
Table 6-3 2022 Peak Hour Queuing Analysis 94
Table 6-4 2022 Urban Street Analysis 111
Table 6-5 2022 Two-Lane Highway Analysis Based on HCM 113
Table 6-6 2022 Multilane, Freeway, and Ramp Analysis Based on HCM - Eastbound 114
Table 6-7 2022 Multilane, Freeway, and Ramp Analysis Based on HCM - Westbound 116
Table 7-1 2042 Peak Hour Signal Warrant Analysis 121
Table 7-2 2042 Peak Hour Intersection Analysis 125
Table 7-3 2042 Peak Hour Queuing Analysis 130
Table 7-4 2042 Urban Street Analysis 148
Table 7-5 2042 Two-Lane Highway Analysis Based on HCM 150

Table 7-6 2042 Multilane, Freeway, and Ramp Analysis Based on HCM - Eastbound 151
Table 7-7 2042 Multilane, Freeway, and Ramp Analysis Based on HCM - Westbound 153

CHAPTER 1. INTRODUCTION

The North County Corridor has been identified as an improvement to accommodate regional east-west traffic and to improve north-south network connectivity in northern Stanislaus and southern San Joaquin counties. Traffic through the Corridor is a combination of commuter, local, commerce, and goods movement, with a large component of recreational traffic. This traffic currently conflicts with local traffic on the existing facilities, creating congestion and safety concerns, as well as noise and air pollution issues. These conditions are expected to worsen over time as development continues and traffic increases within the Corridor.

1.1 PURPOSE OF REPORT

The purpose of this traffic analysis report is to document existing and future travel conditions associated with the North County Corridor Project. Traffic operations were analyzed to determine the project benefits in the study area. The results contained in this report serve as the basis for the traffic operations section of the Project Approval/Environmental Document (PA/ED).

1.2 STUDY AREA

The project will be located within unincorporated areas of Stanislaus County. The study area is generally bounded by SR 108/SR 120 to the north, Pelandale Avenue/Claratina Avenue to the south, Carver Road to the west and Maag Avenue to the east. This study evaluated the following 34 roadway segments:

1. Kiernan Avenue between Carver Road and Tully Road
2. Kiernan Avenue between Tully Road and McHenry Avenue
3. SR 108 between Ladd Road and Kiernan Avenue
4. SR 108 between Kiernan Avenue and Pelandale Avenue
5. SR 108 between McHenry Avenue and Oakdale Road
6. Coffee Road between SR 108 and Claribel Road
7. Coffee Road between Claribel Road and Pelandale Avenue
8. Oakdale Road between SR 108 and Claribel Road
9. Oakdale Road between Claribel Road and Pelandale Avenue
10. Claribel Road between SR 108 and Coffee Road
11. Claribel Road between Coffee Road and Oakdale Road
12. Claratina Avenue between McHenry Avenue and Coffee Road
13. Claratina Avenue between Coffee Road and Oakdale Road.
14. SR 108 between Oakdale Road and 1st Street
15. SR 108 between 1st Street and Claus Road
18. Roselle Avenue between Claribel Road and Sylvan Avenue
19. Claus Road between Patterson Road and Claribel Road
20. Claus Road between Claribel Road and Sylvan Avenue
21. Claribel Road between Oakdale Road and Claus Road
22. SR 108 between Claus Road and Crane Road
23. Langworth Road between SR 108 and Claribel Road
24. Claribel Road between Claus Road and Langworth Road
25. SR 108 between Crane Road and Oak Avenue
26. Patterson Road between Crane Road and Albers Road
27. Claribel Road between Langworth Road and Oakdale Waterford Highway
28. SR 108 between Oak Avenue and SR 120
29. Yosemite Avenue between SR 108 and Patterson Road
30. Albers Road between Patterson Road and Claribel Road
31. Oakdale Waterford Highway between Patterson Road and Claribel Road
32. SR 120 between Yosemite Avenue and Maag Avenue

16. Patterson Pass between SR 108 and Langworth Road
17. Roselle Avenue between Patterson Road and Claribel Road
33. SR 120 between Maag Avenue and Wamble Road
34. SR 120 between Wamble Road and Lancaster Road

In addition, this study evaluated the following 23 intersections:

1. Kiernan Avenue/Carver Road
2. Kiernan Avenue/Tully Road
3. McHenry Avenue/Ladd Road
4. McHenry Avenue/SR 108
5. Patterson Road/SR 108
6. SR 108/Kiernan Avenue
7. SR 108/Pelandale Avenue
8. Coffee Road/Claribel Road
9. Coffee Road/Claratina Avenue
10. Oakdale Road/SR 108
11. Oakdale Road/Claribel Road
12. Oakdale Road/Claratina Avenue
13. SR 108/1st Street
14. Claribel Road/Roselle Avenue
15. SR 108/Claus Road
16. Claribel Road/Claus Road
17. Patterson Road/Crane Road
18. Claribel Road/Bentley Road
19. SR 108/Oak Avenue
20. SR 108/SR 120
21. SR 108/Maag Avenue
22. Patterson Road/Albers Road
23. Claribel Road/Albers Road

The study area was developed in consultation with Caltrans. The Caltrans-approved scope of work is included in Appendix A.

1.3 PROJECT DESCRIPTION

The proposed North County Corridor is a four- to six-lane east-west expressway extending from about the SR 219 (Kiernan Avenue)/Tully Road intersection to SR 120/108 just east of the City of Oakdale. There are four project alternatives (1A, 1B, 2A, and 2B) under consideration. **Figure 1-1** is a project vicinity map.

1.4 PROJECT PURPOSE

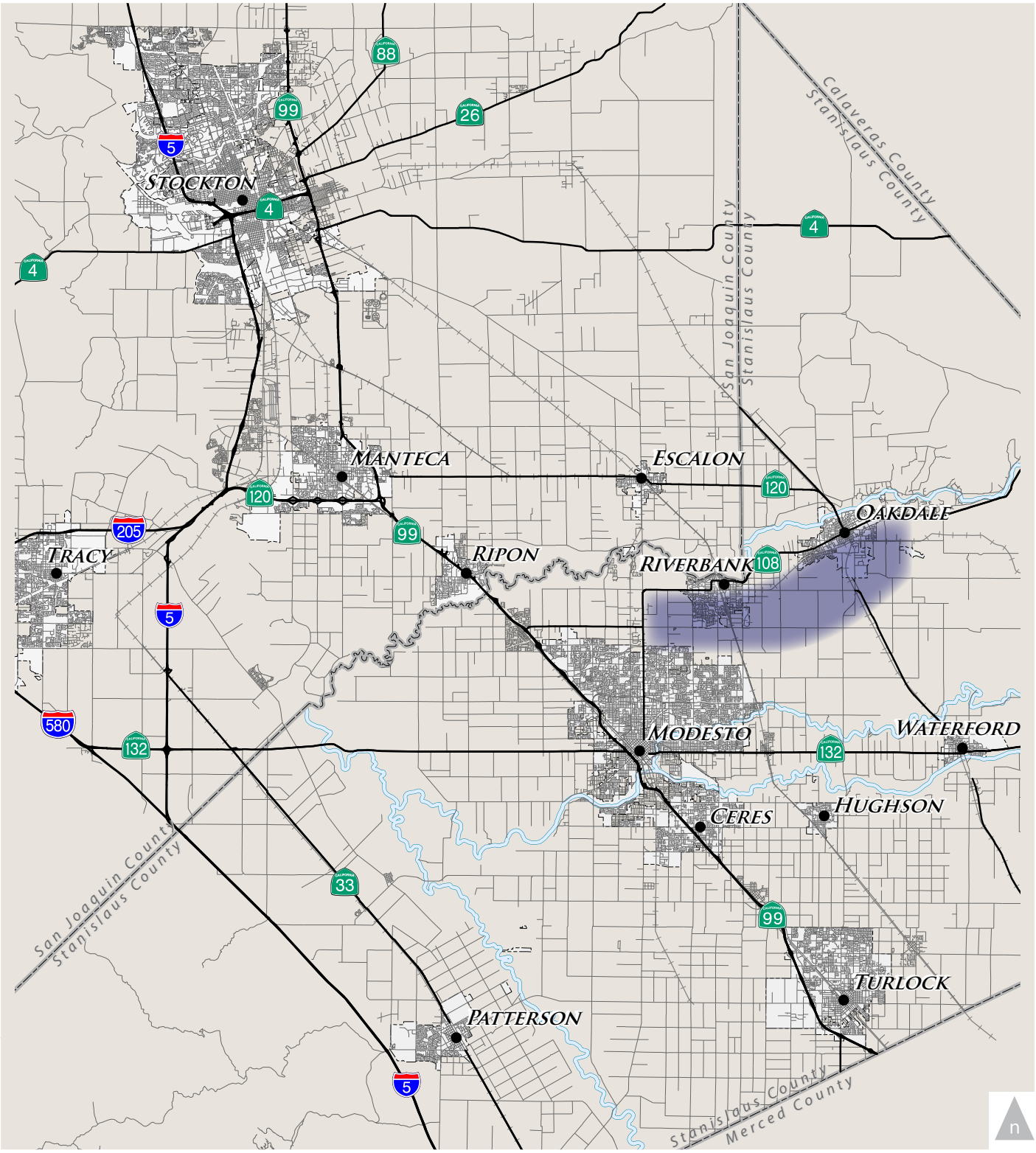
The purpose of the project is to reduce existing and future traffic congestion in northern Stanislaus County, enhance traffic safety on existing SR 108, support the efficient movement of goods, and improve interregional travel as follows:

- Reduce existing and future traffic congestion on existing SR 108 and surrounding regional transportation network in northern Stanislaus County and the Cities of Modesto, Riverbank, and Oakdale by providing a new east-west transportation facility;

- Enhance traffic safety on existing SR 108 through the communities of Riverbank and Oakdale by reducing average daily traffic volumes (particularly truck traffic),

- Support efficient movement of goods by providing a new east-west transportation facility that will reduce the number of conflict areas with non-motorized traffic, increase the average operating speeds, and improve travel time reliability, and

- Improve interregional travel by reducing travel times for long distance commuters, recreational traffic, and interregional goods movement



LEGEND

Area Contains Project Alignments
(Final Project Alignment TBD)

Figure 1-1

Project Vicinity Map

CHAPTER 2. DATA COLLECTION AND ANALYSIS METHODOLOGY

The analysis methodology chapter presents the study area, data collection and operational analysis methodologies. **Figure 2-1** illustrates the project study area.

2.1 DATA COLLECTION

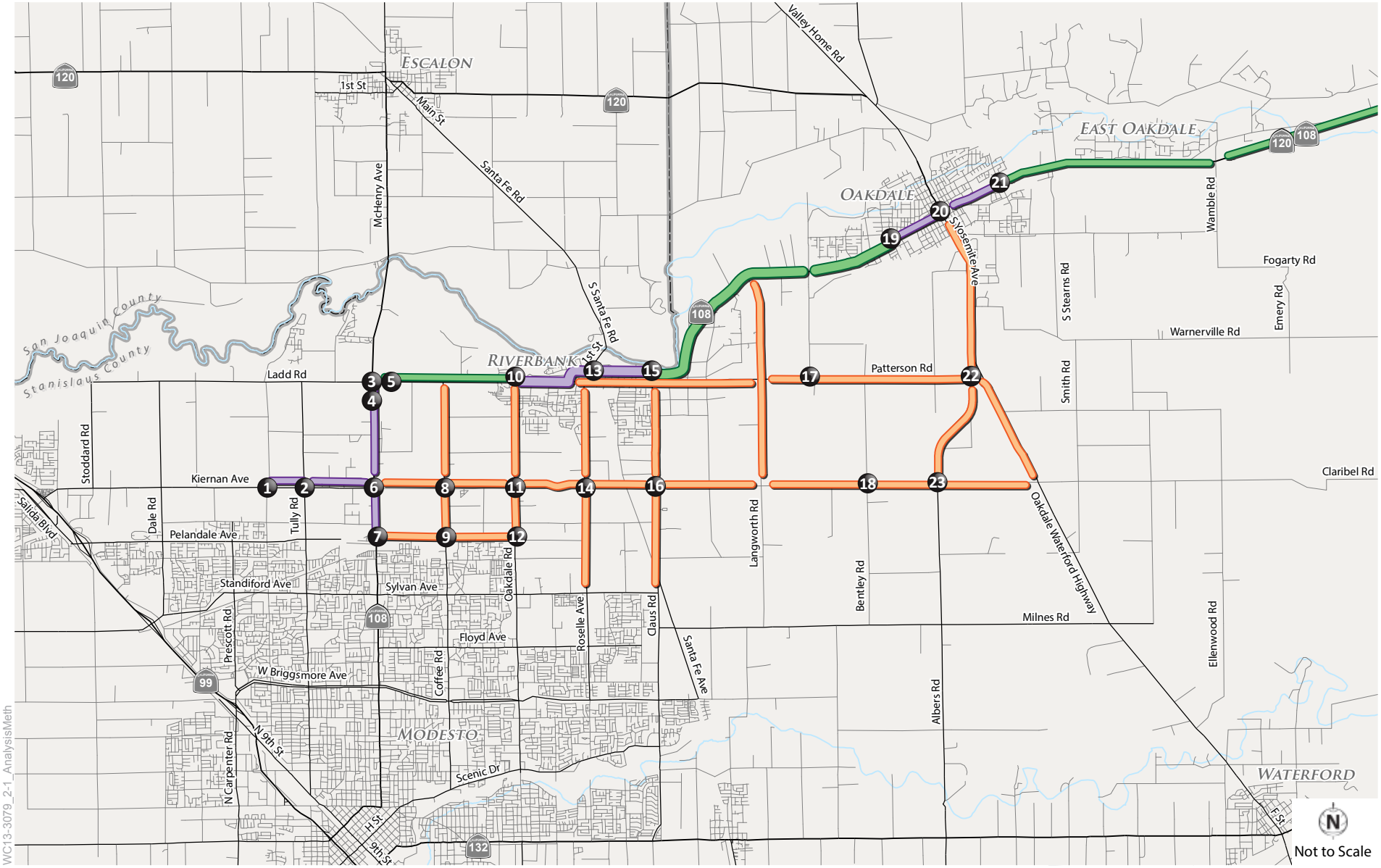
Extensive data collection efforts were undertaken to determine existing roadway average daily and peak hour traffic volumes, truck percentages, and queues on roadways within the study area boundaries. In addition, lane configurations and posted speed limits were collected for study area roadways.

2.1.1 Local Street System Traffic Data

Forty-eight hour tube classification counts were collected in September and October 2008 for many roadways in the study area; the truck volumes are primarily based on this 48-hour tube count data. Daily traffic volumes were also collected in early November 2010 at several locations to identify the changes in volumes that could have resulted from recent land use/traffic circulation changes (e.g., Kiernan Avenue widening, Claratina Avenue roadway extension, and construction of Gregori High School). The daily traffic counts indicate that the highest volumes generally occur in the morning between 7:00 AM and 9:00 AM and in the evening between 4:00 PM and 6:00 PM in the study area. Congestion at the intersections was observed to be highest during these periods.

Intersection counts were conducted during the morning (7:00 AM to 9:00 AM) and evening (4:00 PM to 6:00 PM) peak periods at the 23 study intersections during a typical weekday (Tuesday through Thursday) in August and September of 2010 and October 2012. Peak hour turning movement volumes and intersection control and lane configurations for the study intersections are shown in **Figure 2-2**. The peak hour volumes presented reflect minor adjustments to the raw traffic counts to ensure balanced vehicle trips between adjacent intersections. Peak hour roadway volumes are shown on **Figure 2-3A** and **Figure 2-3B**; average weekday daily traffic volumes are shown on **Figure 2-4**.[1] The raw traffic count data is presented in Appendix B.

[1] In addition to typical weekday ADT Caltrans requested that annual average daily traffic (AADT) also be presented. Caltrans defines AADT as the total amount of traffic traveled in a year divided by the number of days (normally 365) in that year. AADT includes data for a Monday, Friday, Saturday, and Sunday, which is not considered as part of a typical weekday. Figure B-1 in Appendix B presents AADT data for Caltrans facilities.



WC13-3079_2-1_AnalysisMeth

LEGEND

- Urban Street Methodology Per HCM
- Two-Lane Highway Methodology Per HCM
- Volume-to-Capacity Methodology Per County Method
- # Existing Intersection Analysis Per HCM

Figure 2-1

Study Area and Analysis Methodology

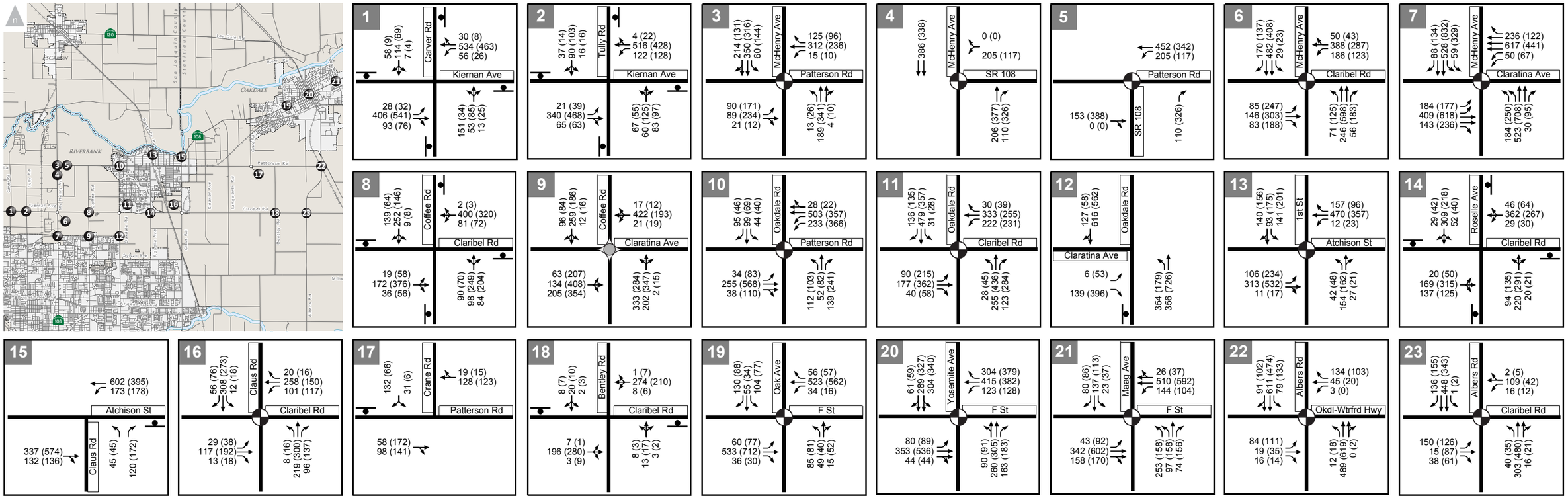
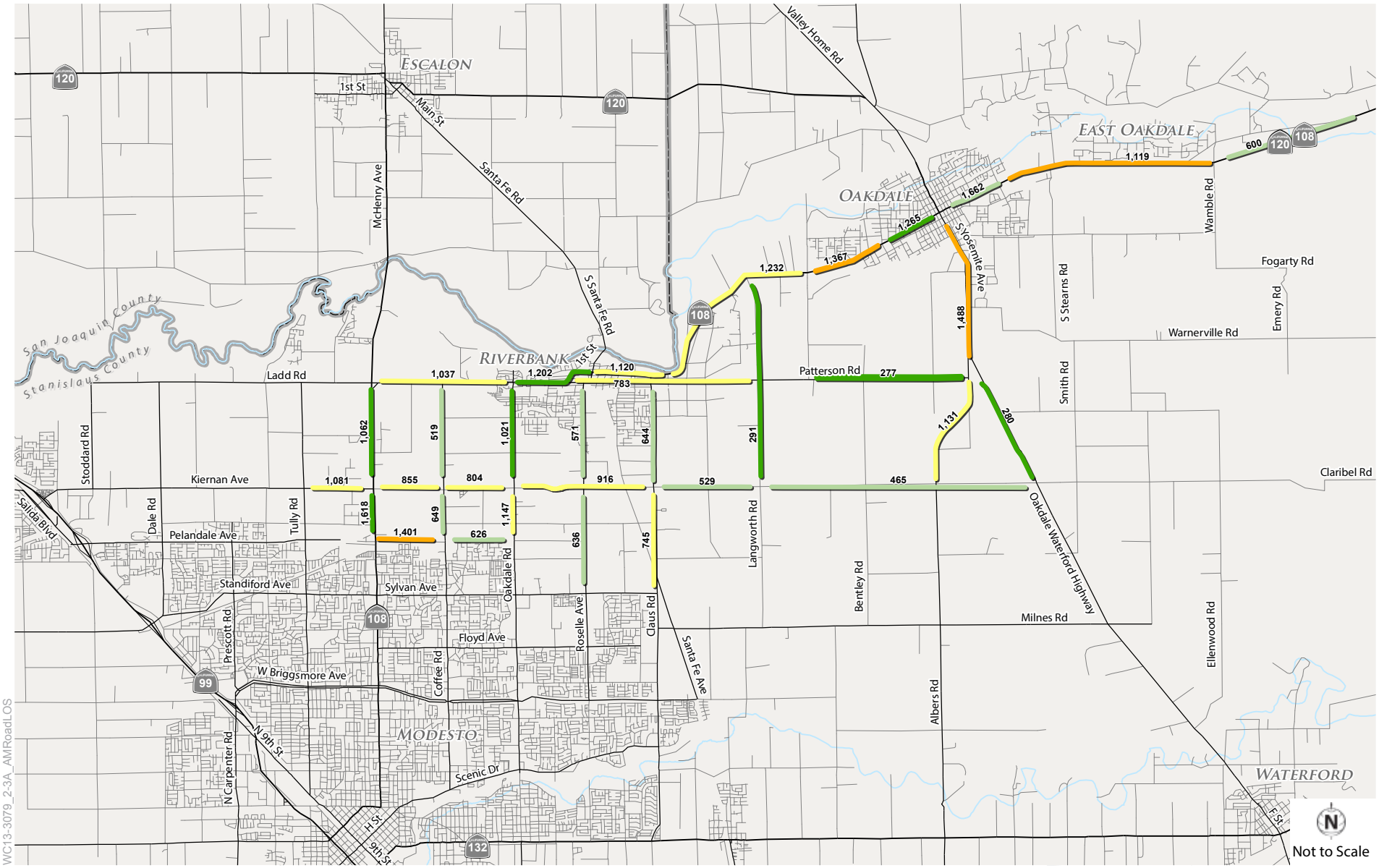


Figure 2-2

Existing Intersection Traffic Controls, Lane Geometries, and Peak Hour Traffic Volumes

WC13-3079_2-2_ExVol



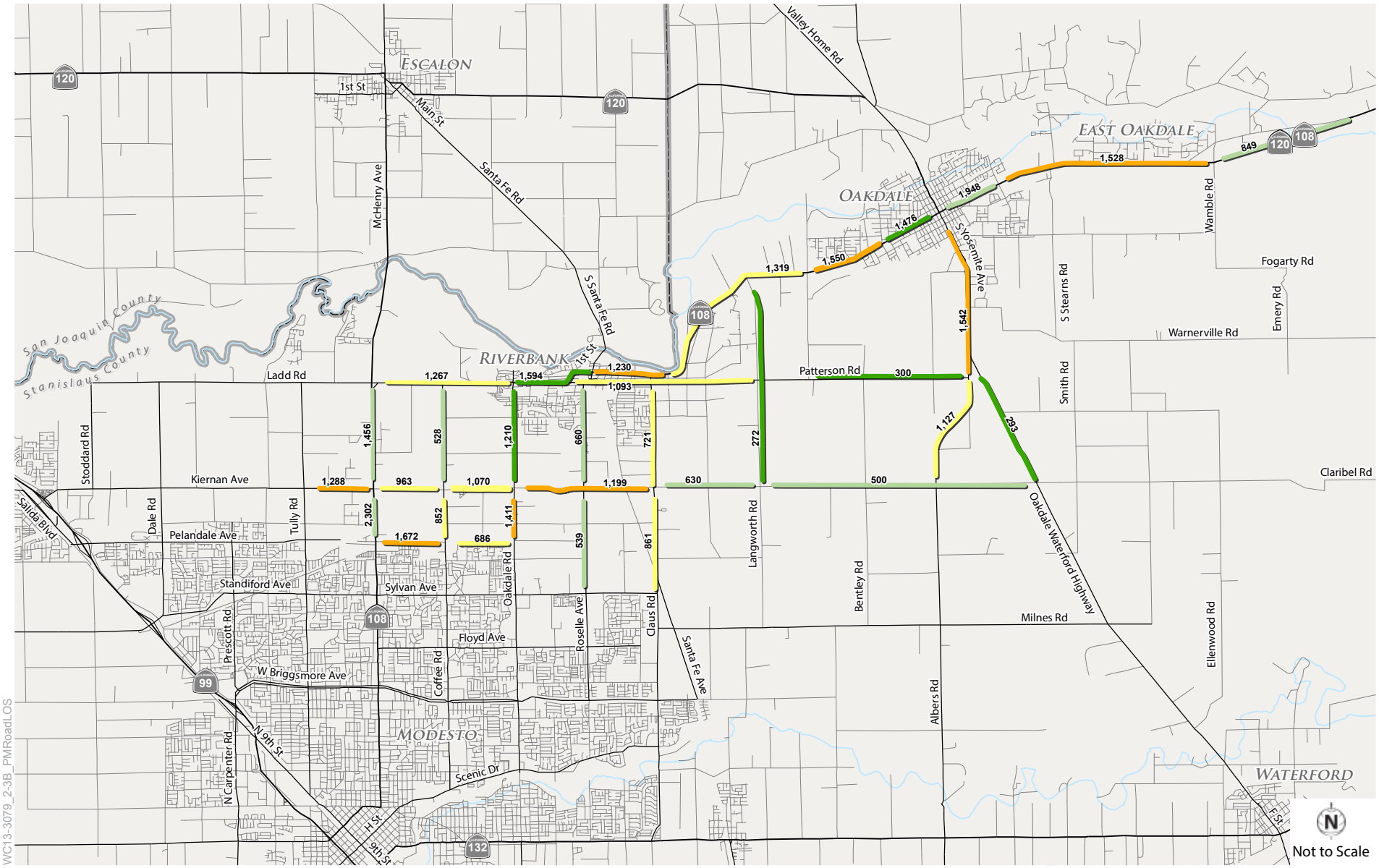
LEGEND

- A
- B
- C
- D
- E
- F

Figure 2-3A

Existing AM Peak Hour Roadway Volume and LOS

WC13-3079_2-3A_AMRoadLOS



LEGEND

- A
- B
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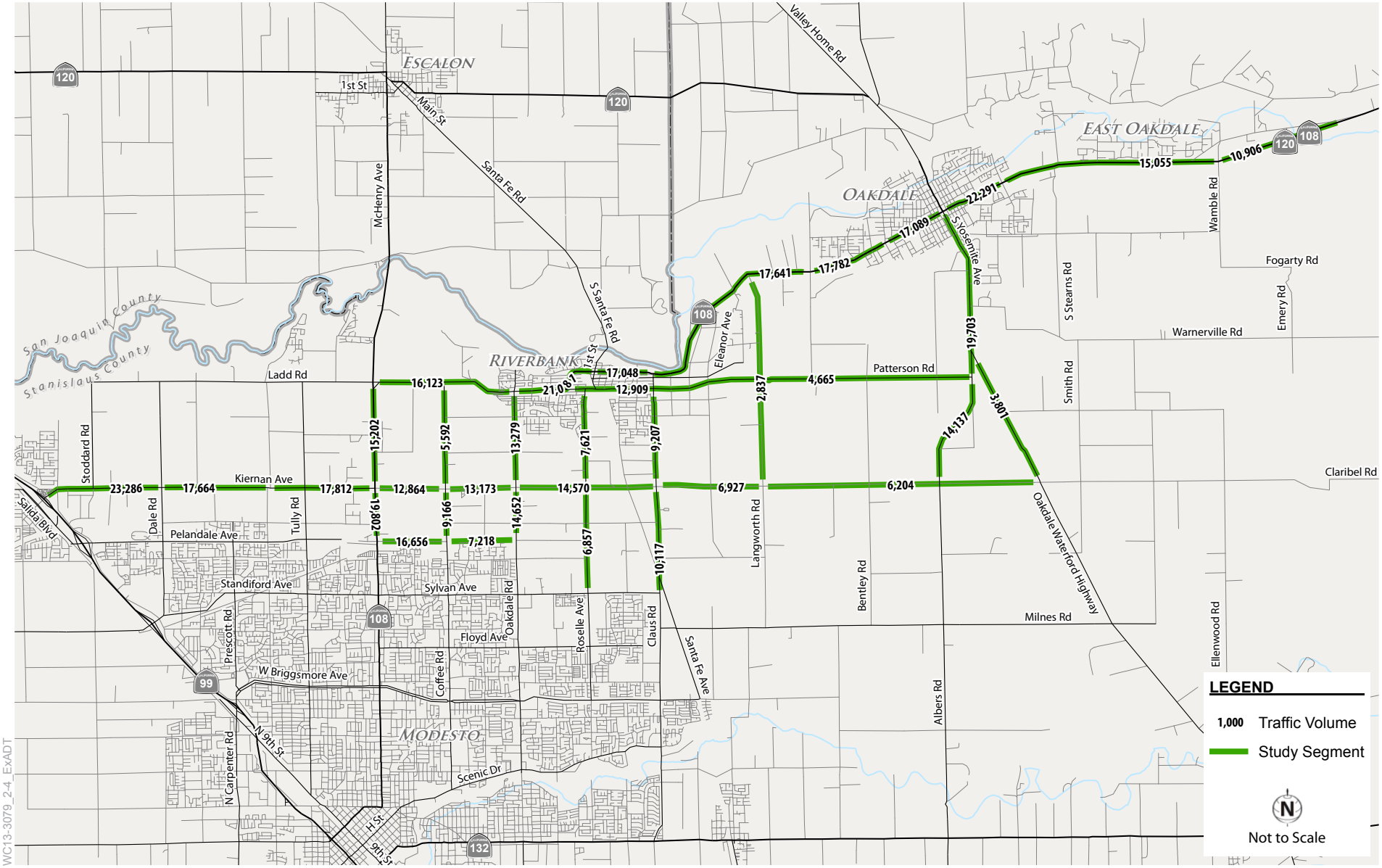
- D
- E
- F

Figure 2-3B

Existing PM Peak Hour Roadway Volume and LOS

WC13-3079_2-3B_PMRoadLOS



WC13-3079_2-4_ExADT

Figure 2-4

Existing Typical Weekday Average Daily Traffic Volumes

2.1.2 Field Observations

Field observations of traffic congestion and queues were conducted during the AM and PM peak periods in August and September 2010. Traffic queues at most study intersections were observed to be minimal and usually cleared every cycle at the signalized intersections. The study intersections where more extensive queues were observed are summarized below.

- Kiernan Avenue / Tully Road
  - PM Peak – Eastbound queue exceeded 20 vehicles.

- SR 108 / Kiernan Avenue
  - AM and PM Peak – Southbound queue reached as many as 14 vehicles.
  - AM and PM Peak – Westbound queue reached as many as 16 vehicles.
  - PM Peak – Northbound queue reached as many as 17 vehicles. Additionally, left turn queue reached as many as 13 vehicles but was observed to clear every cycle.

- SR 108 / Pelandale Avenue
  - AM and PM Peak – Northbound queue reached as many as 16 vehicles. Additionally, left turn queue reached as many as 17 vehicles but was observed to clear every cycle.
  - PM Peak – Southbound queue reached as many as 16 vehicles.
  - AM Peak – Eastbound queue reached as many as 20 vehicles.
  - AM Peak – Westbound queue reached as many as 15 vehicles.

- Coffee Road / Claribel Road
  - AM Peak – Westbound queue exceeded 20 vehicles.
  - PM Peak – Eastbound queue exceeded 20 vehicles.

- Oakdale Road / SR 108
  - PM Peak – Northbound right turn queue reached approximately 25 vehicles.

- Oakdale Road / Claribel Road
  - PM Peak – Northbound queue reached as many as 15 vehicles.

- SR 108 / 1st Street
  - AM Peak – Westbound queue reached over 20 vehicles.
  - PM Peak – Southbound queue reached over 30 vehicles; queues did not clear every cycle.
  - PM Peak – Eastbound queue reached over 20 vehicles.

- SR 108 / Oak Avenue
  - AM and PM Peak – Eastbound queue reached as many as 15 vehicles.

- SR 108 / SR 120
  - AM and PM Peak – Westbound queue reached as many as 20 vehicles.
  - AM and PM Peak – Eastbound queue reached over 20 vehicles.

2.2 ROADWAY SYSTEM ANALYSIS METHODOLOGY

The traffic operations analysis methodologies and key assumptions for intersections and mainline facilities are described below.

2.2.1 Intersections

Traffic operations for the study area were analyzed using the Synchro/SimTraffic 8.0 software program. Synchro/SimTraffic is based on procedures outlined in the Transportation Research Board's *2010 Highway Capacity Manual* (HCM). Use of the SimTraffic simulation model allows the study area to be analyzed as an interconnected roadway network, which is needed to accurately analyze the vehicle interactions along study roadways to reflect potential vehicle queue impacts in the study area.

The SimTraffic models were validated to existing conditions using the criteria suggested in *Guidelines for Applying Traffic Microsimulation Modeling Software* (California Department of Transportation, 2002) and additional criteria developed by Fehr & Peers. Chapter 3 contains information relating to the development of the simulation models and the calibration and validation process.

The analysis results include a descriptive term known as level of service (LOS). LOS is a measure of traffic operating conditions, which varies from LOS A (indicating free flow traffic conditions with little or no delay) to LOS F (representing over-saturated conditions where traffic flows exceed design capacity resulting in long queues and delays). These grades represent the perspective of drivers and are an indication of the comfort and convenience associated with driving.

The LOS is determined differently depending on the type of control at the intersection. For side-street stop-controlled intersections, the LOS rating is based on the weighted average control delay of the side-street. At all-way stop-controlled, roundabout and signalized intersections, the LOS rating is based on the weighted average control delay of all movements measured in seconds per vehicle. Peak hour traffic volumes, lane configurations, and signal timing plans are used as inputs in the LOS calculations. **Table 2-1** summarizes the relationship between the average control delay per vehicle and LOS for signalized and unsignalized intersections.

TABLE 2-1
INTERSECTION LEVEL OF SERVICE THRESHOLDS

Level of Service	Signalized Intersection Control Delay (sec/veh)[1]	Unsignalized Intersection Control Delay (sec/veh)[1]	General Description
A	0 – 10.0	0 – 10.0	Little to no congestion or delays.
B	10.1 – 20.0	10.1 – 15.0	Limited congestion. Short delays.
C	20.1 – 35.0	15.1 – 25.0	Some congestion with average delays.
D	35.1 – 55.0	25.1 – 35.0	Significant congestion and delays.
E	55.1 – 80.0	35.1 – 50.0	Severe congestion and delays.
F	> 80.0	> 50.0	Total breakdown with extreme delays.

Notes:
1. Control delay includes initial deceleration delay, queue move-up time, stopped delay, and acceleration delay.

Source: *HCM 2010*, Transportation Research Board.

SimTraffic was chosen as the operations tool suitable to estimate existing operations, but more importantly to better estimate operations under future conditions when congestion is expected to be worse. Results from SimTraffic, the microsimulation component of Synchro, were used to determine delay and LOS at all intersections except at the roundabout intersection of Coffee Road/Claratina Avenue. The Synchro/SimTraffic software package has limitations in accurately calculating LOS at roundabouts. Instead, the SIDRA (Signalized and Unsignalized Intersection Design and Research Aid) software package was used as the operations tool for roundabouts.

Peak hour factors (PHF) used in the analysis were based on the results of the data collection effort. PHF's range between 0.85 and 0.91 during the AM peak hour and between 0.91 and 0.97 during the PM peak hour.

Truck percentages used in the analysis were also based on the results of the data collection effort. **Table 2-2** summarizes the truck percentages assumed in the analysis. For locations not listed in **Table 2-2**, such as local residential streets, trucks were assumed to be 2% of the total peak hour volume.

TABLE 2-2
EXISTING PEAK HOUR TRUCK PERCENTAGES

Roadway Segment	Peak Hour Truck %[1]
Tully Road between Ladd Road and Pelandale Avenue	10% (8%)
Kiernan Avenue between Carver Road and Roselle Avenue	11% (8%)
Claribel Road between Roselle Avenue and Langworth Road	12% (9%)
McHenry Avenue between Ladd Road and Pelandale Avenue	13% (9%)
Coffee Road between Patterson Road and Pelandale Avenue	5% (4%)
Oakdale Road between Patterson Road and Pelandale Avenue	8% (6%)
Ladd Road/Patterson Road between Tully Road and Coffee Road	9% (8%)
Pelandale Avenue between Tully Road and Oakdale Road	5% (5%)
SR 108 between Coffee Road and Claus Road	9% (6%)
SR 108 between Oak Avenue and Maag Avenue	19% (13%)
Claus Road between Patterson Road and Santa Fe Avenue	13% (8%)
1st Street between Henry Road and Patterson Road	23% (16%)
Yosemite Avenue between River Road and J Street	20% (15%)
Albers Road between Warnerville Road and Claribel Road	16% (12%)
Patterson Road between Langworth Road and Alvarado Road	21% (16%)
Average	**13% (10%)**

Notes:
1. Data shown as: AM (PM)

Source: Fehr & Peers, 2015.

2.2.2 Freeway and Multilane Highway

Freeway and multilane highway facility operations are also described in terms of LOS. The service level for a freeway section and multilane highway is based on vehicle density expressed as passenger cars/lane/mile. **Table 2-3** presents a summary of the relationship between density and level of service for freeway sections, multilane highway, and freeway ramp junctions.

TABLE 2-3
FREEWAY LOS CRITERIA

Level of Service	Description	Basic Freeway Segment Density Criteria[1]	Multilane Highway Density Criteria[1,2]	Freeway Merge/Diverge Segment Density Criteria[1]
A	Free-flow speeds prevail. Vehicles are almost completely unimpeded in their ability to maneuver within the traffic stream.	≤ 11.0	≤ 11.0	≤ 10.0
B	Free-flow speeds are maintained. The ability to maneuver with the traffic stream is only slightly restricted.	> 11.0 to 18.0	> 11.0 to 18.0	> 10.0 to 20.0
C	Flow with speeds at or near free-flow speeds. Freedom to maneuver within the traffic stream is noticeably restricted, and lane changes require more care and vigilance on the part of the driver.	> 18.0 to 26.0	> 18.0 to 26.0	> 20.0 to 28.0
D	Speeds decline slightly with increasing flows. Freedom to maneuver with the traffic stream is more noticeably limited, and the driver experiences reduced physical and psychological comfort.	> 26.0 to 35.0	> 26.0 to 35.0	> 28.0 to 35.0
E	Operation at capacity. There are virtually no usable gaps within the traffic stream, leaving little room to maneuver. Any disruption can be expected to produce a breakdown with queuing.	> 35.0 to 45.0	> 35.0 to 41.0	> 35.0 to 43.0
F	Represents a breakdown in flow.	> 45.0	> 41.0	> 43.0

Notes:
1. Density in passenger cars per mile per lane
2. Criteria based on free-flow speed of 55 mph.

Source: *2010 Highway Capacity Manual.*

2.2.3 Freeway Weaving Sections

Per Caltrans' requirements, the level of service for freeway weaving sections are determined using the Leisch Method as outlined in Figure 504.7A in Caltrans' *Highway Design Manual* (HDM), 5th Edition. The Leisch Method calculates the level of service based on the service flow (passenger cars/ per hour/ per lane [pc/ph/pl]) through the weaving section.

2.2.4 Urban Streets

The level of service for the existing roadway segments that may change due to the build alternative were analyzed using the urban street methodology found in Chapter 17 of the HCM. Urban street LOS is based on average through-vehicle speed for the segment, which is influenced both by the number of signals per mile and by the intersection control delay. **Table 2-4** presents the urban street LOS criteria

based on average travel speed and urban street class. Urban street LOS was determined using the same Synchro/Simtraffic models developed for the intersection analyses.

TABLE 2-4
URBAN STREET LOS CRITERIA

LOS	Travel Speed as a Percentage of Base Free-Flow Speed (%)
A	> 85
B	> 67 - 85
C	> 50 - 67
D	> 40 - 50
E	> 30 – 40
F	≤ 30

Source: *HCM 2010*, Transportation Research Board.

2.2.5 Two-Lane Highways

The level of service for all other existing roadway segments were analyzed using the two-lane highway methodology found in Chapter 15 of the HCM. According to the HCM, existing SR 108 is classified as a Class I facility because it operates as a regional route. On Class I highways, LOS is defined in terms of both percent time-spent-following and average travel speed. **Table 2-5** presents the two-lane highway LOS criteria. The McTrans HCS 2010 software program was used to determine the two-lane highway LOS.

TABLE 2-5
TWO-LANE HIGHWAY LOS CRITERIA

LOS[1]	Percent Time-Spent-Following	Average Travel Speed (mph)
A	≤ 35	> 55
B	> 35 – 50	> 50 – 55
C	> 50 – 65	> 45 – 50
D	> 65 – 80	> 40 – 45
E	> 80	≤ 40

Notes:
1. LOS F applies whenever the flow rate exceeds the segment capacity.

Source: *HCM 2010*, Transportation Research Board.

Table 2-6 presents the assumptions used for the two-lane highway analysis.

TABLE 2-6
TWO-LANE HIGHWAY ANALYSIS ASSUMPTIONS

Roadway Segment	PHF	Truck %	Free-Flow Speed (mph)
4. SR 108 between McHenry Avenue and Oakdale Road	0.89 (0.95)	10% (11%)	55
21. SR 108 between Claus Road and Crane Road	0.89 (0.95)	12% (12%)	55
24. SR 108 between Crane Road and Oak Avenue	0.89 (0.95)	12% (12%)	45
32. SR 108/SR 120 between Maag Avenue and Wamble Road	0.89 (0.95)	15% (12%)	50
33. SR 108/SR 120 between Wamble Road and Lancaster Road	0.89 (0.95)	18% (10%)	55

Source: Fehr & Peers, 2010.

2.2.6 Volume-to-Capacity Methodology per County Method

LOS for select study area roadways was determined by comparing the roadway's average AM and PM peak hour traffic volume to the planning level hourly thresholds presented in **Table 2-7**. These thresholds are consistent with the LOS thresholds presented in the Stanislaus County General Plan.

TABLE 2-7
ROADWAY SEGMENT LEVEL OF SERVICE CRITERIA

Roadway Capacity class	Level of Service Thresholds (vehicles / hour / lane)				
	A	B	C	D	E
Class A Expressway	450	750	1,050	1,260	1,500
Class B Expressway	375	625	875	1,050	1,250
Class C Expressway	300	500	700	840	1,000
2 Lane Arterial	70	190	340	590	1,000
4+ Lane Arterial	252	423	594	711	900
2 Lane Collector	35	95	170	295	500
4 Lane Collector	140	235	330	395	500

Source: *Stanislaus County General Plan*

2.3 EVALUATION CRITERIA

As shown in **Table 2-8**, some jurisdictions apply a standard of LOS C or better , while others use a standard of LOS D. LOS standards on Caltrans facilities are based on the Transportation Concept Report (TCR) for each facility. In the study area, SR 99, SR 132, and SR 219 maintain a LOS D standard, while SR 108 and SR 120 maintain a LOS C standard in rural areas and a LOS D standard in urban areas.

TABLE 2-8
LEVEL OF SERVICE STANDARDS

Jurisdiction/Agency	Level of Service Standard
Stanislaus County	C (LOS D if location is within the sphere of influence of Modesto, Riverbank, or Oakdale)
City of Modesto	D
City of Riverbank	D
City of Oakdale	D
Caltrans	Based on Transportation Concept Report for each facility

Sources: *Stanislaus County General Plan; Caltrans Transportation Concept Reports* for state routes 99, 108, 120, and 132.

It is often useful to supplement the individual roadway analyses with regional performance measures such as vehicle miles of travel (VMT) and vehicle hours of delay (VHD). This is particularly useful when comparing future project alternatives. The following is a brief description of the MOEs:

- ***Vehicle Miles of Travel* (VMT)** – is a measure of the total miles traveled by all vehicles in the study area during the analysis period
- ***Vehicle Hours of Delay (VHD)*** – is the amount of total vehicle delay incurred as a result of congestion

CHAPTER 3. EXISTING CONDITIONS

This chapter presents the existing physical and operational characteristics of the transportation system within the study area.

3.1. ROADWAY SYSTEM

The project study area is generally bounded by SR 108/SR 120 to the north, Pelandale Avenue/Claratina Avenue to the south, Tully Road to the west and Maag Avenue to the east. The project study area covers portions of four jurisdictions, including Stanislaus County and the cities of Modesto, Riverbank, and Oakdale. The existing roadway network in the project study area includes state highways, arterials, collectors, and local streets. The following provides a brief description of the roadways.

State Route 120 (SR 120) is an east-west freeway with two lanes in each direction between I-5 and SR 99. East of SR 99, SR 120 becomes an east-west two-lane highway that extends through the study area.

State Route 108 (SR 108) is a north-south two-lane state highway between Needham Street and Patterson Road, that then becomes an east-west two-lane state highway east of McHenry Avenue. East of Yosemite Avenue, SR 108 and SR 120 converge and share the same alignment within the study area. This roadway does widen out to four or six lanes at some locations.

State Route 132 (SR 132) is an east-west state highway that extends through the project study area, and varies in width from two to four lanes.

Kiernan Avenue is an east-west two-lane state highway (SR 219) that extends from west of SR 99 to McHenry Avenue, where it becomes Claribel Avenue. This roadway was recently widened to four lanes from Sisk Road to Dale Road.

McHenry Avenue is a north-south two-lane state highway south of Patterson Road and a two-lane arterial north of Patterson Road. McHenry Avenue extends from Needham Street to SR 120. This roadway does widen out to four or six lanes at some locations. McHenry Avenue is designated as SR 108 between Needham Street and Patterson Road.

Ladd Road is an east-west minor arterial that extends from Stoddard Road to McHenry Avenue, where it becomes Patterson Road.

Patterson Road is an east-west two-lane roadway that is classified as a state highway (SR 108) between McHenry Avenue and Callander Avenue, and a minor arterial east of Callander Avenue. Patterson Road extends from McHenry Avenue to Albers Road.

Claribel Road is an east-west two-lane minor arterial that extends from McHenry Avenue to east of Tim Bell Road.

Pelandale Avenue is an east-west principal arterial/expressway that extends from SR 99 to McHenry Avenue, where it becomes Claratina Avenue. This roadway varies in width from four to six lanes.

Claratina Avenue is an east-west expressway that extends from McHenry Avenue to Oakdale Road. This roadway is currently a two-lane facility and will be widened as adjacent development occurs.

Murphy Road is an east-west two-lane minor arterial that extends from Toomes Road to Salida Boulevard, where it becomes Dakota Road.

Sylvan Avenue is a four-lane, east-west arterial that extends from McHenry Avenue to Claus Road.

Tully Road is a north-south minor arterial that extends from 9th Street to Country Club Drive. This roadway varies in width from two to four lanes.

Coffee Road is a north-south minor arterial that extends from Scenic Drive to Patterson Road. This roadway varies in width from two to four lanes.

Oakdale Road is a north-south minor arterial that extends from Scenic Drive to Arrowwood Drive. This roadway varies in width from two to five lanes.

Roselle Avenue is a north-south minor arterial that extends from Briggsmore Avenue to Patterson Road. This roadway varies in width from two to four lanes.

Claus Road is a north-south arterial that extends from SR 132 to SR 108. This roadway varies in width from two to six lanes.

Eleanor Road is a north-south two-lane minor arterial that extends from Claribel Road to SR 108.

Langworth Road is a north-south two-lane minor arterial that extends from Milnes Road to SR 108.

Albers Road is a north-south two-lane minor arterial that extends from SR 132 to Warnerville Road, where it becomes Yosemite Boulevard.

Oakdale-Waterford Highway is a north-south two-lane rural highway that extends from SR 132 to Albers Road.

Maag Avenue is a north-south collector roadway that extends from Irvin Drive to Sierra Road.

Crane Road is a north-south collector roadway that extends from Walnut Street to Patterson Road.

Oak Avenue is a north-south collector roadway that extends from West J Street to Kimball Street, where it becomes River Avenue.

First Street is a north-south collector roadway that extends from Patterson Road to Henry Road, where it becomes Santa Fe Road.

3.1.1 Intersection Traffic Operations

The following sub-sections discuss the Synchro and SimTraffic model development process used to determine existing intersection operations. The Guidelines for *Applying Traffic Microsimulation Modeling Software* (September 2002) developed by Caltrans were used as a guideline for model development, calibration, and validation. In March 2011, Caltrans reviewed and approved an existing conditions traffic operations report for this project. Appendix A presents the Caltrans review and approval letter.

Model Development

SimTraffic models were developed representing the existing AM peak hour and PM peak hour traffic conditions for the local streets. Because the existing conditions models will be used to evaluate future traffic conditions, an extensive model calibration and validation process was followed to ensure that the modeled results are consistent with the observed conditions on the local streets.

The majority of model development was performed using Synchro before converting the network into the SimTraffic software. The Synchro models include all of the study intersections and were coded with the demand peak hour volumes, posted speed limit, vehicle mix, and signal timings. Traffic signal-related information such as phasing and initial timings (minimum green, maximum green, etc.) for the signalized

intersections were obtained from the respective agencies and municipalities (City of Modesto, Stanislaus County, and Caltrans). Additional detail such as turn pocket lengths and intersection spacing was coded based on field observations and aerial photography. A detailed description of the model development and calibration/validation process is presented in Appendix C.

Intersection Analysis Results

Existing intersection traffic operations were evaluated using the calibrated/validated SimTraffic models developed for the 23 study intersections. The simulation models were recorded for the peak hour with a 10-minute seeding period. **Table 3-1** presents the simulated intersection level of service results for each of the study intersections. As shown in **Table 3-1**, all study intersections operate at acceptable service levels during the AM and PM peak hours, except the following locations:

- Kiernan Avenue/Carver Road operates at LOS F during the AM peak Hour
- Kiernan Avenue/Tully Road operates at LOS F during the PM peak hour
- Coffee Road/Claribel Road operates at LOS F during the AM and PM peak hours
- Coffee Road/Claratina Avenue operates at LOS F during the AM and PM peak hours
- SR 108/1st Street operates at LOS E during the PM peak hour
- Claribel Road/Roselle Avenue operates at LOS F during the AM and PM peak hours

Intersection queues were also evaluated with the calibrated/validated SimTraffic models. **Table 3-2** presents the simulated queue results by movement. Queues exceed available storage lengths at the following locations:

- Kiernan Avenue/Carver Road during the AM and PM peak hours
- McHenry Avenue/Ladd Road during the AM peak hour
- SR 108/Kiernan Avenue during the AM and PM peak hours
- SR 108/Pelandale Avenue during the AM and PM peak hours
- SR 108/Oakdale Road during the AM peak hour
- SR 108/1st Street during the AM and PM peak hours
- SR 108/Oak Avenue during the AM peak hour
- SR 108/SR 120 during the AM and PM peak hours
- SR 108/Maag Avenue during the AM and PM peak hours

The Fehr & Peers analysis worksheets are presented in Appendix D.[2]

[2] Please note that Synchro worksheets are provided for the study intersections in Appendix D for informational purposes to present key modeling inputs including lanes, volumes, and signal timings. The results presented in Tables 3-1 and 3-2 are from the Fehr & Peers analysis worksheets, which are the average of ten SimTraffic model runs.

TABLE 3-1
EXISTING PEAK HOUR INTERSECTION ANALYSIS

Intersection	Traffic Control[1]	Peak Hour	Delay (seconds/ vehicle)[2,3]	LOS[2,3]	Jurisdiction
1. Kiernan Avenue/Carver Road	AWSC	AM	**82.7**	**F**	Caltrans
		PM	22.3	C	
2. Kiernan Avenue/Tully Road	AWSC	AM	28.4	D	Caltrans
		PM	**56.6**	**F**	
3. McHenry Avenue/Ladd Road	Signal	AM	24.2	C	Stanislaus County
		PM	28.6	C	
4. McHenry Avenue/SR 108	Signal	AM	10.6	B	Caltrans
		PM	7.7	A	
5. SR 108/Patterson Road	Signal	AM	7.4	A	Caltrans
		PM	9.7	A	
6. SR 108/Kiernan Avenue	Signal	AM	28.5	C	Caltrans
		PM	31.8	C	
7. SR 108/Pelandale Avenue	Signal	AM	28.1	C	Caltrans
		PM	38.2	D	
8. Coffee Road/Claribel Road	AWSC	AM	**80.4**	**F**	Stanislaus County
		PM	**87.0**	**F**	
9. Coffee Road/Claratina Avenue	Round-about	AM	**57.4**	**F**	City of Modesto
		PM	**53.0**	**F**	
10. Oakdale Road/SR 108	Signal	AM	31.7	C	Caltrans
		PM	54.0	D	
11. Oakdale Road/Claribel Road	Signal	AM	33.3	C	City of Riverbank
		PM	38.8	D	
12. Oakdale Road/Claratina Avenue	SSSC	AM	10 (13.5)	A (B)	City of Modesto
		PM	11.5 (34.4)	B (D)	

Notes: Results in bold represent unacceptable levels of service as determined by the applicable LOS standards of the relevant jurisdiction. Results based on SimTraffic simulation of 10 runs.
1. Signal = signalized intersection, SSSC = side street stop controlled intersection, AWSC = all-way stop-controlled intersection, Roundabout = roundabout controlled intersection
2. Signalized and all-way stop intersection level of service based on weighted average control delay per vehicle, according to the 2010 Highway Capacity Manual.
3. Side-street stop intersection level of service based on weighted average control delay per vehicle and worst approach control delay per vehicle, according to the 2000 Highway Capacity Manual in the notation: average (worst approach).

Source: Fehr & Peers, 2015

TABLE 3-1
EXISTING PEAK HOUR INTERSECTION ANALYSIS

Intersection	Traffic Control[1]	Peak Hour	Delay (seconds/ vehicle)[2,3]	LOS[2,3]	Jurisdiction
13. SR 108/1st Street	Signal	AM	37.3	D	Caltrans
		PM	65.8	**E**	
14. Claribel Road/Roselle Avenue	AWSC	AM	**52.5**	**F**	City of Riverbank/ Stanislaus County
		PM	**83.8**	**F**	
15. SR 108/Claus Road	SSSC	AM	4.5 (10.1)	A (B)	Caltrans
		PM	6.8 (17.5)	A (B)	
16. Claribel Road/Claus Road	Signal	AM	17.9	B	City of Riverbank
		PM	21.1	C	
17. Patterson Road/Crane Road	SSSC	AM	2.6 (4)	A (A)	Stanislaus County
		PM	2.9 (3.3)	A (A)	
18. Claribel Road/Bentley Road	SSSC	AM	1.9 (7.6)	A (A)	Stanislaus County
		PM	1.5 (7.8)	A (A)	
19. SR 108/Oak Avenue	Signal	AM	19.8	B	Caltrans
		PM	20.0	B	
20. SR 108/SR 120	Signal	AM	39.1	D	Caltrans
		PM	43.3	D	
21. SR 108/Maag Avenue	Signal	AM	23.2	C	Caltrans
		PM	23.4	C	
22. Patterson Road/Albers Road	Signal	AM	18.5	B	Stanislaus County
		PM	20.6	C	
23. Claribel Road/Albers Road	Signal	AM	16.2	B	Stanislaus County
		PM	11.2	B	

Notes: Results in bold represent unacceptable levels of service as determined by the applicable LOS standards of the relevant jurisdiction. Results based on SimTraffic simulation of 10 runs.
1. Signal = signalized intersection, SSSC = side street stop controlled intersection, AWSC = all-way stop-controlled intersection, Roundabout = roundabout controlled intersection
2. Signalized and all-way stop intersection level of service based on weighted average control delay per vehicle, according to the 2010 Highway Capacity Manual.
3. Side-street stop intersection level of service based on weighted average control delay per vehicle and worst approach control delay per vehicle, according to the 2000 Highway Capacity Manual in the notation: average (worst approach).

Source: Fehr & Peers, 2015

TABLE 3-2
EXISTING PEAK HOUR QUEUING ANALYSIS

Intersection	Movement[1]	Available Storage (ft)	AM Peak Hour 95th Percentile Queue (ft)	PM Peak Hour 95th Percentile Queue (ft)
1. Kiernan Avenue/Carver Road	NB-LTR	2,600	144	74
	SB-LTR	7,900	117	57
	EB-L	80	**129**	**117**
	EB-T	8,000	463	335
	EB-R	50	**95**	**104**
	WB-L	70	**181**	59
	WB-T	2,600	1607	133
	WB-R	50	**100**	49
2. Kiernan Avenue / Tully Road	NB-LTR	3700	114	153
	SB-LTR	2600	95	86
	EB-L	150	68	253
	EB-TR	2,500	170	1167
	WB-L	125	215	188
	WB-TR	1,900	553	346
3. McHenry Avenue / Ladd Road	NB-L	185	43	65
	NB-TR	450	101	175
	SB-L	290	101	159
	SB-TR	3,500	231	176
	EB-L	250	128	178
	EB-TR	2,600	101	139
	WB-L	90	65	70
	WB-T	580	319	253
	WB-R	160	**170**	130
4. McHenry Avenue / SR 108	NB-T	3,300	94	146
	SB-T	450	254	173
	WB-LR	660	155	103
5. SR 108 / Patterson Road	NB-R	660	52	116
	EB-TR	500	122	228
	WB-L	530	134	110
	WB-T	2,300	0	0

Notes: Results in bold denote locations where storage length is exceeded.
1. NB-northbound, SB-southbound, EB-eastbound, WB-westbound, L- left turn movement, T-through movement, R-right turn movement

Source: Fehr & Peers, 2015

TABLE 3-2
EXISTING PEAK HOUR QUEUING ANALYSIS

Intersection	Movement[1]	Available Storage (ft)	AM Peak Hour 95th Percentile Queue (ft)	PM Peak Hour 95th Percentile Queue (ft)
6. SR 108 / Kiernan Avenue	NB-L	200	124	183
	NB-T	1,370	150	262
	NB-R	475	48	108
	SB-L	200	71	70
	SB-T	1,260	219	201
	SB-R	300	121	101
	EB-L	225	130	**274**
	EB-T	1,450	137	296
	EB-R	1,450	52	81
	WB-L	200	**245**	**206**
	WB-TR	5,180	371	324
7. SR 108 / Pelandale Avenue	NB-L	225	157	**255**
	NB-T	590	265	391
	NB-R	50	**90**	**129**
	SB-L	200	111	**290**
	SB-T	600	258	447
	SB-R	50	**114**	**133**
	EB-L	350	123	125
	EB-T	750	194	299
	EB-R	750	82	152
	WB-L	300	56	81
	WB-T	2,540	196	176
	WB-R	350	183	106
10. Oakdale Road / SR 108	NB-L	200	184	199
	NB-T	590	115	202
	NB-R	590	234	696
	SB-L	150	105	107
	SB-T	250	195	153
	SB-R	75	**122**	86
	EB-L	525	86	163
	EB-TR	1,100	124	264
	WB-L	625	175	316
	WB-TR	1,200	179	138

Notes: Results in bold denote locations where storage length is exceeded.
1. NB-northbound, SB-southbound, EB-eastbound, WB-westbound, L- left turn movement, T-through movement, R-right turn movement
Source: Fehr & Peers, 2015

TABLE 3-2
EXISTING PEAK HOUR QUEUING ANALYSIS

Intersection	Movement[1]	Available Storage (ft)	AM Peak Hour 95th Percentile Queue (ft)	PM Peak Hour 95th Percentile Queue (ft)
13. SR 108 / 1st Street	NB-L	250	111	109
	NB-TR	260	**281**	**266**
	SB-L	175	**246**	**291**
	SB-TR	250	**448**	**1,591**
	EB-L	775	164	329
	EB-TR	1,860	255	511
	WB-L	75	54	**100**
	WB-T	400	**599**	**422**
	WB-R	150	**248**	**211**
15. SR 108 / Claus Road	NB-L	320	64	92
	NB-R	150	61	103
	EB-TR	170	21	34
	WB-L	125	90	112
	WB-T	1,350	12	23
19. SR 108 / Oak Avenue	NB-L	250	100	98
	NB-TR	670	68	92
	SB-L	100	101	94
	SB-T	420	80	62
	SB-R	75	**82**	66
	EB-L	250	105	138
	EB-T	730	331	341
	EB-R	200	84	88
	WB-L	250	85	80
	WB-T	480	393	394
	WB-R	200	145	158

Notes: Results in bold denote locations where storage length is exceeded.
1. NB-northbound, SB-southbound, EB-eastbound, WB-westbound, L- left turn movement, T-through movement, R-right turn movement

Source: Fehr & Peers, 2015

TABLE 3-2
EXISTING PEAK HOUR QUEUING ANALYSIS

Intersection	Movement[1]	Available Storage (ft)	AM Peak Hour 95th Percentile Queue (ft)	PM Peak Hour 95th Percentile Queue (ft)
20. SR 108/SR 120	NB-LT	390	258	256
	NB-T	390	265	259
	NB-R	300	144	137
	SB-LT	400	**472**	**497**
	SB-TR	400	381	398
	EB-L	50	**131**	**129**
	EB-T	200	**359**	**811**
	EB-TR	200	**264**	**297**
	WB-L	240	**328**	**271**
	WB-T	240	**605**	**446**
	WB-R	240	175	185
21. SR 108 / Maag Avenue	NB-L	200	143	117
	NB-T	980	107	184
	NB-R	50	**73**	**117**
	SB-L	100	57	83
	SB-T	700	150	137
	SB-R	100	102	91
	EB-L	250	66	122
	EB-T	2,160	181	250
	EB-TR	2,160	198	260
	WB-L	200	158	126
	WB-T	2,500	192	218
	WB-TR	2,500	213	234

Notes: Results in bold denote locations where storage length is exceeded.
1. NB-northbound, SB-southbound, EB-eastbound, WB-westbound, L- left turn movement, T-through movement, R-right turn movement

Source: Fehr & Peers, 2015

Intersection Peak Hour Signal Warrants

To assess consideration for signalization of stop-controlled intersections, the *California Manual of Uniform Traffic Control Devices* (CA MUTCD) presents eight signal warrants. Generally, meeting one of the signal warrants could justify signalization of an intersection; however, additional factors (e.g., congestion, approach conditions, driver confusion) should be considered before the decision to install a signal is made. In this study, the peak hour volume warrant (Warrant 3) for urban conditions was evaluated using the available data. The results of the traffic signal warrant analyses are shown in **Table 3-3**. Detailed signal warrant assessments are provided in Appendix E. As shown in **Table 3-3**, the urban peak hour volume traffic signal warrant is satisfied at six of the eight unsignalized study intersections; only the Patterson Road/Crane Road and Claribel Road/Bentley Road intersections do not meet the warrant.

TABLE 3-3
EXISTING PEAK HOUR SIGNAL WARRANT ANALYSIS

Intersection	Control[1]	Peak Hour Warrant Met?
1. Kiernan Avenue/Carver Road	AWSC	Yes (AM and PM)
2. Kiernan Avenue/Tully Road	AWSC	Yes (AM and PM)
8. Coffee Road/Claribel Road	AWSC	Yes (AM and PM)
12. Oakdale Road/Claratina Avenue	SSSC	Yes (AM and PM)
14. Claribel Road/Roselle Avenue	AWSC	Yes (AM and PM)
15. SR 108/Claus Road	SSSC	Yes (AM and PM)
17. Patterson Road/Crane Road	SSSC	No
18. Claribel Road/Bentley Road	SSSC	No

Note:
1. SSSC = side-street stop-controlled intersection, AWSC = all-way stop-controlled intersection

Source: Fehr & Peers, 2015

3.1.2 Urban Street Analysis

The existing segments of SR 108 from Pelandale Avenue to Ladd Avenue; between Oakdale Road and 1st Street; and between Oak Avenue and Maag Avenue were analyzed using the HCM's urban street LOS methodology. **Table 3-4** presents the urban street LOS for the study segments along SR 108. As shown in **Table 3-4** all study segments operate at LOS C or better during the AM and PM peak hours. The technical analysis worksheets are provided in Appendix F.

TABLE 3-4
EXISTING URBAN STREET LOS

Segment	Direction[1]	Class Type	AM Peak Hour		PM Peak Hour	
			Average Speed (mph)	LOS	Average Speed (mph)	LOS
3. SR 108 between Ladd Road and Kiernan Avenue	NB	I	36.3	B	30.4	B
	SB	I	34.3	B	32.5	C
4. SR 108 between Kiernan Avenue and Pelandale Avenue	NB	II	28.4	B	27.6	C
	SB	II	29.7	B	27.7	C
14. SR 108 between Oakdale Road and 1st Street	EB	III	29.4	B	27.3	B
	WB	III	27.3	C	31.2	A
28. SR 108 between Oak Avenue and SR 120	EB	IV	19.9	B	20.8	B
	WB	IV	25.9	B	24.6	B
32. SR 108/SR 120 between Yosemite Avenue and Maag Avenue	EB	III	27.2	B	25.8	B
	WB	III	19.4	C	21.6	C

Notes:
1. EB = Eastbound, WB = Westbound, NB = Northbound, SB = Southbound

Source: Fehr & Peers, 2015.

3.1.3 Two-Lane Highway Analysis

The existing segments of SR 108 between McHenry Avenue and Oakdale Road, Claus Road and Oak Avenue, and Maag Avenue to SR 120, were analyzed using the HCM's two-lane highway LOS methodology. According to the HCM, existing SR 108 is classified as a Class I facility because it operates as a regional route. **Table 3-5** presents the two-lane highway LOS for the study segments along SR 108. As shown in **Table 3-5**, all study segments operate at unacceptable service levels except for the segment of SR 108/SR 120 between Wamble Road and Lancaster Road. The technical analysis worksheets are provided in Appendix G.

TABLE 3-5
EXISTING TWO-LANE HIGHWAY LOS

Segment	AM Peak Hour			PM Peak Hour		
	% Time Spent Following	Average Travel Speed (mph)	LOS	% Time Spent Following	Average Travel Speed (mph)	LOS
4. SR 108 between McHenry Avenue and Oakdale Road	**81.6%**	**42.0**	**E**	**82.7%**	**41.3**	**E**
21. SR 108 between Claus Road and Crane Road	**84.7%**	**40.3**	**E**	**81.6%**	**40.6**	**E**
24. SR 108 between Crane Road and Oak Avenue	**81.7%**	**40.1**	**E**	**82.8%**	**39.5**	**E**
32. SR 108/SR 120 between Maag Avenue and Wamble Road	**82.6%**	**40.5**	**E**	**83.3%**	**38.7**	**E**
33. SR 108/SR 120 between Wamble Road and Lancaster Road	55.6%	47.8	C	64.2%	46.3	C

Notes: Results in **bold** represent unacceptable levels of service as determined by the applicable LOS standards of the relevant jurisdictions.
Source: Fehr & Peers, 2015.

3.1.4 Volume-to-Capacity Analysis

Peak hour roadway volumes were compared to hourly roadway segment capacities to determine the level of service at 23 study segments. The results are presented in **Figure 2-3A** and **Figure 2-3B**. Detailed LOS calculations are presented in Appendix H. As shown in **Figure 2-3A** and **Figure 2-3B**, the following roadway segments do not meet the LOS standards of the jurisdictions and agencies that control them:

- SR 219 between Tully Road and McHenry Avenue operates at LOS E during the PM peak hour
- Oakdale Road between Claribel Road and Claratina Avenue operates at LOS E during the PM peak hour
- Claribel Road between SR 108 and Oakdale Road operates at LOS D during the AM and PM peak hours
- Claratina Avenue between McHenry Avenue and Coffee Road operates at LOS E during the AM and PM peak hours
- SR 108 between 1st Street and Claus Road operates at LOS E during the PM peak hour
- Patterson Road between SR 108 and Langworth Road operates at LOS D during the AM and PM peak hours
- Claus Road between Patterson Road and Claribel Road operates at LOS D during the PM peak hour
- Claus Road between Claribel Road and Sylvan Avenue operates at LOS D during the AM and PM peak hours
- Claribel Road between Oakdale Road and Claus Road operates at LOS D during the AM peak hour and at LOS E during the PM peak hour

- Yosemite Avenue between SR 108 and Patterson Road operates at LOS E during the AM and PM peak hour
- Albers Road between Patterson Road and Claribel Road operates at LOS D during the AM and PM peak hour

3.1.5 Accident Analysis

The accident history on SR 108, SR 120 and SR 219 by type of collision is presented in **Table 3-6**; an accident rate comparison to statewide averages is presented in **Table 3-7**. The largest proportion of accidents on all of the state routes evaluated were rear end accidents. The raw accident history data is provided in Appendix I.

The high percentage of rear end accidents on SR 108 and SR 219 is at least partially associated with characteristics such as relatively high traffic volumes and speeds, large numbers of conflict points, and lack of turning lanes. SR 108 averages more than 7 intersections per mile in the study area, and some sections have more than 15 intersections per mile. The high number of access points, combined with the lack of turning lanes, increases the potential for rear end accidents as traffic on SR 108 slows or stops to accommodate turning movements into or out of the side streets. As shown in **Table 3-7**, the rate for accidents resulting in fatalities or injuries along the study segments of SR 108, SR 120 and SR 219 were higher than the statewide average for similar facilities.

TABLE 3-6
ACCIDENT HISTORY DATA BY TYPE

Type of collision	SR 108 between McHenry Avenue (PM 27.618) and Yosemite Avenue (PM 38.236)		SR 108/SR 120 between Yosemite Avenue (PM 5.116) and Lancaster Road (PM 10.9)		SR 219 between SR 99 (PM 0.116) and SR 108 (PM 4.858)		SR 108 between SR 99 (PM 22.438) and SR 219 (PM 27.610)	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Head On	16	4.20%	3	1.64%	6	3.53%	27	6.12%
Sideswipe	34	8.92%	25	13.66%	9	5.29%	51	11.56%
Rear End	206	54.07%	67	36.61%	86	50.59%	169	38.32%
Broadside	70	18.37%	46	25.14%	57	33.53%	143	32.43%
Hit Object	28	7.35%	22	12.02%	9	5.29%	21	4.76%
Overturn	3	0.79%	4	2.19%	0	0.00%	4	0.91%
Auto-Pedestrian	14	3.67%	9	4.92%	2	1.18%	14	3.17%
Other	10	2.62%	7	3.83%	1	0.59%	12	2.72%
Not Stated	0	0.00%	0	0.00%	0	0.00%	0	0.00%
Total	381	100.00%	183	100.00%	170	100.00%	441	100.00%

Source: Caltrans District 10 TASAS data between January 1, 2009 and December 31, 2011.

TABLE 3-7
ACCIDENT RATE COMPARISON

Facility	Number of Accidents			Accident Rate (accidents/million vehicle miles)					
				Actual			State Average		
	Total	Fatal	Fatal + Injury	Fatality	Fatal + Injury	Total	Fatality	Fatal + Injury	Total
SR 108 between McHenry Avenue (PM 24.618) and Yosemite Avenue (PM 38.236)	381	5	163	**0.023**	**0.76**	**1.78**	0.017	0.51	1.26
SR 108/SR 120 between Yosemite Avenue (PM 5.116) and Lancaster Road (PM 10.9)	183	1	76	0.009	**0.66**	**1.58**	0.016	0.42	0.97
SR 219 between SR 99 (PM 0.116) and SR 108 (PM 4.858)	170	0	61	0.00	**0.56**	**1.56**	0.012	0.47	1.15
SR 108 between SR 99 (PM 22.438) and SR 219 (PM 27.610)	441	4	267	**0.025**	**1.66**	**2.73**	0.010	0.91	1.71

Note: Shading and **bold** denotes locations that exceed the statewide average for similar facilities.

Source: Caltrans District 10 TASAS data between January 1, 2009 and December 31, 2011.

3.2 GOODS MOVEMENT

Stanislaus County is an important food-processing region. Poultry, dairy, and vegetable products from the County are processed and distributed throughout the world every day. Goods movement is the result of production activities within and outside of the region, and movement takes place within a complex system of routes, modes, terminals, and warehouse facilities.

The State has recognized the importance of agricultural goods movement in Central Valley areas such as Stanislaus County. The State's Goods Movement Action Plan (November 2007) identifies four high-priority gateway regions in California that are necessary to support the continued growth of the California economy. The Central Valley region, which includes SR 99 and Interstate 5 and other important east-west corridors that traverse Stanislaus County, is one of these high-priority regions. Traffic congestion and operational conflicts between trucks and passenger vehicles have been identified as key issues that need to be addressed to maintain efficient goods movement. The high percentage of trucks on the roads in the study area reflects the high demand in the area for goods movement.

Over 90 interstate truck lines and 100 contract carriers operate in the Stanislaus region. These operators, distributed throughout the region, rely on the regional system of State Highways, expressways, intermodal yards (such as in the City of Ripon and the community of Empire), and major arterials to move supplies and product to the backbones of the highway freight system (SR 99, Interstate 5, and SR 132).

Trains provide an economical means of transporting bulk goods. The Stanislaus region is serviced by two trans-continental railroad systems, the Union Pacific and the Burlington Northern Santa Fe Railway; and two local railroad systems, the Modesto and Empire Traction Company and the Sierra Railroad. The Port of Stockton, 30 miles north of Stanislaus County, provides deep-water access to the Pacific Ocean. Rail

and truck transport to and from the port is available. Within the study area, the Union Pacific Railway runs parallel to SR 99 with an average of 19 trains per day traveling through the area.

3.3 TRANSIT SYSTEM

A variety of transit services are provided in the project study area, including bus and passenger rail service.

3.3.1 Passenger Bus Service

Bus service to the project study area is provided by Stanislaus Regional Transit (StaRT), which is operated by Stanislaus County, and Modesto Area Express (MAX), which is operated by the City of Modesto; **Figure 3-1** presents the passenger bus service routes in the area.

Stanislaus Regional Transit

StaRT is run by Stanislaus County, which operates inter-city and inter-county fixed-route bus services Monday through Saturday. StaRT serves the cities of Modesto, Riverbank, Oakdale, Turlock, Patterson, Grayson, Westley, Newman, Gustine, and Merced. Within the project study area, StaRT provides fixed-route service between the Cities of Modesto, Riverbank, and Oakdale for a fare of $1.25 ($1.00 senior). The existing StaRT fixed transit route in the study area is summarized in **Table 3-8**. Besides fixed-route transit services, StaRT also offers Runabout, Shuttle, and Dial-A-Ride services in the developed areas of the county.

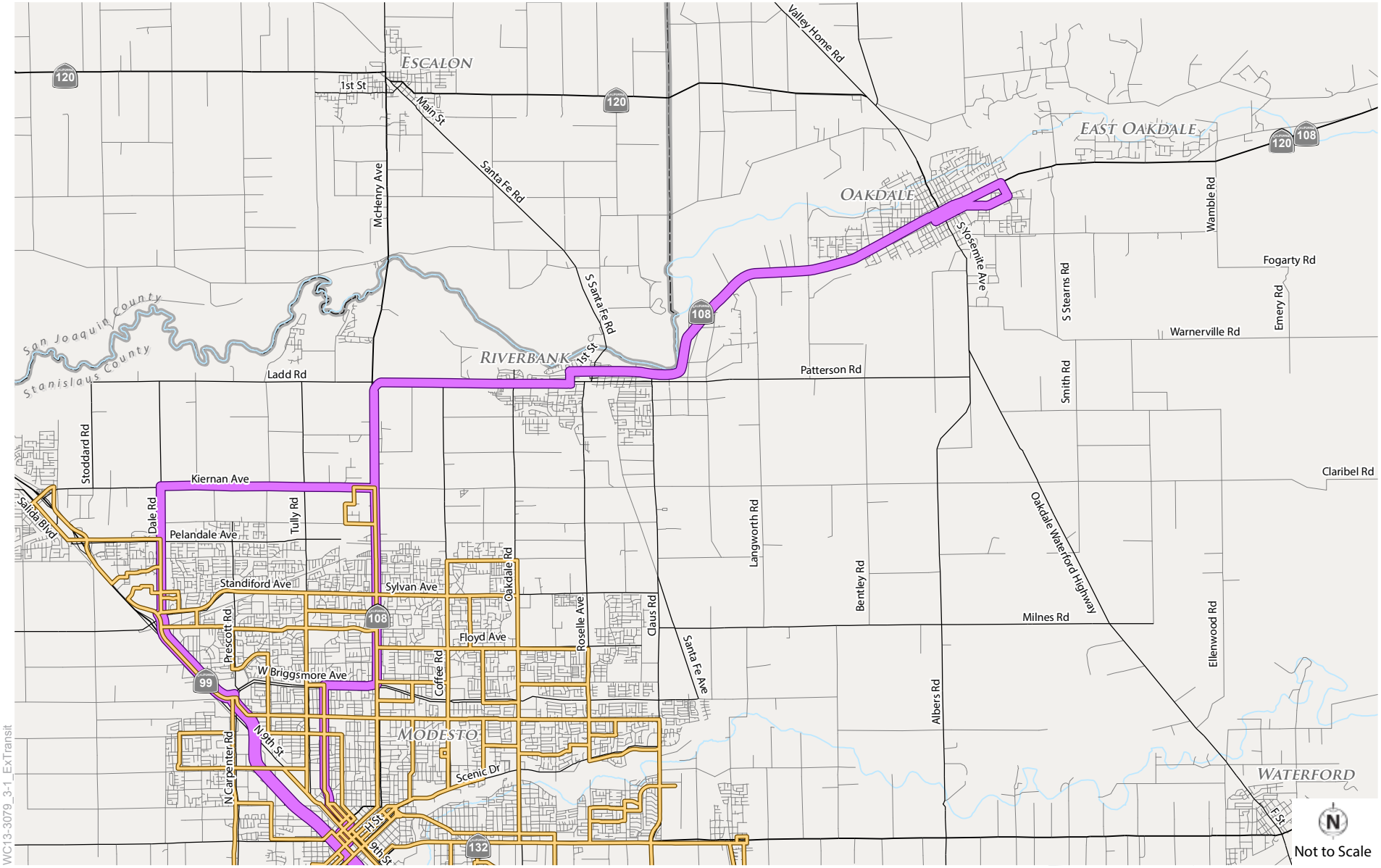
Modesto Area Express

MAX is run by the City of Modesto, which operates local and inter-city bus services 358 days a year. MAX serves the cities of Modesto and Ceres, as well as the communities of Salida and Empire. Within the study area, MAX provides fourteen fixed routes; general fares are $1.00 ($0.85 student / $0.50 senior), daily and monthly passes are also available. The existing MAX fixed transit routes in the study area are summarized in **Table 3-8**. MAX also offers Dial-A-Ride service to seniors and persons with disabilities within the City of Modesto.

TABLE 3-8
EXISTING BUS ROUTES IN PROJECT STUDY AREA

Operator	Route	Service Area	Approximate Frequency		
			Peak Period	Off-Peak	Weekend
Stanislaus Regional Transit	60	Modesto, Riverbank, and Oakdale	30 min	120 min	120 min
Modesto Area Express	22	McHenry Ave, Standiford Ave, Vintage Faire Mall, Downtown Modesto	30 min	30 min	60 min
	24	Sylvan Ave, Coffee Rd, Oakdale Road, Roselle Ave, McHenry Ave, Downtown Modesto	60 min	60 min	60 min
	25	Sisk Rd, Orangeburg Ave, Claus Rd, Vintage Faire Mall, Central Valley Plaza, Downtown Modesto	30 min	30 min	60 min
	27	Kiernan Ave, McHenry Ave, Briggsmore Ave, Downtown Modesto	60 min	60 min	60 min
	28	Sisk Rd, Pelandale Ave, Dale Rd	30 min	30 min	60 min
	30	Standiford Ave, Carver Rd, Vintage Faire Mall, Downtown Modesto	30 min	30 min	30 min
	31	Dale Rd, Pelandale Ave, Tully Rd, Downtown Modesto	30 min	30 min	60 min
	32	Coffee Rd, Downtown Modesto	30 min	30 min	60 min
	34	McHenry Ave, Sylvan Ave, Coffee Rd, Oakdale Rd, Downtown Modesto	60 min	60 min	60 min
	36	Sisk Rd, Carpenter Rd, Vintage Faire Mall, Central Valley Plaza, Downtown Modesto	60 min	60 min	60 min
	37	Sylvan Ave, Oakdale Rd, Yosemite Blvd (SR 132), Vintage Faire Mall, Downtown Modesto	60 min	60 min	60 min
	38	Yosemite Blvd (SR 132) and Downtown Modesto	30 min	30 min	30 min
	39	Yosemite Blvd (SR 132) and Downtown Modesto	90 min	150 min	N/A
	41	SR 99, Vintage Faire Mall, Downtown Modesto	30 min	30 min	60 min

Source:
Based on information presented in operator's website.



Source: StanCOG Non-Motorized Transportation Master Plan, Fehr & Peers, 2008

LEGEND

Bus Route

MAX

StaRT

Figure 3-1

Existing Transit System

3.4 BICYCLE SYSTEM

A brief description of bicycle facility types is presented below.

- Class I Bikeway (Bicycle Path) – Provides a completely separate right-of-way and is designated for the exclusive use of bicycles and pedestrians with vehicle and pedestrian cross-flow minimized.
- Class II Bikeway (Bicycle Lane) – Provides a restricted right-of-way and is designated for the use of bicycles with a striped lane on a street or highway. Vehicle parking and vehicle/pedestrian cross-flow are permitted.
- Class III (Bicycle Route) – Provides for a right-of-way designated by signs and/or pavement markings for shared use with pedestrians or motor vehicles.

Currently there are limited bicycle facilities provided within the study area. No bicycle facilities exist in the unincorporated areas of the county. The rural nature of the unincorporated area roadways generally requires that bicycles share the roadways with motor vehicles.

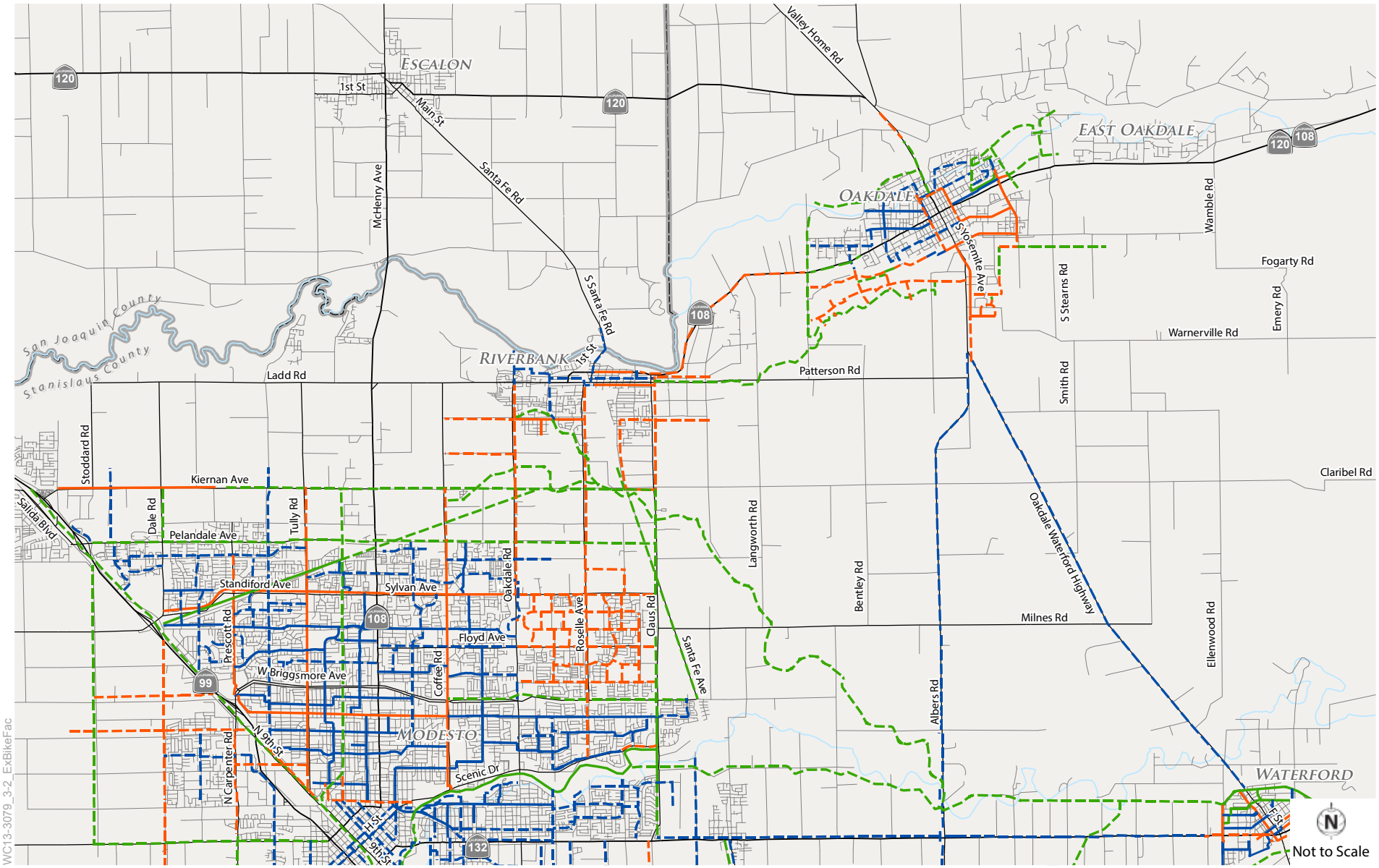
Within City limits, Class II bike lanes exist along segments of Kiernan Avenue, Tully Road and Coffee Road in Modesto; on Morrill Road and Patterson Road in Riverbank; and on Yosemite Avenue, G Street, J Street, 6th Street and Maag Avenue in Oakdale. Class III bike routes are provided on Walnut Street, Poplar Street, Oak Avenue, 1st Avenue and D Street in Oakdale. While there are some bicycle facilities throughout the region, gaps in the existing bicycle network make it difficult to travel east-west or north-south through the area. **Figure 3-2** displays the existing bicycle facilities in the area.

Several bicycle facilities are planned throughout the county, as noted in the *Stanislaus County Non-Motorized Transportation Plan (*Stanislaus Council of Governments, 2008). Within the study area, Class I bike paths are planned along segments of Claribel Road, Patterson Road, Crane Road, Pelandale Avenue, Claratina Avenue and along the canals that run through the City of Riverbank. Class II bike lanes are planned along segments of SR 108, Oakdale Road, Roselle Avenue, Claus Road, J Street and Greger Drive. Funding mechanisms to implement these planned facilities have not yet been identified. **Figure 3-2** also displays the planned bicycle facilities in the area.

3.5 PEDESTRIAN SYSTEM

Pedestrian facilities, such as sidewalks, crosswalks, and pedestrian signals, exist in the developed areas of Modesto, Riverbank and Oakdale; however, most roadways in the unincorporated areas of the county do not have pedestrian facilities. All signalized study intersections include crosswalks and pedestrian signals. None of the unsignalized study intersections include crosswalks, except the roundabout controlled intersection of Coffee Road/Claratina Avenue.

Currently no pedestrian paths are provided within the study area. As shown in **Figure 3-2**, Class I bicycle/pedestrian paths are planned along segments of Claribel Road, Patterson Road, Crane Road, Pelandale Avenue, Claratina Avenue and along the canals that run through the City of Riverbank. However, funding mechanisms to implement these planned facilities have not yet been identified.



Source: StanCOG Non-Motorized Transportation Master Plan, Fehr & Peers, 2008

WC13-3079_3-2_ExBikeFac

LEGEND *Bicycle Facilities*

Status, Class	Status, Class	Status, Class
Existing, I	Proposed, I	Proposed, III/II
Existing, II	Proposed, II	
Existing, III	Proposed, III	

Figure 3-2

Existing and Planned Bicycle Facilities

CHAPTER 4. TRAFFIC FORECASTS

The detailed traffic forecasting analysis results are presented in the following technical memoranda (included in Appendix J):

- *Final Year 2022, 2032, and 2042 Traffic Demand Forecasts for North County Corridor PA/ED (*July 12, 2013*)*
- *Addendum to the Approved Traffic Demand Forecasts for North County Corridor PA/ED* (March 7, 2014)

The Caltrans approval letters of the forecasts are also presented in Appendix J.

4.1 ANALYSIS SCENARIOS

The North County Corridor (NCC) would be a new four- to six-lane east-west expressway in northern Stanislaus County extending from about the Tully Road/Kiernan Avenue intersection to SR 120/108 just east of the City of Oakdale. In general, the proposed NCC facility would consist of six lanes between Tully Road and Oakdale Road, and four lanes east of Oakdale Road. There are currently four project alternatives under consideration (1A, 1B, 2A, and 2B). The route layouts for the four project alternatives are presented in Appendix K.

The analysis scenarios for this study are the following:

- Year 2022 No Project
- Year 2022 With Project Alternative 1A
- Year 2022 With Project Alternative 1B
- Year 2022 With Project Alternative 2A
- Year 2022 With Project Alternative 2B
- Year 2042 No Project
- Year 2042 With Project Alternative 1A
- Year 2042 With Project Alternative 1B
- Year 2042 With Project Alternative 2A
- Year 2042 With Project Alternative 2B

4.2 TRAVEL DEMAND MODEL

The Stanislaus Council of Governments (StanCOG) is the Metropolitan Planning Organization for Stanislaus County, and in that capacity the agency maintains a travel demand forecasting (TDF) model for use in regional planning efforts. The StanCOG Travel Demand Model developed as part of the 2011 Regional Transportation Plan (2011 RTP) was used to develop the traffic demand forecasts for this study.

4.3 YEAR 2022 AND 2042 LAND USE ASSUMPTIONS

The NCC transportation study remains consistent with regional countywide land use projections prepared by StanCOG for the 2011 RTP. **Table 4-1** presents the year 2022 and 2042 land use assumptions for Stanislaus County.

TABLE 4-1
COUNTYWIDE LAND USE PROJECTIONS

Stanislaus County	Year 2022		Year 2042	
	Households	Jobs	Households	Jobs
Totals	209,888	217,292	268,044	272,759

Source: Fehr & Peers, 2015.

4.4 YEAR 2022 AND 2042 ROADWAY NETWORK ASSUMPTIONS

4.4.1 Year 2022 No Project

The 2011 StanCOG RTP identifies Tier I fiscally constrained roadway improvement projects for both mainline and roadways/highways anticipated to be in place by year 2035. The Tier 1 list also identifies the year that each infrastructure improvement is anticipated to be open to traffic. Only those projects anticipated being in place by year 2022 were assumed in this scenario.

4.4.2 Year 2022 With Project

The roadway network improvements assumed under No Project conditions were also assumed under With Project conditions. The following four project alternatives were analyzed:

- Alternative 1A
- Alternative 1B
- Alternative 2A
- Alternative 2B

In general, the proposed NCC facility would consist of six lanes between Tully Road and Oakdale Road, and four lanes east of Oakdale Road. The following is a list of interchanges and at-grade intersections proposed for each project alternative:

Alternative 1A	**Alternative 1B**	**Alternative 2A**	**Alternative 2B**
Interchanges: • McHenry Avenue • Coffee Road • Oakdale Road • Roselle Avenue At-Grade Intersections: • Claus Road • Crane Road • Albers Road • Stearns Road • SR 108/120	Interchanges: • McHenry Avenue • Coffee Road • Oakdale Road • Roselle Avenue At-Grade Intersections: • Claus Road • Crane Road • Albers Road • Stearns Road • New Access Road • SR 108/120	Interchanges: • McHenry Avenue • Coffee Road • Oakdale Road • Roselle Avenue At-Grade Intersections: • Claus Road • Bentley Road • Albers Road • Stearns Road • SR 108/120	Interchanges: • McHenry Avenue • Coffee Road • Oakdale Road • Roselle Avenue At-Grade Intersections: • Claus Road • Bentley Road • Albers Road • Smith Road • New Access Road • SR 108/120

4.4.3 Year 2042 No Project

The 2011 StanCOG RTP identifies Tier I fiscally constrained roadway improvement projects anticipated to be in place by year 2035. Although some additional projects identified in the Tier II list of the RTP might possibly be constructed during the period of 2035 to 2042, for the sake of presenting a more conservative analysis it was determined that only the projects identified in the Tier I list would be included.

4.4.4 Year 2042 With Project

The roadway network improvements assumed under No Project conditions were also assumed under With Project conditions. In addition, the same Project configurations used in year 2022 were used in year 2042.

4.5 YEAR 2022 AND 2042 TRAFFIC DEMAND FORECASTS

The 2022 and 2042 traffic forecasts are presented on the following figures:

Figures	Traffic Forecasts
4-1 through 4-4	2022 No Project Peak Hour and Daily Traffic Volumes
4-5 through 4-12	2022 Alternative 1A and 1B Peak Hour and Daily Traffic Volumes
4-13 through 4-20	2022 Alternative 2A and 2B Peak Hour and Daily Traffic Volumes
4-21 through 4-24	2042 No Project Peak Hour and Daily Traffic Volumes
4-25 through 4-32	2042 Alternative 1A and 1B Peak Hour and Daily Traffic Volumes
4-33 through 4-40	2042 Alternative 2A and 2B Peak Hour and Daily Traffic Volumes

Year 2022 and 2042 NCC mainline and ramp peak hour volumes are presented in the following figures:

Figures	Traffic Forecasts
4-41	2022 and 2042 NCC Mainline and Ramp Peak Hour Volumes for Alternative 1A and 1B
4-42	2022 and 2042 NCC Mainline and Ramp Peak Hour Volumes for Alternative 2A and 2B

4.6 TRAFFIC FORECASTS SUMMARY

Under No Project conditions the daily traffic volumes on existing SR 108 between McHenry Avenue and Yosemite Avenue are anticipated to increase by about 0.6% per year and east of Yosemite Avenue the daily traffic volumes are anticipated to increase by about 1.2% per year. Based on available Caltrans traffic data, between 2000 and 2010 the daily traffic volumes on SR 108 in the study area have dropped slightly. The projected model growth rates are reasonable based on past historical growth trends on existing SR 108.

Daily traffic volumes on SR 219 (Kiernan Avenue) between SR 99 and McHenry Avenue are anticipated to increase by about 3.1% per year under No Project conditions. Based on available Caltrans traffic data, between 2000 and 2010 the daily traffic volumes on SR 219 between SR 99 and McHenry Avenue have increased by about 3.5% per year. The model growth rates and historical growth rates on SR 219 are similar.

All of the project alternatives would result in a redistribution of traffic volumes in the study area. Generally, all alternatives result in an overall reduction in traffic volumes on major east-west roadways such as SR 108, Patterson Road, and Claratina Avenue, as some of that traffic is shifted to the new NCC.

Table 4-2 presents the estimated daily volume reduction on SR 108 between McHenry Avenue and Stearns Avenue after implementation of each project alternative. Alternative 1A generally results in a greater reduction in daily traffic volumes on SR 108 primarily because the Alternative 1A alignment is in closer proximity to the urbanized areas of the cities of Riverbank and Oakdale compared to other proposed alignments. A complete summary of the daily traffic forecasts is presented in Appendix J.

TABLE 4-2
ESTIMATED AVERAGE YEAR 2042 DAILY DEMAND VOLUME REDUCTION ON SR 108 BETWEEN MCHENRY AVENUE AND STEARNS AVENUE AFTER PROJECT IMPLEMENTATION

Alternative	Reduction in Daily Volume
1A	27%
1B	21%
2A	17%
2B	11%

Source: Fehr & Peers, 2015.

4.7 DESIGN HOURLY VOLUMES

It is the Department's policy that freeway/highway/expressway design be based on 30th highest hour/design hourly volume (DHV). A conservative approach for freeway/highway/expressway design is to use not less than 10% of annual average daily traffic (AADT) in rural areas; however, lower percentages can be used with justification. In response to Caltrans' request comparing the peak hour demand volumes to a design hourly volume of 10% of the daily volumes, the percent of daily traffic represented by the peak hour demand forecasts was calculated and presented in **Table 4-3**. As shown in **Table 4-3**, the forecasted peak hour demand volumes generally account for about 10% to 12% of the daily volume.

4.8 REGIONAL MEASURES OF EFFECTIVENESS

Regional measures of effectiveness (MOEs) were calculated to determine the impacts under With Project conditions from a regional perspective. **Table 4-4** below summarizes the daily area-wide vehicle miles of travel (VMT) and vehicle hours of delay (VHD) with and without the Project. The following is a brief description of the MOEs:

- ***Vehicle Miles of Travel* (VMT)** – is a measure of the total miles traveled by all vehicles in the study area during the analysis period
- ***Vehicle Hours of Delay (VHD)*** – is the amount of total vehicle delay incurred as a result of congestion

As **Table 4-4** shows, the overall amount of daily travel (as reflected in the vehicle miles of travel measures) will be slightly less under With Project conditions when compared to No Project conditions for all analysis years. As these results show, any Project alternative would have positive region-wide impacts in reducing travel times and delays caused by congestion.

TABLE 4-3
YEAR 2042 AVERAGE DAILY AND PEAK HOUR TRAFFIC DEMAND VOLUME COMPARISON

Location	Average Daily Traffic[1]	Peak Hour Demand Based on Model[1,2]	% ADT
NCC between McHenry Avenue and Coffee Road	49,700 (49,500) [48,400] {48,400}	5,280 (5,250) [4,900] {4,900}	10.6% (10.6%) [10.1%] {10.1%}
NCC between Coffee Road and Oakdale Road	46,100 (45,600) [40,600] {40,300}	4,610 (4,570) [4,220] {4,200}	10.0% (10.0%) [10.4%] {10.4%}
NCC between Oakdale Road and Roselle Avenue	36,700 (35,900) [31,100] {29,900}	4,380 (4,340) [3,700] {3,600}	11.9% (12.0%) [11.9%] {12.0%}
NCC between Roselle Avenue and Claus Road	36,700 (35,900) [31,000] {29,800}	4,380 (4,320) [3,680] {3,580}	11.9% (12.0%) [11.9%] {12.0%}
NCC between Claus Road and Crane Road (Alternative 1A & 1B)/ NCC between Claus Road and Bentley Road (Alternative 2A & 2B)	34,300 (33,100) [25,500] {24,100}	4,020 (3,880) [3,000] {2,790}	11.7% (11.7%) [11.8%] {11.6%}
NCC between Crane Road and Albers Road (Alternative 1A & 1B)/ NCC between Bentley Road and Albers Road (Alternative 2A & 2B)	24,700 (23,800) [21,100] {19,300}	2,940 (2,780) [2,510] {2,270}	11.9% (11.7%) [11.9%] {11.8%}
NCC between Albers Road and Stearns Road (Alternative 1A, 1B, & 2A)/ NCC between Albers Road and Smith Road (Alternative 2B)	16,400 (12,300) [16,200] {10,300}	1,880 (1,410) [1,860] {1,170}	11.5% (11.5%) [11.5%] {11.4%}
NCC between Stearns Road and SR 108/SR 120 (Alternative 1A, 1B, & 2A)/ NCC between Smith Road and SR 108/SR 120 (Alternative 2B)	9,600 (7,200) [8,800] {6,700}	1,100 (930) [1,040] {840}	11.5% (12.9%) [11.8%] {12.5%}

Notes:
1. WWW(XXX)[YYY]{ZZZ} = Alternative 1A (Alternative 1B) [Alternative 2A] {Alternative 2B}
2. This represents the PM peak hour volume for both directions of traffic.

Source: Fehr & Peers, 2015.

TABLE 4-4
REGIONAL MEASURES OF EFFECTIVENESS FOR PROJECT AREA

Measure	Year 2022				
	No Project	Alt. 1A	Alt. 1B	Alt. 2A	Alt. 2B
Daily Vehicle Miles of Travel (VMT)	2,497,408	2,572,913 (3.0%)	2,572,019 (3.0%)	2,562,813 (2.6%)	2,562,740 (2.6%)
Daily Vehicle Hours of Delay (VHD)2	1,873	1,477 (-21.1%)	1,505 (-19.7%)	1,676 (-10.5%)	1,722 (-8.0%)
Year 2042					
Daily Vehicle Miles of Travel (VMT)	3,174,063	3,262,350 (2.8%)	3,255,592 (2.6%)	3,253,685 (2.5%)	3,246,040 (2.3%)
Daily Vehicle Hours of Delay (VHD)2	7,159	4,736 (-33.8%)	4,903 (-31.5%)	5,952 (-16.9%)	6,300 (-12.0%)

Notes:
1 Percent change from No Project conditions is presented in parentheses.
2 Only includes roadway delay (intersection delay is not included).
Source: Fehr & Peers, 2015.

4.9 TRAVEL TIMES

Error! Reference source not found. presents the estimated east-west travel times between the project start location (Kiernan Avenue/Tully Road) and the Stanislaus County/Tuolumne County border. Under No Build conditions, these types of trips are likely to use existing SR 108 through the communities of Riverbank and Oakdale and under Project conditions these trips are likely to use the NCC facility. As shown in Error! Reference source not found., the project alternatives would reduce east-west travel times between 16% and 20% depending on the alternative and future year.

TABLE 4-5
TRAVEL TIMES IN MINUTES BETWEEN KIERNAN AVENUE/TULLY INTERSECTION AND STANISLAUS COUNTY/TUOLUMNE COUNTY BORDER

Year 2022								
No Build	Alt. 1A		Alt. 1B		Alt. 2A		Alt. 2B	
Travel Time	Travel Time	% Change	Travel Time	% Change	Travel Time	% Change	Travel Time	% Change
32.5	27.0	-17.0%	27.2	-16.3%	27.3	-16.1%	27.5	-15.6%
Year 2042								
34.1	27.2	-20.2%	27.4	-19.7%	27.5	-19.4%	27.6	-19.1%

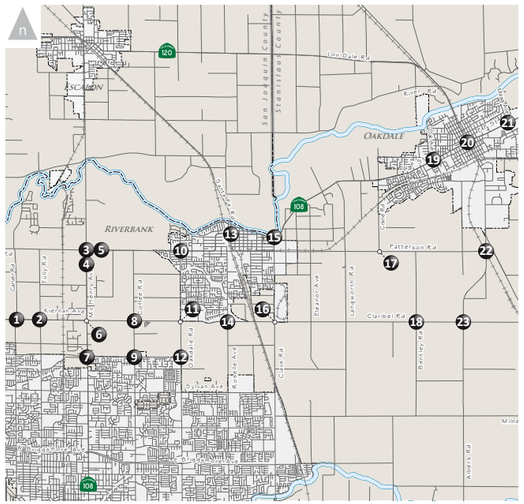
4.10 CALTRANS FORECASTING APPROVAL

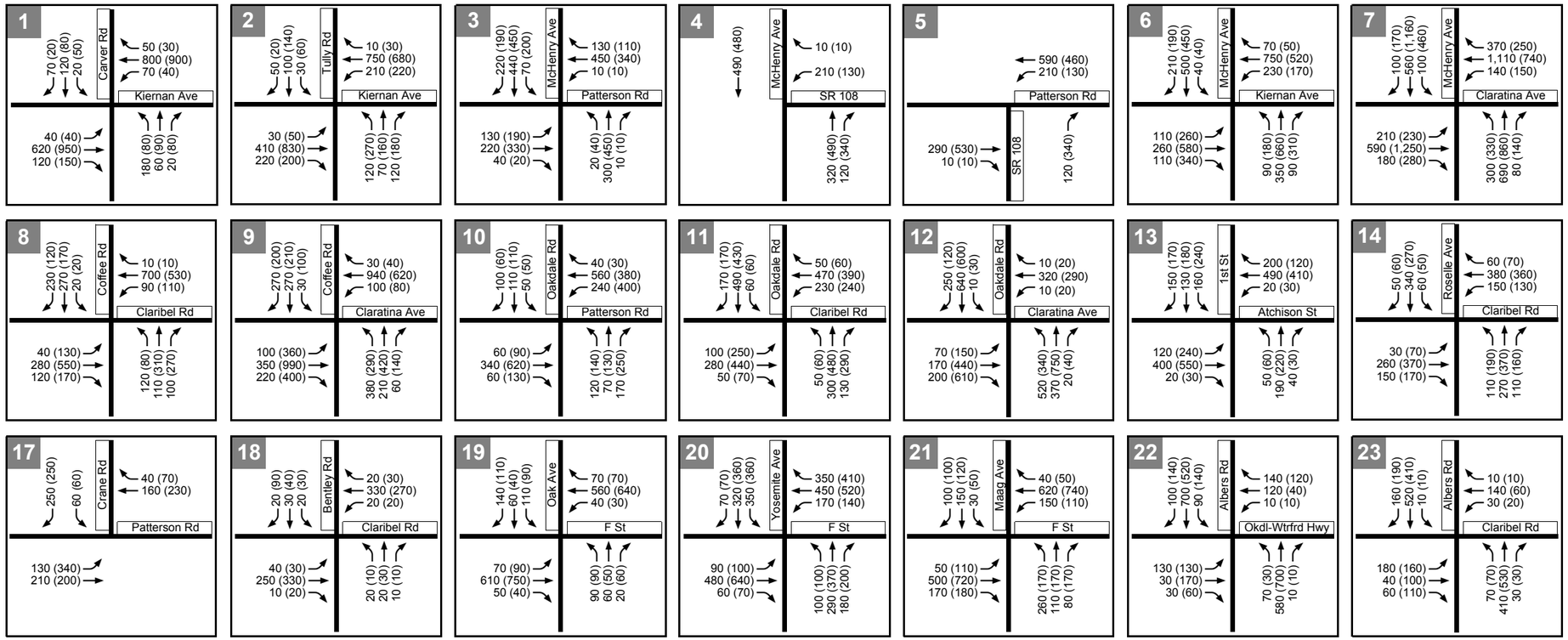
As noted earlier, the Caltrans approval letters of the forecasts are presented in Appendix J. Caltrans identified the following key elements in the forecasts as the basis for their approval:

- The changes in traffic volumes (project vs. no project) along SR 219 (Kiernan Avenue) appear within reasonable limits and do not appear to show an overall significant change in traffic along the entire segment of SR 219 between SR 99 and McHenry Avenue. Based on this, District 10 Forecasting supports the intersection of Tully Road at SR 219 as the location of the western termini of the project.

- Under Project conditions, the travel demand model assumes SR 219 as a four-lane expressway between SR 99 and Carver Road and a six-lane expressway starting at Carver Road going eastward. Caltrans staff notes that the StanCOG 2014 RTP Tier I list indicates that SR 219 will ultimately be widened to a six-lane facility between SR 99 and McHenry Avenue.

- Under No Project and Project conditions, the travel demand model assumed the SR 99/Hammett interchange was reconstructed with a two-lane east-west arterial that runs between the interchange and Dale Road. Caltrans staff notes that the StanCOG 2014 RTP Tier I list indicates identifies the reconstruction of the interchange.





MAP KEY

Study Intersection

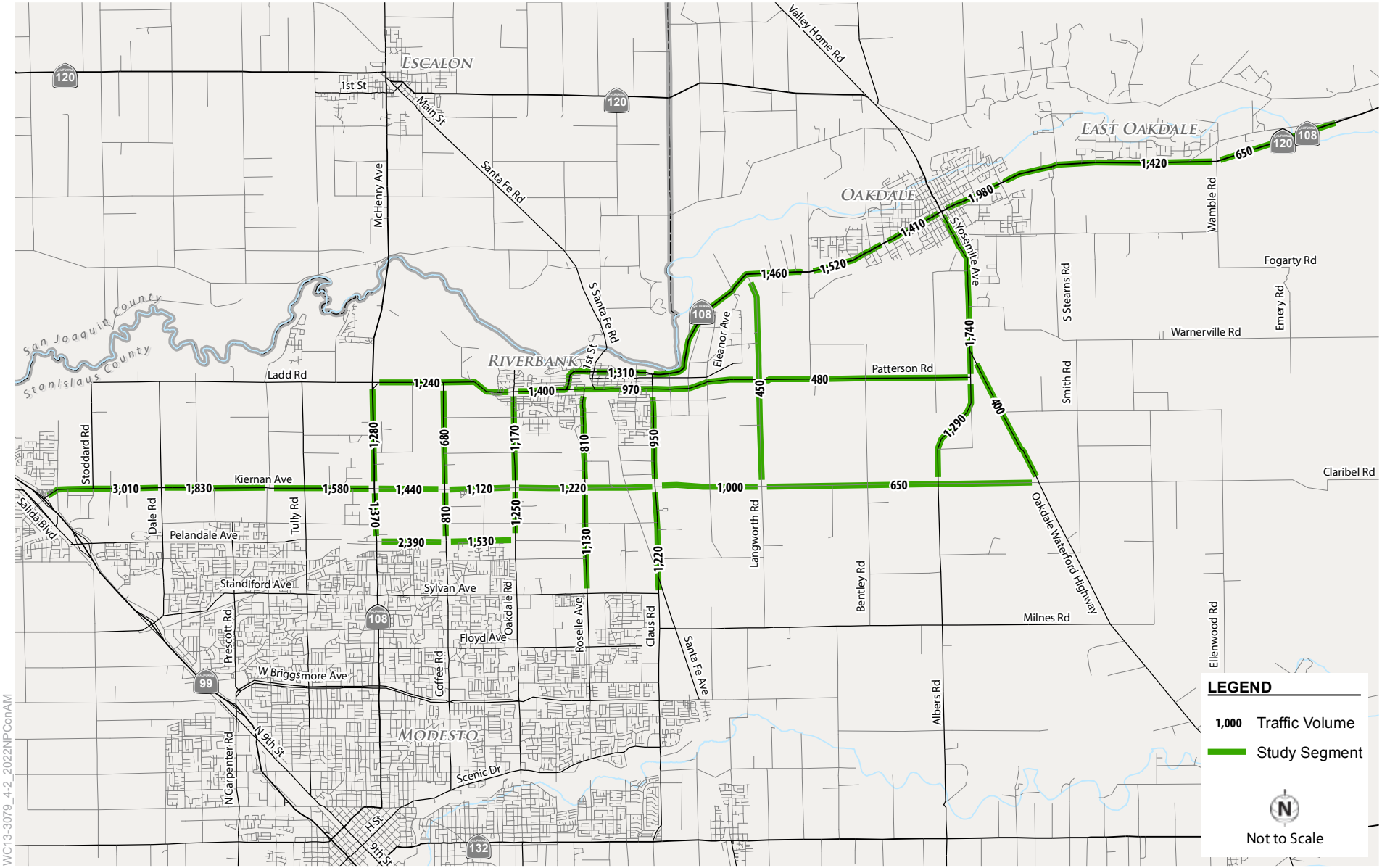
VOLUMES KEY

XX (YY) AM (PM) Peak Hour Traffic Volumes

WC13-3079_4-1_2022NPvol

Figure 4-1

2022 No Project Peak Hour Intersection Volumes



LEGEND

1,000 Traffic Volume

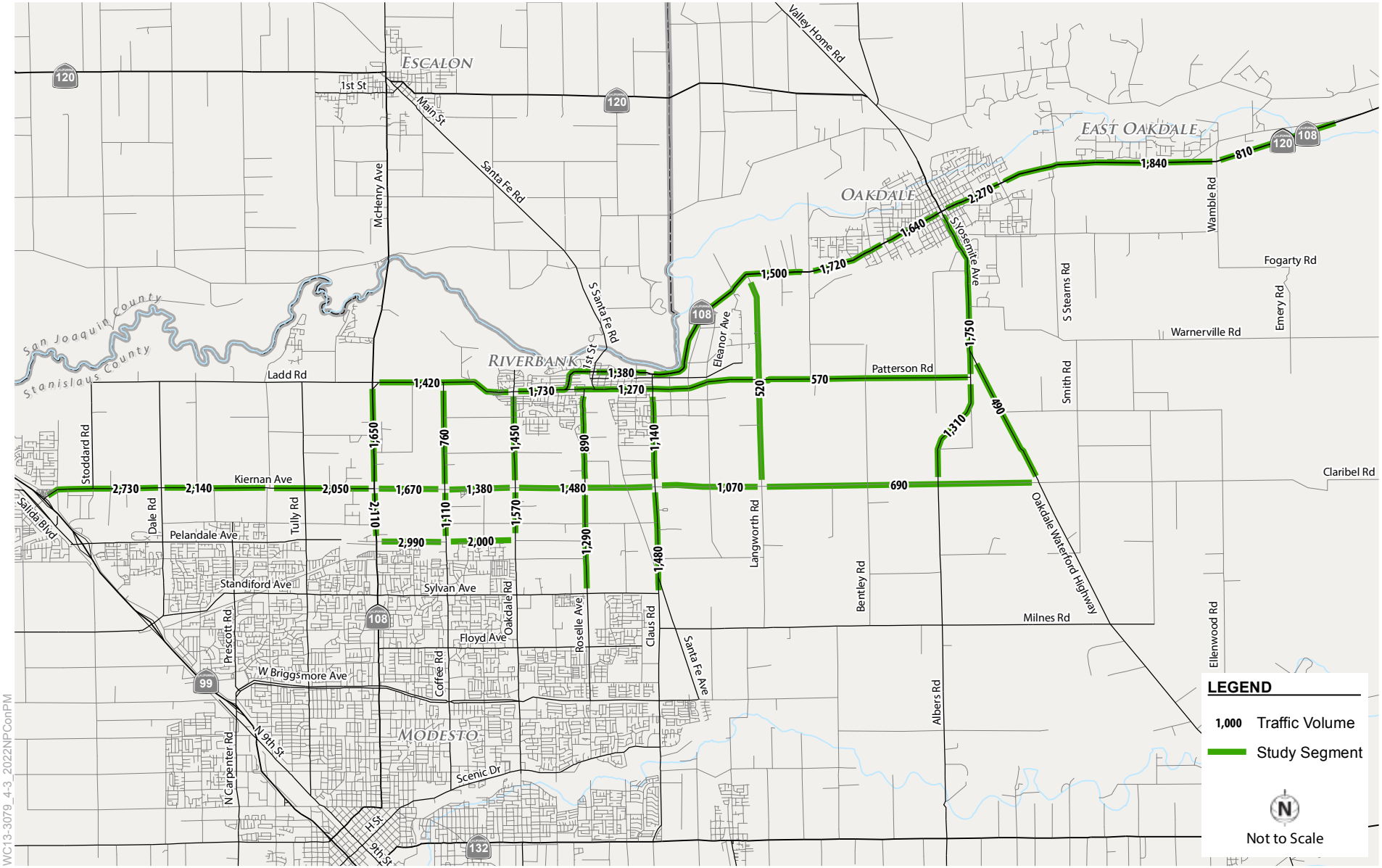
Study Segment

Not to Scale

WC13-3079_4-2_2022NPConAM

Figure 4-2

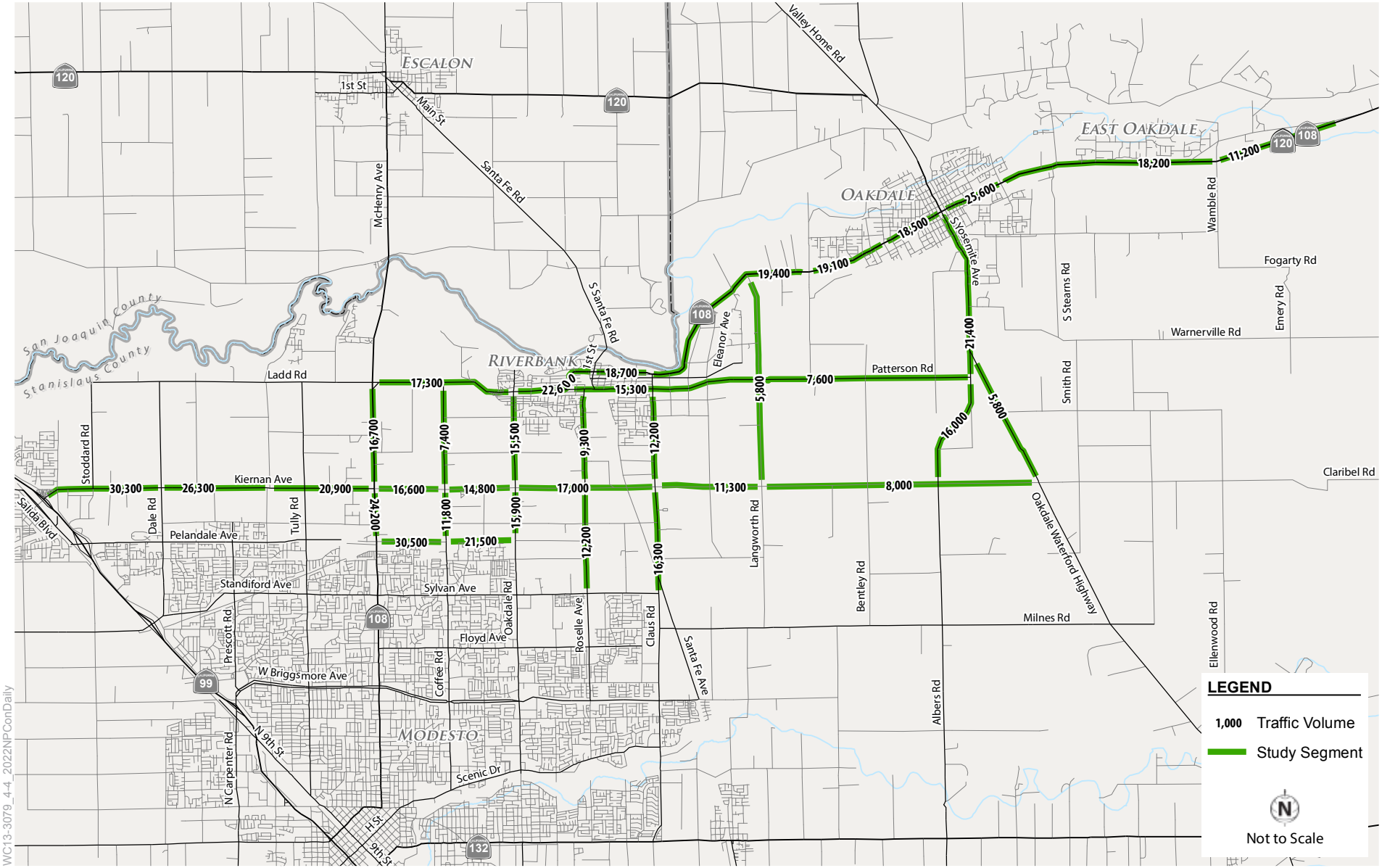
2022 No Project AM Peak Hour Roadway Volumes



WC13-3079_4-3_2022NPConPM

Figure 4-3

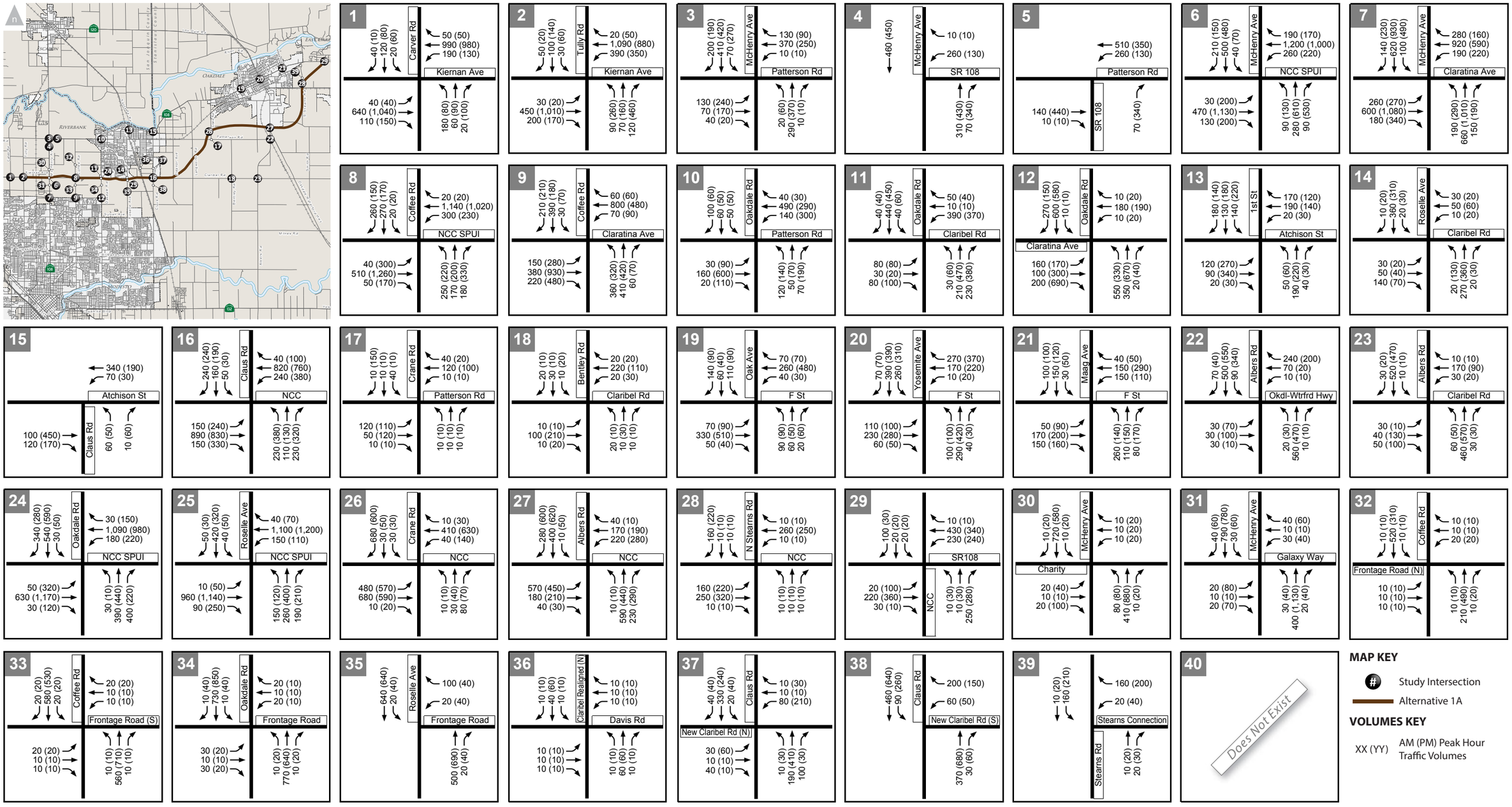
2022 No Project PM Peak Hour Roadway Volumes



WC13-3079_4-4_2022NPConDaily

Figure 4-4

2022 No Project Daily Roadway Volumes



WC13-3079_4-5_2022Alt1Avol

Figure 4-5

2022 Alternative 1A Peak Hour Intersection Volumes

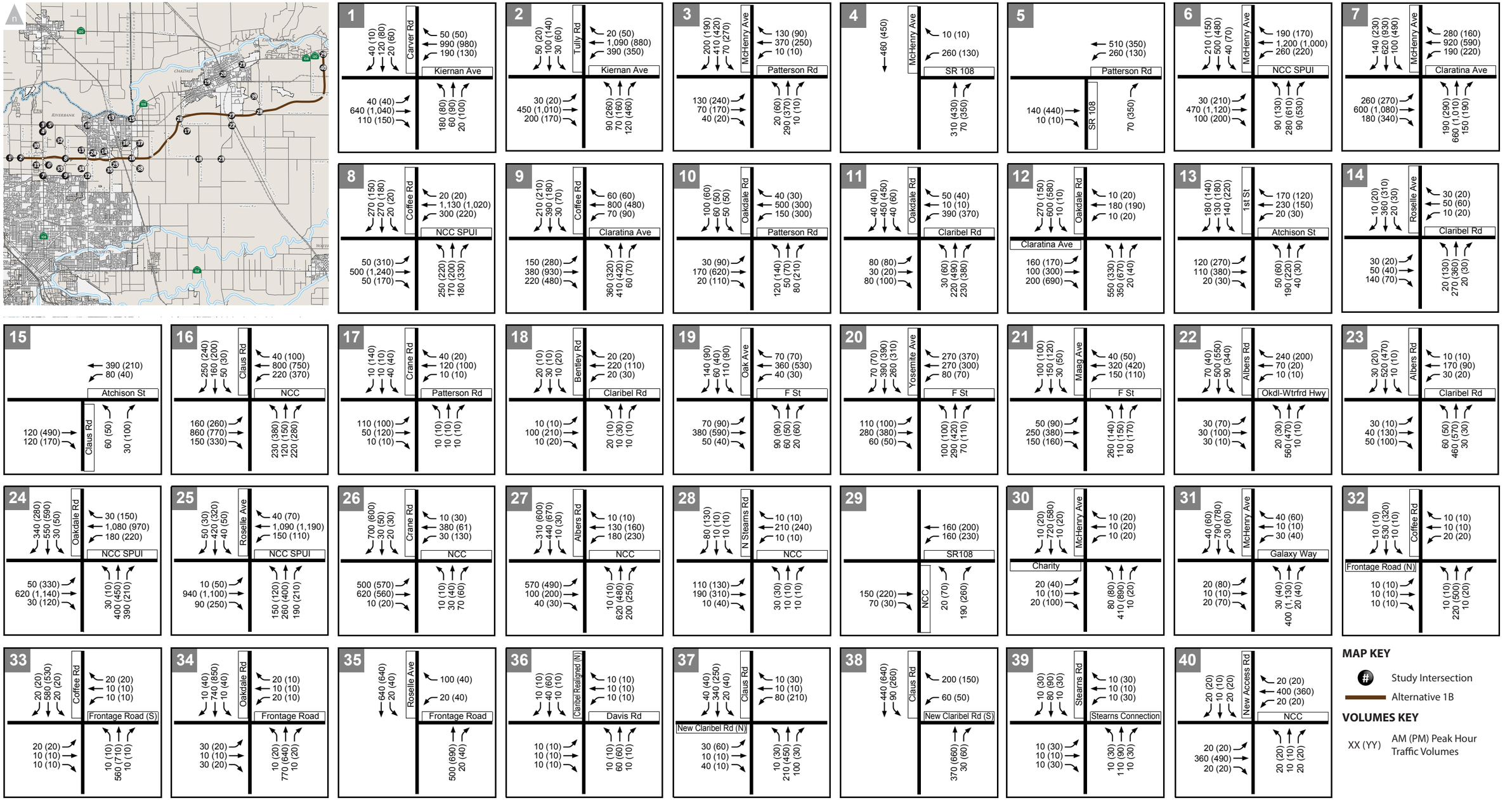
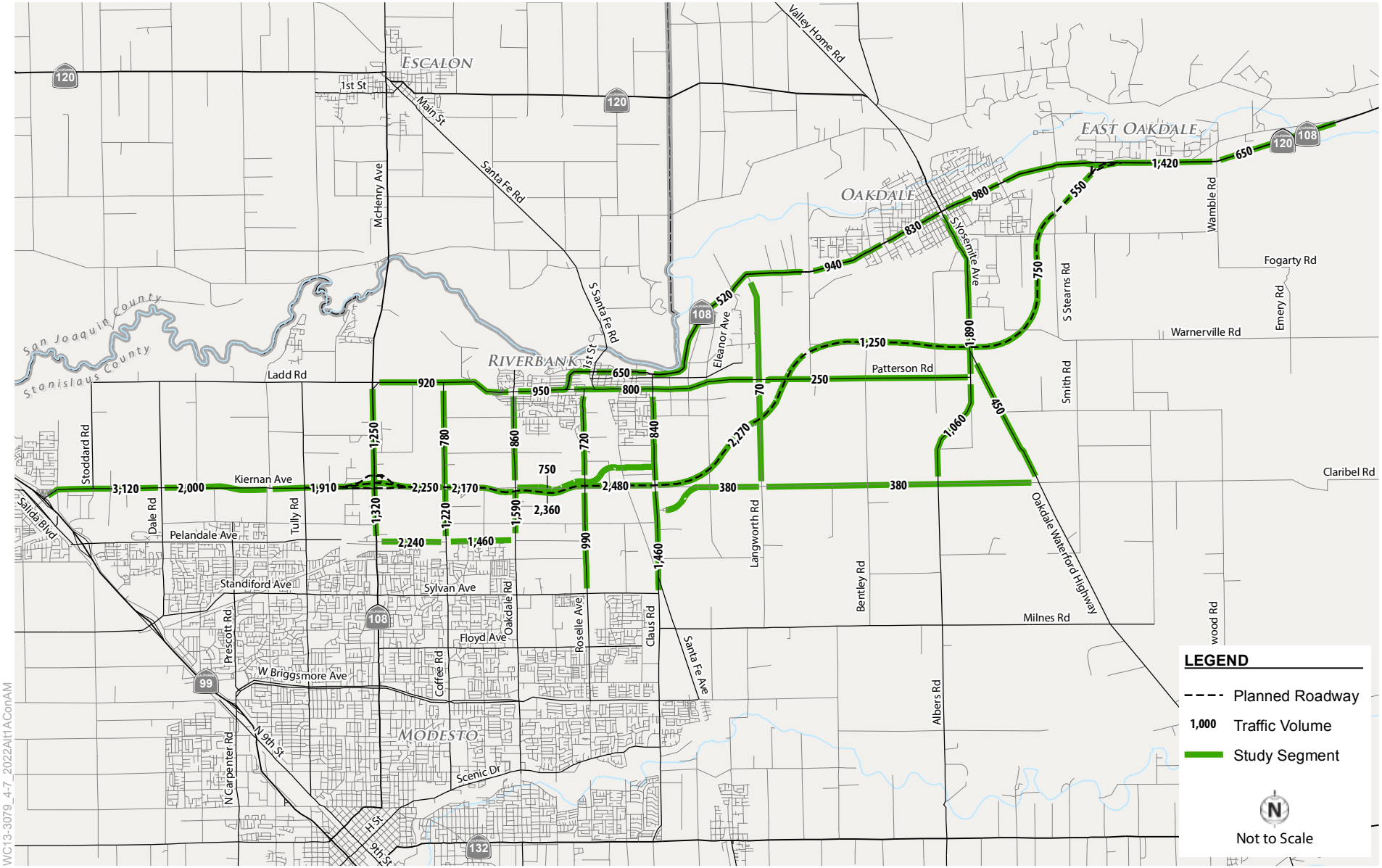


Figure 4-6

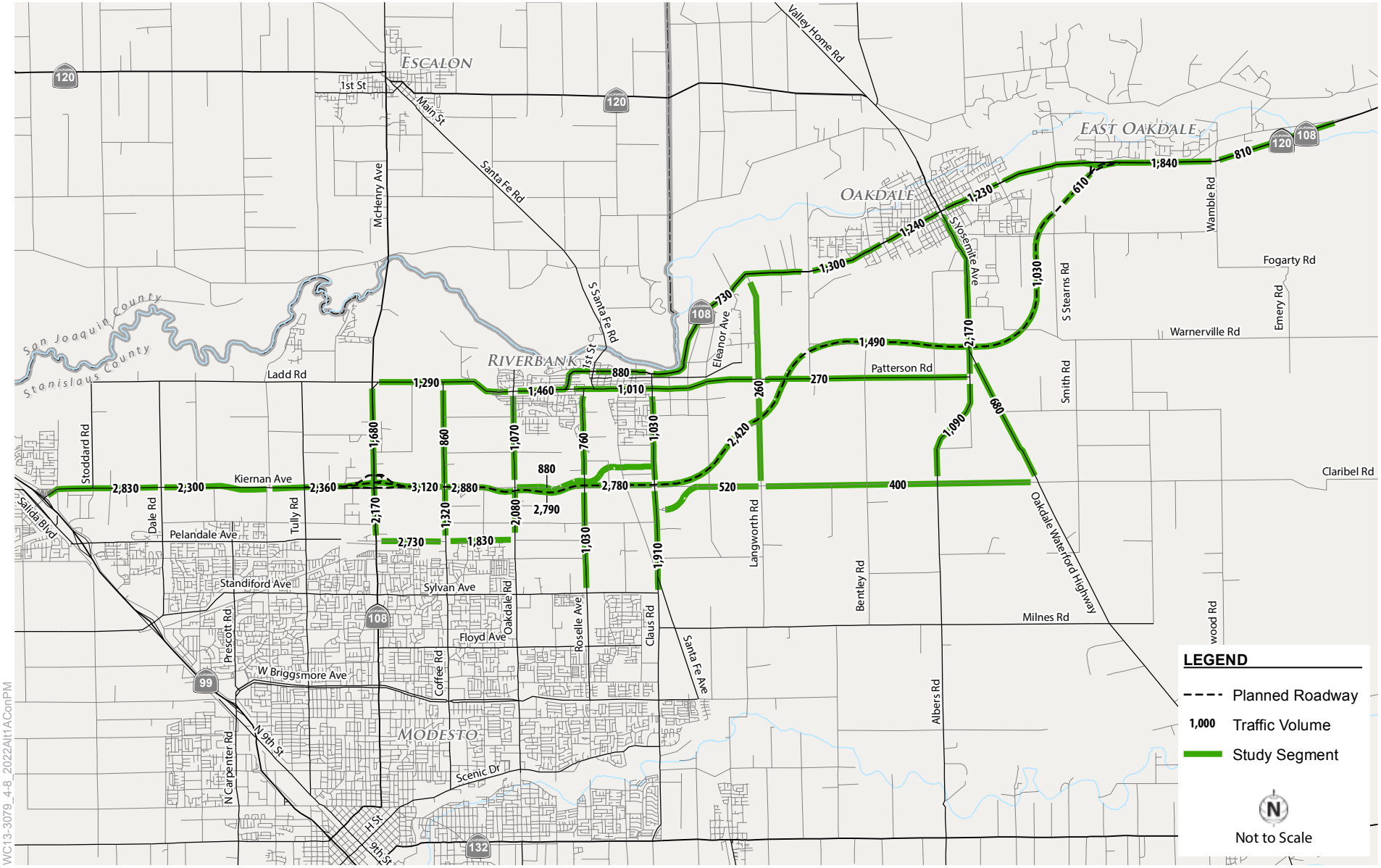
2022 Alternative 1B Peak Hour Intersection Volumes



WC13-3079_4-7_2022Alt1AConAM

Figure 4-7

2022 Alternative 1A AM Peak Hour Roadway Volumes



WC13-3079_4-8_2022Alt1AConPM

Figure 4-8

2022 Alternative 1A PM Peak Hour Roadway Volumes

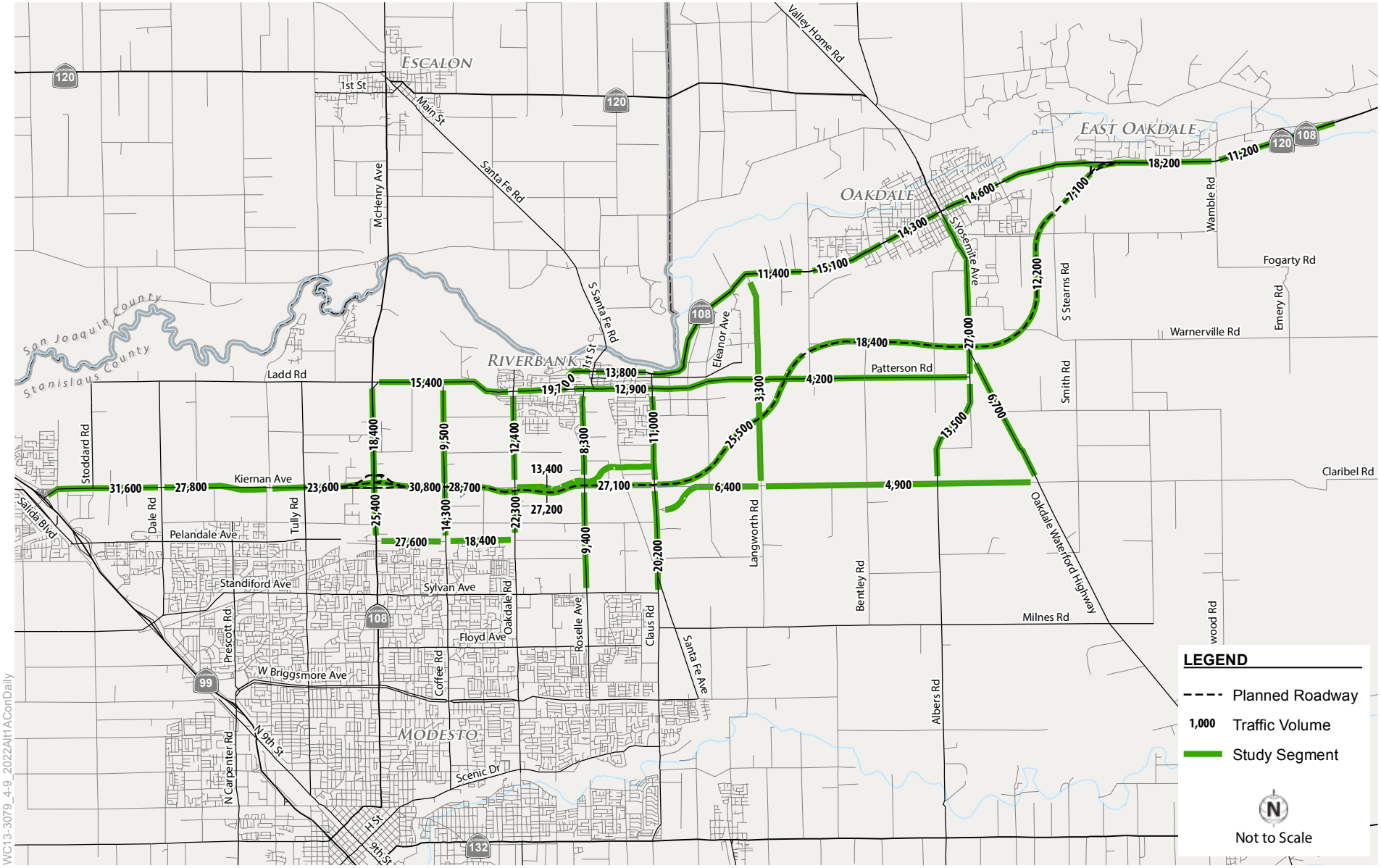
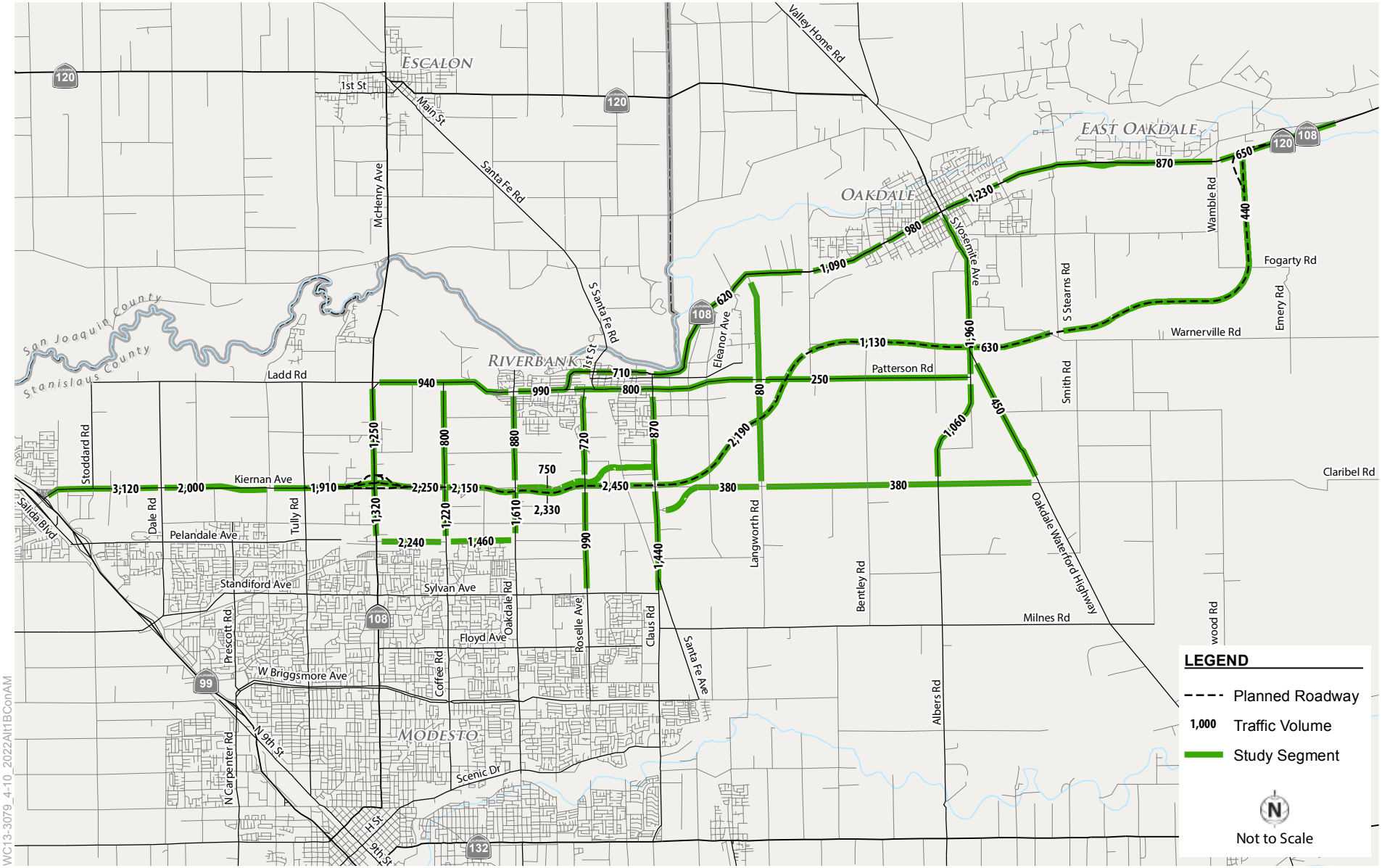


Figure 4-9

2022 Alternative 1A Daily Roadway Volumes



LEGEND

Planned Roadway

1,000 Traffic Volume

Study Segment

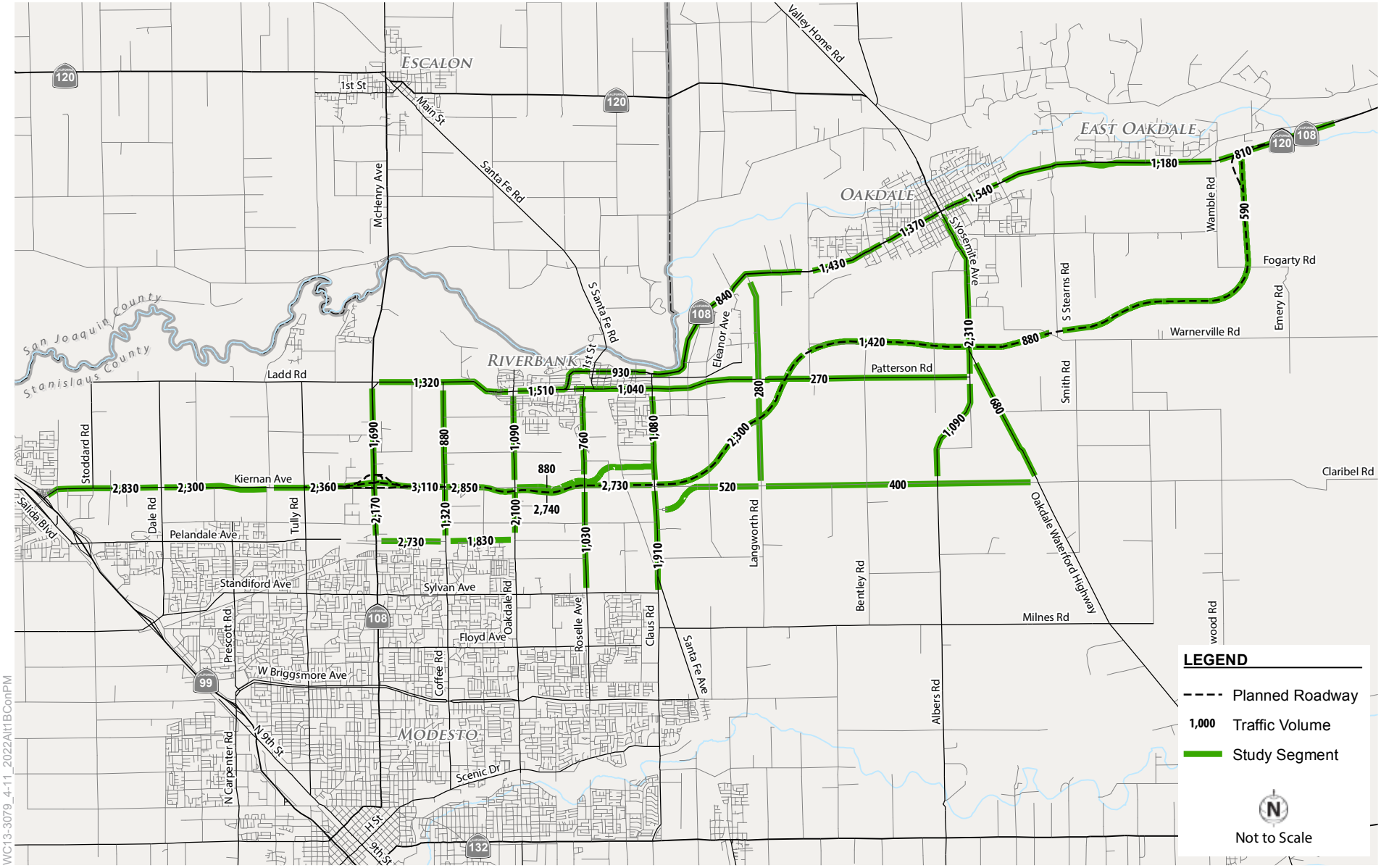
N

Not to Scale

WC13-3079_4-10_2022Alt1BConAM

Figure 4-10

2022 Alternative 1B AM Peak Hour Roadway Volumes



LEGEND

Planned Roadway

1,000 Traffic Volume

Study Segment

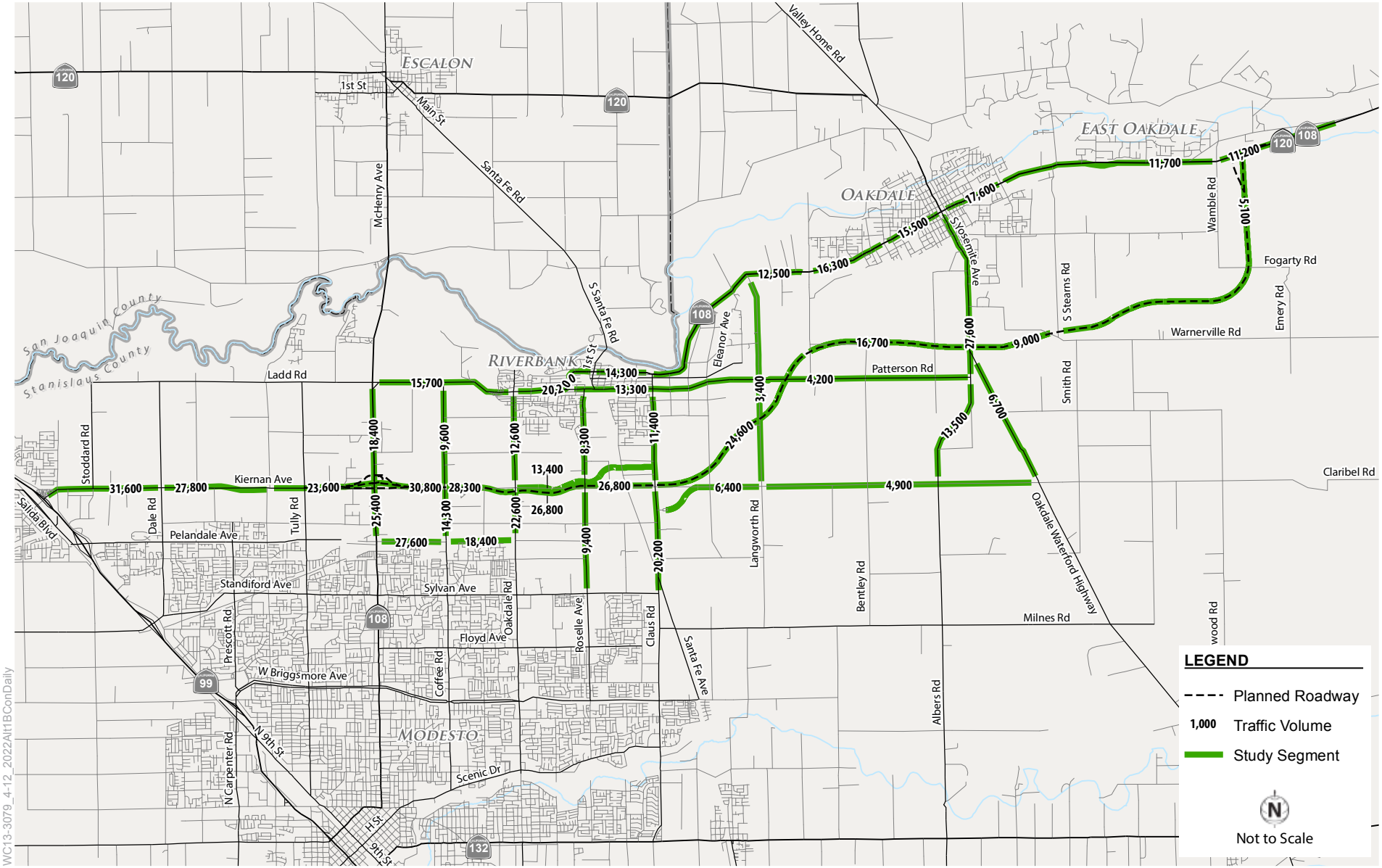
N

Not to Scale

WC13-3079_4-11_2022Alt1BConPM

Figure 4-11

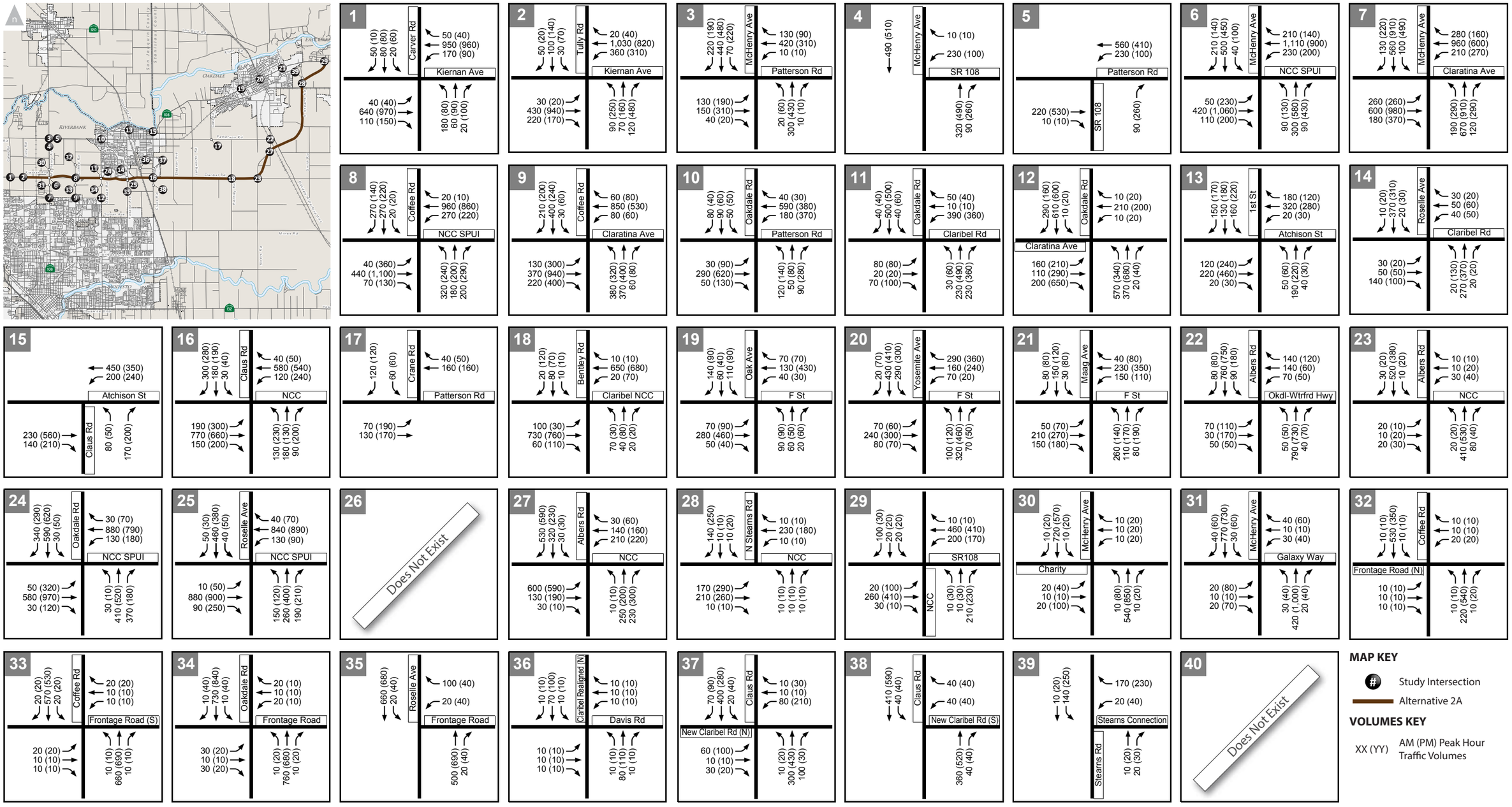
2022 Alternative 1B PM Peak Hour Roadway Volumes



WC13-3079_4-12_2022Alt1BConDaily

Figure 4-12

2022 Alternative 1B Daily Roadway Volumes



WC13-3079_4-13_2022AltI2AvoI

Figure 4-13

2022 Alternative 2A Peak Hour Intersection Volumes

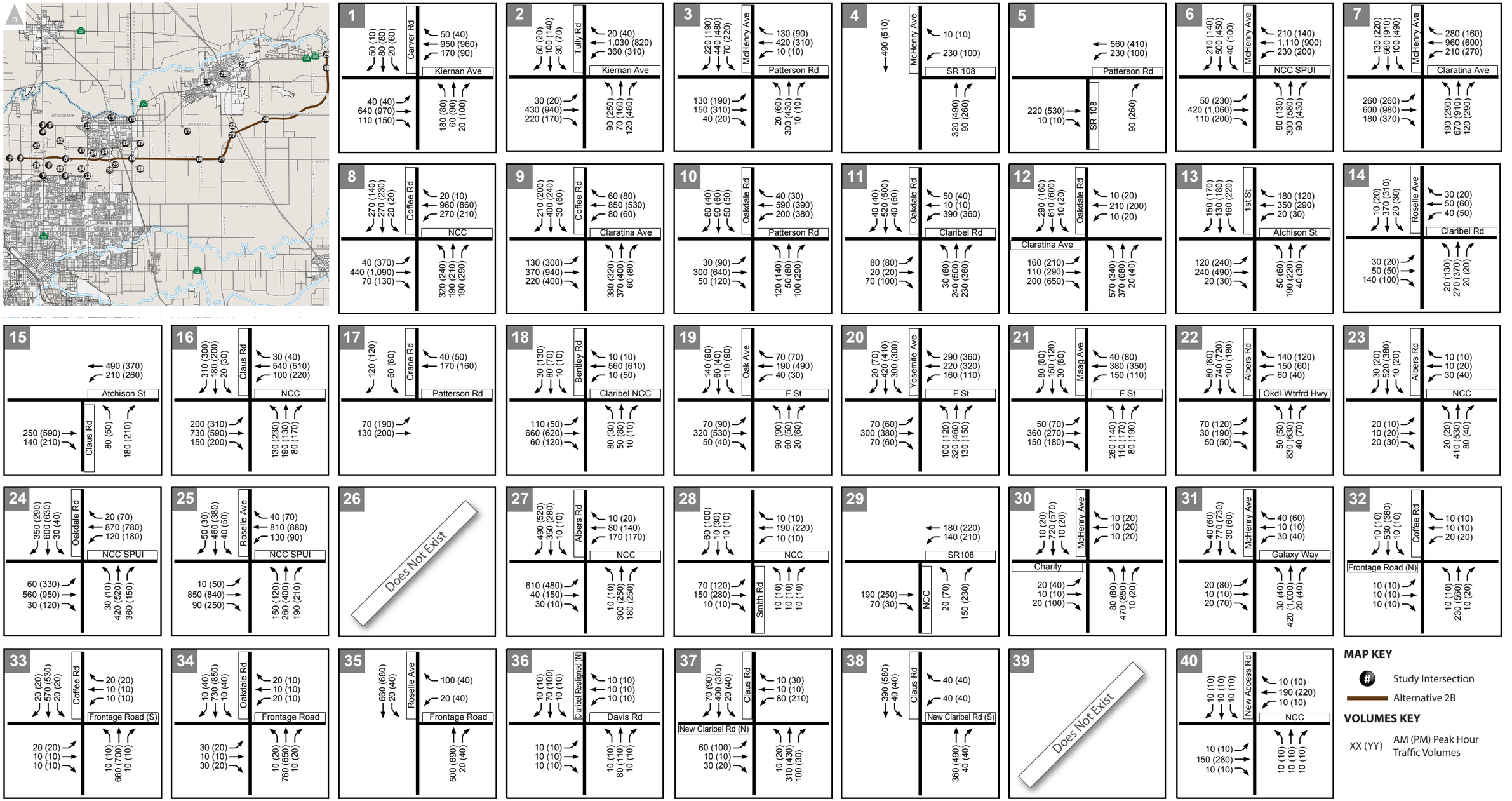


Figure 4-14

2022 Alternative 2B Peak Hour Intersection Volumes

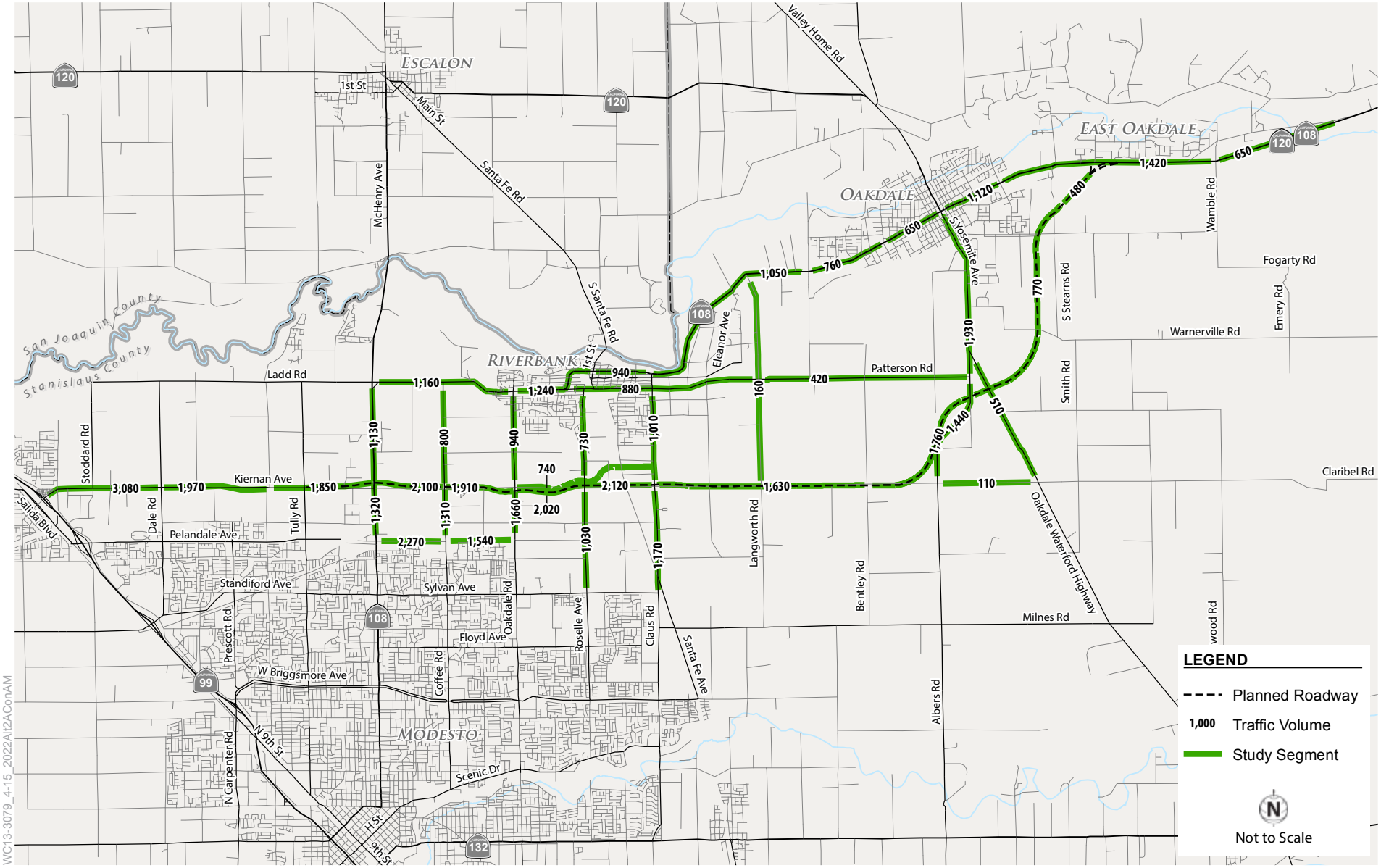


Figure 4-15

2022 Alternative 2A AM Peak Hour Roadway Volumes

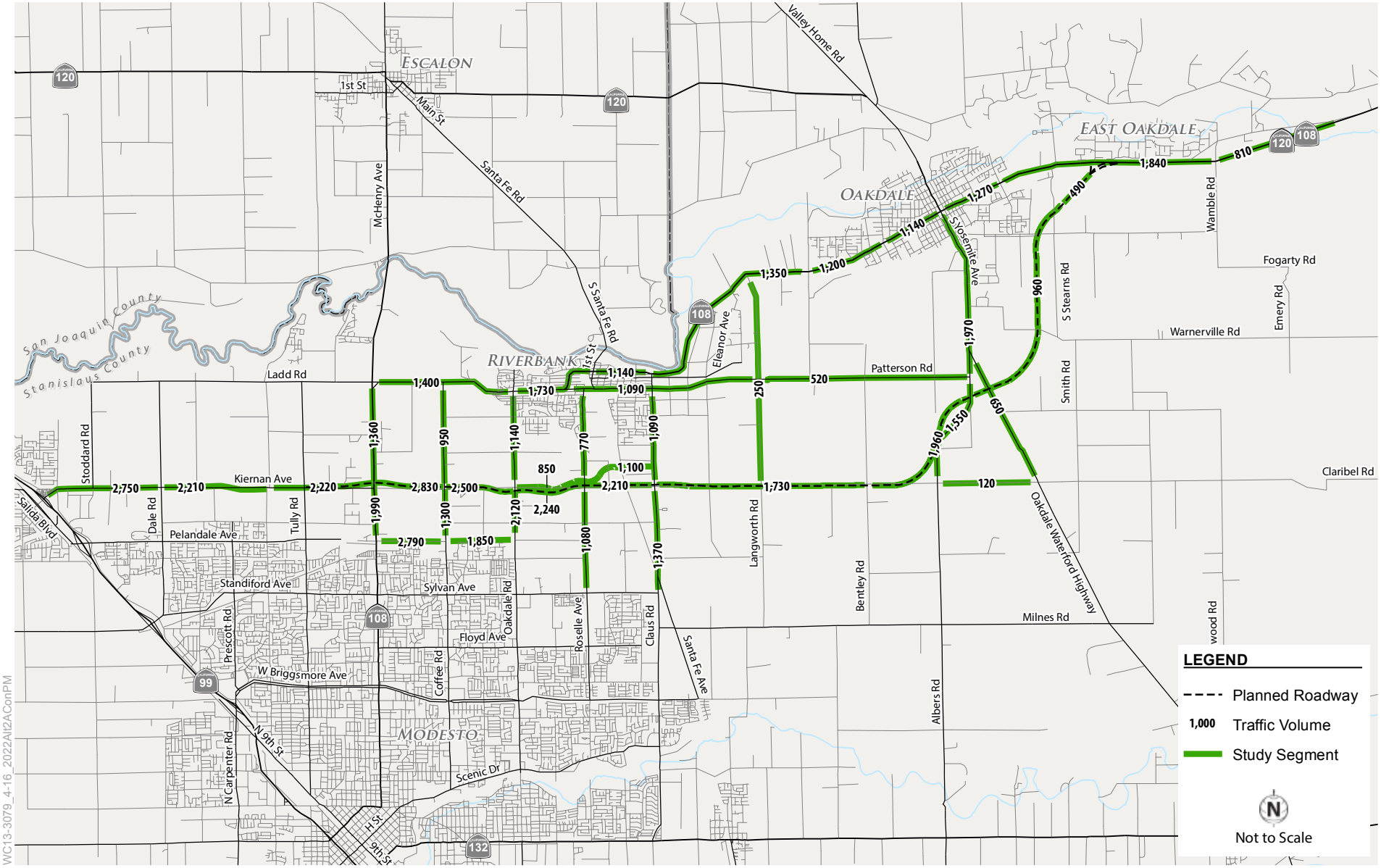
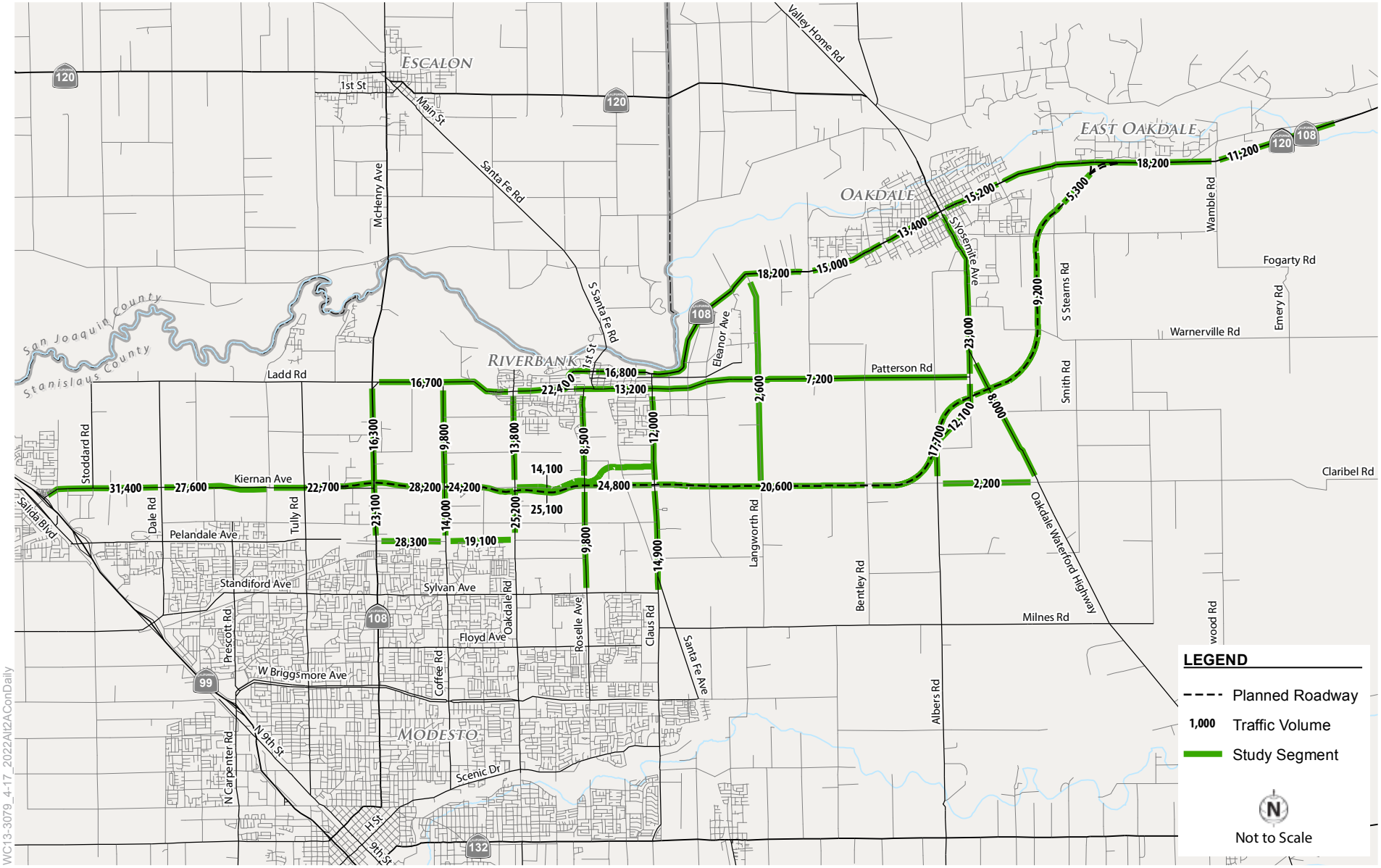


Figure 4-16

2022 Alternative 2A PM Peak Hour Roadway Volumes



LEGEND

Planned Roadway

1,000 Traffic Volume

Study Segment

Not to Scale

WC13-3079_4-17_2022Alt2AConDaily

Figure 4-17

2022 Alternative 2A Daily Roadway Volumes

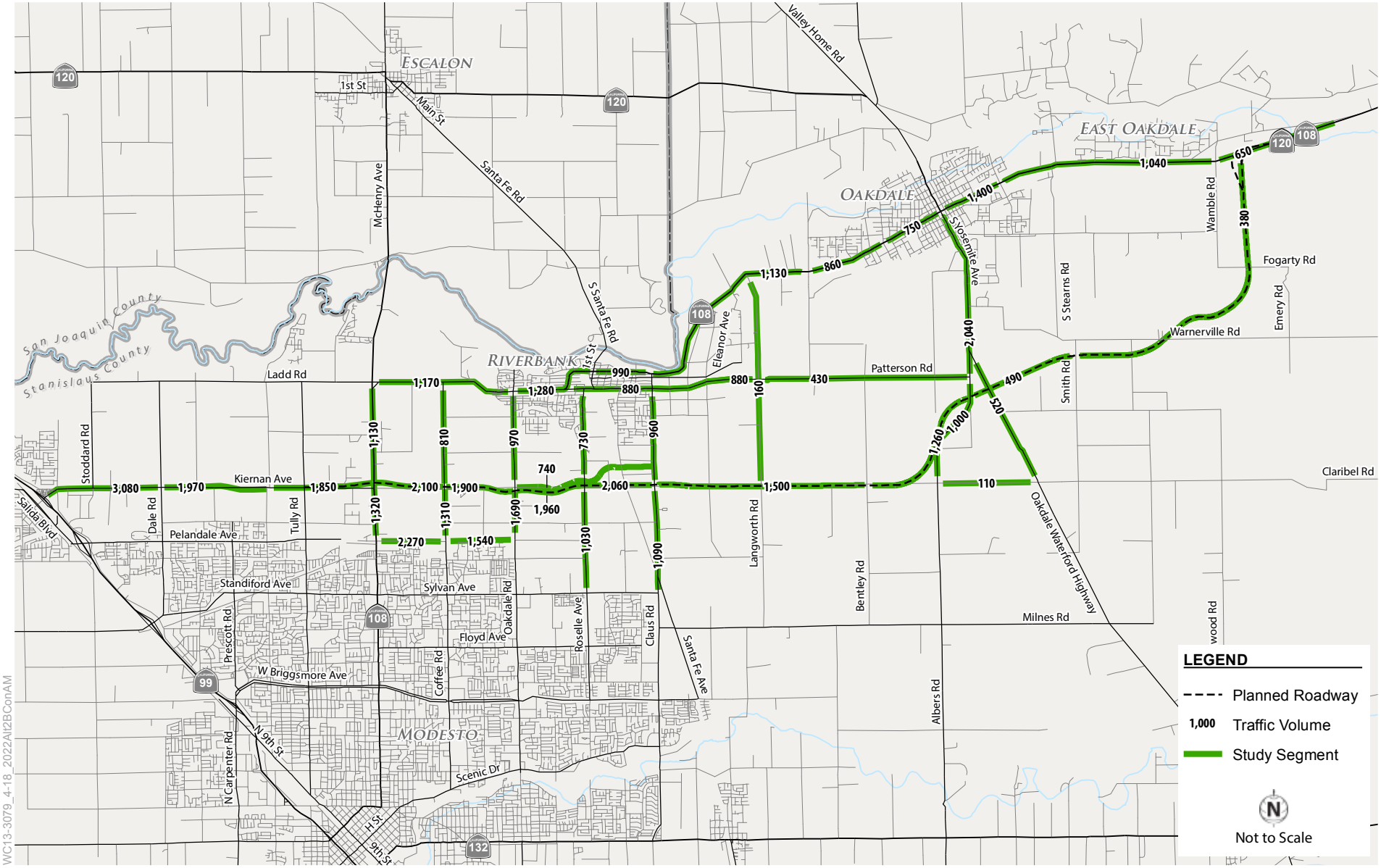


Figure 4-18

2022 Alternative 2B AM Peak Hour Roadway Volumes

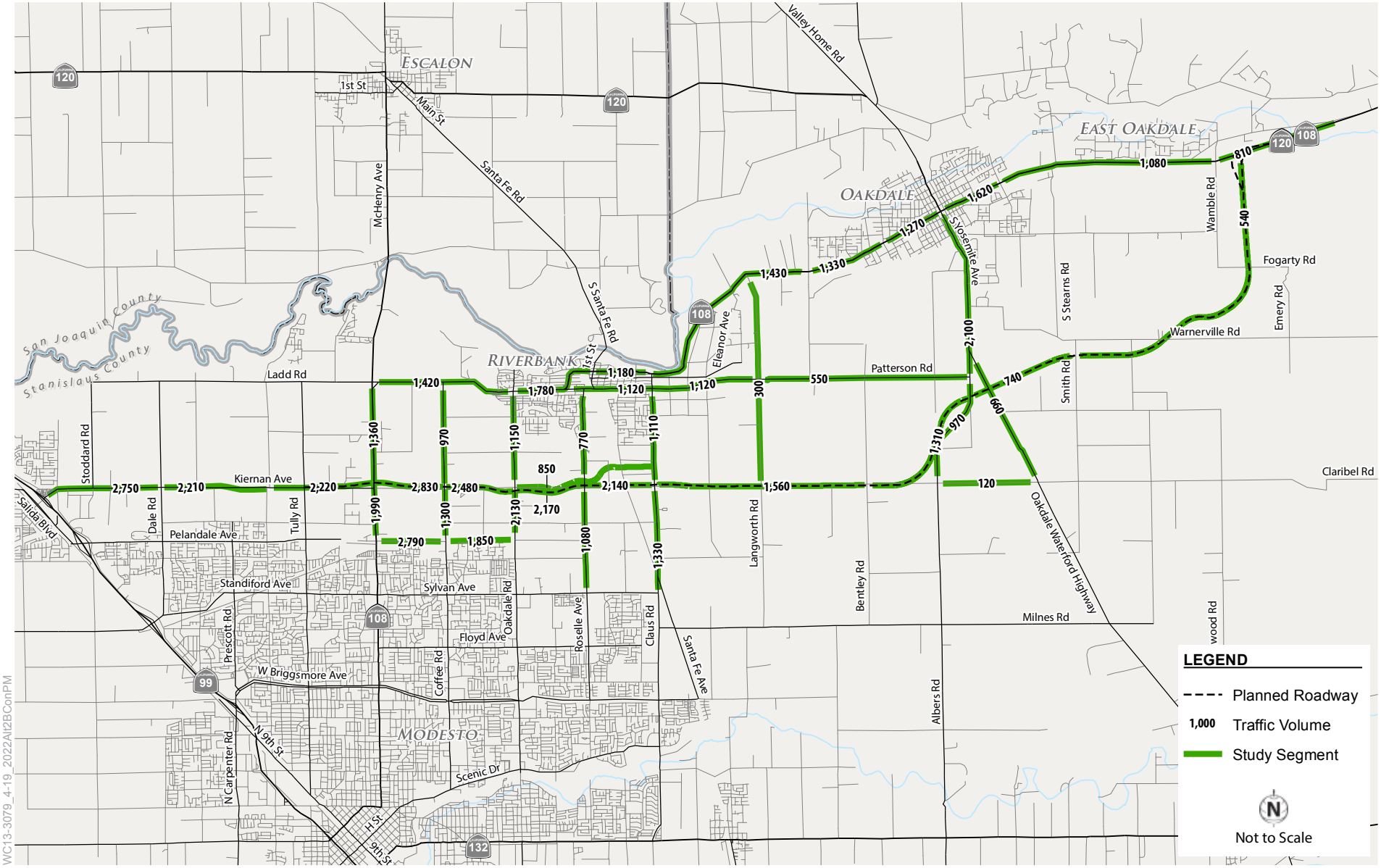


Figure 4-19

2022 Alternative 2B PM Peak Hour Roadway Volumes

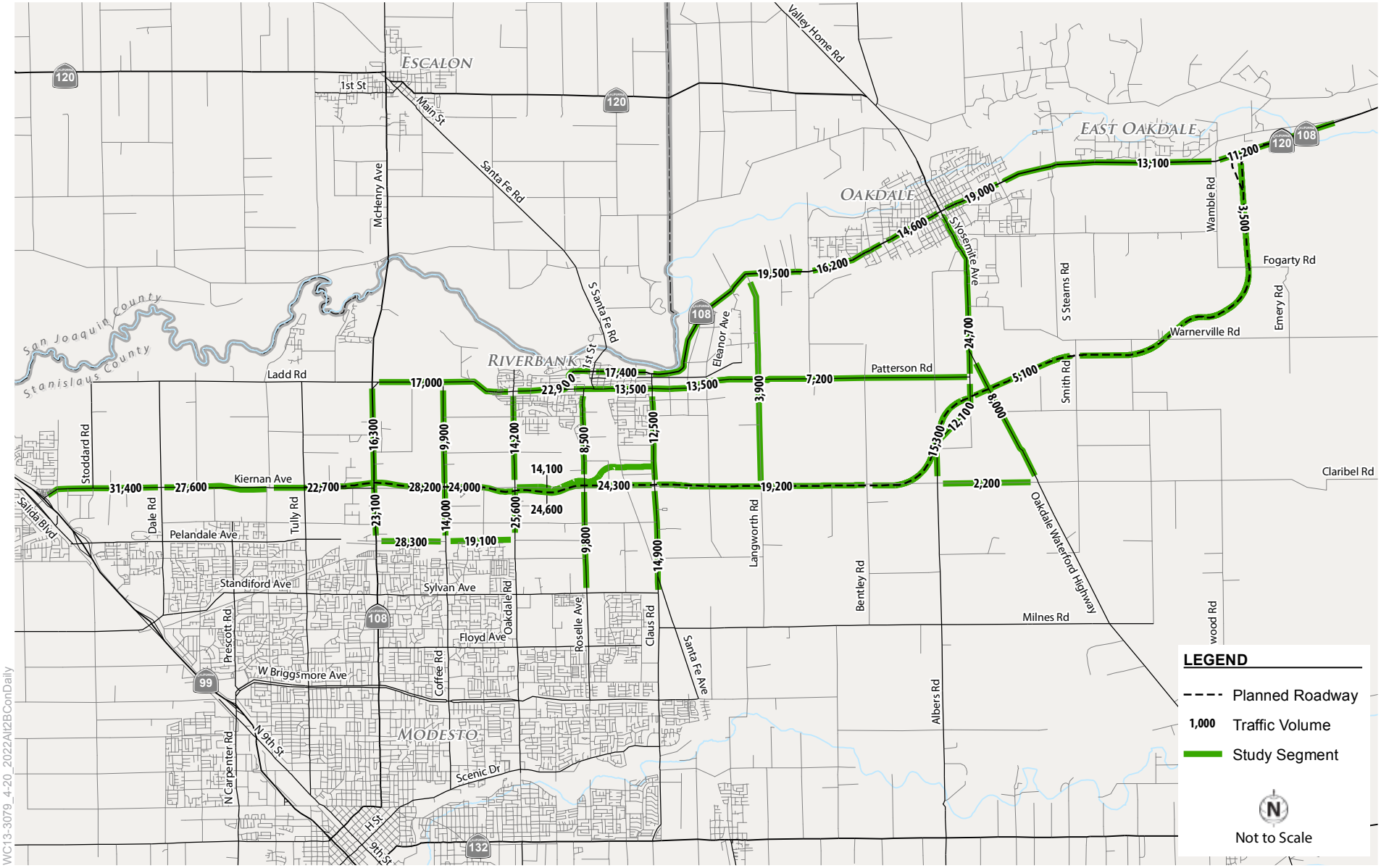
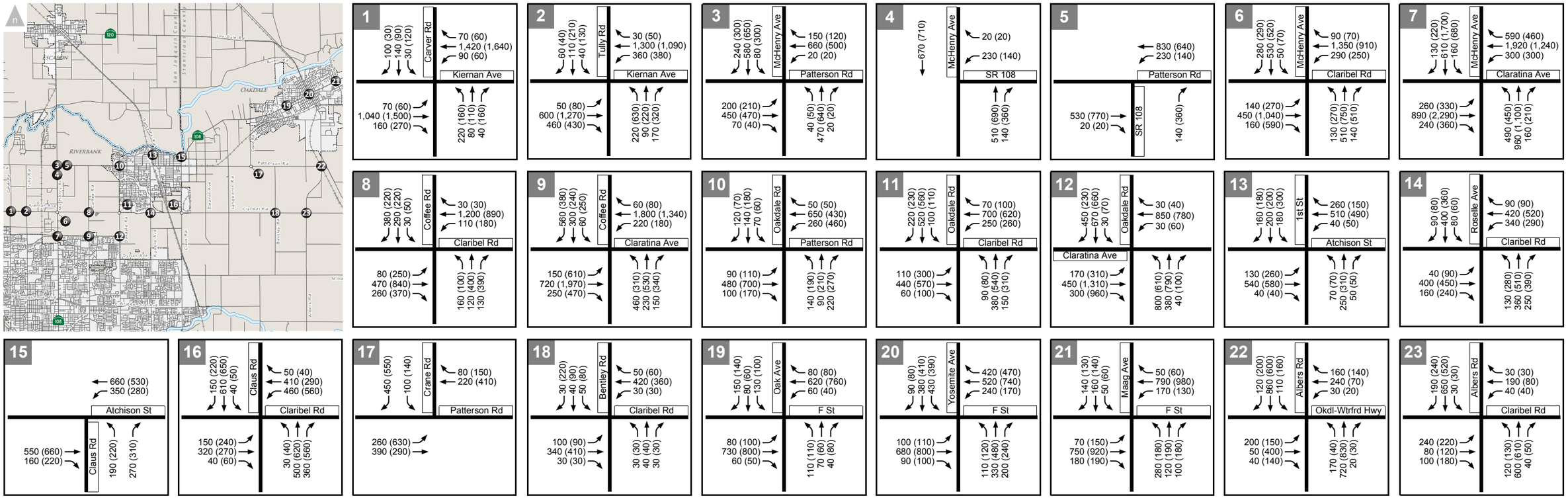


Figure 4-20

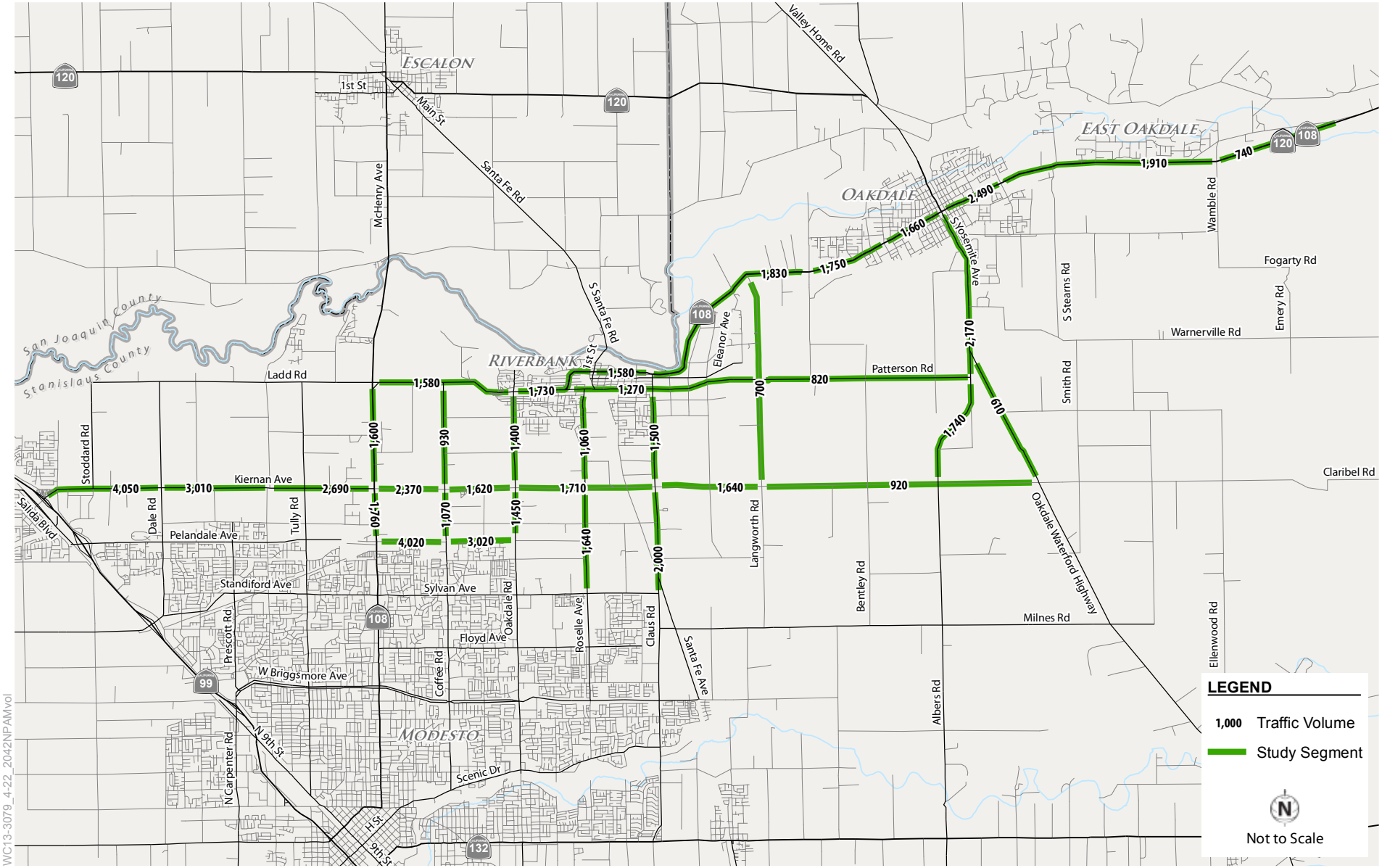
2022 Alternative 2B Daily Roadway Volumes



WC13-3079_4-21_2042NPvol

Figure 4-21

2042 No Project Peak Hour Intersection Volumes



LEGEND

1,000 Traffic Volume

Study Segment

Not to Scale

WC13-3079_4-22_2042NPAMvol

Figure 4-22

2042 No Project AM Peak Hour Roadway Volumes

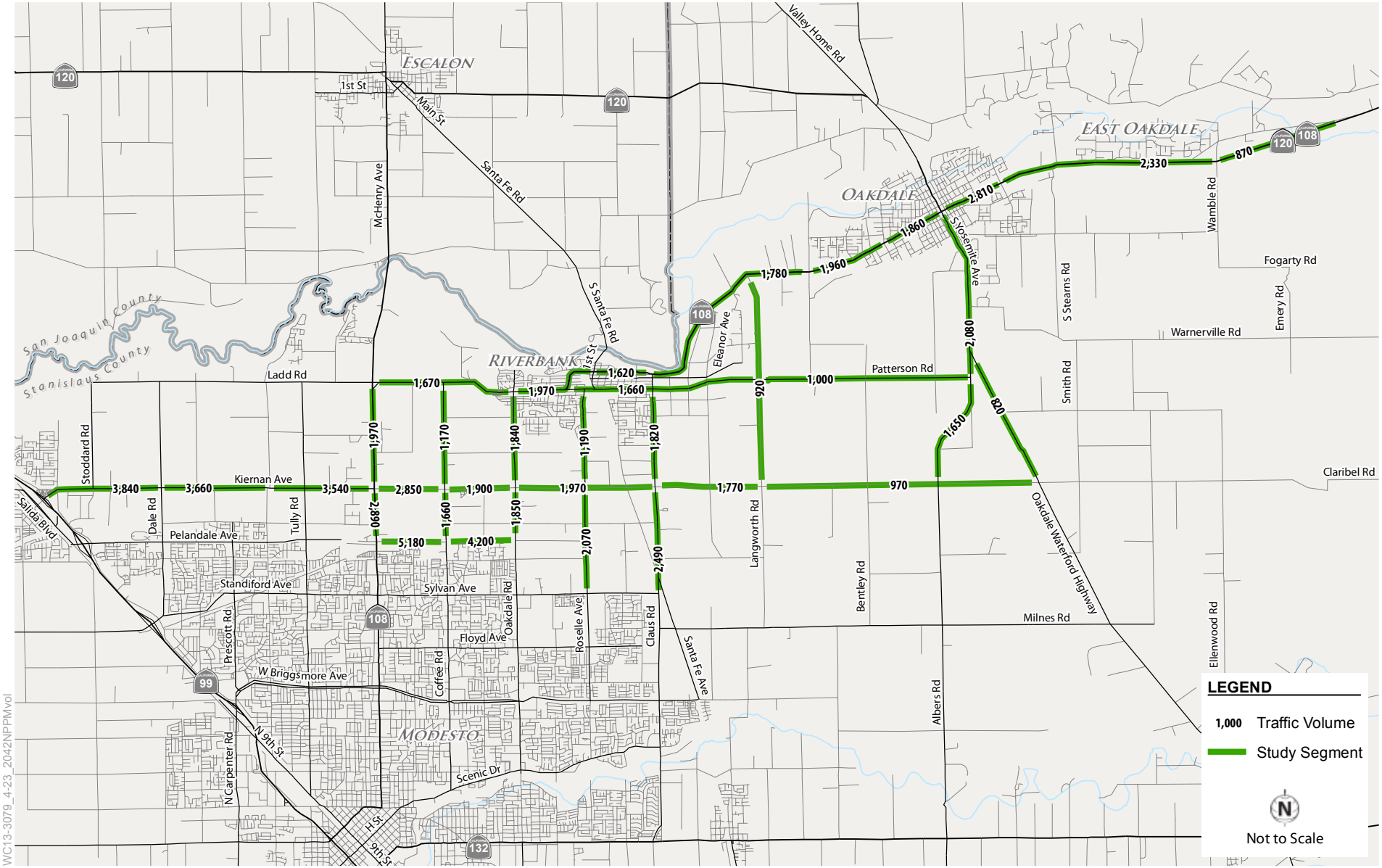


Figure 4-23

2042 No Project PM Peak Hour Roadway Volumes

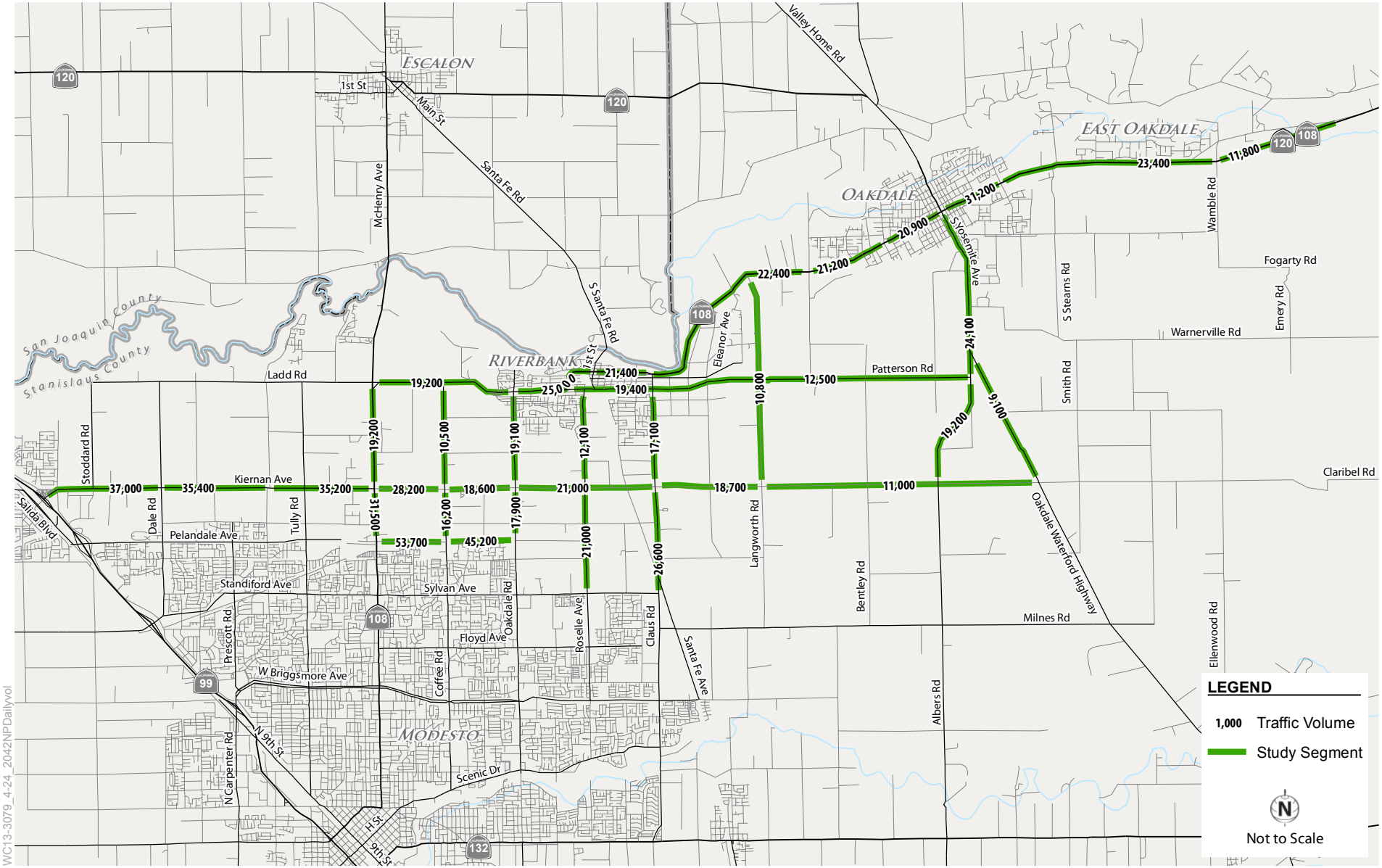
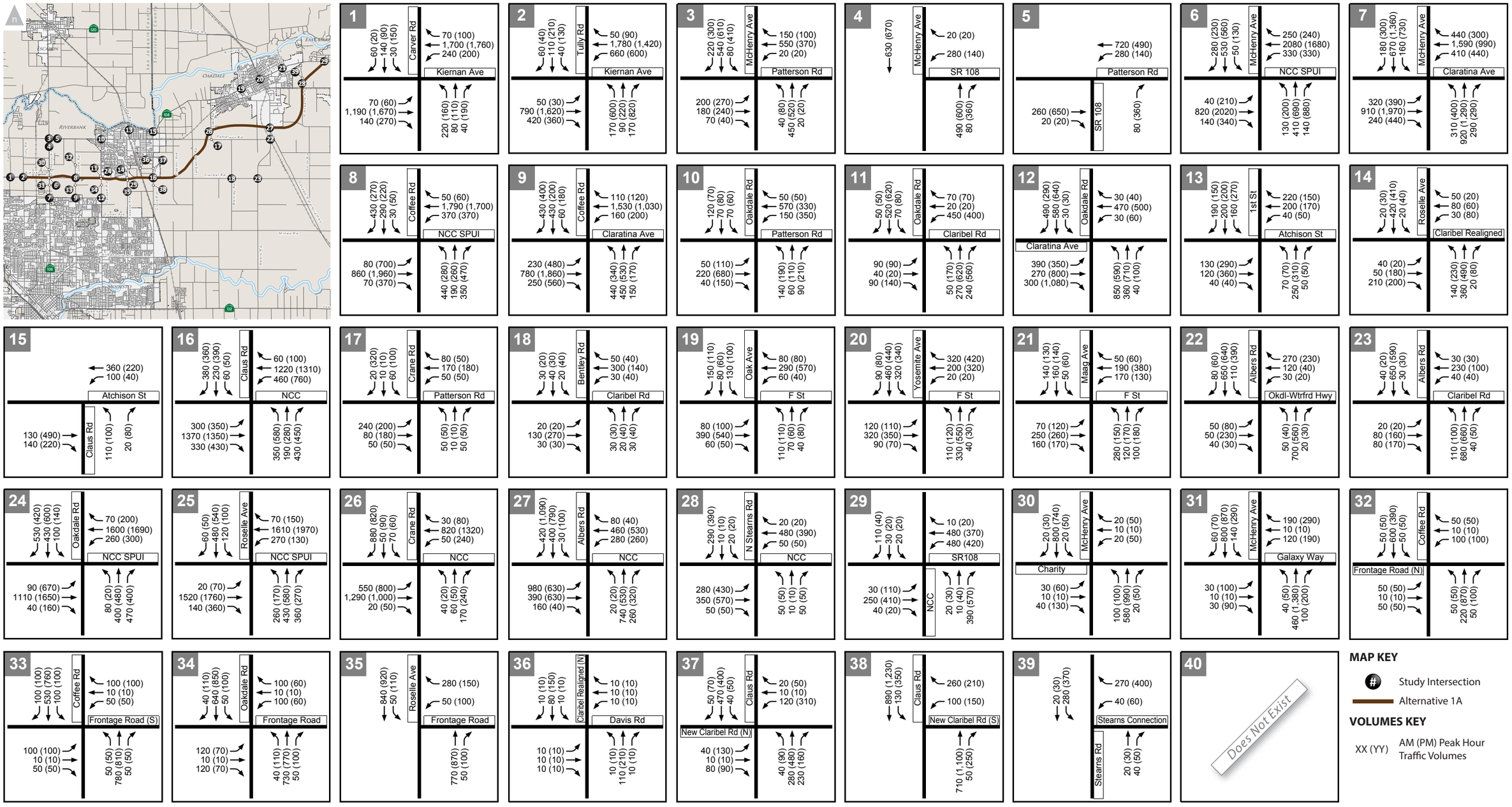


Figure 4-24

2042 No Project Daily Roadway Volumes



WC13-3079_4-25_2042Alt1Avol

Figure 4-25

2042 Alternative 1A Peak Hour Intersection Volumes

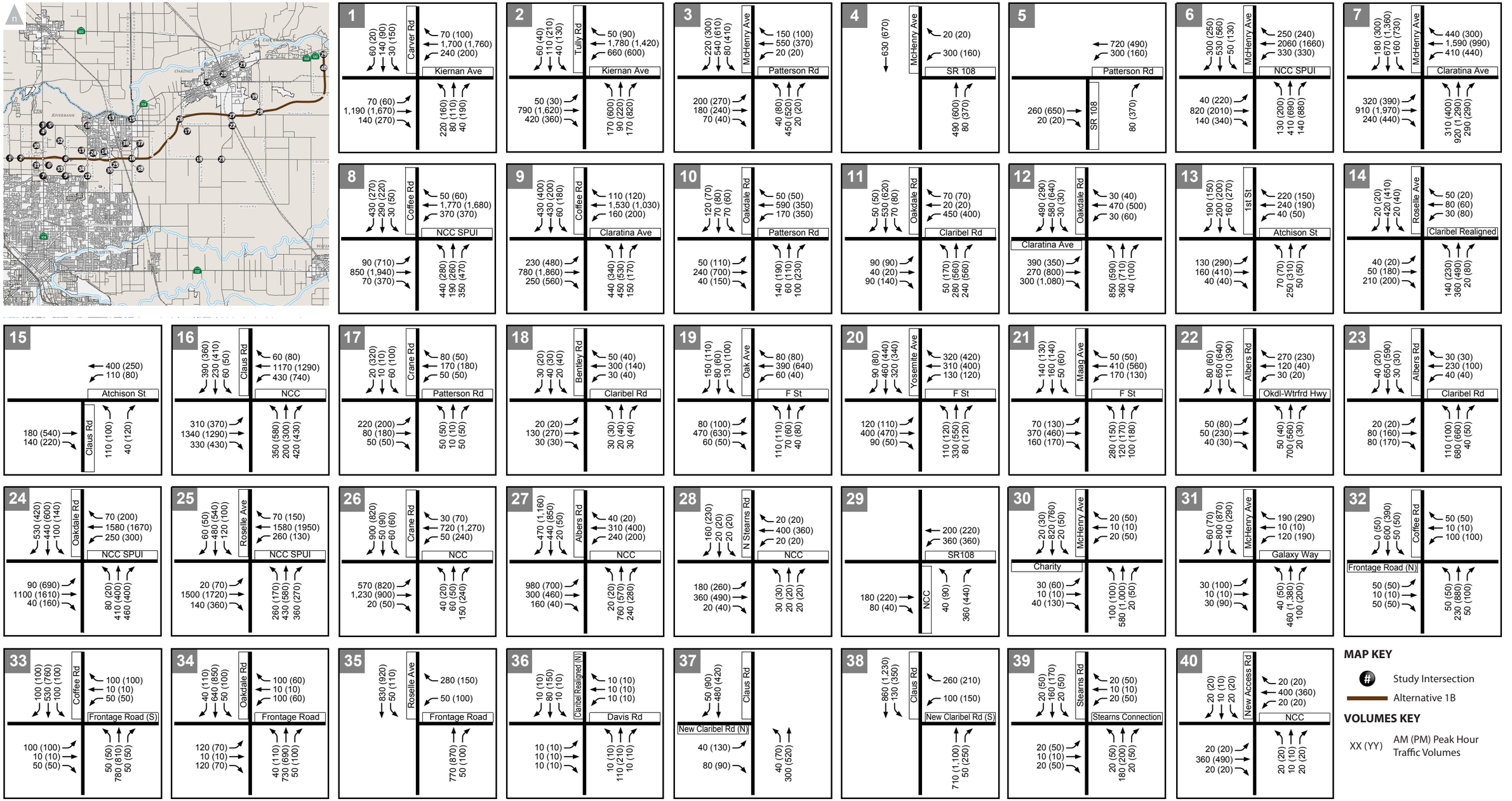


Figure 4-26

2042 Alternative 1B Peak Hour Intersection Volumes

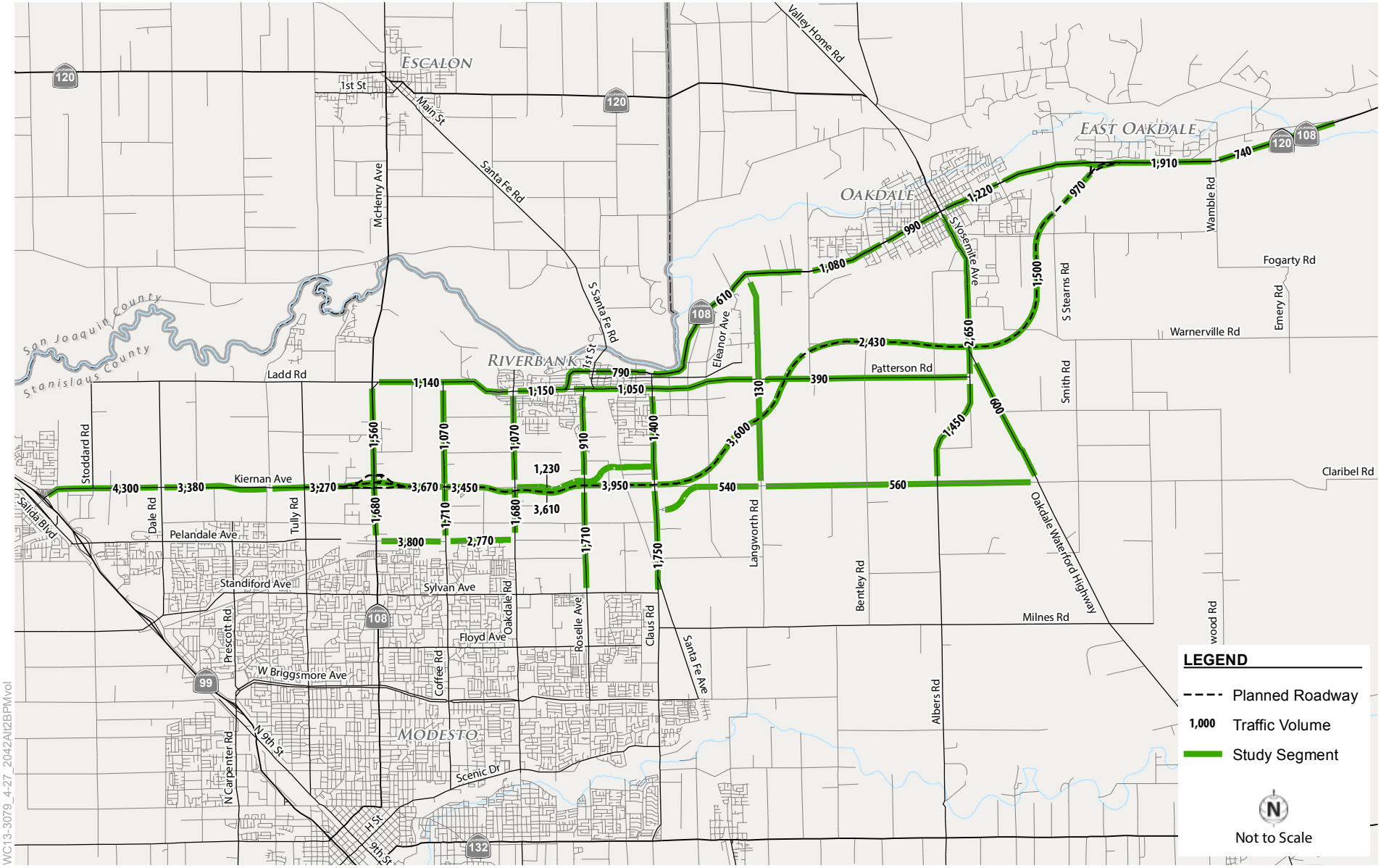


Figure 4-27

2042 Alternative 1A AM Peak Hour Roadway Volumes

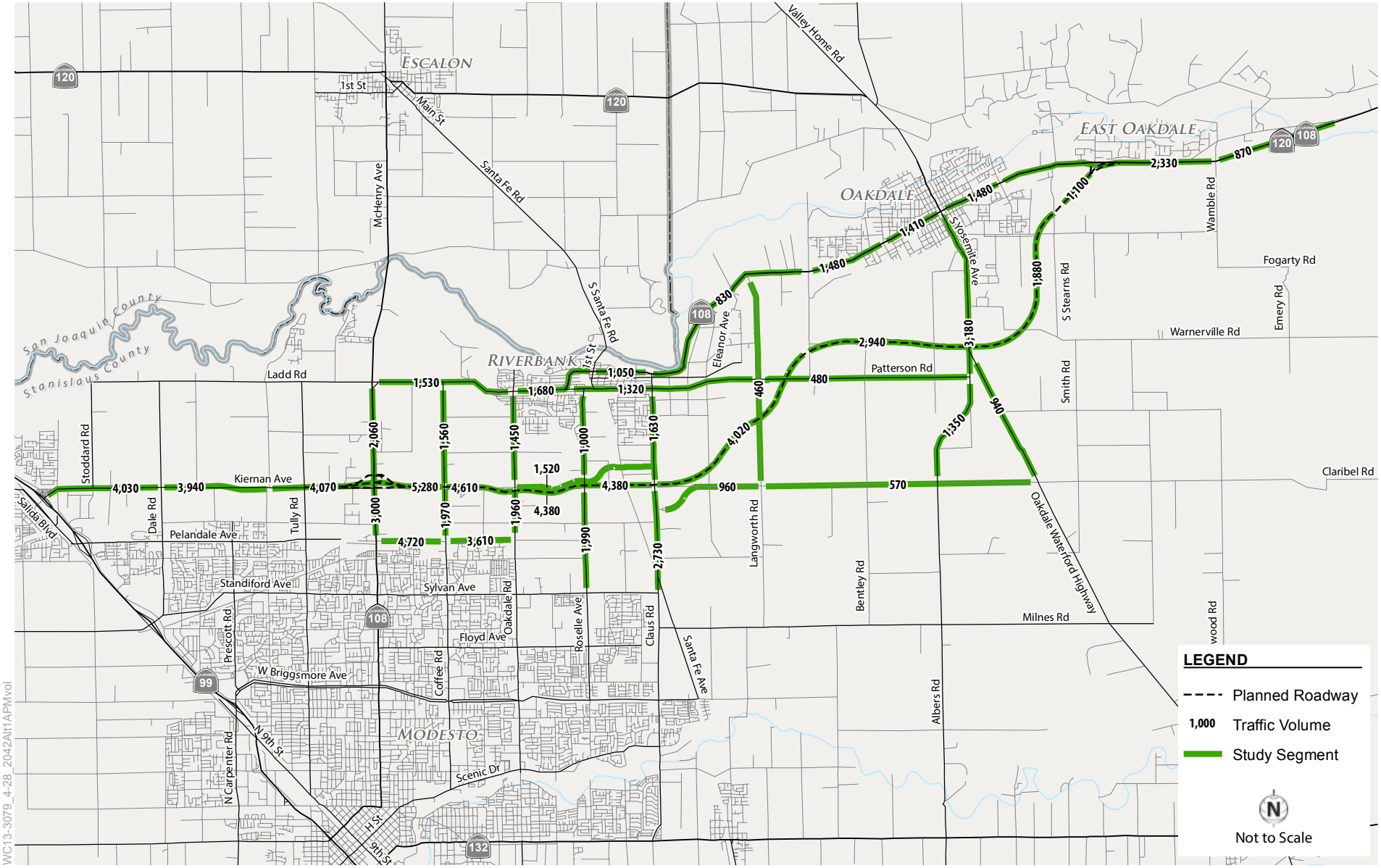
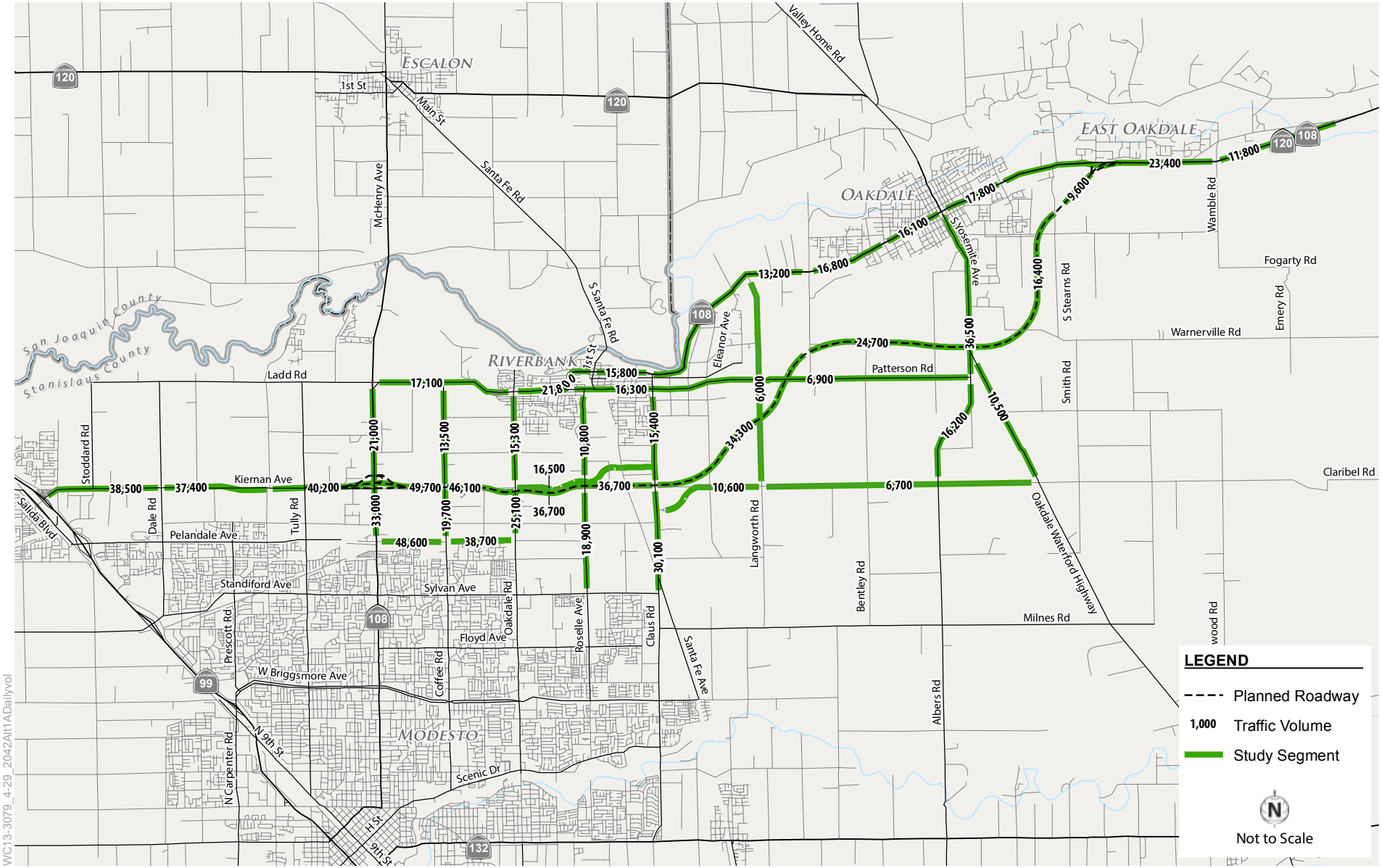


Figure 4-28

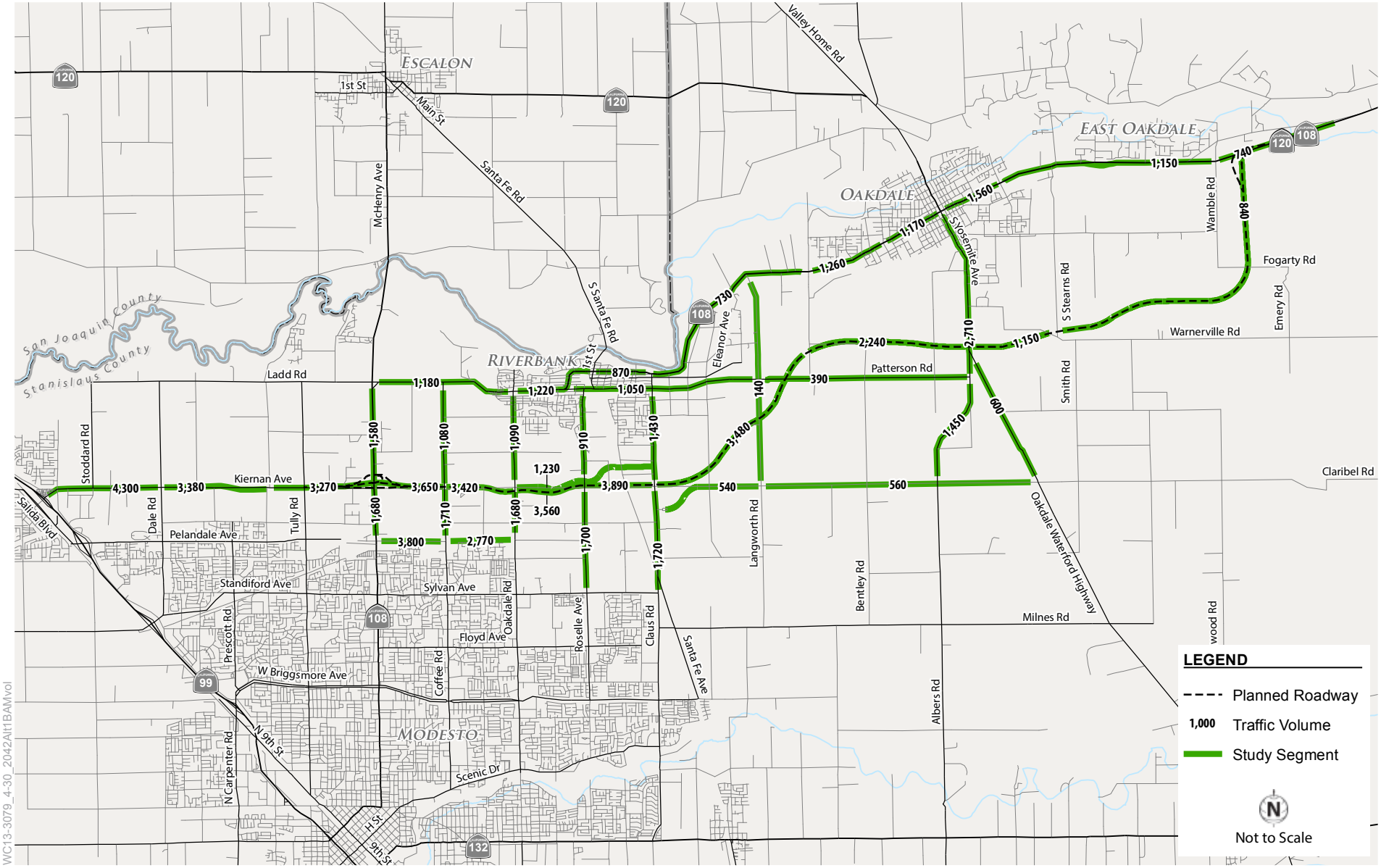
2042 Alternative 1A PM Peak Hour Roadway Volumes



WC13-3079_4-29_2042Alt1ADailyvol

Figure 4-29

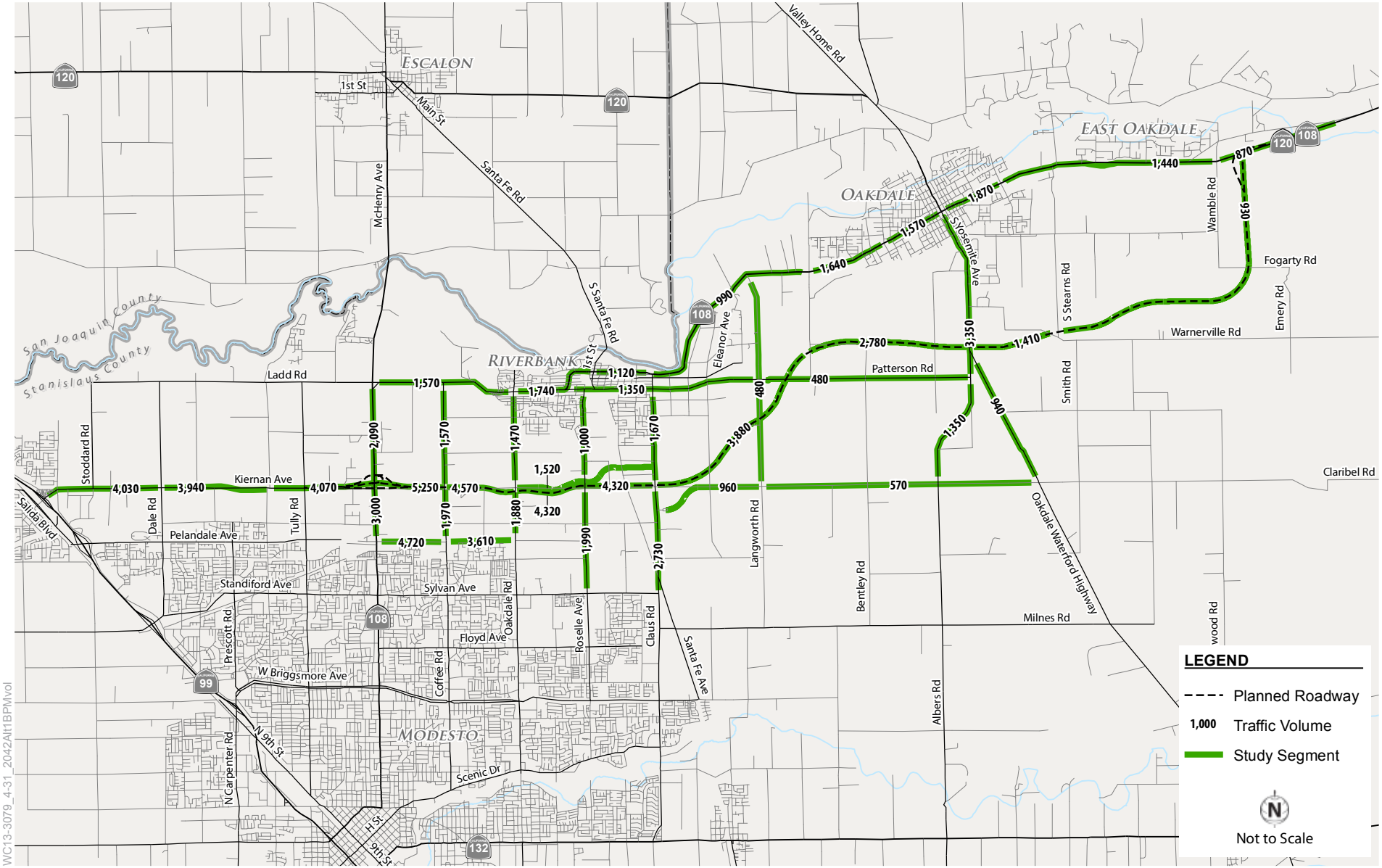
2042 Alternative 1A Daily Roadway Volumes



WC13-3079_4-30_2042Alt1BAMvol

Figure 4-30

2042 Alternative 1B AM Peak Hour Roadway Volumes



LEGEND

Planned Roadway

1,000 Traffic Volume

Study Segment

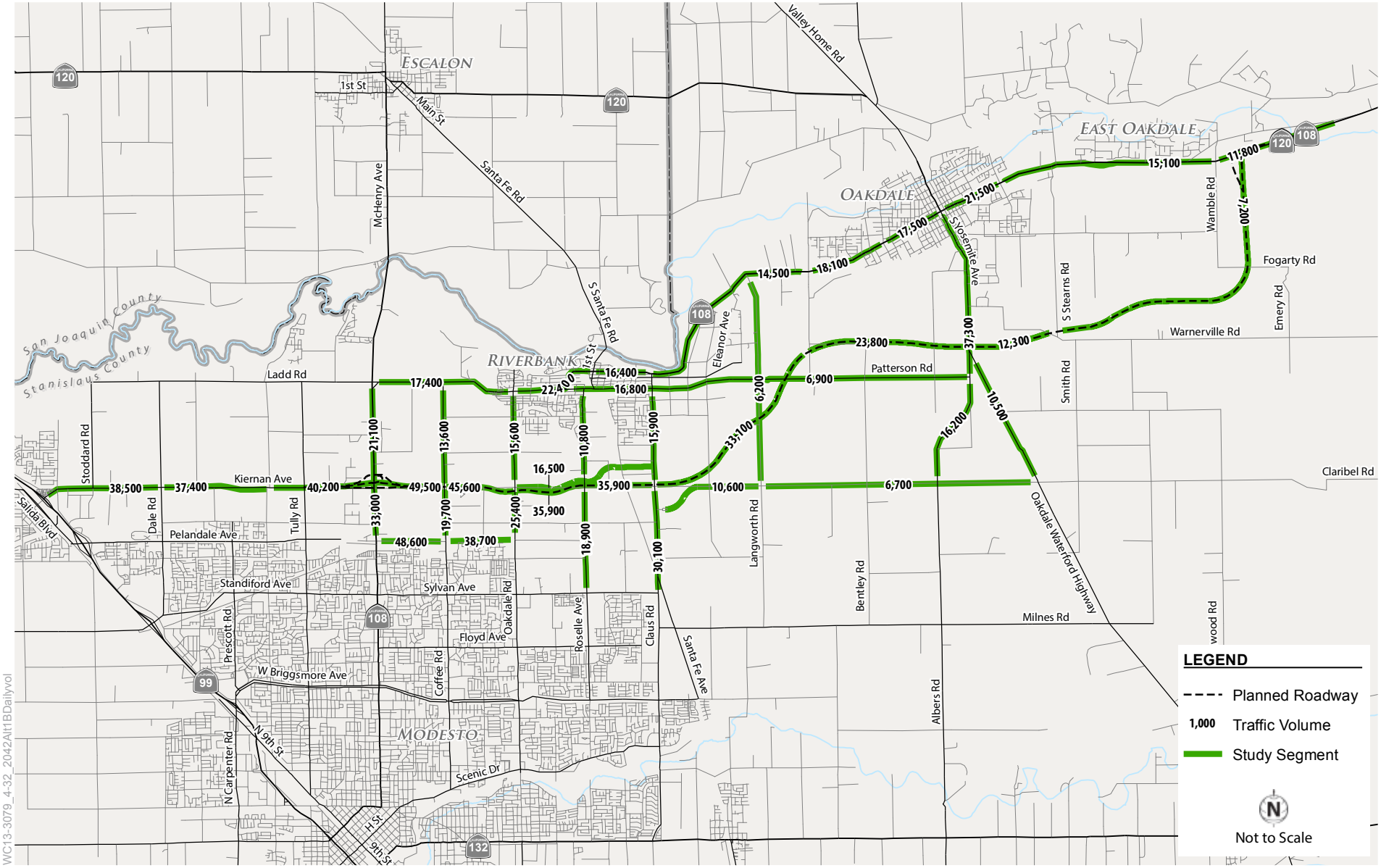
N

Not to Scale

WC13-3079_4-31_2042Alt1BPMvol

Figure 4-31

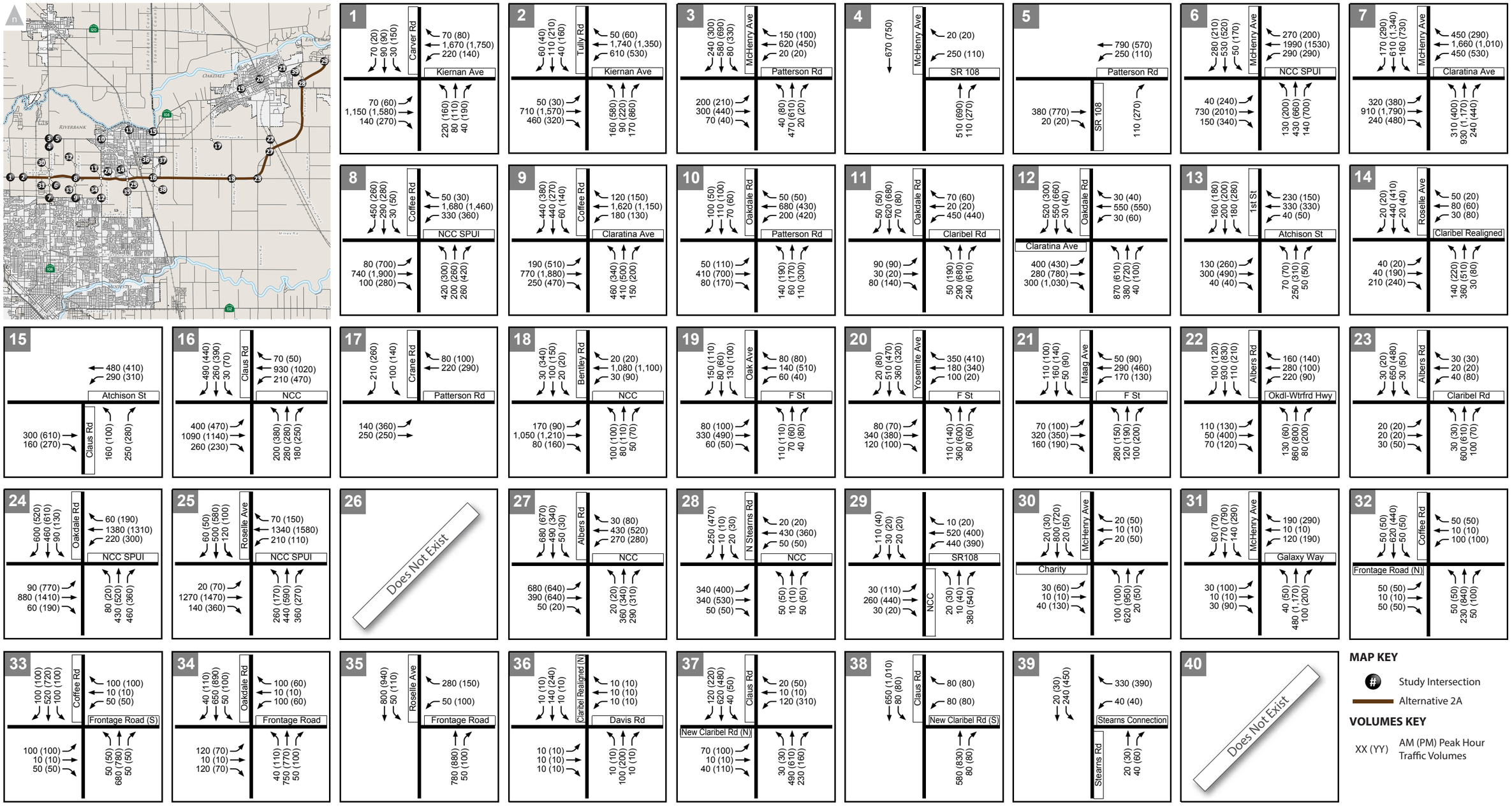
2042 Alternative 1B PM Peak Hour Roadway Volumes



WC13-3079_4-32_2042Alt1BDailyvol

Figure 4-32

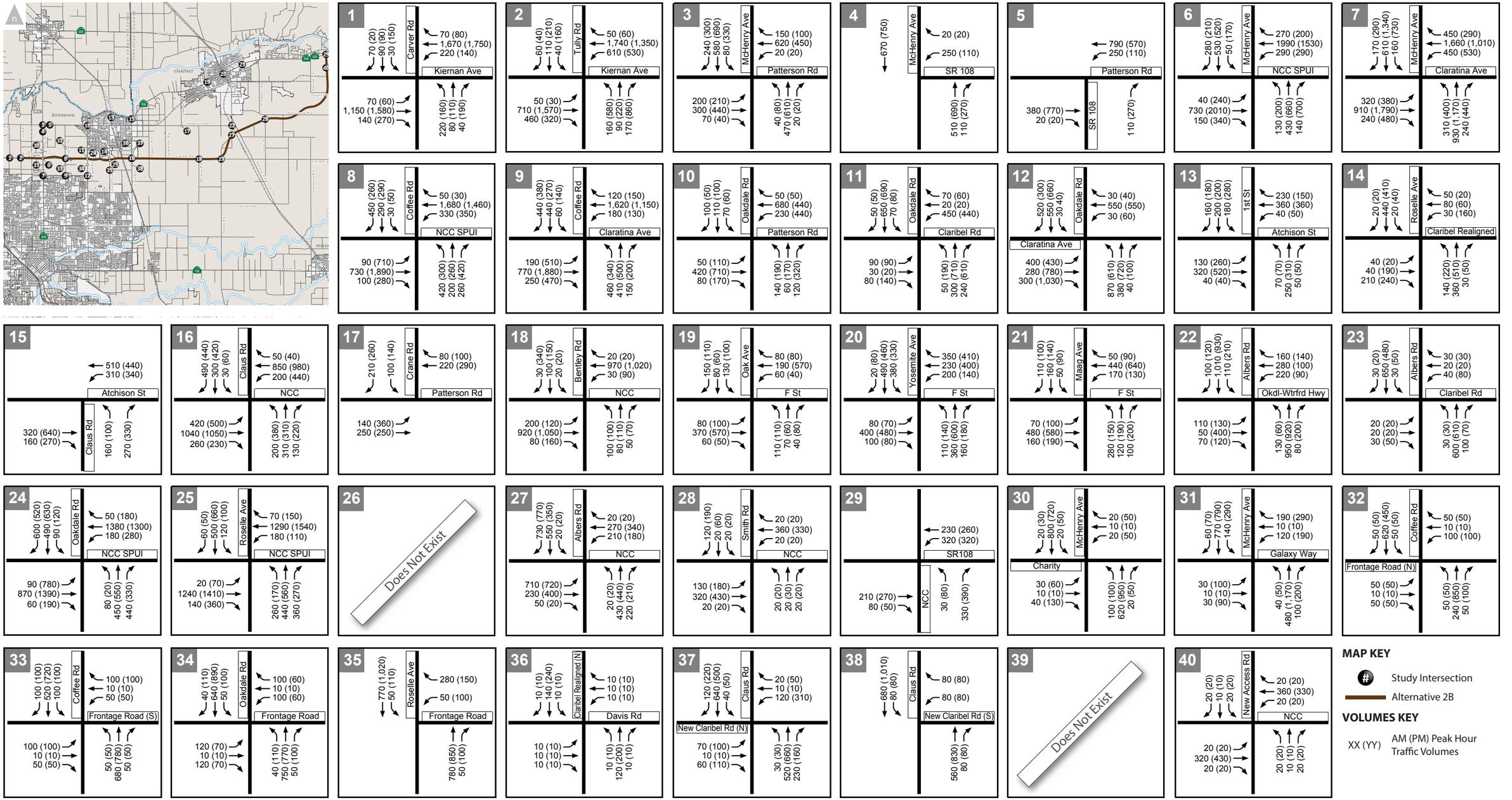
2042 Alternative 1B Daily Roadway Volumes



WC13-3079_4-33_2042AltI2AvoI

Figure 4-33

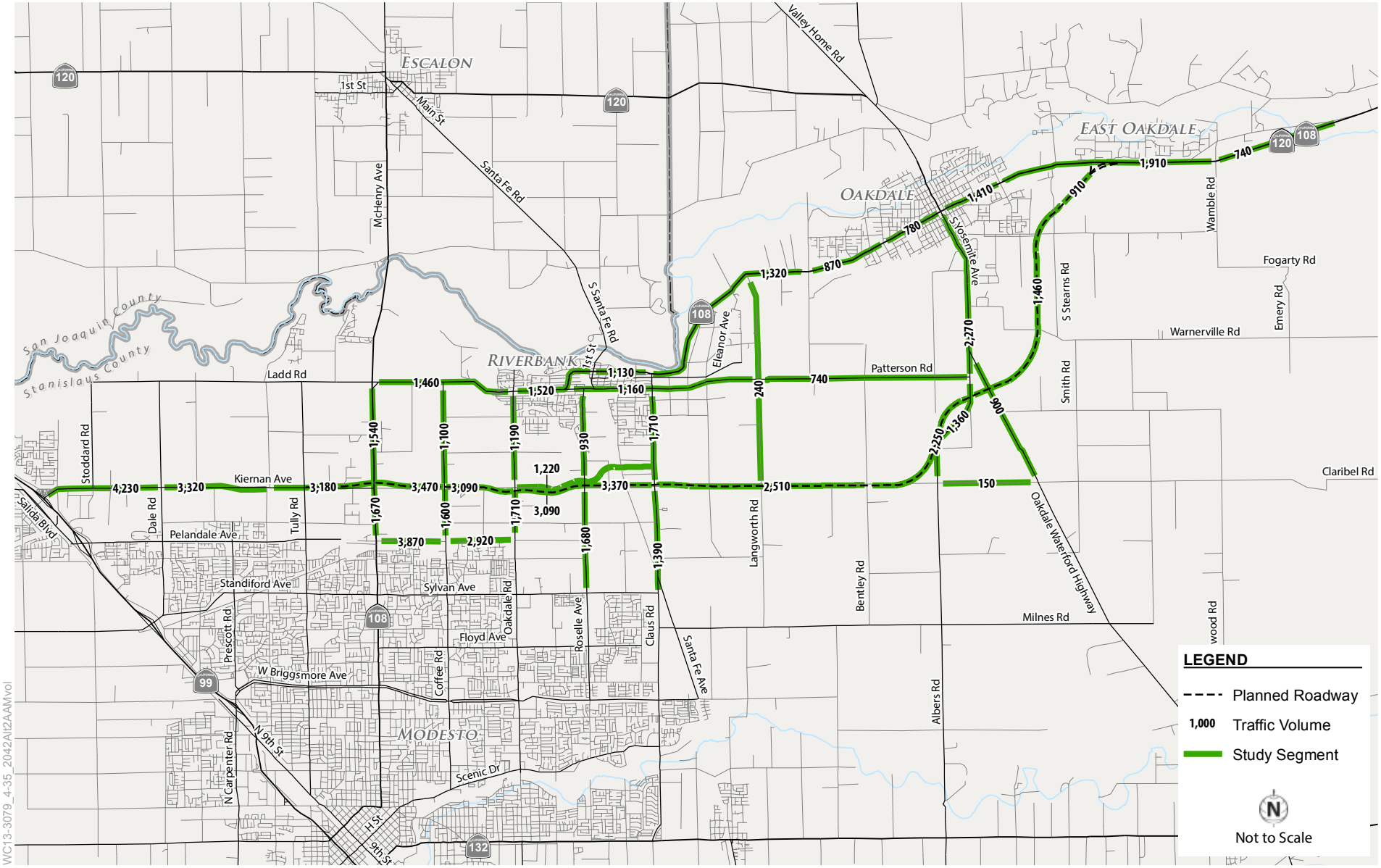
2042 Alternative 2A Peak Hour Intersection Volumes



WC13-3079_4-34_2042Alt2Bvol

Figure 4-34

2042 Alternative 2B Peak Hour Intersection Volumes



WC13-3079_4-35_2042Alt2AAMvol

Figure 4-35

2042 Alternative 2A AM Peak Hour Roadway Volumes

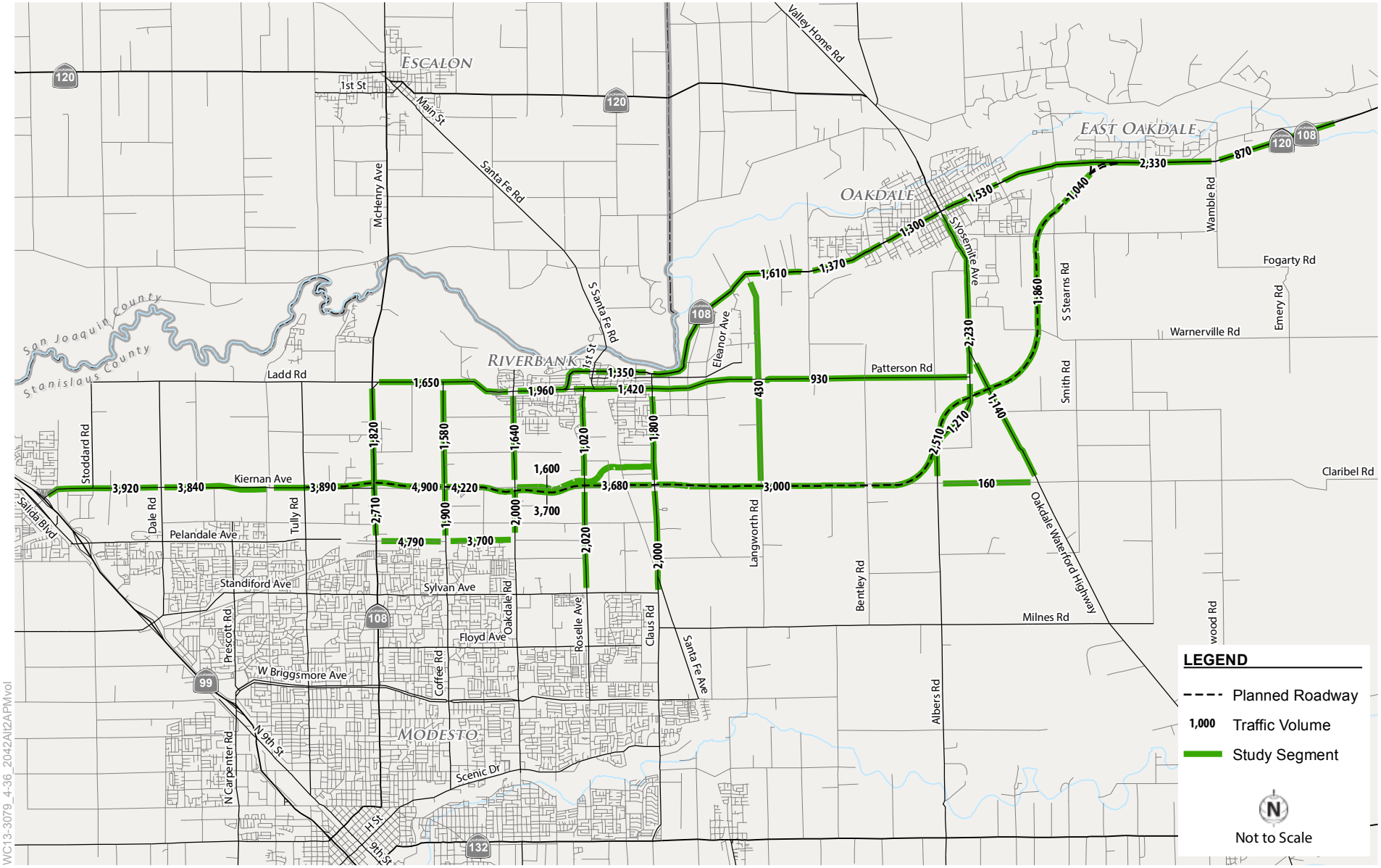


Figure 4-36

2042 Alternative 2A PM Peak Hour Roadway Volumes

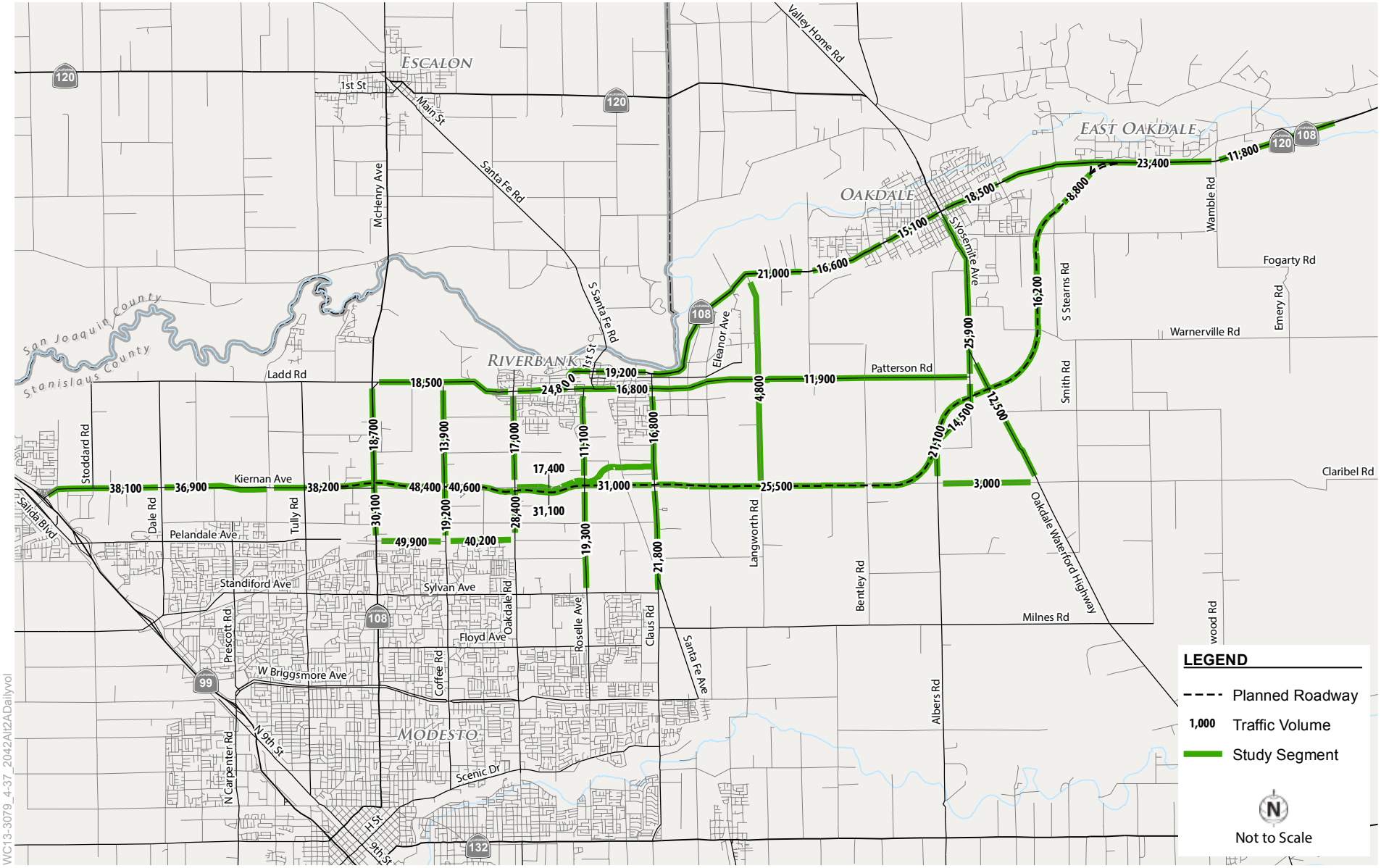


Figure 4-37

2042 Alternative 2A Daily Roadway Volumes

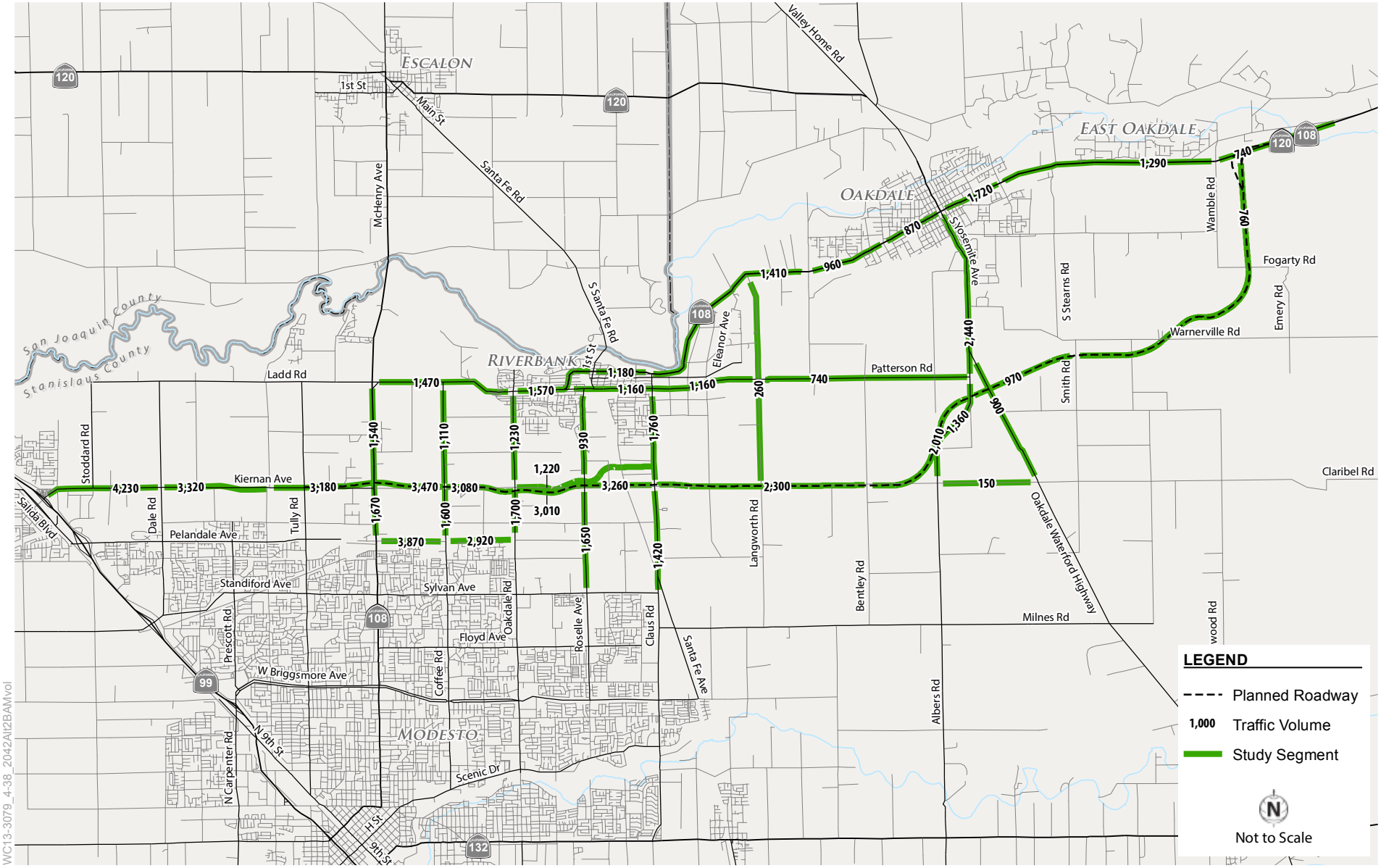


Figure 4-38

2042 Alternative 2B AM Peak Hour Roadway Volumes

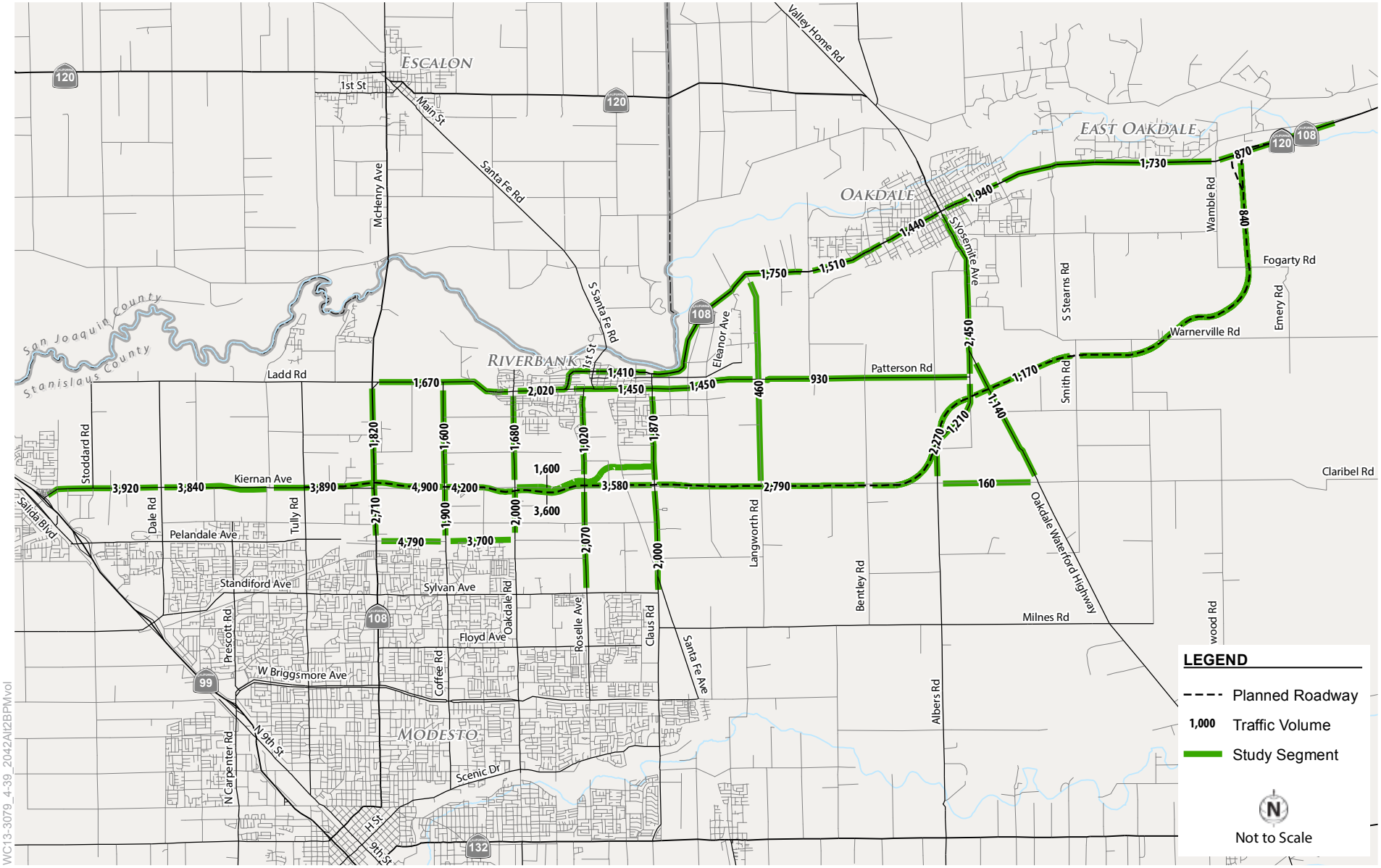
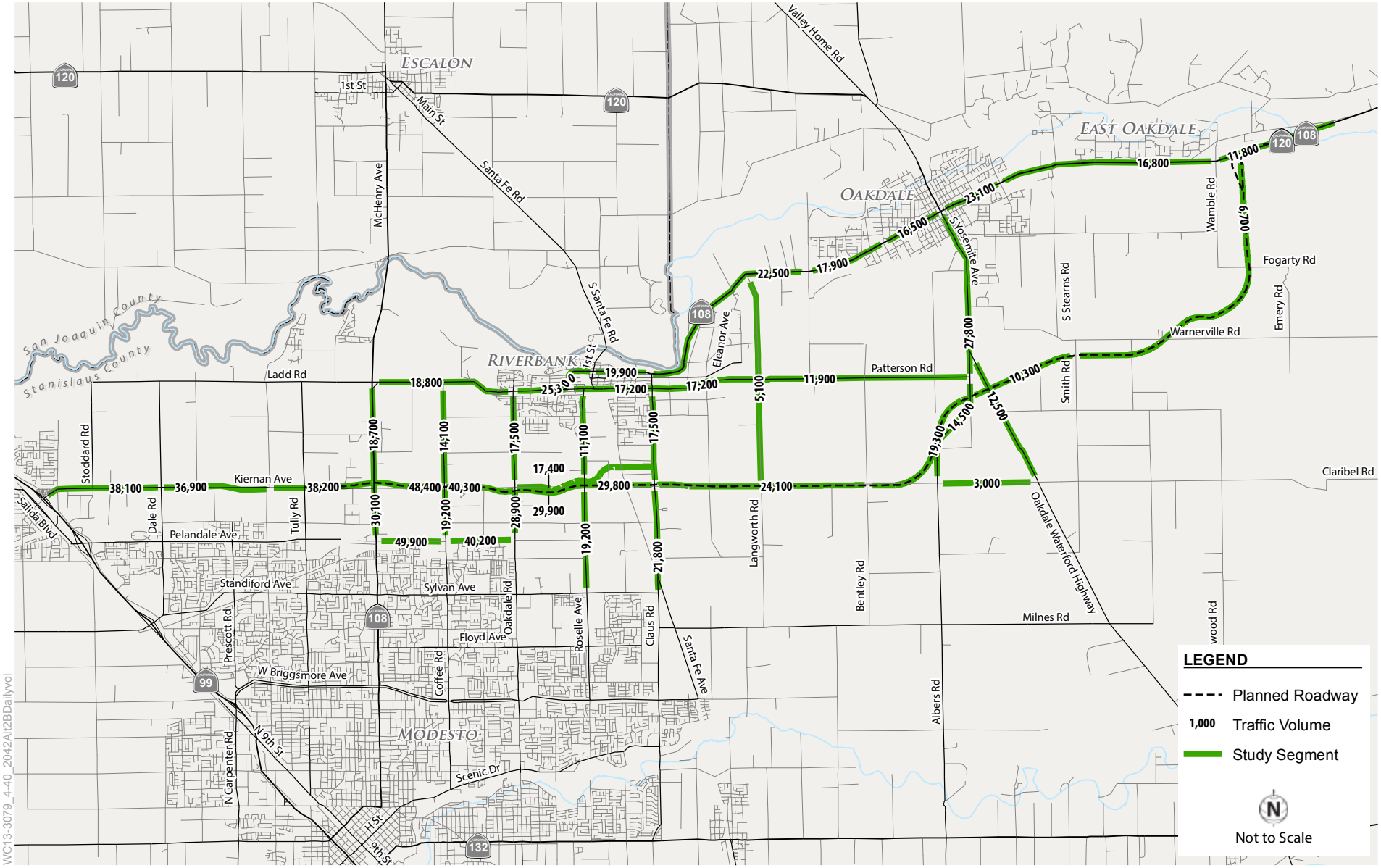


Figure 4-39

2042 Alternative 2B PM Peak Hour Roadway Volumes



LEGEND

Planned Roadway

1,000 Traffic Volume

Study Segment

N

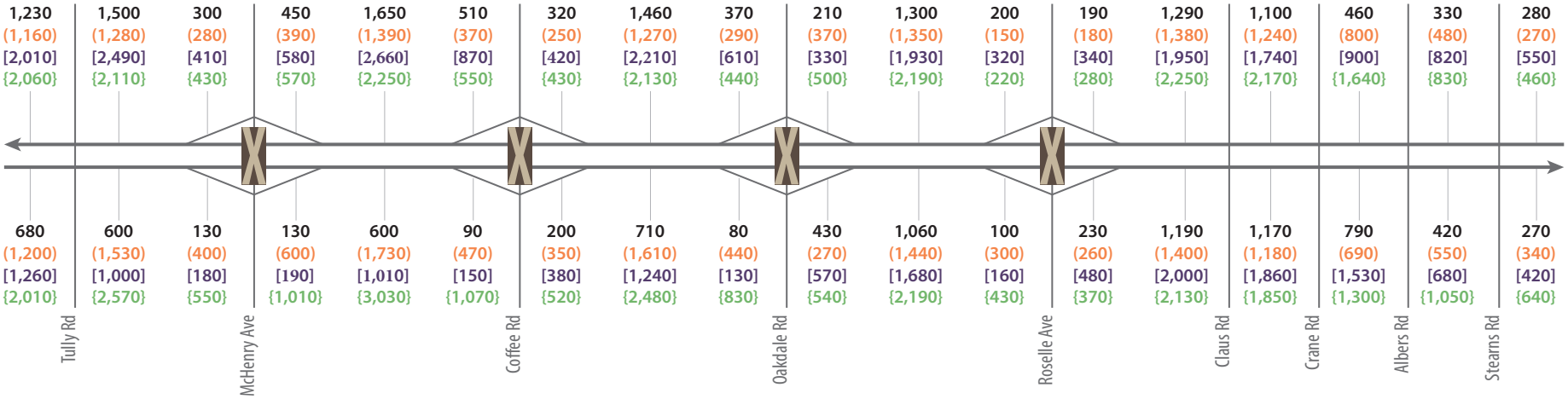
Not to Scale

WC13-3079_4-40_2042Alt2BDailyvol

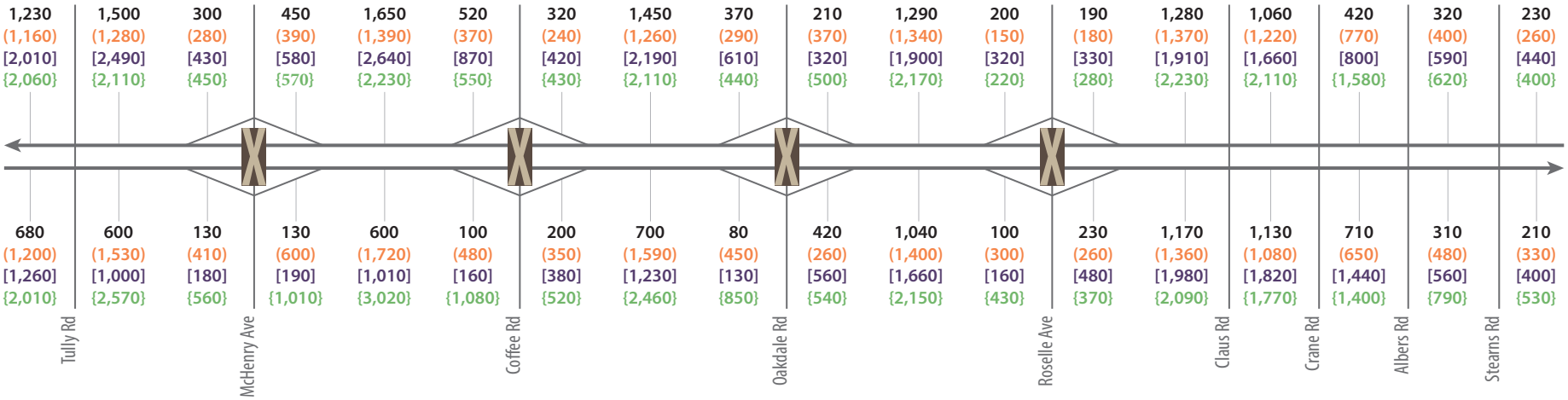
Figure 4-40

2042 Alternative 2B Daily Roadway Volumes

ALTERNATIVE 1A



ALTERNATIVE 1B



WC13-3079_4-41_Alt1Comparison

LEGEND

###	2022 AM
(###)	(2022 PM)
[###]	[2042 AM]
{###}	{2042 PM}

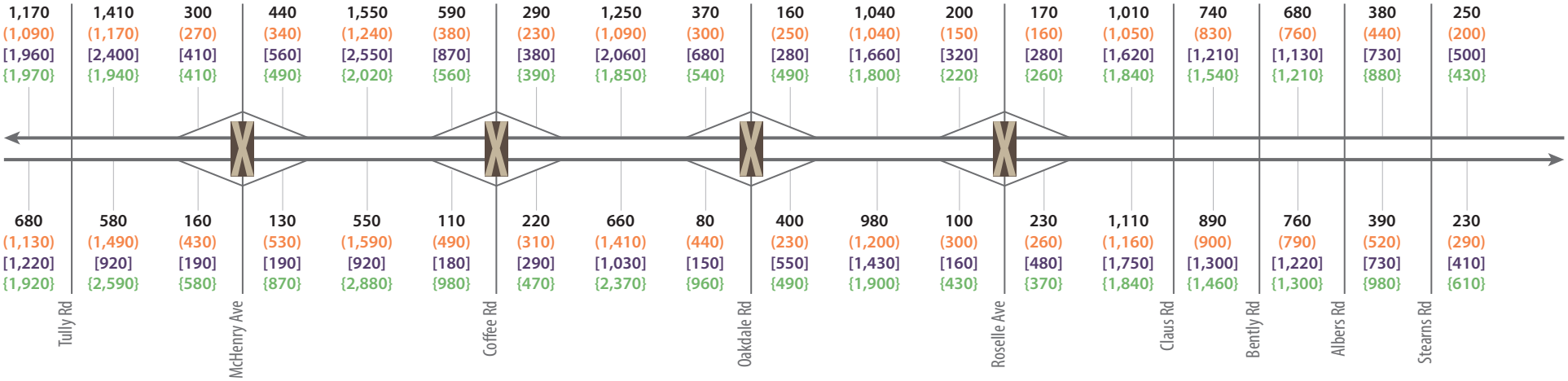
Single Point Urban Interchange (SPUI)

Figure 4-41

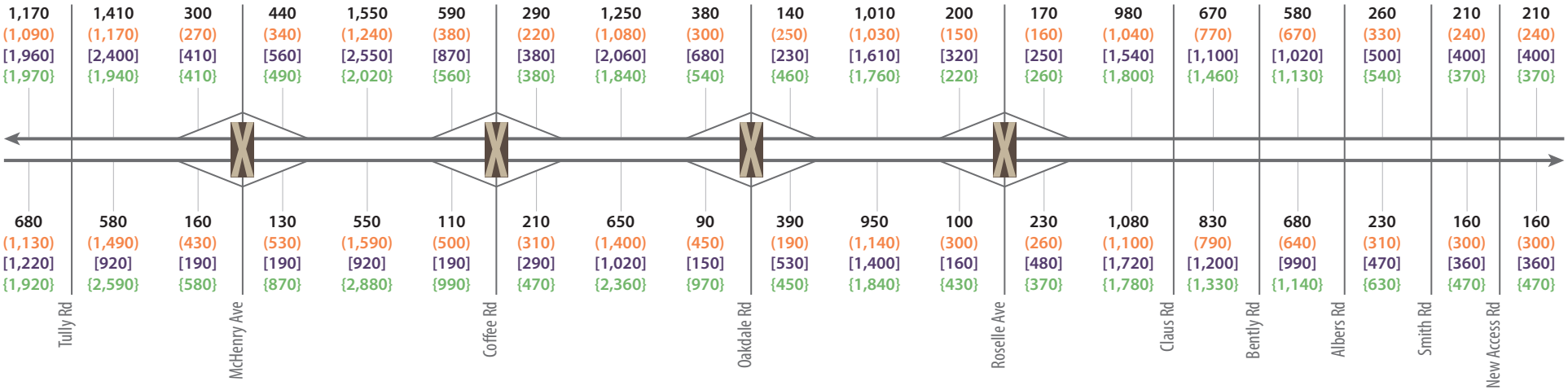
2022 and 2042

NCC Mainline and Ramp Peak Hour Volumes for Alternative 1A and Alternative 1B

ALTERNATIVE 2A



ALTERNATIVE 2B



WC13-3079_4-42_Alt2Comparison

LEGEND

###	2022 AM
(###)	(2022 PM)
[###]	[2042 AM]
{###}	{2042 PM}

Single Point Urban Interchange (SPUI)

Figure 4-42

2022 and 2042

NCC Mainline and Ramp Peak Hour Volumes for Alternative 2A and Alternative 2B

CHAPTER 5. YEAR 2022 TRAFFIC OPERATIONS ANALYSIS

This chapter presents the results of the traffic operations analysis for year 2022. The operations analysis for year 2022 addresses intersection, arterial, highway, freeway and ramp junction operations for No Project and the four Project Alternatives.

5.1 INTERSECTION PEAK HOUR SIGNAL WARRANTS

The peak hour volume traffic signal warrant found in the CA MUTCD was evaluated for the usignalized intersections in the study area and summarized in **Table 5-1**. The following intersections meet the peak hour signal warrant under 2022 No Project conditions:

- Kiernan Avenue/Carver Road
- Kiernan Avenue/Tully Road
- Kiernan Avenue/Coffee Road
- Oakdale Road/Claratina Avenue
- Claribel Road/Roselle Avenue
- SR 108/Claus Road
- Patterson Road/Crane Road
- Claribel Road/Bentley Road – PM only

As shown in **Table 5-1**, most of the intersections above would continue to meet the peak hour signal warrant under With Project conditions. Claribel Road/Bentley road would only meet signal warrant in Alternatives 2A and 2B. All of the intersections added by the project would meet the peak hour signal warrant, except Claribel Realigned/Davis Road and North County Corridor/Smith Road. An evaluation of all applicable warrants should be conducted and additional factors (e.g., congestion, approach conditions, driver confusion) should be considered before the decision to install a signal is made. Detailed signal warrant calculations are provided in Appendix L.

TABLE 5-1
2022 PEAK HOUR SIGNAL WARRANT ANALYSIS

Intersection	Control[1]	Peak Hour Warrant Met?				
		No Project	Alt 1A	Alt 1B	Alt 2A	Alt 2B
1. Kiernan Avenue/Carver Road	AWSC	Yes (AM and PM)	Yes (AM and PM)	Yes (AM and PM)	Yes (AM and PM)	Yes (AM and PM)
2. Kiernan Avenue/Tully Road	AWSC	Yes (AM and PM)	Yes (AM and PM)	Yes (AM and PM)	Yes (AM and PM)	Yes (AM and PM)
8. North County Corridor/Coffee Road	AWSC	Yes (AM and PM)	Yes (AM) and No (PM)	Yes (AM and PM)	Yes (AM and PM)	Yes (AM and PM)
12. Oakdale Road/Claratina Avenue	AWSC	Yes (AM and PM)	Yes (AM and PM)	Yes (AM and PM)	Yes (AM and PM)	Yes (AM and PM)
14. Claribel Road/Roselle Avenue	AWSC	Yes (AM and PM)	No	No	No	No
15. SR 108/Claus Road	AWSC	Yes (AM and PM)	No	Yes (AM and PM)	Yes (AM and PM)	Yes (AM and PM)
17. Patterson Road/Crane Road	AWSC	No (AM) and Yes (PM)	No	No	No	No
18. Claribel Road/Bentley Road	SSSC	No	No	No	Yes (AM and PM)	Yes (AM and PM)
24. North County Corridor/Oakdale Road	AWSC	Does not exist	Yes (AM) and (PM)	Yes (AM) and (PM)	No (AM) and Yes (PM)	No (AM) and Yes (PM)
25. North County Corridor/Roselle Avenue	AWSC		No	No	No	No
26. North County Corridor/Crane Road	AWSC		Yes (AM) and (PM)	Yes (AM) and (PM)	N/A	
27. North County Corridor/Albers Road	AWSC		Yes (AM) and (PM)	Yes (AM) and (PM)	Yes (AM) and (PM)	Yes (AM) and (PM)
28. North County Corridor/North Stearns Road (Smith Road)	Round-about		Yes (AM) and (PM)	No	No (AM) and Yes (PM)	No
29. North County Corridor/SR 108	Round-about		Yes (AM) and (PM)	No (AM) and Yes (PM)	Yes (AM) and (PM)	No (AM) and Yes (PM)
30. McHenry Avenue/Charity Way	AWSC		No (AM) and Yes (PM)	No (AM) and Yes (PM)	No (AM) and Yes (PM)	No (AM) and Yes (PM)
31. McHenry Avenue/Galaxy Way	AWSC		No (AM) and Yes (PM)	No (AM) and Yes (PM)	No (AM) and Yes (PM)	No (AM) and Yes (PM)

Notes:
1. SSSC = side-street stop-controlled intersection, AWSC = all-way stop-controlled intersection

Source: Fehr & Peers, 2015.

TABLE 5-1
2022 PEAK HOUR SIGNAL WARRANT ANALYSIS

Intersection	Control[1]	Peak Hour Warrant Met?				
		No Project	Alt 1A	Alt 1B	Alt 2A	Alt 2B
32. Coffee Road/Frontage Road (N)	AWSC		No	No	No	No
33. Coffee Road/Frontage Road (S)	AWSC	Does not exist	Yes (AM and PM)	Yes (AM and PM)	Yes (AM and PM)	Yes (AM and PM)
34. Oakdale Road/Frontage Road (S)	AWSC		Yes (AM and PM)	Yes (AM and PM)	Yes (AM and PM)	Yes (AM and PM)
35. Roselle Avenue/Frontage Road (S)	AWSC		Yes (AM and PM)	Yes (AM and PM)	Yes (AM and PM)	Yes (AM and PM)
36. Claribel Realigned (N)/Davis Road	SSSC		No	No	No	No
37. Claus Road/Claribel Realigned (N)	AWSC		Yes (AM and PM)	Yes (AM and PM)	Yes (AM and PM)	Yes (AM and PM)
38. Claus Road/Claribel Realigned (S)	AWSC		Yes (AM and PM)	Yes (AM and PM)	Yes (AM and PM)	Yes (AM and PM)
39. Stearns Road/Stearns Road Connection	AWSC		No (AM) and Yes(PM)	No	No (AM) and Yes(PM)	N/A
40. North County Corridor/New Access Road	Round-about		N/A	No	N/A	No

Notes:
1. SSSC = side-street stop-controlled intersection, AWSC = all-way stop-controlled intersection

Source: Fehr & Peers, 2015.

5.2 YEAR 2022 INTERSECTION OPERATIONS

Year 2022 intersection traffic operations were evaluated using the calibrated/validated SimTraffic models developed for Existing Conditions. The models were updated to reflect planned roadway improvements (e.g. Kiernan Avenue widening, Claribel Road widening, etc.). **Table 5-2** and **Table 5-3** present the Year 2022 simulated intersection level of service and vehicle queuing results for each of the study intersections under No Project and the four Project Alternatives. The Fehr & Peers analysis worksheets are presented in Appendix M.[3]

[3] Please note that Synchro worksheets are provided for the study intersections in Appendix M for informational purposes to present key modeling inputs including lanes, volumes, and signal timings. The results presented in Tables 6-2 and 6-3 are from the Fehr & Peers analysis worksheets, which are the average of ten SimTraffic model runs.

Intersection Level of Service

As shown in **Table 5-2**, 3 intersections are anticipated to operate at unacceptable levels (according to thresholds presented in section 2.4 of this report) under No Project conditions during the AM and/or PM peak, including:

- 1st Street/SR 108 during the PM peak hour
- Roselle Avenue/Claribel Road during the PM peak hour
- SR 120/SR 108 during the AM and PM peak hours

Under the project alternatives none of the study intersections area anticipated to operate at unacceptable service levels.

Some of the intersections listed above are outside the State right-of-way. The local agencies have reviewed these results and acknowledge that several of the intersections will have substandard level of service in the future. Note that at locations that operate at unacceptable service levels in the future, all of the project alternatives either would result in no change to the intersection level of service or would provide a slight improvement. Therefore, none of the project alternatives would result in a degradation of traffic operations at any of the study intersections.

As shown in **Table 5-2**, the new NCC intersections (including frontage roads) are anticipated to operate at acceptable service levels under all Project Alternatives. The new single point urban interchanges (SPUI) at SR 108, Coffee Road, Oakdale Road, and Roselle Avenue are anticipated to operate at LOS B or better conditions

Vehicle Queuing

Table 5-3 summarizes the 95th percentile queue lengths at intersections located along the State highway system and at the new NCC intersections. The 95th percentile queue lengths for all of the study intersections are presented in Appendix M. As shown in **Table 5-3**, queues at several turn bays exceed available storage under the No Project conditions and the Project alternatives. Under Project conditions, all of the intersections along Kiernan Avenue and NCC would provide adequate vehicle storage.

TABLE 5-2
2022 PEAK HOUR INTERSECTION ANALYSIS

Intersection	Traffic Control[1]	Peak Hour	No Project		Alternative 1A		Alternative 1B		Alternative 2A		Alternative 2B	
			Delay (secs / veh)[2,3]	LOS[2,3]	Delay (secs / veh)[2,3]	LOS[2,3]	Delay (secs / veh)[2,3]	LOS[2,3]	Delay (secs / veh)[2,3]	LOS[2,3]	Delay (secs / veh)[2,3]	LOS[2,3]
1. Carver Road/Kiernan Avenue	Signal	AM	19	B	24	C	24	C	22	C	23	C
		PM	15	B	20	B	20	B	18	B	18	B
2. Tully Road/Kiernan Avenue	Signal	AM	18	B	17	B	17	B	18	B	13	B
		PM	27	C	21	C	21	C	16	B	20	B
3. McHenry Avenue/Ladd Road	Signal	AM	34	C	29	C	29	C	32	C	30	C
		PM	39	D	41	D	44	D	40	D	40	D
4. McHenry Avenue/SR 108	Signal	AM	12	B	11	B	11	B	11	B	11	B
		PM	9	A	8	A	8	A	9	A	9	A
5. SR 108/Patterson Road	Signal	AM	10	A	8	A	8	A	9	A	8	A
		PM	14	B	12	B	12	B	14	B	13	B
6. McHenry Avenue/Kiernan Avenue	Signal	AM	26	C	14	B	14	B	14	B	14	B
		PM	28	C	15	B	14	B	15	B	14	B
7. McHenry Avenue/Claratina Avenue	Signal	AM	33	C	30	C	30	C	31	C	29	C
		PM	53	D	39	D	42	D	36	D	37	D
8. Coffee Road/Claribel Road	Signal	AM	18	B	13	B	11	B	14	B	14	B
		PM	17	B	12	B	12	B	13	B	13	B

Notes: Results in **bold** represent unacceptable levels of service as determined by the applicable standards of the relevant jurisdictions. Results based on SimTraffic simulation of 10 runs.

1. Signal = signalized intersection, SSSC = side street stop controlled intersection, AWSC = all-way stop-controlled intersection, Roundabout = roundabout controlled intersection

2. Signalized and all-way stop intersection level of service based on weighted average control delay per vehicle, according to the *2010 Highway Capacity Manual*.

3. Side-street stop intersection level of service based on weighted average control delay per vehicle and worst approach control delay per vehicle, according to the *2010 Highway Capacity Manual* in the notation: average (worst approach).

Source: Fehr & Peers, 2015.

TABLE 5-2
2022 PEAK HOUR INTERSECTION ANALYSIS

Intersection	Traffic Control[1]	Peak Hour	No Project		Alternative 1A		Alternative 1B		Alternative 2A		Alternative 2B	
			Delay (secs / veh)[2,3]	LOS[2,3]	Delay (secs / veh)[2,3]	LOS[2,3]	Delay (secs / veh)[2,3]	LOS[2,3]	Delay (secs / veh)[2,3]	LOS[2,3]	Delay (secs / veh)[2,3]	LOS[2,3]
9. Coffee Road/Claratina Avenue	Signal	AM	24	C	23	C	23	C	25	C	23	C
		PM	25	C	23	C	23	C	23	C	23	C
10. Oakdale Road/Patterson Road	Signal	AM	26	C	21	C	21	C	22	C	22	C
		PM	33	C	28	C	28	C	32	C	34	C
11. Oakdale Road/Claribel Road	Signal	AM	35	D	18	B	18	B	18	B	18	B
		PM	42	D	19	B	20	C	20	B	20	B
12. Oakdale Road/Claratina Avenue	Signal	AM	21	C	23	C	23	C	25	C	24	C
		PM	21	C	18	B	18	B	19	B	19	B
13. 1st Street/SR 108	Signal	AM	48	D	23	C	23	C	27	C	30	C
		PM	**56**	**E**	31	C	32	C	37	D	38	D
14. Roselle Avenue/Claribel Road	Signal	AM	39	D	4	A	4	A	4	A	4	A
		PM	**90**	**F**	4	A	5	A	5	A	5	A
15. Claus Road/SR 108	Signal	AM	15	B	5	A	5	A	8	A	8	A
		PM	20	B	6	A	7	A	11	B	11	B
16. Claus Road/Claribel Road	Signal	AM	31	C	20	C	20	C	18	B	17	B
		PM	38	D	25	C	27	C	19	B	21	C

Notes: Results in **bold** represent unacceptable levels of service as determined by the applicable standards of the relevant jurisdictions.

1. Results based on SimTraffic simulation of 10 runs.
2. Signal = signalized intersection, SSSC = side street stop controlled intersection, AWSC = all-way stop-controlled intersection, Roundabout = roundabout controlled intersection
3. Signalized and all-way stop intersection level of service based on weighted average control delay per vehicle, according to the *2010 Highway Capacity Manual*.
4. Side-street stop intersection level of service based on weighted average control delay per vehicle and worst approach control delay per vehicle, according to the *2010 Highway Capacity Manual* in the notation: average (worst approach).

Source: Fehr & Peers, 2015.

TABLE 5-2
2022 PEAK HOUR INTERSECTION ANALYSIS

Intersection	Traffic Control[1]	Peak Hour	No Project		Alternative 1A		Alternative 1B		Alternative 2A		Alternative 2B	
			Delay (secs / veh)[2,3]	LOS[2,3]	Delay (secs / veh)[2,3]	LOS[2,3]	Delay (secs / veh)[2,3]	LOS[2,3]	Delay (secs / veh)[2,3]	LOS[2,3]	Delay (secs / veh)[2,3]	LOS[2,3]
17. Crane Road/Patterson Road	Signal	AM	5	A	3	A	3	A	3	A	3	A
		PM	14	B	3	A	3	A	4	A	9	A
18. Bentley Road/Claribel Road	SSSC/ Signal	AM	3	A	2	A	2	A	16	C	16	C
		PM	4	A	3	A	3	A	14	B	14	B
19. Oak Avenue/SR 108	Signal	AM	22	C	11	B	11	B	11	B	11	B
		PM	25	C	12	B	13	B	12	B	12	B
20. SR 120/SR 108	Signal	AM	**56**	**E**	28	C	28	C	28	C	35	C
		PM	**74**	**E**	32	C	36	D	32	C	36	D
21. SR 108/Maag Avenue	Signal	AM	24	C	18	B	18	B	20	C	21	C
		PM	25	C	17	B	18	B	18	B	18	B
22. Albers Road/Patterson Road	Signal	AM	28	C	18	B	18	B	23	C	23	C
		PM	26	C	25	C	25	C	26	C	25	C
23. Albers Road/Claribel Road	Signal	AM	21	C	16	B	16	B	6	A	7	A
		PM	15	B	13	B	13	B	8	A	8	A
24. Oakdale Road/NCC	Signal	AM	Not Applicable Under No Project Conditions		9	A	9	A	8	A	8	A
		PM			19	B	13	B	13	B	14	B

Notes: Results in **bold** represent unacceptable levels of service as determined by the applicable standards of the relevant jurisdictions.

1. Results based on SimTraffic simulation of 10 runs.
2. Signal = signalized intersection, SSSC = side street stop controlled intersection, AWSC = all-way stop-controlled intersection, Roundabout = roundabout controlled intersection
3. Signalized and all-way stop intersection level of service based on weighted average control delay per vehicle, according to the *2010 Highway Capacity Manual*.
4. Side-street stop intersection level of service based on weighted average control delay per vehicle and worst approach control delay per vehicle, according to the *2010 Highway Capacity Manual* in the notation: average (worst approach).

Source: Fehr & Peers, 2015.

TABLE 5-2
2022 PEAK HOUR INTERSECTION ANALYSIS

Intersection	Traffic Control[1]	Peak Hour	No Project		Alternative 1A		Alternative 1B		Alternative 2A		Alternative 2B	
			Delay (secs / veh)[2,3]	LOS[2,3]	Delay (secs / veh)[2,3]	LOS[2,3]	Delay (secs / veh)[2,3]	LOS[2,3]	Delay (secs / veh)[2,3]	LOS[2,3]	Delay (secs / veh)[2,3]	LOS[2,3]
25. Roselle Ave/NCC	Signal	AM	Not Applicable Under No Project Conditions		11	B	11	B	10	B	10	B
		PM			15	B	12	B	12	B	13	B
26. Crane Road/NCC	Signal	AM			11	B	11	B	Intersection Does Not Exist			
		PM			31	C	14	B				
27. Albers Road/NCC	Signal	AM			19	B	19	B	20	C	20	B
		PM			35	C	18	B	18	B	17	B
28. Stearns Connection/NCC	Signal (1B, 2B) / Roundabout (1A, 2A)	AM			5	A	5	A	4	A	7	A
		PM			5	A	5	A	5	A	8	A
29. NCC/ SR120/108	Roundabout	AM			5	A	4	A	5	A	4	A
		PM			5	A	4	A	5	A	4	A
30. McHenry Ave/Charity Way	Signal	AM			6	A	6	A	4	A	6	A
		PM			11	B	8	A	8	A	8	A
31. McHenry Ave/Galaxy Way	Signal	AM			5	A	5	A	6	A	6	A
		PM			29	C	10	A	10	A	10	A
32. Coffee Road/Frontage Road (N)	Signal	AM			2	A	2	A	2	A	2	A
		PM			10	A	2	A	2	A	4	A
33. Coffee Road/Frontage Road (S)	Signal	AM			2	A	2	A	3	A	3	A
		PM			12	B	2	A	2	A	4	A

Notes: Results in **bold** represent unacceptable levels of service as determined by applicable standards of relevant jurisdictions.

1. Results based on SimTraffic simulation of 10 runs.
2. Signal = signalized intersection, SSSC = side street stop controlled intersection, AWSC = all-way stop-controlled intersection, Roundabout = roundabout controlled intersection
3. Signalized and all-way stop intersection level of service based on weighted average control delay per vehicle, according to the *2010 Highway Capacity Manual*.
4. Side-street stop intersection level of service based on weighted average control delay per vehicle and worst approach control delay per vehicle, according to the *2010 Highway Capacity Manual* in the notation: average (worst approach).
5. Roundabout analysis based on Sidra 6.0 traffic analysis software using the HCM Roundabout Analysis methodology with California-specific values.

Source: Fehr & Peers, 2015.

TABLE 5-2
2022 PEAK HOUR INTERSECTION ANALYSIS

Intersection	Traffic Control[1]	Peak Hour	No Project		Alternative 1A		Alternative 1B		Alternative 2A		Alternative 2B	
			Delay (secs / veh)[2,3]	LOS[2,3]	Delay (secs / veh)[2,3]	LOS[2,3]	Delay (secs / veh)[2,3]	LOS[2,3]	Delay (secs / veh)[2,3]	LOS[2,3]	Delay (secs / veh)[2,3]	LOS[2,3]
34. Oakdale Road/Frontage Road (S)	Signal	AM	Not Applicable Under No Project Conditions		3	A	3	A	3	A	3	A
		PM			12	B	4	A	4	A	6	A
35. Roselle Ave/Frontage Road (S)	Signal	AM			5	A	5	A	5	A	5	A
		PM			11	B	5	A	5	A	5	A
36. Claribel Realigned (N)/Davis Road	SSSC	AM			2	A	2	A	2	A	2	A
		PM			2	A	2	A	2	A	2	A
37. Claus Road/Claribel Realigned (N)	Signal	AM			6	A	6	A	7	A	7	A
		PM			18	B	11	B	11	B	11	B
38. Claus Road/Claribel Realigned (S)	Signal	AM			7	A	7	A	2	A	2	A
		PM			19	B	2	A	2	A	4	A
39. Stearns/Stearns Connection	Signal (AWSC - 1B)	AM			3	A	3	A	3	A	Intersection Does Not Exist	
		PM			7	A	3	A	3	A		
40. New Access Road/NCC	Roundabout	AM			Intersection Does not Exist		4	A	Intersection Does Not Exist		4	A
		PM					4	A			4	A

Notes: Results in **bold** represent unacceptable levels of service as determined based on applicable standards of relevant jurisdictions.

1. Results based on SimTraffic simulation of 10 runs.
2. Signal = signalized intersection, SSSC = side street stop controlled intersection, AWSC = all-way stop-controlled intersection, Roundabout = roundabout controlled intersection
3. Signalized and all-way stop intersection level of service based on weighted average control delay per vehicle, according to the *2010 Highway Capacity Manual*.
4. Side-street stop intersection level of service based on weighted average control delay per vehicle and worst approach control delay per vehicle, according to the *2010 Highway Capacity Manual* in the notation: average (worst approach).
5. Roundabout analysis based on Sidra 6.0 traffic analysis software using the HCM Roundabout Analysis methodology with California-specific values.

Source: Fehr & Peers, 2015.

TABLE 5-3
2022 PEAK HOUR QUEUING ANALYSIS

Intersection	Movement[1]	Scenario	Available Storage (ft)[2]	AM Peak Hour					PM Peak Hour				
				No Project	Alt 1A	Alt 1B	Alt 2A	Alt 2B	No Project	Alt 1A	Alt 1B	Alt 2A	Alt 2B
1. Kiernan Avenue (NCC) / Carver Road	NB-L	all	330	173	206	191	181	187	93	104	112	108	101
	NB-TR	all	2,600	75	92	77	77	79	114	151	135	146	140
	SB-L	all	300	43	48	54	55	50	80	83	97	82	80
	SB-TR	all	7,900	152	159	167	133	143	89	107	97	102	95
	EB-L	all	530	75	80	73	73	80	63	73	73	72	80
	EB-T	all	4,000	166	178	185	179	194	135	204	204	186	185
	EB-R	all	410	76	86	82	77	78	69	86	88	80	90
	WB-L	all	580	99	219	228	201	202	67	150	154	114	126
	WB-T	all	2,600	202	224	238	208	219	177	191	190	191	195
	WB-R	all	530	50	55	53	47	54	38	49	49	46	40
2. Kiernan Avenue (NCC) / Tully Road	NB-L	all	400	130	48	52	51	53	254	100	98	98	98
	NB-T	all	3,700	73	49	54	53	54	135	68	74	70	74
	NB-R	all	400	64	0	0	0	0	99	0	0	0	0
	SB-L	all	300	52	53	57	55	54	88	78	94	95	96
	SB-TR	all	2,600	138	61	67	61	67	154	73	72	74	70
	SB-T	all	2,600	138	58	61	53	52	154	40	36	35	41
	EB-L	all	715	61	65	68	66	69	88	49	52	46	54
	EB-T	all	2,500	126	147	151	145	146	217	409	405	242	252
	EB-R	all	355	136	127	124	135	132	122	103	106	95	96
	WB-L	all	660 (920	190	162	156	156	151	217	162	148	144	141
	WB-T	all	1,900	160	194	189	186	176	162	145	151	129	144
	WB-R	all	415 (750)	14	29	31	29	29	28	40	40	38	39

Notes: Results in **bold** denote locations where storage length is exceeded.

1. NB-northbound, SB-southbound, EB-eastbound, WB-westbound, L-left turn movement, T-through movement, R-right turn movement

2. Storage length shown in feet. If there is a value in parentheses, it shows the different storage length that applies under the With Project scenario unless otherwise indicated.

Source: Fehr & Peers, 2015

TABLE 5-3
2022 PEAK HOUR QUEUING ANALYSIS

Intersection	Movement[1]	Scenario	Available Storage (ft)[2]	AM Peak Hour					PM Peak Hour				
				No Project	Alt 1A	Alt 1B	Alt 2A	Alt 2B	No Project	Alt 1A	Alt 1B	Alt 2A	Alt 2B
3. McHenry Avenue / Ladd Road	NB-L	all	185	65	63	68	55	58	109	103	112	122	115
	NB-T	all	450	167	156	158	182	182	240	193	199	239	217
	NB-TR	all	450	152	148	151	171	158	223	180	189	229	209
	SB-L	all	290	158	126	126	123	133	**294**	**354**	**367**	**316**	**353**
	SB-T	all	3,500	335	231	234	261	242	320	380	440	345	434
	SB-TR	all	3,500	309	282	286	319	304	254	300	292	322	312
	EB-L	all	250	188	162	176	201	180	**287**	**325**	**327**	**299**	**282**
	EB-TR	all	2,600	200	99	95	173	154	380	391	545	419	299
	WB-L	all	90	69	56	68	55	52	71	52	59	74	74
	WB-T	all	580	485	373	389	485	417	409	298	290	332	343
	WB-R	all	160	**247**	**215**	**224**	**259**	**252**	**230**	**161**	**180**	**189**	**188**
4. McHenry Avenue / SR 108	NB-T	all	3,300	137	132	141	142	135	190	139	146	159	152
	SB-T	all	450	325	184	186	195	199	239	193	180	194	205
	WB-LR	all	660	161	184	161	164	151	113	111	119	102	103
5. SR 108 / Patterson Road	NB-R	all	660	59	40	40	53	51	162	135	133	107	112
	EB-TR	all	500	212	113	102	157	137	352	322	290	383	365
	WB-L	all	530	144	147	156	140	134	146	120	116	99	99
	WB-T	all	2,300	122	14	33	108	31	140	14	0	6	3

Notes: Results in **bold** denote locations where storage length is exceeded.

1. NB-northbound, SB-southbound, EB-eastbound, WB-westbound, L-left turn movement, T-through movement, R-right turn movement

2. Storage length shown in feet. If there is a value in parentheses, it shows the different storage length that applies under the With Project scenario unless otherwise indicated.

Source: Fehr & Peers, 2015

TABLE 5-3
2022 PEAK HOUR QUEUING ANALYSIS

Intersection	Movement[1]	Scenario	Available Storage (ft)[2]	AM Peak Hour					PM Peak Hour				
				No Project	Alt 1A	Alt 1B	Alt 2A	Alt 2B	No Project	Alt 1A	Alt 1B	Alt 2A	Alt 2B
6. SR 108 / Kiernan Avenue (NCC)	NB-L	all	260 (700)	141	98	97	101	103	**286**	123	105	112	119
	NB-T	all	1370 (1,670)	177	96	91	92	100	310	125	130	124	118
	NB-R	all	1,370 (700)	57	54	50	48	52	120	121	120	107	108
	SB-L	all	420 (550)	91	66	68	65	57	90	81	96	114	103
	SB-T	all	1260 (1,150)	207	143	117	109	120	186	126	113	114	117
	SB-R	all	535 (550)	140	109	99	99	111	105	88	85	87	80
	EB-L	all	775 (500)	95	45	45	57	60	179	105	101	108	111
	EB-T	all	1,460	122	0	0	0	0	190	0	0	0	0
	EB-R	all	660 (1,350)	33	111	117	122	126	183	183	167	166	160
	WB-L	all	975 (500)	137	98	105	99	101	117	100	99	94	92
	WB-T	all	5,280 (1,240)	305	0	0	0	0	211	0	0	0	0
	WB-TR	No Project	5,280	331	0	0	0	0	211	0	0	0	0
	WB-R	all	1,250	141	187	165	184	171	0	166	157	139	43
7. SR 108 / Pelandale Avenue	NB-L	all	225	222	159	144	142	153	**257**	187	198	190	199
	NB-T	all	590	**>1000**	221	209	223	206	**>1000**	**>1000**	**>1000**	**>1000**	**>1000**
	NB-TR	all	590	60	98	94	90	80	163	186	183	230	245
	SB-L	all	200	118	124	124	128	124	**299**	**274**	**308**	**272**	**278**
	SB-T	all	600	229	260	257	248	234	**>1000**	**267**	**>1000**	**254**	**>1000**
	SB-TR	all	600	176	199	204	187	174	**>1000**	**271**	**280**	**276**	**283**
	EB-L	all	350	**492**	151	152	181	153	**547**	315	335	194	245
	EB-T	all	750	**>1000**	169	168	**>1000**	162	**>1000**	**>1000**	**>1000**	**>1000**	**>1000**
	EB-R	all	350	113	90	83	98	87	**545**	341	**377**	223	281
	WB-L	all	300	189	123	127	162	132	199	130	123	139	145
	WB-T	all	2,540	**>1000**	**>1000**	**>1000**	**>1000**	**>1000**	**>1000**	**>1000**	**>1000**	**>1000**	**>1000**
	WB-R	all	350	306	203	190	225	190	181	102	89	92	88

Notes: Results in **bold** denote locations where storage length is exceeded.

1. NB-northbound, SB-southbound, EB-eastbound, WB-westbound, L-left turn movement, T-through movement, R-right turn movement

2. Storage length shown in feet. If there is a value in parentheses, it shows the different storage length that applies under the With Project scenario unless otherwise indicated.

Source: Fehr & Peers, 2015

TABLE 5-3
2022 PEAK HOUR QUEUING ANALYSIS

Intersection	Movement[1]	Scenario	Available Storage (ft)[2]	AM Peak Hour					PM Peak Hour				
				No Project	Alt 1A	Alt 1B	Alt 2A	Alt 2B	No Project	Alt 1A	Alt 1B	Alt 2A	Alt 2B
8. Coffee Road/Claribel Road (NCC)	NB-L	all	260 (650)	129	176	173	221	216	93	151	136	175	163
	NB-T	all	4,100 (950)	96	52	40	112	47	176	47	45	46	52
	NB-R	all	4,100 (650)	0	42	52	53	48	0	77	77	69	75
	SB-L	all	110 (650)	64	44	46	49	45	49	43	41	44	48
	SB-T	all	2230 (970)	206	100	100	111	104	135	74	79	99	89
	SB-R	all	260 (650)	45	115	142	163	143	0	74	73	75	82
	EB-L	all	320 (880)	77	41	45	44	41	138	113	101	123	121
	EB-T	all	5,280 (3,000)	127	0	0	0	0	183	0	0	0	0
	EB-R	all	250 (880)	0	70	71	72	77	0	135	131	115	120
	WB-L	all	420 (500)	103	121	116	116	111	133	89	91	96	85
	WB-T	all	5,250 (4,580)	238	0	0	0	0	185	0	0	0	0
	WB-R	all	240 (500)	0	52	52	56	50	0	55	55	41	38
10. Oakdale Road / SR 108	NB-L	all	200	160	167	160	158	166	**201**	176	177	182	**201**
	NB-T	all	590	104	91	89	93	82	167	101	113	124	139
	NB-R	all	590	192	111	122	132	124	279	209	221	323	334
	SB-L	all	150	102	95	93	96	99	106	88	90	113	100
	SB-T	all	250	173	104	110	146	141	160	90	97	115	119
	SB-R	all	75	**111**	**95**	**94**	**104**	**97**	**93**	70	75	74	74
	EB-L	all	525	108	65	68	71	79	132	140	133	141	141
	EB-T	all	1,100	135	76	82	121	113	265	218	225	253	268
	EB-TR	all	1,100	155	73	75	120	117	277	234	231	268	277
	WB-L	all	625	151	106	105	115	129	218	166	168	204	207
	WB-T	all	1,200	162	121	130	160	153	124	95	102	128	135
	WB-TR	all	675	209	146	151	184	174	157	113	121	150	156

Notes: Results in **bold** denote locations where storage length is exceeded.

1. NB-northbound, SB-southbound, EB-eastbound, WB-westbound, L-left turn movement, T-through movement, R-right turn movement

2. Storage length shown in feet. If there is a value in parentheses, it shows the different storage length that applies under the With Project scenario unless otherwise indicated.

Source: Fehr & Peers, 2015

TABLE 5-3
2022 PEAK HOUR QUEUING ANALYSIS

Intersection	Movement[1]	Scenario	Available Storage (ft)[2]	AM Peak Hour					PM Peak Hour				
				No Project	Alt 1A	Alt 1B	Alt 2A	Alt 2B	No Project	Alt 1A	Alt 1B	Alt 2A	Alt 2B
13. SR 108 / 1st Street	NB-L	all	250	140	98	117	94	131	171	104	135	165	145
	NB-TR	all	260	**350**	**272**	257	258	**313**	**360**	**304**	**311**	**334**	**333**
	SB-L	all	175	**239**	165	172	**181**	**204**	**271**	**246**	**250**	**254**	**251**
	SB-T	all	250	**317**	198	221	208	238	**564**	**352**	**418**	**459**	**406**
	SB-R	all	100	**177**	**139**	**143**	**123**	**140**	**190**	**153**	**154**	**178**	**178**
	EB-L	all	775	199	148	141	149	165	440	263	277	262	303
	EB-TR	all	1,860	368	92	111	189	211	610	262	330	402	468
	WB-L	all	75	**90**	72	**81**	**84**	**85**	**116**	**83**	**80**	**114**	**108**
	WB-T	all	400	**1185**	217	237	**406**	**483**	**959**	174	182	375	**405**
	WB-R	all	150	**272**	146	**161**	**229**	**251**	**260**	109	108	**196**	**221**
15. SR 108 / Claus Road	NB-L	all	320	87	65	58	86	73	132	59	61	73	81
	NB-R	all	150	91	25	38	75	63	149	52	60	83	104
	EB-T	all	170	**292**	66	77	103	99	**498**	108	108	**187**	**188**
	EB-TR	all	300	163	71	79	104	108	196	113	118	192	191
	WB-L	all	200	195	66	84	147	149	**205**	53	63	183	175
	WB-T	all	1,350	190	50	68	82	78	94	50	57	61	62

Notes: Results in **bold** denote locations where storage length is exceeded.

1. NB-northbound, SB-southbound, EB-eastbound, WB-westbound, L-left turn movement, T-through movement, R-right turn movement

2. Storage length shown in feet. If there is a value in parentheses, it shows the different storage length that applies under the With Project scenario unless otherwise indicated.

Source: Fehr & Peers, 2015

TABLE 5-3
2022 PEAK HOUR QUEUING ANALYSIS

Intersection	Movement[1]	Scenario	Available Storage (ft)[2]	AM Peak Hour					PM Peak Hour				
				No Project	Alt 1A	Alt 1B	Alt 2A	Alt 2B	No Project	Alt 1A	Alt 1B	Alt 2A	Alt 2B
16. Claribel Road/Claus Road (NCC)	NB-L	all	250 (720)	54	129	125	92	90	152	198	209	117	137
	NB-T	all	1,620 (2,100)	296	71	75	96	97	655	67	73	66	70
	NB-TR	No Project	1,620	296	0	0	0	0	729	0	0	0	0
	NB-R	all	1,000	176	130	94	54	51	263	163	146	68	72
	SB-L	all	250 (520)	78	57	62	42	40	144	45	43	52	47
	SB-T	all	960 (1,350)	363	94	109	109	110	387	124	122	92	98
	SB-TR	No Project	960	363	0	0	0	0	338	0	0	0	0
	SB-R	all	720	67	134	133	143	128	63	133	142	117	124
	EB-L	all	150 (800)	124	106	117	127	116	**183**	148	152	150	142
	EB-T	all	2,140 (8,580)	217	225	225	199	183	283	219	221	184	173
	EB-R	all	75 (1000)	**61**	79	85	70	70	**119**	144	157	95	88
	WB-L	all	300 (970)	237	117	108	83	74	239	147	152	106	118
	WB-T	all	4,120 (15,800)	505	169	168	138	138	433	184	190	130	134
	WB-R	all	75 (850)	**88**	26	32	33	29	73	50	63	36	25

Notes: Results in **bold** denote locations where storage length is exceeded.

1. NB-northbound, SB-southbound, EB-eastbound, WB-westbound, L-left turn movement, T-through movement, R-right turn movement

2. Storage length shown in feet. If there is a value in parentheses, it shows the different storage length that applies under the With Project scenario unless otherwise indicated.

Source: Fehr & Peers, 2015

TABLE 5-3
2022 PEAK HOUR QUEUING ANALYSIS

Intersection	Movement[1]	Scenario	Available Storage (ft)[2]	AM Peak Hour					PM Peak Hour				
				No Project	Alt 1A	Alt 1B	Alt 2A	Alt 2B	No Project	Alt 1A	Alt 1B	Alt 2A	Alt 2B
18. Claribel Road/ Bentley Road (NCC – 2A/2B)	NB-L	2A/2B	100	65	48	55	0	0	58	59	54	0	0
	NB-T	2A/2B	1530	0	0	0	97	99	0	0	0	59	54
	NB-TRL	NP/1A/1B	4400	0	0	0	56	59	0	0	0	76	71
	NB-R	2A/B	300	0	0	0	34	20	0	0	0	27	19
	SB-L	2A/2B	150	63	55	56	0	0	81	57	49	0	0
	SB-T	2A/2B	1240	0	0	0	31	30	0	0	0	33	31
	SB-TRL	NP/1A/1B	1240	0	0	0	90	98	0	0	0	76	70
	SB-R	2A/B	100	0	0	0	34	39	0	0	0	78	74
	EB-TRL	NP/1A/1B	2600	55	13	12	0	0	31	14	16	0	0
	EB-L	2A/2B	680	0	0	0	122	114	0	0	0	49	70
	EB-T	2A/2B	2600	0	0	0	151	145	0	0	0	175	138
	EB-R	2A/2B	580	0	0	0	41	39	0	0	0	57	56
	WB-TRL	NP/1A/1B	5280	24	14	13	0	0	23	22	25	0	0
	WB-L	2A/2B	770	0	0	0	44	34	0	0	0	89	72
	WB-T	2A/2B	5280	0	0	0	182	162	0	0	0	157	154
	WB-R	2A/2B	720	0	0	0	18	20	0	0	0	16	17
19. SR 108 / Oak Avenue	NB-L	all	250	107	84	83	98	83	118	90	91	87	92
	NB-TR	all	670	93	76	72	86	70	111	90	93	81	87
	SB-L	all	100	**108**	84	87	100	89	**104**	85	87	83	85
	SB-T	all	420	88	61	68	71	65	87	48	51	51	51
	SB-R	all	75	**96**	71	72	**84**	**76**	**88**	62	63	65	67
	EB-L	all	250	173	70	74	92	74	211	86	93	81	91
	EB-T	all	730	139	91	101	77	99	495	114	131	103	113
	EB-TR	all	730	397	108	119	100	111	135	136	142	124	133
	WB-L	all	250	127	66	61	74	63	113	60	54	55	56
	WB-T	all	480	152	127	155	88	115	**494**	176	179	153	168
	WB-TR	all	300	**446**	81	113	77	79	189	123	140	119	127

Notes: Results in **bold** denote locations where storage length is exceeded.

1. NB-northbound, SB-southbound, EB-eastbound, WB-westbound, L-left turn movement, T-through movement, R-right turn movement

2. Storage length shown in feet. If there is a value in parentheses, it shows the different storage length that applies under the With Project scenario unless otherwise indicated.

Source: Fehr & Peers, 2015

TABLE 5-3
2022 PEAK HOUR QUEUING ANALYSIS

Intersection	Movement[1]	Scenario	Available Storage (ft)[2]	AM Peak Hour					PM Peak Hour				
				No Project	Alt 1A	Alt 1B	Alt 2A	Alt 2B	No Project	Alt 1A	Alt 1B	Alt 2A	Alt 2B
20. SR 108/SR 120	NB-LT	all	390	277	215	209	219	247	**950**	252	279	284	320
	NB-T	all	390	288	213	205	217	239	**1453**	262	275	283	314
	NB-R	all	300	194	71	78	74	111	**478**	59	121	90	144
	SB-LT	all	400	**726**	341	**405**	324	**443**	**753**	399	**424**	390	**415**
	SB-TR	all	400	**552**	341	**405**	324	**443**	**2814**	399	**424**	390	**415**
	EB-L	all	50	**135**	**124**	**129**	**115**	**128**	**130**	**125**	**131**	**120**	**125**
	EB-T	all	200	**1201**	**219**	**289**	185	**297**	**2497**	**209**	**341**	**211**	**273**
	EB-TR	all	200	**307**	195	**233**	180	**237**	**293**	186	**253**	200	**235**
	WB-L	all	240	**416**	32	169	107	230	**415**	56	175	80	193
	WB-T	all	240	**837**	189	**338**	158	**241**	**3116**	**242**	**314**	**289**	**326**
	WB-R	all	240	**276**	140	139	160	151	**398**	196	193	204	193
21. SR 108 / Maag Avenue	NB-L	all	200	150	133	130	160	140	134	111	105	106	97
	NB-T	all	980	134	104	100	131	113	197	142	155	156	153
	NB-R	all	50	**87**	**83**	**77**	**90**	**82**	**123**	**105**	**117**	**117**	**117**
	SB-L	all	100	75	61	70	77	70	83	81	77	**105**	**101**
	SB-T	all	700	179	138	156	183	156	147	126	123	139	129
	SB-R	all	100	**111**	86	**105**	**113**	**102**	97	93	87	86	85
	EB-L	all	250	74	68	73	81	68	166	96	98	82	82
	EB-T	all	2,160	251	102	131	110	177	294	97	152	126	127
	EB-TR	all	2,160	261	122	136	136	192	308	114	164	143	150
	WB-L	all	200	169	134	137	171	146	145	109	112	108	112
	WB-T	all	2,500	215	72	112	104	128	257	99	132	115	124
	WB-TR	all	2,500	233	77	122	110	148	280	118	146	140	143

Notes: Results in **bold** denote locations where storage length is exceeded.

1. NB-northbound, SB-southbound, EB-eastbound, WB-westbound, L-left turn movement, T-through movement, R-right turn movement

2. Storage length shown in feet. If there is a value in parentheses, it shows the different storage length that applies under the With Project scenario unless otherwise indicated.

Source: Fehr & Peers, 2015

TABLE 5-3
2022 PEAK HOUR QUEUING ANALYSIS

Intersection	Movement[1]	Scenario	Available Storage (ft)[2]	AM Peak Hour					PM Peak Hour				
				No Project	Alt 1A	Alt 1B	Alt 2A	Alt 2B	No Project	Alt 1A	Alt 1B	Alt 2A	Alt 2B
23. Albers Road/Claribel Road	NB-L	all	325	112	51	48	40	50	96	74	78	52	44
	NB-T	all	1370	174	202	218	101	102	151	224	159	122	118
	NB-TR	all	1370	142	184	185	67	69	124	227	120	93	94
	SB-L	all	350	46	112	138	33	40	35	278	37	54	52
	SB-T	all	1440	238	141	156	110	128	162	148	152	110	105
	SB-R	all	350	95	161	176	34	35	87	162	40	33	27
	EB-L	all	225	169	62	70	45	43	150	107	27	26	25
	EB-T	all	2050	56	69	64	28	30	87	122	107	40	37
	EB-R	all	225	53	51	51	32	33	55	34	53	28	32
	WB-L	all	175	66	31	36	62	57	56	30	52	63	62
	WB-TR	all	2650	167	101	98	42	43	94	48	106	56	51
24. North County Corridor/Oakdale Road	NB-L	1A/1B/2A/2B	300	Does Not Exist	55	56	58	62	Does Not Exist	29	31	32	26
	NB-T	1A/1B/2A/2B	1,420		88	89	90	89		104	110	106	121
	NB-R	1A/1B/2A/2B	300		115	110	108	96		81	87	75	72
	SB-L	1A/1B/2A/2B	600		44	49	57	46		62	64	63	56
	SB-T	1A/1B/2A/2B	1,320		110	114	122	117		142	141	149	143
	SB-R	1A/1B/2A/2B	1,320		109	116	113	105		102	101	92	100
	EB-L	1A/1B/2A/2B	500		62	61	64	64		151	153	144	147
	WB-L	1A/1B/2A/2B	350		81	85	78	74		100	91	81	81
25. North County Corridor/Roselle Avenue	NB-L	1A/1B/2A/2B	550		116	118	112	122		94	93	103	99
	NB-T	1A/1B/2A/2B	780		77	84	76	83		117	117	116	117
	NB-R	1A/1B/2A/2B	550		55	57	52	55		67	62	58	63
	SB-L	1A/1B/2A/2B	550		60	55	55	57		64	60	59	72
	SB-T	1A/1B/2A/2B	1,200		91	92	100	102		88	89	104	104
	SB-R	1A/1B/2A/2B	550		22	23	25	27		15	17	15	15
	EB-L	1A/1B/2A/2B	500		16	17	15	16		43	45	51	46
	EB-R	1A/1B/2A/2B	1,240		99	101	97	91		175	172	186	177
	WB-L	1A/1B/2A/2B	500		82	75	76	73		70	68	68	71
	WB-R	1A/1B/2A/2B	1,300		64	69	66	66		92	96	93	88

Notes: Results in **bold** denote locations where storage length is exceeded.

1. NB-northbound, SB-southbound, EB-eastbound, WB-westbound, L-left turn movement, T-through movement, R-right turn movement

2. Storage length shown in feet. If there is a value in parentheses, it shows the different storage length that applies under the With Project scenario unless otherwise indicated.

Source: Fehr & Peers, 2015

TABLE 5-3
2022 PEAK HOUR QUEUING ANALYSIS

Intersection	Movement[1]	Scenario	Available Storage (ft)[2]	AM Peak Hour					PM Peak Hour				
				No Project	Alt 1A	Alt 1B	Alt 2A	Alt 2B	No Project	Alt 1A	Alt 1B	Alt 2A	Alt 2B
26. North County Corridor/Crane Road	NB-L	1A/1B/2A/2B	100	Does Not Exist	26	23	Does Not Exist		Does Not Exist	26	23	Does Not Exist	
	NB-T	1A/1B/2A/2B	1,880		52	44				86	52		
	NB-R	1A/1B/2A/2B	300		50	45				151	50		
	SB-L	1A/1B/2A/2B	200		58	48				119	58		
	SB-T	1A/1B/2A/2B	2,840		48	51				127	48		
	SB-R	1A/1B/2A/2B	500		113	112				236	113		
	EB-L	1A/1B/2A/2B	750		163	153				353	163		
	EB-T	1A/1B/2A/2B	15,800		107	86				212	107		
	EB-R	1A/1B/2A/2B	630		11	12				43	11		
	WB-L	1A/1B/2A/2B	930		70	58				282	70		
	WB-T	1A/1B/2A/2B	12,420		114	110				356	114		
	WB-R	1A/1B/2A/2B	630		27	30				74	27		
27. North County Corridor/Albers Road[3]	NB-L	1A/1B/2A/2B	150 (100)		32	31	25	22		33	30	27	34
	NB-T	1A/1B/2A/2B	2,240		200	201	205	232		162	153	154	163
	NB-R	1A/1B/2A/2B	300		94	73	91	82		101	88	131	103
	SB-L	1A/1B/2A/2B	200		33	31	50	16		88	68	37	22
	SB-T	1A/1B/2A/2B	2,280		144	154	224	250		208	243	154	203
	SB-R	1A/1B/2A/2B	980		63	60	0	0		85	95	6	7
	EB-L	1A/1B/2A/2B	750 (920)		207	215	224	236		174	195	191	173
	EB-T	1A/1B/2A/2B	12,420		63	50	72	37		80	61	80	75
	EB-R	1A/1B/2A/2B	750 (580)		25	23	49	45		16	16	27	29
	WB-L	1A/1B/2A/2B	720		117	105	109	102		133	138	101	86
	WB-T	1A/1B/2A/2B	14,760		92	88	90	65		90	87	84	77
	WB-R	1A/1B/2A/2B	670 (580)		37	22	48	28		17	19	68	43

Notes: Results in **bold** denote locations where storage length is exceeded.

1. NB-northbound, SB-southbound, EB-eastbound, WB-westbound, L-left turn movement, T-through movement, R-right turn movement
2. Storage length shown in feet. If there is a value in parentheses, it shows the different storage length that applies under the With Project scenario unless otherwise indicated.
3. Storage length reported as Alternative 1A/1B (Alternative 2A/2B) for movements with different storage lengths.

Source: Fehr & Peers, 2015

TABLE 5-3
2022 PEAK HOUR QUEUING ANALYSIS

Intersection	Movement[1]	Scenario	Available Storage (ft)[2]	AM Peak Hour					PM Peak Hour				
				No Project	Alt 1A	Alt 1B	Alt 2A	Alt 2B	No Project	Alt 1A	Alt 1B	Alt 2A	Alt 2B
28. North County Corridor/ North Stearns Road (Smith Road - 2B)	NB-LT	1B	860	Does Not Exist	n/a	50	n/a	n/a	Does Not Exist	n/a	54	n/a	n/a
	NB-R	1B	100			24					27		
	NB-LTR	2B	1,000			n/a		44			n/a		46
	NB Approach	1A/2A	1,000		2		2	n/a		3		2	n/a
	SB-LT	1B/2B	1,000		n/a	42	n/a	42		n/a	41	n/a	60
	SB-R	1B/2B	300 - 1B (630 - 2B)			62		53			71		60
	SB Approach	1A/2A	1,000		18		15			25		27	
	EB-L	1B/2B	870		n/a	91	n/a	74		n/a	101	n/a	91
	EB-T	1B/2B	14,760 (8,480 - 2B)			61		43			72		56
	EB-R	1B/2B	670			20		11			37		10
	EB Approach	1A/2A	1,000		21		19			28		26	
	WB-L	1B/2B	720 (650 - 2B)		n/a	28	n/a	29		n/a	33	n/a	30
	WB-T	1B/2B	4,110			79		67			89		75
	WB-R	1B/2B	720 (650 - 2B)			24		20			24		23
	WB Approach	1A/2A	1,000		16		14			16		12	
29. North County Corridor/SR 108	NB Approach	1A/1B/ 2A/2B	1,000		2	2	3	2		8	7	8	7
	SB Approach	1A/2A	360		22	n/a	22	n/a		10	n/a	10	n/a
	EB Approach	1A/1B/ 2A/2B	1,000		30	24	35	28		48	28	53	32
	WB Approach	1A/1B/ 2A/2B	1,000		40	16	40	16		38	26	38	24

Notes: Results in **bold** denote locations where storage length is exceeded.

1. NB-northbound, SB-southbound, EB-eastbound, WB-westbound, L-left turn movement, T-through movement, R-right turn movement

2. Storage length shown in feet. If there is a value in parentheses, it shows the different storage length that applies under the With Project scenario unless otherwise indicated.

Source: Fehr & Peers, 2015

TABLE 5-3
2022 PEAK HOUR QUEUING ANALYSIS

Intersection	Movement[1]	Scenario	Available Storage (ft)[2]	AM Peak Hour					PM Peak Hour				
				No Project	Alt 1A	Alt 1B	Alt 2A	Alt 2B	No Project	Alt 1A	Alt 1B	Alt 2A	Alt 2B
30. Charity Way/SR 108	NB-L	1A/1B/2A/2B	300	Does Not Exist	84	81	26	82	Does Not Exist	91	86	86	88
	NB-T	1A/1B/2A/2B	430		67	59	67	63		106	112	106	105
	NB-R	1A/1B/2A/2B	300		16	13	14	13		26	23	27	28
	SB-L	1A/1B/2A/2B	300		34	34	27	29		44	50	50	51
	SB-T	1A/1B/2A/2B	1,000		96	89	71	98		104	95	100	103
	SB-R	1A/1B/2A/2B	300		15	21	14	22		32	31	25	30
	EB-L	1A/1B/2A/2B	300		48	48	48	50		62	59	60	62
	EB-TR	1A/1B/2A/2B	1,000		46	41	41	42		75	67	73	74
	WB-L	1A/1B/2A/2B	300		34	32	26	26		41	42	41	43
	WB-TR	1A/1B/2A/2B	1,000		41	38	35	40		48	46	50	43
31. Galaxy Way/SR 108	NB-L	1A/1B/2A/2B	300		52	51	53	51		61	68	68	64
	NB-T	1A/1B/2A/2B	1,000		84	83	80	102		210	209	193	197
	NB-TR	1A/1B/2A/2B	1,000		32	27	27	29		39	37	43	40
	SB-L	1A/1B/2A/2B	300		53	55	53	55		74	73	68	71
	SB-T	1A/1B/2A/2B	1,490		115	127	123	124		142	139	147	143
	SB-R	1A/1B/2A/2B	300		39	41	39	37		45	45	48	46
	EB-L	1A/1B/2A/2B	300		48	54	51	53		104	103	101	93
	EB-TR	1A/1B/2A/2B	1,000		45	57	44	64		73	78	76	69
	WB-L	1A/1B/2A/2B	300		55	51	53	55		63	61	67	62
	WB-TR	1A/1B/2A/2B	1,000		58	57	50	49		80	71	73	71

Notes: Results in **bold** denote locations where storage length is exceeded.

1. NB-northbound, SB-southbound, EB-eastbound, WB-westbound, L-left turn movement, T-through movement, R-right turn movement

2. Storage length shown in feet. If there is a value in parentheses, it shows the different storage length that applies under the With Project scenario unless otherwise indicated.

Source: Fehr & Peers, 2015

TABLE 5-3
2022 PEAK HOUR QUEUING ANALYSIS

Intersection	Movement[1]	Scenario	Available Storage (ft)[2]	AM Peak Hour					PM Peak Hour				
				No Project	Alt 1A	Alt 1B	Alt 2A	Alt 2B	No Project	Alt 1A	Alt 1B	Alt 2A	Alt 2B
32. Coffee Road/Frontage Road North	NB-L	1A/1B/2A/2B	300	Does Not Exist	77	74	78	79	Does Not Exist	88	84	80	72
	NB-T	1A/1B/2A/2B	1,060		87	80	82	83		156	172	164	155
	NB-R	1A/1B/2A/2B	300		44	54	47	49		61	59	63	63
	SB-L	1A/1B/2A/2B	300		80	76	68	80		73	79	74	79
	SB-T	1A/1B/2A/2B	1,000		171	174	196	178		116	104	109	115
	SB-R	1A/1B/2A/2B	300		48	0	52	48		50	43	48	43
	EB-L	1A/1B/2A/2B	300		73	68	70	71		67	65	72	67
	EB-TR	1A/1B/2A/2B	1,000		65	62	63	62		62	62	54	64
	WB-L	1A/1B/2A/2B	300		102	103	99	104		97	102	104	98
	WB-TR	1A/1B/2A/2B	1,000		53	49	53	52		58	56	52	51
33. Coffee Road/Frontage Road South	NB-L	1A/1B/2A/2B	300		80	64	71	71		63	65	61	72
	NB-T	1A/1B/2A/2B	1,000		205	202	190	180		175	175	150	156
	NB-R	1A/1B/2A/2B	300		46	20	23	23		21	17	23	22
	SB-L	1A/1B/2A/2B	300		120	95	97	98		97	102	94	98
	SB-T	1A/1B/2A/2B	1,050		127	94	101	94		119	109	105	113
	SB-R	1A/1B/2A/2B	300		67	34	34	33		27	27	28	35
	EB-L	1A/1B/2A/2B	300		114	122	108	111		114	110	105	103
	EB-TR	1A/1B/2A/2B	1,000		45	65	71	71		67	67	61	69
	WB-L	1A/1B/2A/2B	300		75	69	74	78		70	67	65	71
	WB-TR	1A/1B/2A/2B	1,000		97	96	93	93		95	99	93	90

Notes: Results in **bold** denote locations where storage length is exceeded.

1. NB-northbound, SB-southbound, EB-eastbound, WB-westbound, L-left turn movement, T-through movement, R-right turn movement

2. Storage length shown in feet. If there is a value in parentheses, it shows the different storage length that applies under the With Project scenario unless otherwise indicated.

Source: Fehr & Peers, 2015

TABLE 5-3
2022 PEAK HOUR QUEUING ANALYSIS

Intersection	Movement[1]	Scenario	Available Storage (ft)[2]	AM Peak Hour					PM Peak Hour				
				No Project	Alt 1A	Alt 1B	Alt 2A	Alt 2B	No Project	Alt 1A	Alt 1B	Alt 2A	Alt 2B
34. Oakdale Road/Frontage Road	NB-L	1A/1B/2A/2B	300	Does Not Exist	27	27	25	22	Does Not Exist	39	38	38	52
	NB-T	1A/1B/2A/2B	1,000		6	3	3	5		3	3	6	111
	NB-R	1A/1B/2A/2B	300		0	2	0	0		3	0	0	27
	SB-L	1A/1B/2A/2B	300		22	23	22	21		40	47	43	60
	SB-T	1A/1B/2A/2B	1,050		3	2	7	3		2	6	5	102
	SB-R	1A/1B/2A/2B	300		0	0	1	1		0	2	5	25
	EB-L	1A/1B/2A/2B	300		79	71	68	80		51	55	54	47
	EB-TR	1A/1B/2A/2B	1,000		64	63	63	60		60	63	55	55
	WB-L	1A/1B/2A/2B	300		56	59	55	58		34	36	36	34
	WB-TR	1A/1B/2A/2B	1,000		72	66	59	68		62	55	55	49
35. Roselle Avenue/Frontage Road	NB-T	1A/1B/2A/2B	1,000		98	103	95	94		126	114	127	126
	NB-TR	1A/1B/2A/2B	1,000		78	84	81	76		104	94	102	100
	SB-L	1A/1B/2A/2B	300		52	51	52	48		61	62	60	65
	SB-T	1A/1B/2A/2B	780		103	95	102	105		88	91	102	93
	WB-L	1A/1B/2A/2B	300		52	47	48	54		63	67	64	60
	WB-R	1A/1B/2A/2B	1,000		75	82	80	84		63	57	64	61
36. Davis Road/Claribel Realigned North	NB-L	1A/1B/2A/2B	50		12	14	15	10		8	8	13	9
	NB-TR	1A/1B/2A/2B	800		0	0	0	0		0	0	0	0
	SB-L	1A/1B/2A/2B	50		6	7	9	13		6	10	12	11
	SB-TR	1A/1B/2A/2B	1,200		0	0	0	0		0	0	0	0
	EB-TLR	1A/1B/2A/2B	700		54	55	53	54		0	0	55	56
	WB-TLR	1A/1B/2A/2B	740		53	55	58	54		0	56	55	54

Notes: Results in **bold** denote locations where storage length is exceeded.

1. NB-northbound, SB-southbound, EB-eastbound, WB-westbound, L-left turn movement, T-through movement, R-right turn movement

2. Storage length shown in feet. If there is a value in parentheses, it shows the different storage length that applies under the With Project scenario unless otherwise indicated.

Source: Fehr & Peers, 2015

TABLE 5-3
2022 PEAK HOUR QUEUING ANALYSIS

Intersection	Movement[1]	Scenario	Available Storage (ft)[2]	AM Peak Hour					PM Peak Hour				
				No Project	Alt 1A	Alt 1B	Alt 2A	Alt 2B	No Project	Alt 1A	Alt 1B	Alt 2A	Alt 2B
37. Claus Road/Claribel Realigned North	NB-L	1A/1B/2A/2B	450	Does Not Exist	25	28	25	28	Does Not Exist	54	50	41	50
	NB-T	1A/1B/2A/2B	1,340		53	54	76	70		92	103	106	108
	NB-TR	1A/1B/2A/2B	1,340		79	82	97	98		108	119	125	122
	SB-L	1A/1B/2A/2B	300		48	45	49	47		67	69	64	69
	SB-T	1A/1B/2A/2B	1,000		64	64	71	71		73	72	68	71
	SB-TR	1A/1B/2A/2B	1,000		94	93	113	116		95	101	114	125
	EB-L	1A/1B/2A/2B	400		53	60	72	76		0	0	93	89
	EB-TR	1A/1B/2A/2B	1,000		60	60	60	62		43	42	51	50
	WB-LTR	1A/1B/2A/2B	470		90	82	90	81		161	163	150	159
38. Claus Road/Claribel Realigned South	NB-T	1A/1B/2A/2B	1,000		126	130	6	6		200	206	10	115
	NB-R	1A/1B/2A/2B	300		41	49	6	7		66	59	10	33
	SB-L	1A/1B/2A/2B	890		96	93	0	0		97	93	0	80
	SB-T	1A/1B/2A/2B	2,100		76	83	41	44		118	116	44	54
	WB-L	1A/1B/2A/2B	810		66	74	60	59		71	70	64	57
	WB-R	1A/1B/2A/2B	300		94	94	52	49		101	98	46	47
39. Stearns/Stearns Connection	NB-L	1B/2B	200		n/a	24	n/a	n/a		n/a	44	n/a	n/a
	NB-TR	1A/1B/2A	840 (1B - 730)		60	8	11			67	7	5	
	SB-L	1A/1B/2A	300 (1B- 200)		142	30	30			170	47	51	
	SB-T	1A/2A	840		21	n/a	n/a			20	n/a	n/a	
	SB-TR	1B	970		n/a	2	n/a			n/a	9		
	EB-TLR	1B	690			67					84	n/a	
	WB-L	1A/2A	960		61		43			77	n/a	58	
	WB-R	1A/2A	960		82	n/a	80			91		86	
	WB-TLR	1B	1,360		n/a	69	n/a			n/a	84	n/a	

Notes: Results in **bold** denote locations where storage length is exceeded.

1. NB-northbound, SB-southbound, EB-eastbound, WB-westbound, L-left turn movement, T-through movement, R-right turn movement

2. Storage length shown in feet. If there is a value in parentheses, it shows the different storage length that applies under the With Project scenario unless otherwise indicated.

Source: Fehr & Peers, 2015

TABLE 5-3
2022 PEAK HOUR QUEUING ANALYSIS

Intersection	Movement[1]	Scenario	Available Storage (ft)[2]	AM Peak Hour					PM Peak Hour				
				No Project	Alt 1A	Alt 1B	Alt 2A	Alt 2B	No Project	Alt 1A	Alt 1B	Alt 2A	Alt 2B
40. New Access Road/NCC	NB Approach	1B/2B	1,000	Does Not Exist		3	Does Not Exist	3	Does Not Exist		4	Does Not Exist	3
	SB Approach	1B/2B	1,000			3		3			3		3
	EB Approach	1B/2B	1,000			10		8			17		15
	WB Approach	1B/2B	1,000			12		10			13		12

Notes: Results in **bold** denote locations where storage length is exceeded.

1. NB-northbound, SB-southbound, EB-eastbound, WB-westbound, L-left turn movement, T-through movement, R-right turn movement

2. Storage length shown in feet. If there is a value in parentheses, it shows the different storage length that applies under the With Project scenario unless otherwise indicated.

Source: Fehr & Peers, 2015

5.3 URBAN STREET ANALYSIS

Three segments of SR 108 were analyzed using the HCM's urban street LOS methodology: from Pelandale Avenue to Ladd Avenue; between Oakdale Road and Claus Road; and between Oak Avenue and Maag Avenue. One segment on Kiernan Avenue (NCC) between Carver Road and McHenry Avenue was also analyzed with the urban street analysis. **Table 6-4** presents the urban street LOS for the study segments. As shown in **Table 5-4**, in the No Project scenario all study segments operate at LOS D or better during the AM and PM peak hours.

The four Project alternatives would reduce the peak hour demand volume along SR 108, thus generally increasing the average travel speed along the study corridor. All four Project alternatives either improve or maintain at least LOS C operations along the study segments. The technical analysis worksheets are provided in Appendix N.

TABLE 5-4
2022 URBAN STREET ANALYSIS

Segment	Direction[1]	Class Type	No Project[2]		Alt. 1A[2]		Alt. 1B[2]		Alt. 2A[2]		Alt. 2B[2]	
			AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
1. Kiernan Avenue (NCC) between Carver Road and Tully Road	EB	I	28 - C	24 - D	32 - C	31 - C	32 - C	31 - C	32 - C	31 - C	32 - C	31 - C
	WB	I	29 - C	35 - B	31 - C	34 - C	30 - C	34 - C	31 - C	34 - C	31 - C	34 - C
2. Kiernan Avenue (NCC) between Tully Road and McHenry Avenue	EB	I	41 - B	40 - B	Analyzed as Expressway							
	WB	I	44 - A	41 - B								
3. SR 108 between Ladd Road and Kiernan Avenue	NB	I	35 - B	30 - B	33 - C	31 - C	33 - C	31 - C	33 - C	32 - C	33 - C	32 - C
	SB	I	36 - B	36 - B	36 - B	36 - B	36 - B	36 - B	37 - B	36 - B	37 - B	36 - B
4. SR 108 between Kiernan Avenue and Pelandale Avenue	NB	II	31 - B	31 - B	29 - B	28 - C	29 - B	28 - C	29 - B	28 - C	29 - B	28 - C
	SB	II	29 - B	28 - C	25 - C	26 - C	25 - C	26 - C	25 - C	25 - C	25 - C	25 - C
14. SR 108 between Oakdale Road and 1st Street	EB	III	30 - B	26 - C	32 - A	31 - A	32 - A	31 - A	32 - A	30 - A	32 - A	30 - A
	WB	III	31 - A	31 - A	33 - B	28 - B	33 - B	27 - C	32 - B	25 - C	32 - B	25 - C
15. SR 108 between 1st Street and Claus Road	EB	III	28 - B	27 - B	33 - A	32 - A	33 - A	32 - A	32 - A	30 - B	32 - A	29 - B
	WB	III	24 - C	22 - C	26 - B	25 - B	26 - B	25 - B	25 - B	24 - C	25 - B	24 - C
28. SR 108 between Oak Avenue and SR 120	EB	IV	21 - B	21 - B	24 - B	23 - B	22 - B	23 - B	23 - B	23 - B	21 - B	21 - B
	WB	IV	24 - B	24 - B	26 - A	25 - A	26 - A	25 - A	26 - A	25 - A	26 - A	25 - A
32. SR 108/SR 120 between Yosemite Avenue and Maag Avenue	EB	III	25 - B	26 - B	28 - B	29 - B	27 - B	27 - B	28 - B	28 - B	26 - B	28 - B
	WB	III	19 - C	19 - C	23 - C	22 - C	21 - C	22 - C	23 - C	22 - C	24 - C	23 - C

Notes:

1. EB = Eastbound, WB = Westbound
2. Results in column are reported as: Average Speed (MPH) – LOS

Source: Fehr & Peers, 2015.

5.4 TWO-LANE HIGHWAY ANALYSIS

The rural segments of SR 108 east of McHenry Avenue and of SR 120 east of Maag Avenue were analyzed according to the HCM 2010 two-lane highway LOS methodology. **Table 5-5** presents the two-lane highway results. All study segments are expected to operate at LOS E under No Project conditions with the exception of SR 120 from Wamble Road to Lancaster Road, which would operate at LOS C. Construction of any of the four Project alternatives would decrease the volume demand along SR 108 and SR 120, which would either increase or have no effect on average travel speed and either decrease or have no effect on percent time spent following. Therefore, all of the Project alternatives would either maintain or improve the LOS reported for each segment. The technical analysis worksheets are provided in Appendix O.

TABLE 5-5
2022 TWO-LANE HIGHWAY ANALYSIS BASED ON HCM

Location	Peak Hour	BFFS	No Project			Alternative 1A			Alternative 1B			Alternative 2A			Alternative 2B		
			PTSF	ATS	LOS	PTSF	ATS	LOS	PTSF	ATS	LOS	PTSF	ATS	LOS	PTSF	ATS	LOS
SR 108 from McHenry Avenue to Oakdale Road	AM	55	66	42	D	40	44	D	41	44	D	58	42	D	59	42	D
	PM		84	40	E	84	41	E	84	41	E	84	40	E	84	40	E
SR 108 from Claus Road to Crane Road	AM	55	75	39	E	27	46	C	33	46	C	62	43	D	65	42	D
	PM		85	39	E	72	44	D	77	43	D	82	40	E	83	40	E
SR 108 from Crane Road to Oak Avenue	AM	45	81	29	E	68	34	E	70	33	E	66	36	E	69	35	E
	PM		84	29	E	75	32	E	79	31	E	74	33	E	77	32	E
SR 120 from Maag Avenue to Wamble Road	AM	50	76	34	E	76	34	E	61	38	E	76	34	E	70	37	E
	PM		87	31	E	87	31	E	76	36	E	87	31	E	74	37	E
SR 120 from Wamble Road to Lancaster Road	AM	55	57	47	C	57	47	C	57	47	C	57	47	C	57	47	C
	PM		63	47	C	63	47	C	63	47	C	63	47	C	63	47	C

Bold denotes locations that operate overall at unacceptable service levels.
1.BFFS = Base Free-Flow Speed, mph
2. PTSF = Percent Time Spent Following, %
3. ATS = Average Travel Speed, mph
Source: Fehr & Peers, 2015

5.5 NCC FREEWAY/EXPRESSWAY ANALYSIS

All four Project alternatives plan to construct a four- to six-lane freeway/expressway between Tully Road and SR 120. The planned facility would operate as a freeway between Tully Road and Roselle Avenue and as an expressway east of Roselle Avenue. To determine the year 2022 operations for the facility under each Project alternative, segments were analyzed with either HCM multilane analysis, Leisch weaving method, HCM freeway, or HCM ramp junction analysis. Leisch method was used for segments that would include an auxiliary lane.

Table 5-6 and **Table 5-7** present results for each alternative, in each direction. The planned NCC freeway/expressway would operate at LOS B or better during the AM and PM peak hours for each Project alternative. The technical analysis worksheets are provided in Appendix P.

TABLE 5-6
2022 MULTILANE, FREEWAY, AND RAMP ANALYSIS BASED ON HCM - EASTBOUND

Location	Number of Lanes	Method	Peak Hour	Alt 1A		Alt 1B		Alt 2A		Alt 2B	
				Density[1]	LOS	Density[1]	LOS	Density[1]	LOS	Density[1]	LOS
Carver Road to Tully Road	3	Multilane	AM	5	A	5	A	5	A	5	A
			PM	8	A	8	A	8	A	8	A
Tully Road to McHenry Avenue	3+Aux	Weave	AM	Weave	A	Weave	A	Weave	A	Weave	A
			PM	Weave	A	Weave	A	Weave	A	Weave	A
McHenry Avenue Off-Ramp	3+Aux		AM	Weave	A	Weave	A	Weave	A	Weave	A
			PM	Weave	A	Weave	A	Weave	A	Weave	A
McHenry Avenue On-Ramp	3+Aux		AM	Weave	A	Weave	A	Weave	A	Weave	A
			PM	Weave	A	Weave	A	Weave	A	Weave	A
McHenry Avenue to Coffee Road	3+Aux		AM	Weave	A	Weave	A	Weave	A	Weave	A
			PM	Weave	A	Weave	A	Weave	A	Weave	A
Coffee Road Off-Ramp	3+Aux		AM	Weave	A	Weave	A	Weave	A	Weave	A
			PM	Weave	A	Weave	A	Weave	A	Weave	A
Coffee Road On-Ramp	3	Merge	AM	6	A	6	A	6	A	6	A
			PM	11	B	11	B	10	A	10	A
Coffee Road to Oakdale Road	3	Basic	AM	4	A	4	A	4	A	4	A
			PM	9	A	9	A	8	A	8	A
Oakdale Road Off-Ramp	2	Diverge	AM	0	A	0	A	0	A	0	A
			PM	6	A	6	A	4	A	4	A
Oakdale Road On-Ramp	2	Merge	AM	11	B	11	B	10	B	10	A
			PM	14	B	14	B	12	B	11	B
Oakdale Road to Roselle Avenue	2	Basic	AM	15	B	9	A	8	A	8	A
			PM	12	B	12	B	10	A	10	A
Roselle Avenue Off-Ramp	2	Diverge	AM	13	B	13	B	12	B	12	B
			PM	17	B	16	B	12	B	14	B
Roselle Avenue On-Ramp	2	Merge	AM	12	B	12	B	11	B	11	B
			PM	14	B	13	B	12	B	11	B
Roselle Avenue to Claus Road	2	Multilane	AM	12	B	12	B	10	A	11	A
			PM	14	B	14	B	12	B	11	B

Notes:
1. Multilane = HCM Multilane Highways Analysis; Basic = HCM Basic Freeway Analysis; Merge = HCM Merge Analysis; Diverge = HCM Diverge Analysis; Weave = Leisch Method
2. Density is in passenger cars per mile per lane
Source: Fehr & Peers, 2015

TABLE 5-6
2022 MULTILANE, FREEWAY, AND RAMP ANALYSIS BASED ON HCM - EASTBOUND

Location	Number of Lanes	Method	Peak Hour	Alt 1A		Alt 1B		Alt 2A		Alt 2B	
				Density[1]	LOS	Density[1]	LOS	Density[1]	LOS	Density[1]	LOS
Claus Road to Crane Road	2	Multilane	AM	13	B	13	B	4	A	4	A
			PM	14	B	13	B	8	B	8	A
Crane Road to Albers Road	2		AM	9	A	9	A	2	A	2	A
			PM	9	A	8	A	3	A	4	A
Albers Road to Stearns Road	2		AM	6	A	4	A	5	A	4	A
			PM	8	A	6	A	8	A	5	A
Stearns Road to SR 120	2		AM	4	A	3	A	4	A	3	A
			PM	6	A	4	A	5	A	3	A

Notes:
1. Multilane = HCM Multilane Highways Analysis; Basic = HCM Basic Freeway Analysis; Merge = HCM Merge Analysis; Diverge = HCM Diverge Analysis; Weave = Leisch Method
2. Density is in passenger cars per mile per lane
Source: Fehr & Peers, 2015

TABLE 5-7
2022 MULTILANE, FREEWAY, AND RAMP ANALYSIS BASED ON HCM - WESTBOUND

Location	Number of Lanes	Method	Peak Hour	Alt 1A		Alt 1B		Alt 2A		Alt 2B	
				Density[1]	LOS	Density[1]	LOS	Density[1]	LOS	Density[1]	LOS
SR 120 to Stearns Road	2	Multilane	AM	5	A	4	A	5	A	3	A
			PM	4	A	4	A	4	A	6	A
Stearns Road to Albers Road	2		AM	6	A	5	A	6	A	4	A
			PM	7	A	5	A	6	A	4	A
Albers Road to Crane Road	2		AM	7	B	6	A	3	A	3	A
			PM	10	A	9	A	2	A	2	A
Crane Road to Claus Road	2		AM	13	B	13	A	7	A	7	A
			PM	14	B	14	B	6	A	6	A
Claus Road to Roselle Avenue	2		AM	13	B	13	B	11	B	10	A
			PM	14	B	14	B	11	A	10	A
Roselle Avenue Off-Ramp	2	Diverge	AM	15	B	15	B	13	B	12	B
			PM	16	B	16	B	13	B	13	B
Roselle Avenue On-Ramp	2	Merge	AM	13	B	13	B	11	B	10	B
			PM	13	B	13	B	11	B	11	B
Roselle Avenue to Oakdale Road	2	Basic	AM	11	B	11	B	9	A	11	A
			PM	12	B	11	B	9	A	9	A
Oakdale Road Off-Ramp	2	Diverge	AM	15	B	15	B	13	B	13	B
			PM	16	B	16	B	13	B	13	B
Oakdale Road On-Ramp	2	Merge	AM	9	A	9	A	7	A	10	B
			PM	7	A	12	B	5	A	5	A
Oakdale Road to Coffee Road	3	Basic	AM	13	B	8	A	7	A	7	A
			PM	7	A	7	A	6	A	6	A
Coffee Road Off-Ramp	3	Diverge	AM	14	B	14	B	12	B	12	B
			PM	12	B	12	B	11	B	11	B
Coffee Road On-Ramp	3+Aux	Weave	AM	Weave	A	Weave	A	Weave	A	Weave	A
			PM	Weave	A	Weave	A	Weave	A	Weave	A
Coffee Road to McHenry Avenue	3+Aux		AM	Weave	A	Weave	A	Weave	A	Weave	A
			PM	Weave	A	Weave	A	Weave	A	Weave	A
McHenry Avenue Off-Ramp	3+Aux		AM	Weave	A	Weave	A	Weave	A	Weave	A
			PM	Weave	A	Weave	A	Weave	A	Weave	A
McHenry Avenue On-Ramp	3	Merge	AM	10	B	10	B	10	A	10	A
			PM	9	A	9	A	9	A	9	A
McHenry Avenue to Tully Road	3	Multilane	AM	10	A	10	A	10	A	10	A
			PM	8	A	9	A	8	A	8	A
Tully Road to Carver Road	3		AM	8	A	8	A	8	A	8	A
			PM	8	A	8	A	7	A	7	A

Notes:
1. Multilane = HCM Multilane Highways Analysis; Basic = HCM Basic Freeway Analysis; Merge = HCM Merge Analysis; Diverge = HCM Diverge Analysis; Weave = Leisch Method
2. Density is in passenger cars per mile per lane
Source: Fehr & Peers, 2015

5.6 VOLUME-TO-CAPACITY ANALYSIS

Year 2022 No Project and Project peak hour roadway volumes were compared to hourly roadway segment capacities to determine the level of service of the same 23 study segments evaluated as part of Section 3.1.4. The technical analysis worksheets are provided in Appendix Q.

Based on the acceptable level of service thresholds presented in Table 2-8 of this report, the following segments would operate below the acceptable threshold for at least one peak hour in the year 2022 No Project scenario:

- Oakdale Road from Claribel Road to Pelandale Avenue
- SR 108 from 1st Street to Claus Road
- Patterson Road from SR 108 to Langworth Road
- Claus Road from Claribel Road to Sylvan Avenue
- Claribel Road from Oakdale Road to Claus Road
- Yosemite Avenue from SR 108 to Patterson Road
- Albers Road from Patterson Road to Claribel Road

The Project would improve operations at several of the study segments. As listed above, the No Project scenario has 7 study segments that would operate below the acceptable level of service threshold for at least one peak hour. Implementation of the Project alternatives would result in four study segments operating below the acceptable threshold for at least one peak hour for all of the project alternatives.

5.7 SUMMARY OF 2022 OPERATIONS ANALYSIS

In summary, the results in this chapter indicate the following:

- With implementation of the Project, the number of intersections projected to operate below the applicable LOS standards would be reduced from three to zero. All of the intersections on existing SR 108 within the communities of Riverbank and Oakdale would be improved with the implementation of the Project.

- All of the intersections along the new NCC corridor are expected to operate at acceptable service levels.

- Evaluation of 95th percentile queues indicated that queue storage lengths would be exceeded on at least one movement at 10 intersections in the No Project scenario. With implementation of any of the Project alternatives, that number would be reduced to 8 intersections.

  Project removes queuing issues at:
  - SR 108/Kiernan Avenue
  - Claribel Road/Claus Road

- With implementation of the Project, there are no locations along the North County Corridor where the 95th percentile queues exceed the available storage.

- Several different roadway segment analysis techniques were used, depending on the requirements of the jurisdictions involved; in all cases, the With Project alternatives were found to maintain acceptable or improve the roadway operations compared to the No Project scenario.

CHAPTER 6. YEAR 2042 TRAFFIC OPERATIONS ANALYSIS

This chapter presents the results of intersection control evaluation (ICE) and the traffic operations analysis for year 2042. The operations analysis for year 2042 addresses intersection, arterial, highway, freeway and ramp junction operations for No Project and the four Project Alternatives.

6.1 INTERSECTION CONTROL EVALUATION (ICE) SUMMARY

Per Caltrans Policy Directive 13-02 (Traffic Operations Policy Directive) an intersection control evaluation (ICE) was performed at each of the proposed at-grade state highway intersections to identify the most effective intersection traffic control strategy (i.e. roundabout or traffic signal). The following is a list of at-grade intersections proposed for each project alternative:

Alternative 1A	Alternative 1B	Alternative 2A	Alternative 2B
At-Grade Intersections: • Claus Road • Crane Road • Albers Road • Stearns Road • SR 108/120	At-Grade Intersections: • Claus Road • Crane Road • Albers Road • Stearns Road • New Access Road • SR 108/120	At-Grade Intersections: • Claus Road • Bentley Road • Albers Road • Stearns Road • SR 108/120	At-Grade Intersections: • Claus Road • Bentley Road • Albers Road • Smith Road • New Access Road • SR 108/120

To assist in the ICE process a preliminary traffic analysis was performed at each of these locations assuming a roundabout and a traffic signal[4]. The results of the preliminary analysis are presented in Exhibit 1 on the next page. Team members (Caltrans, Stanislaus County, City of Riverbank, City of Oakdale, City of Modesto, Drake Haglan & Associates, and Fehr & Peers) were asked to score each location using the following 20 criteria:

- Project Cost
- Meet Purpose and Need
- Meet Driver Expectation
- Reduce Accident Severity
- Improve Pedestrian Safety
- Improve Bicyclist Safety
- Improve Level of Service
- Minimize Queues
- Vehicle Hours of Travel
- Vehicle Hours of Delay
- Create Gap in Traffic (for driveway access)
- Accommodate STAA Trucks
- Minimize Right of Way Impacts
- Reduce Emissions
- Minimize Environmental Impacts
- Accommodate Access to Surrounding Properties
- Provide Aesthetic Opportunities
- Reduce Maintenance Costs
- Received Public/Stakeholder Support
- Reduce Fuel Consumption

The ICE process was formally completed on March 23, 2015. The ICE Fact Sheet & Supporting Documentation is presented in Appendix R. The PDT's final intersection control recommendations are presented in Exhibit 2.

[4] Caltrans District 10 assisted with the traffic analysis.

EXHIBIT 1 – ICE TRAFFIC OPERATIONS COMPARISON (YEAR 2042)

Intersection	Criteria	Traffic Signal	2- Lane Roundabout	3- Lane Roundabout
NCC/Claus Road[1]	VHT	113.4	*Does not provide acceptable operations*	69.6
	VHD	90.8		47.0
	Max Queue	542		1050
	LOS	D		D
NCC/Crane Road	VHT	59.6	*Does not provide acceptable operations*	31.3
	VHD	41.2		13.0
	Max Queue	404		499
	LOS	C		B
NCC/Albers	VHT	64.9	*Does not provide acceptable operations*	23.2
	VHD	47.7		6.0
	Max Queue	913		94
	LOS	C		A
NCC/Stearns Road	VHT	19.6	15.0	*Two-lane roundabout provides acceptable service levels*
	VHD	9.0	4.4	
	Max Queue	183	70	
	LOS	B	A	
NCC/SR 120/SR 108	VHT	16.5	10.8	*Two-lane roundabout provides acceptable service levels*
	VHD	9.3	3.5	
	Max Queue	203	76	
	LOS	B	A	
NCC/Bentley Road	VHT	44.4	17.9	*Two-lane roundabout provides acceptable service levels*
	VHD	30.6	4.0	
	Max Queue	451	193	
	LOS	C	A	
NCC/Smith Road	VHT	11.4	8.9	*Two-lane roundabout provides acceptable service levels*
	VHD	4.43	1.92	
	Max Queue	142	36	
	LOS	B	A	
NCC/New Access Road	VHT	7.4	7.2	*Two-lane roundabout provides acceptable service levels*
	VHD	1.4	1.21	
	Max Queue	63	28	
	LOS	A	A	

1. Although the NCC/Claus intersection operates overall at LOS D the eastbound approach would operate at LOS F. All approaches are expected to operate at acceptable service levels until year 2037.

EXHIBIT 2 – SUMMARY OF PDT FINAL INTERSECTION CONTROL RECOMMENDATIONS

Intersections		Final Recommendation		
Alternative	Cross Street	2-Lane Roundabout	3-Lane Roundabout	Signal
All Alternatives	Claus Road			X
1A & 1B	Crane Road			X
2A & 2B	Bentley Road			X
All Alternatives	Albers Road			X
1B	Stearns Road	X		
2B	Smith Road	X		
All Alternatives	New Access Road	X		
All Alternatives	Connection to SR 108/120	X		

Below is a brief summary on how the PDT arrived at a decision (roundabout vs. signal) at each location.

NCC/Claus Road, NCC/New Access Road, NCC/SR 120/SR 108 – There was clear consensus from the PDT at these locations based on the scoring.

- NCC/Claus Road: traffic signal
- NCC/New Access Road: 2-lane roundabout
- NCC/SR 120/SR 108: 2-lane roundabout

NCC/Crane Road – The majority of the PDT felt that this intersection should be controlled by a traffic signal as opposed to a 3-lane roundabout, which would be necessary to provide acceptable traffic operations at this location. The operational benefit of a 3-lane roundabout over a traffic signal was found to be minimal while the safety benefits of a roundabout are substantially reduced as a 3-lane roundabout.

NCC/Albers Road – The majority of the PDT felt that this intersection should be controlled by a traffic signal as opposed to a 3-lane roundabout, which would be necessary to provide acceptable traffic operations at this location. The operational benefit of a 3-lane roundabout over a traffic signal was found to be minimal while the safety benefits of a roundabout are substantially reduced as a 3-lane roundabout.

NCC/Bentley Road – The PDT was divided on whether this intersection should be controlled by a traffic signal or a 2-lane roundabout. Ultimately, the PDT determined that because Claus Road to the west would be signalized and Albers Road to the east would be signalized that a traffic signal at Bentley Road would better meet drivers' expectations.

NCC/Stearns Road – The PDT was divided on whether this intersection should be controlled by a traffic signal or a 2-lane roundabout. Ultimately, the PDT determined that since the locations to the east (New Access Road and SR 120/108) would both be roundabouts that a roundabout at Stearns Road would be a natural transition point to roundabouts and better meet driver's expectations. The PDT discussed and agreed that there would be a safety benefit with a roundabout at this location.

NCC/Smith Road – The PDT was divided on whether this intersection should be controlled by a traffic signal or a 2-lane roundabout. Ultimately, the PDT determined that since the locations to the east (New Access Road and SR 120/108) would both be roundabouts that a roundabout at Smith Road would be a natural transition point to roundabouts and better meet driver's expectations. The PDT discussed and agreed that there would be a safety benefit with a roundabout at this location

6.2 INTERSECTION PEAK HOUR SIGNAL WARRANTS

The peak hour volume traffic signal warrant found in the CA MUTCD was evaluated for the usignalized intersections in the study area and summarized in **Table 6-1**. The following intersections meet the peak hour signal warrant under 2042 No Project conditions:

- Kiernan Avenue/Carver Road
- Kiernan Avenue/Tully Road
- Kiernan Avenue/Coffee Road
- Oakdale Road/Claratina Avenue
- Claribel Road/Roselle Avenue
- SR 108/Claus Road
- Patterson Road/Crane Road
- Claribel Road/Bentley Road – PM only

As shown in **Table 6-1**, most of the intersections above would continue to meet the peak hour signal warrant under With Project conditions. Claribel Road/Bentley road would only meet signal warrant in Alternatives 2A and 2B. All of the intersections added by the project would meet the peak hour signal warrant, except Claribel Realigned/Davis Road and North County Corridor/Smith Road. An evaluation of

all applicable warrants should be conducted and additional factors (e.g., congestion, approach conditions, driver confusion) should be considered before the decision to install a signal is made. Detailed signal warrant calculations are provided in Appendix S.

Based on the results from ICE process four intersections were also evaluated as two-lane roundabouts in addition to traffic signal. The four locations are:

- NCC/Stearns Road (Alternative 1A, 1B, and 2A)
- NCC/Smith Road (Alternative 2B)
- NCC/SR 120/SR 108 (All Alternatives)
- NCC/New Access Road (Alternative 1B and 2B)

TABLE 6-1
2042 PEAK HOUR SIGNAL WARRANT ANALYSIS

Intersection	Control[1]	Peak Hour Warrant Met?				
		No Project	Alt 1A	Alt 1B	Alt 2A	Alt 2B
1. Kiernan Avenue/Carver Road	AWSC	Yes (AM and PM)	Yes (AM and PM)	Yes (AM and PM)	Yes (AM and PM)	Yes (AM and PM)
2. Kiernan Avenue/Tully Road	AWSC	Yes (AM and PM)	Yes (AM and PM)	Yes (AM and PM)	Yes (AM and PM)	Yes (AM and PM)
8. North County Corridor/Coffee Road	AWSC	Yes (AM and PM)	Yes (AM and PM)	Yes (AM and PM)	Yes (AM and PM)	Yes (AM and PM)
12. Oakdale Road/Claratina Avenue	AWSC	Yes (AM and PM)	Yes (AM and PM)	Yes (AM and PM)	Yes (AM and PM)	Yes (AM and PM)
14. Claribel Road/Roselle Avenue	AWSC	Yes (AM and PM)	Yes (AM and PM)	Yes (AM and PM)	Yes (AM and PM)	Yes (AM and PM)
15. SR 108/Claus Road	AWSC	Yes (AM and PM)	No (AM) and Yes(PM)	No (AM) and Yes(PM)	Yes (AM and PM)	Yes (AM and PM)
17. Patterson Road/Crane Road	AWSC	Yes (AM) and Yes (PM)	No (AM) and Yes(PM)	No (AM) and Yes(PM)	Yes (AM and PM)	Yes (AM and PM)
18. Claribel Road/Bentley Road	SSSC	No (AM) and Yes(PM)	No	No	Yes (AM and PM)	Yes (AM and PM)
24. North County Corridor/Oakdale Road	AWSC	Does not exist	Yes (AM and PM)	Yes (AM and PM)	Yes (AM and PM)	Yes (AM and PM)
25. North County Corridor/Roselle Avenue	AWSC		Yes (AM and PM)	Yes (AM and PM)	Yes (AM and PM)	Yes (AM and PM)
26. North County Corridor/Crane Road	AWSC		Yes (AM and PM)	Yes (AM and PM)	N/A	
27. North County Corridor/Albers Road	AWSC		Yes (AM and PM)	Yes (AM and PM)	Yes (AM and PM)	Yes (AM and PM)

TABLE 6-1
2042 PEAK HOUR SIGNAL WARRANT ANALYSIS

Intersection	Control[1]	Peak Hour Warrant Met?				
		No Project	Alt 1A	Alt 1B	Alt 2A	Alt 2B
28. North County Corridor/North Stearns Road (Smith Road)	Round-about		Yes (AM and PM)	Yes (AM and PM)	Yes (AM and PM)	Yes (AM and PM)
29. North County Corridor/SR 108	Round-about		Yes (AM and PM)	Yes (AM and PM)	Yes (AM and PM)	Yes (AM and PM)
30. McHenry Avenue/Charity Way	AWSC		No (AM) and Yes(PM)	No (AM) and Yes(PM)	No (AM) and Yes(PM)	No (AM) and Yes(PM)
31. McHenry Avenue/Galaxy Way	AWSC		Yes (AM and PM)	Yes (AM and PM)	Yes (AM and PM)	Yes (AM and PM)
32. Coffee Road/Frontage Road (N)	AWSC		Yes (AM and PM)	Yes (AM and PM)	Yes (AM and PM)	Yes (AM and PM)
33. Coffee Road/Frontage Road (S)	AWSC	Does not exist	Yes (AM and PM)	Yes (AM and PM)	Yes (AM and PM)	Yes (AM and PM)
34. Oakdale Road/Frontage Road (S)	AWSC		Yes (AM and PM)	Yes (AM and PM)	Yes (AM and PM)	Yes (AM and PM)
35. Roselle Avenue/Frontage Road (S)	AWSC		Yes (AM and PM)	Yes (AM and PM)	Yes (AM and PM)	Yes (AM and PM)
36. Claribel Realigned (N)/Davis Road	SSSC		No	No	No	No
37. Claus Road/Claribel Realigned (N)	AWSC		Yes (AM and PM)	Yes (AM and PM)	Yes (AM and PM)	Yes (AM and PM)
38. Claus Road/Claribel Realigned (S)	AWSC		Yes (AM and PM)	Yes (AM and PM)	Yes (AM and PM)	Yes (AM and PM)
39. Stearns Road/Stearns Road Connection	AWSC		No (AM) and Yes(PM)	No	No (AM) and Yes(PM)	N/A
40. North County Corridor/New Access Road	Round-about		N/A	No	N/A	No

Notes:
1. SSSC = side-street stop-controlled intersection, AWSC = all-way stop-controlled intersection

Source: Fehr & Peers, 2015.

6.3 YEAR 2042 INTERSECTION OPERATIONS

Year 2042 intersection traffic operations were evaluated using the calibrated/validated SimTraffic models developed for Existing Conditions. With the exception of a few locations, any of the Project alternatives improve overall traffic operations on most local streets as compared to No Project conditions. **Table 6-2**

and **Table 6-3** present the Year 2042 simulated intersection level of service and vehicle queuing results for each of the study intersections under No Project and the four Project Alternatives. The Fehr & Peers analysis worksheets are presented in Appendix T.[5]

Intersection Level of Service

As shown in **Table 6-2**, 15 intersections are anticipated to operate at unacceptable levels (according to thresholds presented in section 2.4 of this report) under No Project conditions during the AM and/or PM peak, including:

- Tully Road/Kiernan Avenue during the PM peak hour
- McHenry Avenue/Ladd Road during the AM and PM peak hours
- McHenry Avenue/Patterson Road during the AM and PM peak hours
- SR 108/Kiernan Avenue during the AM and PM peak hours
- SR 108/Claratina Avenue during the AM and PM peak hours
- Coffee Road/Claratina Avenue during the AM and PM peak hours
- Oakdale Road/Claribel Road during the AM and PM peak hours
- Oakdale Road/Claratina Road during the PM peak hour
- 1st Street/SR 108 during the AM and PM peak hours
- Roselle Avenue/Claribel Road during the AM and PM peak hours
- Claus Road/Claribel Road during the AM and PM peak hours
- Crane Road/Patterson Road during the PM peak hour
- Bentley Road/Claribel Road during the PM peak hour
- SR 120/SR 108 during the AM and PM peak hours
- Albers Road/Patterson Road during the AM and PM peak hours

The project alternatives are expected to reduce delay at many of the study intersections; however, there will still be intersections that continue to operate at unacceptable service levels in the future even after project implementation. The following intersections would continue to operate at unacceptable levels under some or all of the Project alternatives:

- McHenry Avenue/Ladd Road during the AM and PM peak hour of all scenarios
- SR 108/Patterson Road during the AM peak hour of all scenarios
- McHenry Avenue/Claratina Avenue during AM and PM peak hours of all scenarios
- Coffee Road/Claratina Avenue during the PM peak hour of Alternatives 1A and 1B and the AM peak hour of Alternative 2A
- 1st Street/SR 108 during the PM peak hour of Alternatives 1B, 2A, and 2B
- SR 120/SR 108 during the AM and PM peak hours of Alternative 1B and the PM peak hour of Alternative 2B
- Albers Road/Patterson Road during the AM and PM peak hour of Alternatives 2A and 2B

Some of the intersections listed above are outside the State right-of-way. The local agencies have reviewed these results and acknowledge that several of the intersections will have substandard level of service in the future. Note that at locations that operate at unacceptable service levels in the future, all of the project alternatives either would result in no change to the intersection level of service or would provide a slight improvement. Therefore, none of the project alternatives would result in a degradation of traffic operations at any of the study intersections.

[5] Please note that Synchro worksheets are provided for the study intersections in Appendix M for informational purposes to present key modeling inputs including lanes, volumes, and signal timings. The results presented in Tables 7-2 and 7-3 are from the Fehr & Peers analysis worksheets, which are the average of ten SimTraffic model runs.

As shown in **Table 6-2**, the new NCC intersections (including frontage roads) are anticipated to operate at acceptable service levels under all Project Alternatives. The new single point urban interchanges (SPUI) at SR 108, Coffee Road, Oakdale Road, and Roselle Avenue are anticipated to operate at LOS C or better conditions.

Vehicle Queuing

Table 6-3 summarizes the 95th percentile queue lengths at intersections located along the State highway system and at the new NCC intersections. The 95th percentile queue lengths for all of the study intersections are presented in Appendix T. As shown in **Table 6-3**, queues at several turn bays exceed available storage under the No Project conditions and the Project alternatives. Under Project conditions, most of the intersections along Kiernan Avenue and NCC would provide adequate vehicle storage except at the following two locations:

- Kiernan Avenue/Carver Road – Project Alternatives 1A and 1B result in some movements exceeding available storage during the PM peak hour. In all cases the 95th percentile queues exceed available storage by less than 40 feet. This intersection is outside the project scope and no changes are proposed as part of the project.

- Kiernan Avenue/Tully Road – Project Alternatives 1A, 1B, and 2A result in the eastbound right-turn exceeding available storage during the PM peak hour. In all cases the 95th percentile queue exceeds available storage by less than 75 feet. The eastbound approach to this intersection is outside the project scope and no changes are proposed as part of the project.

Queues would also exceed available storage at two NCC locations due to through volumes blocking access to the turn pocket. The recommendation is to extend turning pocket lengths at the following locations:

- Bentley Road/Claribel Road – Project Alternatives 2A and 2B for the southbound right and northbound left turning movements

- Albers Road/North County Corridor – Project Alternative 2B for the northbound left turning movement

TABLE 6-2
2042 PEAK HOUR INTERSECTION ANALYSIS

Intersection	Traffic Control[1]	Peak Hour	No Project		Alternative 1A		Alternative 1B		Alternative 2A		Alternative 2B	
			Delay (secs / veh)[2,3]	LOS[2,3]	Delay (secs / veh)[2,3]	LOS[2,3]	Delay (secs / veh)[2,3]	LOS[2,3]	Delay (secs / veh)[2,3]	LOS[2,3]	Delay (secs / veh)[2,3]	LOS[2,3]
1. Carver Road/Kiernan Avenue	Signal	AM	30	C	42	D	41	D	36	D	37	D
		PM	28	C	46	D	46	D	40	D	40	D
2. Tully Road/Kiernan Avenue	Signal	AM	27	C	30	C	28	C	28	C	28	C
		PM	**>100**	**F**	45	D	47	D	40	D	42	D
3. McHenry Avenue/Ladd Road	Signal	AM	**60**	**E**	51	D	52	D	54	D	**55**	**E**
		PM	**>100**	**F**	**>100**	**F**	**>100**	**F**	**>100**	**F**	**>100**	**F**
4. McHenry Avenue/SR 108	Signal	AM	12	B	13	B	13	B	12	B	12	B
		PM	11	B	10	A	10	A	11	B	11	B
5. SR 108/Patterson Road	Signal	AM	**>100**	**F**	**>100**	**F**	**>100**	**F**	**>100**	**F**	**>100**	**F**
		PM	**>100**	**F**	16	B	17	B	55	D	41	D
6. McHenry Avenue/Kiernan Avenue	Signal	AM	**>100**	**F**	16	B	16	B	16	B	16	B
		PM	**58**	**E**	19	B	20	B	17	B	18	B
7. McHenry Avenue/Claratina Avenue	Signal	AM	**> 100**	**F**	**89**	**F**	**100**	**F**	**>100**	**F**	**98**	**F**
		PM	**> 100**	**F**	**>100**	**F**	**>100**	**F**	**>100**	**F**	**>100**	**F**
8. Coffee Road/Claribel Road	Signal	AM	31	C	23	C	26	C	28	C	25	C
		PM	32	C	18	B	20	B	19	B	20	B

Notes: Results in **bold** represent unacceptable levels of service as determined by the applicable standards of the relevant jurisdictions. Results based on SimTraffic simulation of 10 runs.

1. Signal = signalized intersection, SSSC = side street stop controlled intersection, AWSC = all-way stop-controlled intersection, Roundabout = roundabout controlled intersection

2. Signalized and all-way stop intersection level of service based on weighted average control delay per vehicle, according to the *2010 Highway Capacity Manual*.

3. Side-street stop intersection level of service based on weighted average control delay per vehicle and worst approach control delay per vehicle, according to the *2010 Highway Capacity Manual* in the notation: average (worst approach).

Source: Fehr & Peers, 2015.

TABLE 6-2
2042 PEAK HOUR INTERSECTION ANALYSIS

Intersection	Traffic Control[1]	Peak Hour	No Project		Alternative 1A		Alternative 1B		Alternative 2A		Alternative 2B	
			Delay (secs / veh)[2,3]	LOS[2,3]	Delay (secs / veh)[2,3]	LOS[2,3]	Delay (secs / veh)[2,3]	LOS[2,3]	Delay (secs / veh)[2,3]	LOS[2,3]	Delay (secs / veh)[2,3]	LOS[2,3]
9. Coffee Road/Claratina Avenue	Signal	AM	**>100**	**F**	39	D	40	D	47	D	47	D
		PM	**>100**	**F**	**79**	**E**	**71**	**E**	47	D	50	D
10. Oakdale Road/Patterson Road	Signal	AM	33	C	23	C	24	C	26	C	26	C
		PM	38	D	33	C	35	C	38	D	38	D
11. Oakdale Road/Claribel Road	Signal	AM	45	D	24	C	25	C	25	C	26	C
		PM	**76**	**E**	28	C	26	C	31	C	31	C
12. Oakdale Road/Claratina Avenue	Signal	AM	42	D	41	D	40	D	50	D	44	D
		PM	**68**	**E**	32	C	33	C	35	D	35	D
13. 1st Street/SR 108	Signal	AM	**>100**	**F**	32	C	33	C	39	D	51	D
		PM	**>100**	**F**	**59**	**E**	**55**	**E**	**73**	**E**	**>100**	**F**
14. Roselle Avenue/Claribel Road	Signal	AM	**>100**	**F**	16	B	16	B	16	B	16	B
		PM	**>100**	**F**	23	C	23	C	24	C	26	C
15. Claus Road/SR 108	Signal	AM	15	B	6	A	6	A	16	B	15	B
		PM	16	B	6	A	8	A	16	B	17	B
16. Claus Road/Claribel Road (NCC)	Signal	AM	**61**	**E**	33	C	35	D	27	C	28	C
		PM	**59**	**E**	51	D	47	D	37	D	37	D

Notes: Results in **bold** represent unacceptable levels of service as determined by the applicable standards of the relevant jurisdictions.

1. Results based on SimTraffic simulation of 10 runs.

2. Signal = signalized intersection, SSSC = side street stop controlled intersection, AWSC = all-way stop-controlled intersection, Roundabout = roundabout controlled intersection

3. Signalized and all-way stop intersection level of service based on weighted average control delay per vehicle, according to the *2010 Highway Capacity Manual*.

4. Side-street stop intersection level of service based on weighted average control delay per vehicle and worst approach control delay per vehicle, according to the *2010 Highway Capacity Manual* in the notation: average (worst approach).

Source: Fehr & Peers, 2015.

TABLE 6-2
2042 PEAK HOUR INTERSECTION ANALYSIS

Intersection	Traffic Control[1]	Peak Hour	No Project		Alternative 1A		Alternative 1B		Alternative 2A		Alternative 2B	
			Delay (secs / veh)[2,3]	LOS[2,3]	Delay (secs / veh)[2,3]	LOS[2,3]	Delay (secs / veh)[2,3]	LOS[2,3]	Delay (secs / veh)[2,3]	LOS[2,3]	Delay (secs / veh)[2,3]	LOS[2,3]
17. Crane Road/Patterson Road	Signal	AM	17	B	13	B	13	B	11	B	11	B
		PM	**>100**	**F**	14	B	14	B	20	C	21	C
18. Bentley Road/Claribel Road	SSSC/ Signal	AM	7 (22)	A (C)	11	B	11	B	26	D	25	C
		PM	29 **(90)**	D **(F)**	12	B	12	B	32	D	30	D
19. Oak Avenue/SR 108	Signal	AM	17	B	14	B	15	B	13	B	13	B
		PM	17	B	15	B	16	B	15	B	16	B
20. SR 120/SR 108	Signal	AM	**>100**	**F**	36	D	**100**	**F**	36	D	48	D
		PM	**>100**	**F**	46	D	**98**	**F**	52	D	**72**	**E**
21. SR 108/Maag Avenue	Signal	AM	29	C	22	C	24	C	24	C	25	C
		PM	31	C	21	C	24	C	23	C	26	C
22. Albers Road/Patterson Road	Signal	AM	**52**	**D**	25	C	25	C	**36**	**D**	**39**	**D**
		PM	**37**	**D**	35	C	34	C	**38**	**D**	**41**	**D**
23. Albers Road/Claribel Road	Signal	AM	32	C	20	C	20	C	10	A	10	A
		PM	23	C	19	B	18	B	12	B	11	B
24. Oakdale Road/NCC	Signal	AM	Not Applicable Under No Project Conditions		14	B	14	B	14	B	14	B
		PM			19	B	19	B	20	C	20	C

Notes: Results in **bold** represent unacceptable levels of service as determined by the applicable standards of the relevant jurisdictions.

1. Results based on SimTraffic simulation of 10 runs.

2. Signal = signalized intersection, SSSC = side street stop controlled intersection, AWSC = all-way stop-controlled intersection, Roundabout = roundabout controlled intersection

3. Signalized and all-way stop intersection level of service based on weighted average control delay per vehicle, according to the *2010 Highway Capacity Manual*.

4. Side-street stop intersection level of service based on weighted average control delay per vehicle and worst approach control delay per vehicle, according to the *2010 Highway Capacity Manual* in the notation: average (worst approach).

Source: Fehr & Peers, 2015.

TABLE 6-2
2042 PEAK HOUR INTERSECTION ANALYSIS

Intersection	Traffic Control[1]	Peak Hour	No Project		Alternative 1A		Alternative 1B		Alternative 2A		Alternative 2B	
			Delay (secs / veh)[2,3]	LOS[2,3]	Delay (secs / veh)[2,3]	LOS[2,3]	Delay (secs / veh)[2,3]	LOS[2,3]	Delay (secs / veh)[2,3]	LOS[2,3]	Delay (secs / veh)[2,3]	LOS[2,3]
25. Roselle Ave/NCC	Signal	AM	Not Applicable Under No Project Conditions		17	B	16	B	15	B	15	B
		PM			15	B	15	B	15	B	16	B
26. Crane Road/NCC	Signal	AM			20	B	17	B	Intersection Does Not Exist			
		PM			31	C	32	C				
27. Albers Road/NCC	Signal	AM			40	D	35	C	37	D	35	D
		PM			35	C	30	C	29	C	29	C
28. Stearns Connection (Smith Road – 2B)/NCC	Signal (Roundabout)	AM			15 (7)	B (A)	8 (5)	A (A)	14 (7)	B (A)	10 (4)	B (A)
		PM			16 (8)	B (A)	9 (6)	A (A)	17 (8)	B (A)	12 (5)	B (A)
29. NCC/ SR120/108	Signal (Roundabout)	AM			13 (7)	B (A)	7 (4)	A (A)	14 (7)	B (A)	6 (4)	A (A)
		PM			16 (6)	B (A)	9 (4)	A (A)	16 (6)	B (A)	10 (4)	B (A)
30. McHenry Ave/Charity Way	Signal	AM			8	A	8	A	8	A	8	A
		PM			11	B	11	B	11	B	11	B
31. McHenry Ave/Galaxy Way	Signal	AM			12	B	12	B	12	B	12	B
		PM			29	C	28	C	25	C	25	C
32. Coffee Road/Frontage Road (N)	Signal	AM			10	A	10	A	10	B	10	B
		PM			10	A	10	B	10	A	10	A
33. Coffee Road/Frontage Road (S)	Signal	AM			12	B	13	B	12	B	12	B
		PM			12	B	12	B	11	B	12	B

Notes: Results in **bold** represent unacceptable levels of service as determined by applicable standards of relevant jurisdictions.

1. Results based on SimTraffic simulation of 10 runs.
2. Signal = signalized intersection, SSSC = side street stop controlled intersection, AWSC = all-way stop-controlled intersection, Roundabout = roundabout controlled intersection
3. Signalized and all-way stop intersection level of service based on weighted average control delay per vehicle, according to the *2010 Highway Capacity Manual*.
4. Side-street stop intersection level of service based on weighted average control delay per vehicle and worst approach control delay per vehicle, according to the *2010 Highway Capacity Manual* in the notation: average (worst approach).
5. Roundabout analysis based on Sidra 6.0 traffic analysis software using the HCM Roundabout Analysis methodology with California-specific values.

Source: Fehr & Peers, 2015.

TABLE 6-2
2042 PEAK HOUR INTERSECTION ANALYSIS

Intersection	Traffic Control[1]	Peak Hour	No Project		Alternative 1A		Alternative 1B		Alternative 2A		Alternative 2B	
			Delay (secs / veh)[2,3]	LOS[2,3]	Delay (secs / veh)[2,3]	LOS[2,3]	Delay (secs / veh)[2,3]	LOS[2,3]	Delay (secs / veh)[2,3]	LOS[2,3]	Delay (secs / veh)[2,3]	LOS[2,3]
34. Oakdale Road/Frontage Road (S)	Signal	AM	Not Applicable Under No Project Conditions		12	B	11	B	12	B	12	B
		PM			12	B	13	B	13	B	12	B
35. Roselle Ave/Frontage Road (S)	Signal	AM			10	B	10	A	10	B	10	B
		PM			11	B	11	B	11	B	11	B
36. Claribel Realigned (N)/Davis Road	SSSC	AM			2 (7)	A (A)	2 (7)	A (A)	2 (7)	A (A)	2 (7)	A (A)
		PM			2 (8)	A (A)	1 (7)	A (A)	1 (12)	A (B)	1 (8)	A (A)
37. Claus Road/Claribel Realigned (N)	Signal	AM			11	B	11	B	13	B	13	B
		PM			18	B	18	B	19	B	19	B
38. Claus Road/Claribel Realigned (S)	Signal	AM			12	B	12	B	8	A	8	A
		PM			19	B	27	C	9	A	9	A
39. Stearns/Stearns Connection	Signal (AWSC - 1B)	AM			7	A	2 (8)	A (A)	6	A	Intersection Does Not Exist	
		PM			7	A	4	A	8	A		
40. New Access Road/NCC	Signal (Roundabout)	AM			Intersection Does not Exist		5 (4)	A (A)	Intersection Does Not Exist		5 (4)	A (A)
		PM					5 (4)	A (A)			5 (4)	A (A)

Notes: Results in **bold** represent unacceptable levels of service as determined based on applicable standards of relevant jurisdictions.

1. Results based on SimTraffic simulation of 10 runs.
2. Signal = signalized intersection, SSSC = side street stop controlled intersection, AWSC = all-way stop-controlled intersection, Roundabout = roundabout controlled intersection
3. Signalized and all-way stop intersection level of service based on weighted average control delay per vehicle, according to the *2010 Highway Capacity Manual*.
4. Side-street stop intersection level of service based on weighted average control delay per vehicle and worst approach control delay per vehicle, according to the *2010 Highway Capacity Manual* in the notation: average (worst approach).
5. Roundabout analysis based on Sidra 6.0 traffic analysis software using the HCM Roundabout Analysis methodology with California-specific values.

Source: Fehr & Peers, 2015.

TABLE 6-3
2042 PEAK HOUR QUEUING ANALYSIS

Intersection	Movement[1]	Scenario	Available Storage (ft)[2]	AM Peak Hour					PM Peak Hour				
				No Project	Alt 1A	Alt 1B	Alt 2A	Alt 2B	No Project	Alt 1A	Alt 1B	Alt 2A	Alt 2B
1. Kiernan Avenue (NCC) / Carver Road	NB-L	all	330	249	308	264	294	286	200	**337**	325	315	316
	NB-TR	all	2,600	120	151	134	153	134	267	449	530	464	521
	SB-L	all	300	63	69	82	73	64	164	249	215	228	209
	SB-TR	all	7,900	264	244	261	190	191	137	188	155	165	152
	EB-L	all	530	143	130	150	121	135	121	228	271	154	152
	EB-T	all	8,000	299	402	399	377	392	291	692	702	477	502
	EB-R	all	410	100	142	155	130	158	110	**441**	**442**	276	273
	WB-L	all	580	130	416	391	290	289	110	366	297	207	210
	WB-T	all	2,600	328	588	452	422	404	341	407	408	401	424
	WB-R	all	530	62	95	62	63	62	52	71	74	68	63
2. Kiernan Avenue (NCC) / Tully Road	NB-L	all	800	213	88	90	81	84	**> 1,000**	309	348	256	179
	NB-T	all	3,700	94	64	66	61	62	2990	123	107	111	66
	NB-R	all	400	86	0	0	0	0	280	0	0	0	0
	SB-L	all	550	73	68	76	72	78	**432**	219	208	298	160
	SB-TR	all	2,600	175	74	67	74	76	1058	256	216	172	97
	SB-T	all	2,600	175	91	83	76	86	1058	244	207	101	72
	EB-L	all	715	97	102	113	110	113	**881**	69	150	67	34
	EB-T	all	2,500	356	389	591	769	651	1980	851	982	653	344
	EB-R	all	355	288	284	270	315	316	**532**	**421**	**415**	**378**	156
	WB-L	all	660 (920 - Project)	177	260	247	239	238	**769**	316	360	242	169
	WB-T	all	1,900	259	491	362	348	338	930	287	262	259	166
	WB-R	all	415 (750 - Project)	22	41	43	44	42	48	50	49	41	15

Notes: Results in **bold** denote locations where storage length is exceeded.

1. NB-northbound, SB-southbound, EB-eastbound, WB-westbound, L-left turn movement, T-through movement, R-right turn movement

2. Storage length shown in feet. If there is a value in parentheses, it shows the different storage length that applies under the With Project scenario unless otherwise indicated.

Source: Fehr & Peers, 2015

TABLE 6-3
2042 PEAK HOUR QUEUING ANALYSIS

Intersection	Movement[1]	Scenario	Available Storage (ft)[2]	AM Peak Hour					PM Peak Hour				
				No Project	Alt 1A	Alt 1B	Alt 2A	Alt 2B	No Project	Alt 1A	Alt 1B	Alt 2A	Alt 2B
3. McHenry Avenue / Ladd Road	NB-L	all	185	115	126	114	109	140	**188**	**193**	173	**227**	**218**
	NB-T	all	450	271	258	256	263	270	393	299	288	361	338
	NB-TR	all	450	259	238	246	248	255	356	275	278	343	317
	SB-L	all	290	268	184	213	242	239	**369**	**351**	**350**	**359**	**351**
	SB-T	all	3,500	474	379	363	457	484	2342	**4564**	**4557**	**3957**	**4042**
	SB-TR	all	3,500	516	423	405	495	528	2137	**4750**	**4749**	**4039**	**4143**
	EB-L	all	250	**358**	**295**	**281**	**304**	**310**	**353**	**319**	**310**	**368**	**364**
	EB-TR	all	2,600	829	292	253	389	367	**3909**	**3897**	**4070**	**2991**	**3549**
	WB-L	all	90	**97**	**104**	**100**	**87**	**91**	**99**	**103**	**107**	**100**	**90**
	WB-T	all	580	505	552	519	504	505	537	509	508	**590**	**592**
	WB-R	all	160	**290**	**279**	**289**	**283**	**277**	**284**	**264**	**238**	**270**	**275**
4. McHenry Avenue / SR 108	NB-T	all	3,300	182	189	187	189	201	227	182	165	234	197
	SB-T	all	450	259	254	245	259	252	255	225	223	263	255
	WB-LR	all	660	164	173	190	173	167	148	124	128	104	107
5. SR 108 / Patterson Road	NB-R	all	660	61	41	48	53	60	228	144	152	118	119
	EB-TR	all	500	385	162	171	255	230	500	426	432	**557**	**566**
	WB-L	all	530	**825**	**808**	**816**	**810**	**819**	**821**	127	144	**572**	459
	WB-T	all	2,300	**4585**	**3614**	**3873**	**4648**	**4656**	**3377**	107	96	1520	946

Notes: Results in **bold** denote locations where storage length is exceeded.

1. NB-northbound, SB-southbound, EB-eastbound, WB-westbound, L-left turn movement, T-through movement, R-right turn movement

2. Storage length shown in feet. If there is a value in parentheses, it shows the different storage length that applies under the With Project scenario unless otherwise indicated.

Source: Fehr & Peers, 2015

TABLE 6-3
2042 PEAK HOUR QUEUING ANALYSIS

Intersection	Movement[1]	Scenario	Available Storage (ft)[2]	AM Peak Hour					PM Peak Hour				
				No Project	Alt 1A	Alt 1B	Alt 2A	Alt 2B	No Project	Alt 1A	Alt 1B	Alt 2A	Alt 2B
6. SR 108 / Kiernan Avenue (NCC)	NB-L	all	260 (700)	**301**	125	136	131	123	**362**	167	172	161	176
	NB-T	all	1370 (1,670)	349	108	113	118	115	525	142	147	131	140
	NB-R	all	1,370 (700)	77	64	60	62	56	325	192	197	144	161
	SB-L	all	420 (550)	107	71	67	74	68	161	140	134	156	166
	SB-T	all	1260 (1,150)	279	150	135	151	145	258	175	170	156	161
	SB-R	all	535 (550)	236	146	146	140	138	213	125	142	118	121
	EB-L	all	775 (500)	164	54	52	53	51	229	111	148	135	129
	EB-T	all	1,460	203	0	0	0	0	342	0	0	0	0
	EB-R	all	660 (1,350)	94	145	154	177	179	300	263	288	259	259
	WB-L	all	975 (500)	**1390**	128	124	126	122	800	0	0	0	0
	WB-T	all	5,280 (1240)	2840	0	0	0	0	1307	0	0	0	0
	WB-TR	No Project	5,280	2840					1307				
	WB-R	all	1,250	0	208	199	222	212	0	0	0	0	43
7. SR 108 / Pelandale Avenue	NB-L	all	225	**287**	**260**	**269**	**337**	**309**	**286**	**328**	**331**	**312**	**298**
	NB-T	all	590	**>1000**	308	298	**982**	451	**>1000**	**>1000**	**>1000**	**>1000**	**>1000**
	NB-TR	all	590	244	224	238	216	227	261	334	328	278	298
	SB-L	all	200	166	180	192	**223**	195	**710**	**662**	**705**	**661**	**669**
	SB-T	all	600	257	303	298	269	277	**>1000**	**858**	**>1000**	**846**	**>1000**
	SB-TR	all	600	230	275	251	234	234	**>1000**	**733**	**950**	**655**	**693**
	EB-L	all	350	**492**	**449**	**437**	**479**	**459**	**547**	**529**	**536**	**521**	**518**
	EB-T	all	750	**>1000**	576	651	**>1000**	741	**>1000**	**>1000**	**>1000**	**>1000**	**>1000**
	EB-R	all	350	113	120	130	169	128	**545**	**508**	**526**	**488**	**475**
	WB-L	all	300	**479**	**451**	**446**	**433**	**431**	**432**	**361**	**363**	**361**	**362**
	WB-T	all	2,540	**>1000**	**>1000**	**>1000**	**>1000**	**>1000**	903	**>1000**	**>1000**	**>1000**	**>1000**
	WB-R	all	350	**461**	**504**	**511**	**497**	**511**	**488**	239	200	173	160

Notes: Results in **bold** denote locations where storage length is exceeded.

1. NB-northbound, SB-southbound, EB-eastbound, WB-westbound, L-left turn movement, T-through movement, R-right turn movement

2. Storage length shown in feet. If there is a value in parentheses, it shows the different storage length that applies under the With Project scenario unless otherwise indicated.

Source: Fehr & Peers, 2015

TABLE 6-3
2042 PEAK HOUR QUEUING ANALYSIS

Intersection	Movement[1]	Scenario	Available Storage (ft)[2]	AM Peak Hour					PM Peak Hour				
				No Project	Alt 1A	Alt 1B	Alt 2A	Alt 2B	No Project	Alt 1A	Alt 1B	Alt 2A	Alt 2B
8. Coffee Road/Claribel Road (NCC)	NB-L	all	260 (650)	219	361	361	344	341	200	223	229	235	263
	NB-T	all	4,100 (950)	158	51	53	78	58	353	74	79	81	79
	NB-R	all	4,100 (650)	0	123	114	81	96	0	223	238	209	209
	SB-L	all	110 (650)	**113**	62	60	65	64	**120**	75	78	79	88
	SB-T	all	2230 (970)	333	219	205	390	332	232	91	108	106	114
	SB-R	all	260 (650)	171	419	508	578	527	31	163	171	148	155
	EB-L	all	320 (880)	203	72	66	64	69	306	389	351	244	273
	EB-T	all	5,280 (3,000)	206					336				
	EB-R	all	250 (880)		78	85	107	111	186	307	275	230	227
	WB-L	all	420 (500)	243	178	170	165	142	264	135	138	128	126
	WB-T	all	5,250 (4,580)	516					404				
	WB-R	all	240 (500)	163	96	81	97	90	127	100	103	55	66
10. Oakdale Road / SR 108	NB-L	all	200	**202**	180	190	188	178	**253**	**238**	**245**	**239**	**244**
	NB-T	all	590	144	96	114	100	98	261	185	193	249	235
	NB-R	all	590	270	143	146	148	154	274	232	267	307	357
	SB-L	all	150	**151**	113	117	138	122	145	112	120	120	137
	SB-T	all	250	248	120	123	188	180	240	137	140	147	154
	SB-R	all	75	**142**	**104**	**105**	**127**	**109**	**124**	**95**	**93**	**89**	**86**
	EB-L	all	525	154	94	92	96	102	167	165	157	161	163
	EB-T	all	1,100	222	91	102	176	150	333	272	311	339	341
	EB-TR	all	1,100	235	101	109	185	172	348	295	322	351	366
	WB-L	all	625	175	102	122	147	163	250	204	203	271	241
	WB-T	all	1,200	236	180	175	227	204	170	133	132	155	167
	WB-TR	all	675	268	204	202	254	225	185	151	162	180	188

Notes: Results in **bold** denote locations where storage length is exceeded.

1. NB-northbound, SB-southbound, EB-eastbound, WB-westbound, L-left turn movement, T-through movement, R-right turn movement

2. Storage length shown in feet. If there is a value in parentheses, it shows the different storage length that applies under the With Project scenario unless otherwise indicated.

Source: Fehr & Peers, 2015

TABLE 6-3
2042 PEAK HOUR QUEUING ANALYSIS

Intersection	Movement[1]	Scenario	Available Storage (ft)[2]	AM Peak Hour					PM Peak Hour				
				No Project	Alt 1A	Alt 1B	Alt 2A	Alt 2B	No Project	Alt 1A	Alt 1B	Alt 2A	Alt 2B
13. SR 108 / 1st Street	NB-L	all	250	**287**	217	189	167	213	**380**	**317**	**322**	**338**	**343**
	NB-TR	all	260	**651**	**465**	**416**	**376**	**431**	**1423**	**994**	**837**	**1100**	**1086**
	SB-L	all	175	**276**	**234**	**251**	**232**	**257**	**274**	**276**	**279**	**280**	**278**
	SB-T	all	250	**730**	**495**	**483**	**351**	**446**	**1976**	**708**	**673**	**1095**	**1347**
	SB-R	all	100	**202**	**189**	**194**	**177**	**189**	**191**	**180**	**184**	**191**	**191**
	EB-L	all	775	486	168	173	181	172	**789**	476	434	360	692
	EB-TR	all	1,860	1063	146	181	295	333	1310	358	435	617	1060
	WB-L	all	75	**117**	**110**	**125**	**125**	**134**	**127**	**122**	**129**	**144**	**136**
	WB-T	all	400	**3210**	245	356	**688**	**1191**	**3989**	254	265	**653**	**1848**
	WB-R	all	150	**269**	**176**	**228**	**264**	**274**	**266**	**167**	**190**	**260**	**275**
15. SR 108 / Claus Road	NB-L	all	320	163	83	76	138	110	243	89	101	117	109
	NB-R	all	150	125	32	46	113	89	**188**	55	68	126	149
	EB-T	all	170	**214**	69	79	141	136	**220**	116	136	**225**	**254**
	EB-TR	all	300	210	81	80	144	143	224	115	148	244	255
	WB-L	all	200	**284**	87	95	**356**	**339**	**244**	60	88	**245**	**268**
	WB-T	all	1,350	98	69	68	201	196	94	52	55	85	83

Notes: Results in **bold** denote locations where storage length is exceeded.

1. NB-northbound, SB-southbound, EB-eastbound, WB-westbound, L-left turn movement, T-through movement, R-right turn movement

2. Storage length shown in feet. If there is a value in parentheses, it shows the different storage length that applies under the With Project scenario unless otherwise indicated.

Source: Fehr & Peers, 2015

TABLE 6-3
2042 PEAK HOUR QUEUING ANALYSIS

Intersection	Movement[1]	Scenario	Available Storage (ft)[2]	AM Peak Hour					PM Peak Hour				
				No Project	Alt 1A	Alt 1B	Alt 2A	Alt 2B	No Project	Alt 1A	Alt 1B	Alt 2A	Alt 2B
16. Claribel Road/Claus Road (NCC)	NB-L	all	250 (720)	250 (720)	221	199	197	122	130	157	199	294	205
	NB-T	all	1,620 (2,100)	1,620 (2,100)	949	133	141	173	187	622	133	172	169
	NB-TR	No Project	1,620	1,620	949					729			
	NB-R	all	1,000	1,000	**1026**	308	270	100	78	729	308	282	140
	SB-L	all	250 (520)	250 (520)	173	79	76	50	50	138	79	70	81
	SB-T	all	960 (1,350)	960 (1,350)	485	181	193	173	196	317	181	297	230
	SB-TR	No Project	960	960	485					338			
	SB-R	all	720	720	498	278	288	313	293	338	278	297	304
	EB-L	all	150 (800)	150 (800)	243	202	195	211	217	250	202	285	269
	EB-T	all	2,140 (8,580)	2,140 (8,580)	599	396	499	257	256	1161	396	480	343
	EB-R	all	75 (1000)	75 (1000)	135	188	167	115	112	151	188	278	121
	WB-L	all	300 (970)	300 (970)	300	192	185	133	124	388	192	361	236
	WB-T	all	4,120 (15,800)	4,120 (15,800)	385	304	286	274	247	607	304	342	291
	WB-R	all	75 (850)	75 (850)	118	45	42	49	44	128	45	54	41

Notes: Results in **bold** denote locations where storage length is exceeded.

1. NB-northbound, SB-southbound, EB-eastbound, WB-westbound, L-left turn movement, T-through movement, R-right turn movement

2. Storage length shown in feet. If there is a value in parentheses, it shows the different storage length that applies under the With Project scenario unless otherwise indicated.

Source: Fehr & Peers, 2015

TABLE 6-3
2042 PEAK HOUR QUEUING ANALYSIS

Intersection	Movement[1]	Scenario	Available Storage (ft)[2]	AM Peak Hour					PM Peak Hour				
				No Project	Alt 1A	Alt 1B	Alt 2A	Alt 2B	No Project	Alt 1A	Alt 1B	Alt 2A	Alt 2B
18. Claribel Road/ Bentley Road (NCC – 2A/2B)	NB-L	2A/2B	200				134	131				157	132
	NB-T	2A/2B	1530				102	128				153	126
	NB-TRL	NP/1A/1B	4400	95	61	62			98	71	66		
	NB-R	2A/B	300				56	49				70	69
	SB-L	2A/2B	150				56	55				77	77
	SB-T	2A/2B	1240				129	119				244	235
	SB-TRL	NP/1A/1B	1240	122	63	68			850	66	72		
	SB-R	2A/B	300				45	52				228	222
	EB-TRL	NP/1A/1B	2600	127	38	33			146	27	25		
	EB-L	2A/2B	680				232	277				155	215
	EB-T	2A/2B	2600				245	199				374	288
	EB-R	2A/2B	580				44	45				80	71
	WB-TRL	NP/1A/1B	5280	40	27	23			47	32	31		
	WB-L	2A/2B	770				66	63				136	146
	WB-T	2A/2B	5280				361	300				328	298
	WB-R	2A/2B	720				28	30				24	25
19. SR 108 / Oak Avenue	NB-L	all	250	250	120	102	102	112	95	109	102	107	105
	NB-TR	all	670	670	98	87	94	110	85	103	104	107	101
	SB-L	all	100	100	**119**	**111**	**109**	**113**	99	98	94	90	92
	SB-T	all	420	420	100	91	81	115	81	88	73	78	66
	SB-R	all	75	75	**90**	**79**	**82**	**92**	**77**	**80**	68	**76**	71
	EB-L	all	250	250	95	84	90	98	88	111	103	105	110
	EB-T	all	730	730	201	127	150	101	120	192	138	158	127
	EB-TR	all	730	730	226	142	168	126	146	214	154	177	148
	WB-L	all	250	250	88	79	80	102	78	67	69	63	65
	WB-T	all	480	480	253	151	175	101	113	272	213	232	202
	WB-TR	all	300	300	210	104	142	81	83	226	168	200	162

Notes: Results in **bold** denote locations where storage length is exceeded.

1. NB-northbound, SB-southbound, EB-eastbound, WB-westbound, L-left turn movement, T-through movement, R-right turn movement

2. Storage length shown in feet. If there is a value in parentheses, it shows the different storage length that applies under the With Project scenario unless otherwise indicated.

Source: Fehr & Peers, 2015

TABLE 6-3
2042 PEAK HOUR QUEUING ANALYSIS

Intersection	Movement[1]	Scenario	Available Storage (ft)[2]	AM Peak Hour					PM Peak Hour				
				No Project	Alt 1A	Alt 1B	Alt 2A	Alt 2B	No Project	Alt 1A	Alt 1B	Alt 2A	Alt 2B
20. SR 108/SR 120	NB-LT	all	390	390	342	262	280	250	304	**950**	**414**	**527**	**472**
	NB-T	all	390	390		269	280	253	319	**1453**	**425**	**562**	**493**
	NB-R	all	300	300		65	108	80	166	**478**	180	**330**	235
	SB-LT	all	400	400	**2225**	**485**	**537**	**448**	**627**	**2833**	**563**	**599**	**613**
	SB-TR	all	400	400	**2225**	**485**	**537**	**448**	**627**	**2814**	**563**	**599**	**613**
	EB-L	all	50	50	**133**	**130**	**130**	**134**	**129**	**131**	**128**	**132**	**131**
	EB-T	all	200	200	**3370**	**350**	**616**	**333**	**711**	**3192**	**397**	**602**	**665**
	EB-TR	all	200	200	**276**	**253**	**296**	**265**	**300**	**278**	**252**	**292**	**290**
	WB-L	all	240	240	**400**	58	**410**	160	**353**	**455**	163	**473**	82
	WB-T	all	240	240		**263**	**2962**	219	**374**	**3116**	**495**	**2637**	**440**
	WB-R	all	240	240	**3095**	198	**2978**	177	206	**3299**	**275**	**2607**	**275**
21. SR 108 / Maag Avenue	NB-L	all	200	200	181	149	161	187	171	166	113	133	130
	NB-T	all	980	980	143	118	117	159	129	238	167	195	223
	NB-R	all	50	50	**103**	**90**	**90**	**108**	**87**	**132**	**118**	**127**	**132**
	SB-L	all	100	100	**109**	83	94	**116**	**102**	**118**	99	95	**125**
	SB-T	all	700	700	193	154	169	210	163	179	142	163	166
	SB-R	all	100	100	**142**	**116**	**117**	**137**	**119**	**121**	**115**	**117**	**104**
	EB-L	all	250	250	153	89	105	102	93	244	134	141	111
	EB-T	all	2,160	2,160	363	146	194	158	232	389	125	204	173
	EB-TR	all	2,160	2,160	371	160	210	187	236	401	146	219	201
	WB-L	all	200	200	**221**	160	175	193	169	**219**	136	144	149
	WB-T	all	2,500	2,500	290	82	164	115	161	353	147	202	177
	WB-TR	all	2,500	2,500	306	104	175	131	183	372	176	220	200

Notes: Results in **bold** denote locations where storage length is exceeded.

1. NB-northbound, SB-southbound, EB-eastbound, WB-westbound, L-left turn movement, T-through movement, R-right turn movement

2. Storage length shown in feet. If there is a value in parentheses, it shows the different storage length that applies under the With Project scenario unless otherwise indicated.

Source: Fehr & Peers, 2015

TABLE 6-3
2042 PEAK HOUR QUEUING ANALYSIS

Intersection	Movement[1]	Scenario	Available Storage (ft)[2]	AM Peak Hour					PM Peak Hour				
				No Project	Alt 1A	Alt 1B	Alt 2A	Alt 2B	No Project	Alt 1A	Alt 1B	Alt 2A	Alt 2B
24. Albers Road/Claribel Road	NB-L	all	325	192	91	146	59	63	171	123	129	60	59
	NB-T	all	1370	282	269	205	146	153	208	192	205	151	157
	NB-TR	all	1370	276	258	194	120	136	192	172	191	123	127
	SB-L	all	350	82	142	73	69	73	67	70	72	84	82
	SB-T	all	1440	346	236	259	161	157	232	222	230	130	132
	SB-R	all	350	121	257	58	41	40	119	43	41	33	35
	EB-L	all	225	**268**	96	52	46	40	221	52	43	39	43
	EB-T	all	2050	178	86	94	45	39	144	151	146	43	42
	EB-R	all	225	78	54	57	36	35	90	92	84	40	36
	WB-L	all	175	125	76	94	75	75	80	78	77	100	93
	WB-TR	all	2650	267	128	234	65	62	142	128	130	64	66
24. North County Corridor/Oakdale Road	NB-L	1A/1B/2A/2B	300	Does Not Exist	107	102	111	105	Does Not Exist	40	39	46	43
	NB-T	1A/1B/2A/2B	1,420		110	109	109	101		130	135	149	147
	NB-R	1A/1B/2A/2B	300		183	172	169	162		187	176	154	153
	SB-L	1A/1B/2A/2B	600		123	102	116	104		137	140	146	127
	SB-T	1A/1B/2A/2B	1,320		101	109	108	120		158	165	171	178
	SB-R	1A/1B/2A/2B	1,320		199	197	225	238		163	158	194	215
	EB-L	1A/1B/2A/2B	500		84	84	86	86		231	272	272	284
	WB-L	1A/1B/2A/2B	350		114	113	115	102		108	108	119	104
25. North County Corridor/Roselle Avenue	NB-L	1A/1B/2A/2B	550		206	205	198	188		129	127	134	135
	NB-T	1A/1B/2A/2B	780		169	166	155	169		206	198	186	199
	NB-R	1A/1B/2A/2B	550		136	138	134	127		96	87	97	103
	SB-L	1A/1B/2A/2B	550		123	121	131	118		112	101	105	108
	SB-T	1A/1B/2A/2B	1,200		148	141	134	140		162	165	160	185
	SB-R	1A/1B/2A/2B	550		41	31	33	35		22	21	29	24
	EB-L	1A/1B/2A/2B	500		27	29	32	29		62	57	62	66
	EB-R	1A/1B/2A/2B	1,240		143	131	138	135		240	248	247	264
	WB-L	1A/1B/2A/2B	500		118	117	105	97		75	74	77	68
	WB-R	1A/1B/2A/2B	1,300		94	95	94	99		144	141	147	157

Notes: Results in **bold** denote locations where storage length is exceeded.

1. NB-northbound, SB-southbound, EB-eastbound, WB-westbound, L-left turn movement, T-through movement, R-right turn movement

2. Storage length shown in feet. If there is a value in parentheses, it shows the different storage length that applies under the With Project scenario unless otherwise indicated.

Source: Fehr & Peers, 2015

TABLE 6-3
2042 PEAK HOUR QUEUING ANALYSIS

Intersection	Movement[1]	Scenario	Available Storage (ft)[2]	AM Peak Hour					PM Peak Hour				
				No Project	Alt 1A	Alt 1B	Alt 2A	Alt 2B	No Project	Alt 1A	Alt 1B	Alt 2A	Alt 2B
26. North County Corridor/Crane Road	NB-L	1A/1B/2A/2B	100	Does Not Exist	72	64	Does Not Exist		Does Not Exist	72	64	Does Not Exist	
	NB-T	1A/1B/2A/2B	1,880		82	82				82	82		
	NB-R	1A/1B/2A/2B	300		127	98				127	98		
	SB-L	1A/1B/2A/2B	200		104	96				104	96		
	SB-T	1A/1B/2A/2B	2,840		79	76				79	76		
	SB-R	1A/1B/2A/2B	500		200	195				200	195		
	EB-L	1A/1B/2A/2B	750		260	240				260	240		
	EB-T	1A/1B/2A/2B	15,800		224	172				224	172		
	EB-R	1A/1B/2A/2B	630		21	25				21	25		
	WB-L	1A/1B/2A/2B	930		95	87				95	87		
	WB-T	1A/1B/2A/2B	12,420		221	190				221	190		
	WB-R	1A/1B/2A/2B	630		47	45				47	45		
27. North County Corridor/Albers Road[3]	NB-L	1A/1B/2A/2B	150 (100)		142	123	91	82		142	123	91	82
	NB-T	1A/1B/2A/2B	2,240		506	476	351	400		506	476	351	400
	NB-R	1A/1B/2A/2B	300		287	292	199	176		287	292	199	176
	SB-L	1A/1B/2A/2B	200		78	63	164	107		78	63	164	107
	SB-T	1A/1B/2A/2B	2,280		204	198	449	563		204	198	449	563
	SB-R	1A/1B/2A/2B	980		95	92	11	21		95	92	11	21
	EB-L	1A/1B/2A/2B	750 (920)		463	417	468	453		463	417	468	453
	EB-T	1A/1B/2A/2B	12,420		158	113	178	116		158	113	178	116
	EB-R	1A/1B/2A/2B	750 (580)		78	71	58	62		78	71	58	62
	WB-L	1A/1B/2A/2B	720		168	159	162	136		168	159	162	136
	WB-T	1A/1B/2A/2B	14,760		324	196	241	165		324	196	241	165
	WB-R	1A/1B/2A/2B	670 (580)		95	60	49	42		95	60	49	42

Notes: Results in **bold** denote locations where storage length is exceeded.

1. NB-northbound, SB-southbound, EB-eastbound, WB-westbound, L-left turn movement, T-through movement, R-right turn movement
2. Storage length shown in feet. If there is a value in parentheses, it shows the different storage length that applies under the With Project scenario unless otherwise indicated.
3. Storage length reported as Alternative 1A/1B (Alternative 2A/2B) for movements with different storage lengths.

Source: Fehr & Peers, 2015

TABLE 6-3
2042 PEAK HOUR QUEUING ANALYSIS

Intersection	Movement[1]	Scenario	Available Storage (ft)[2]	AM Peak Hour					PM Peak Hour				
				No Project	Alt 1A	Alt 1B	Alt 2A	Alt 2B	No Project	Alt 1A	Alt 1B	Alt 2A	Alt 2B
28. North County Corridor/ Stearns Road (Smith Road – 2A/2B) – With Traffic Signal	NB-L	1A/2A	150	Does Not Exist	73	n/a	64	n/a	Does Not Exist	75		63	n/a
	NB-LT	1B	860		n/a	66	n/a			n/a	63		
	NB-TR	1A/2A	860		42	n/a	50			63		49	
	NB-R	1B	100		n/a	38	n/a			n/a	63		
	NB-LTR	2B	1,000			n/a		72			n/a		68
	SB-LT	1A/1B/2A/2B	1,000		55	61	54	669		48	59	55	85
	SB-R	1A/1B/2A/2B	300 - 1B (630 - 2B)		156	82	110	71		183	101	224	90
	EB-L	1A/1B/2A/2B	870		135	154	138	119		169	190	168	148
	EB-T	1A/1B/2A/2B	14,760 (8,480 - 2B)		88	90	78	77		131	102	135	89
	EB-R	1A/1B/2A/2B	670		32	19	34	18		44	86	52	14
	WB-L	1A/1B/2A/2B	720 (650 - 2B)		72	58	85	546		73	46	88	48
	WB-T	1A/1B/2A/2B	4,110		147	133	141	111		139	124	143	122
	WB-R	1A/2A	150		45	n/a	49	n/a		47	n/a	42	n/a
28. North County Corridor/ Stearns Road (Smith Road - 2B) - Roundabout	NB Approach	1A/1B/ 2A/2B	1,000		9	7	10	7		12	8	12	8
	SB Approach	1A/1B/ 2A/2B	1,000		50	32	38	27		67	43	90	54
	EB Approach	1A/1B/ 2A/2B	1,000		40	40	44	44		70	70	64	62
	WB Approach	1A/1B/ 2A/2B	1,000		40	37	37	36		35	35	32	31
29. North County Corridor/SR 108 – With Traffic Signal	NB-L	1B/2B	1000		n/a	51	n/a	48		n/a	91	n/a	86
	NB-LT	1A/2A	1000		47	n/a	45	n/a		76	n/a	81	n/a
	SB-LTR	1A/2A	1000		125		129			78		81	
	EB-L	1A/2A	200		58		58			120		116	
	EB-T	1A/1B/ 2A/2B	1000		165	106	155	100		203	124	209	156

TABLE 6-3
2042 PEAK HOUR QUEUING ANALYSIS

Intersection	Movement[1]	Scenario	Available Storage (ft)[2]	AM Peak Hour					PM Peak Hour				
				No Project	Alt 1A	Alt 1B	Alt 2A	Alt 2B	No Project	Alt 1A	Alt 1B	Alt 2A	Alt 2B
	EB-R	1A/1B/ 2A/2B	200		55	62	44	61		35	48	48	56
	WB-L	1A/1B/ 2A/2B	300		151	110	170	102		141	121	160	124
	WB-T	1A/1B/ 2A/2B	1000		169	48	192	42		168	61	175	87
	WB-R	1A /2A	150		169	n/a	21	n/a		32	n/a	36	n/a
29. North County Corridor/SR 108 - Roundabout	NB Approach	1A/1B/ 2A/2B	1,000		3	4	4	3		9	9	10	9
	SB Approach	1A/2A	360		35	n/a	35	n/a		14	n/a	14	n/a
	EB Approach	1A/1B/ 2A/2B	1,000		46	45	43	37		76	33	82	41
	WB Approach	1A/1B/ 2A/2B	1,000		70	45	70	38		62	46	59	39

Notes: Results in **bold** denote locations where storage length is exceeded.

1. NB-northbound, SB-southbound, EB-eastbound, WB-westbound, L-left turn movement, T-through movement, R-right turn movement

2. Storage length shown in feet. If there is a value in parentheses, it shows the different storage length that applies under the With Project scenario unless otherwise indicated.

Source: Fehr & Peers, 2015

TABLE 6-3
2042 PEAK HOUR QUEUING ANALYSIS

Intersection	Movement[1]	Scenario	Available Storage (ft)[2]	AM Peak Hour					PM Peak Hour				
				No Project	Alt 1A	Alt 1B	Alt 2A	Alt 2B	No Project	Alt 1A	Alt 1B	Alt 2A	Alt 2B
30. Charity Way/SR 108	NB-L	1A/1B/2A/2B	300	Does Not Exist	103	105	108	103	Does Not Exist	111	110	105	112
	NB-T	1A/1B/2A/2B	430		89	88	95	92		140	147	135	140
	NB-R	1A/1B/2A/2B	300		22	25	25	25		125	130	48	46
	SB-L	1A/1B/2A/2B	300		56	53	52	52		80	79	74	77
	SB-T	1A/1B/2A/2B	1,000		123	125	118	122		139	144	141	145
	SB-R	1A/1B/2A/2B	300		31	30	31	36		40	40	39	36
	EB-L	1A/1B/2A/2B	300		57	61	62	54		82	75	73	71
	EB-TR	1A/1B/2A/2B	1,000		57	51	58	58		92	91	85	88
	WB-L	1A/1B/2A/2B	300		46	46	47	47		76	70	74	69
	WB-TR	1A/1B/2A/2B	1,000		44	48	45	45		60	56	60	65
31. Galaxy Way/SR 108	NB-L	1A/1B/2A/2B	300		68	76	70	69		170	179	115	136
	NB-T	1A/1B/2A/2B	1,000		148	155	165	169		588	551	442	432
	NB-TR	1A/1B/2A/2B	1,000		68	64	69	66		212	146	104	89
	SB-L	1A/1B/2A/2B	300		96	97	100	97		203	206	184	184
	SB-T	1A/1B/2A/2B	1,490		168	167	180	170		230	231	215	224
	SB-R	1A/1B/2A/2B	300		55	53	54	48		51	58	54	56
	EB-L	1A/1B/2A/2B	300		65	69	55	73		199	163	164	153
	EB-TR	1A/1B/2A/2B	1,000		58	71	61	70		120	127	108	101
	WB-L	1A/1B/2A/2B	300		127	129	135	117		271	238	234	234
	WB-TR	1A/1B/2A/2B	1,000		108	111	131	116		350	319	284	273

Notes: Results in **bold** denote locations where storage length is exceeded.

1. NB-northbound, SB-southbound, EB-eastbound, WB-westbound, L-left turn movement, T-through movement, R-right turn movement

2. Storage length shown in feet. If there is a value in parentheses, it shows the different storage length that applies under the With Project scenario unless otherwise indicated.

Source: Fehr & Peers, 2015

TABLE 6-3
2042 PEAK HOUR QUEUING ANALYSIS

Intersection	Movement[1]	Scenario	Available Storage (ft)[2]	AM Peak Hour					PM Peak Hour				
				No Project	Alt 1A	Alt 1B	Alt 2A	Alt 2B	No Project	Alt 1A	Alt 1B	Alt 2A	Alt 2B
32. Coffee Road/Frontage Road North	NB-L	1A/1B/2A/2B	300	Does Not Exist	77	74	78	79	Does Not Exist	88	84	80	72
	NB-T	1A/1B/2A/2B	1,060		87	80	82	83		156	172	164	155
	NB-R	1A/1B/2A/2B	300		44	54	47	49		61	59	63	63
	SB-L	1A/1B/2A/2B	300		80	76	68	80		73	79	74	79
	SB-T	1A/1B/2A/2B	1,000		171	174	196	178		116	104	109	115
	SB-R	1A/1B/2A/2B	300		48	0	52	48		50	43	48	43
	EB-L	1A/1B/2A/2B	300		73	68	70	71		67	65	72	67
	EB-TR	1A/1B/2A/2B	1,000		65	62	63	62		62	62	54	64
	WB-L	1A/1B/2A/2B	300		102	103	99	104		97	102	104	98
	WB-TR	1A/1B/2A/2B	1,000		53	49	53	52		58	56	52	51
33. Coffee Road/Frontage Road South	NB-L	1A/1B/2A/2B	300		80	64	71	71		63	65	61	72
	NB-T	1A/1B/2A/2B	1,000		205	202	190	180		175	175	150	156
	NB-R	1A/1B/2A/2B	300		46	20	23	23		21	17	23	22
	SB-L	1A/1B/2A/2B	300		120	95	97	98		97	102	94	98
	SB-T	1A/1B/2A/2B	1,050		127	94	101	94		119	109	105	113
	SB-R	1A/1B/2A/2B	300		67	34	34	33		27	27	28	35
	EB-L	1A/1B/2A/2B	300		114	122	108	111		114	110	105	103
	EB-TR	1A/1B/2A/2B	1,000		45	65	71	71		67	67	61	69
	WB-L	1A/1B/2A/2B	300		75	69	74	78		70	67	65	71
	WB-TR	1A/1B/2A/2B	1,000		97	96	93	93		95	99	93	90

Notes: Results in **bold** denote locations where storage length is exceeded.

1. NB-northbound, SB-southbound, EB-eastbound, WB-westbound, L-left turn movement, T-through movement, R-right turn movement

2. Storage length shown in feet. If there is a value in parentheses, it shows the different storage length that applies under the With Project scenario unless otherwise indicated.

Source: Fehr & Peers, 2015

TABLE 6-3
2042 PEAK HOUR QUEUING ANALYSIS

Intersection	Movement[1]	Scenario	Available Storage (ft)[2]	AM Peak Hour					PM Peak Hour				
				No Project	Alt 1A	Alt 1B	Alt 2A	Alt 2B	No Project	Alt 1A	Alt 1B	Alt 2A	Alt 2B
34. Oakdale Road/Frontage Road	NB-L	1A/1B/2A/2B	300	Does Not Exist	67	71	75	72	Does Not Exist	122	118	127	116
	NB-T	1A/1B/2A/2B	1,000		240	242	252	261		225	207	204	209
	NB-R	1A/1B/2A/2B	300		42	40	42	86		55	56	54	54
	SB-L	1A/1B/2A/2B	300		76	73	77	82		112	117	111	112
	SB-T	1A/1B/2A/2B	1,050		134	124	123	129		161	171	175	161
	SB-R	1A/1B/2A/2B	300		35	38	33	35		60	55	55	52
	EB-L	1A/1B/2A/2B	300		119	126	126	124		90	96	91	98
	EB-TR	1A/1B/2A/2B	1,000		91	94	97	95		76	78	79	82
	WB-L	1A/1B/2A/2B	300		110	115	116	112		92	89	90	84
	WB-TR	1A/1B/2A/2B	1,000		94	96	100	98		79	77	73	78
35. Roselle Avenue/Frontage Road	NB-T	1A/1B/2A/2B	1,000		215	193	197	212		231	238	237	229
	NB-TR	1A/1B/2A/2B	1,000		184	181	187	179		207	211	220	207
	SB-L	1A/1B/2A/2B	300		84	83	78	85		126	126	131	126
	SB-T	1A/1B/2A/2B	780		149	141	141	139		126	130	127	141
	WB-L	1A/1B/2A/2B	300		71	73	79	77		121	120	121	110
	WB-R	1A/1B/2A/2B	1,000		161	162	177	172		110	108	104	114
36. Davis Road/Claribel Realigned North	NB-L	1A/1B/2A/2B	50		14	14	15	13		17	15	15	18
	NB-TR	1A/1B/2A/2B	800		0	0	0	4		5	4	0	6
	SB-L	1A/1B/2A/2B	50		11	10	9	11		12	13	17	10
	SB-TR	1A/1B/2A/2B	1,200		6	0	0	0		0	0	2	6
	EB-TLR	1A/1B/2A/2B	700		52	56	53	55		0	0	52	56
	WB-TLR	1A/1B/2A/2B	740		54	56	58	57		0	57	56	52

Notes: Results in **bold** denote locations where storage length is exceeded.

1. NB-northbound, SB-southbound, EB-eastbound, WB-westbound, L-left turn movement, T-through movement, R-right turn movement

2. Storage length shown in feet. If there is a value in parentheses, it shows the different storage length that applies under the With Project scenario unless otherwise indicated.

Source: Fehr & Peers, 2015

TABLE 6-3
2042 PEAK HOUR QUEUING ANALYSIS

Intersection	Movement[1]	Scenario	Available Storage (ft)[2]	AM Peak Hour					PM Peak Hour				
				No Project	Alt 1A	Alt 1B	Alt 2A	Alt 2B	No Project	Alt 1A	Alt 1B	Alt 2A	Alt 2B
37. Claus Road/Claribel Realigned North	NB-L	1A/1B/2A/2B	450	Does Not Exist	72	69	69	67	Does Not Exist	117	108	68	69
	NB-T	1A/1B/2A/2B	1,340		105	120	164	178		221	231	253	256
	NB-TR	1A/1B/2A/2B	1,340		164	182	207	212		221	231	271	278
	SB-L	1A/1B/2A/2B	300		71	69	73	70		96	86	78	86
	SB-T	1A/1B/2A/2B	1,000		98	92	95	114		192	187	153	161
	SB-TR	1A/1B/2A/2B	1,000		149	159	232	251		192	187	319	286
	EB-L	1A/1B/2A/2B	400		63	62	92	97		0	0	108	109
	EB-TR	1A/1B/2A/2B	1,000		78	83	72	80		77	80	89	86
	WB-LTR	1A/1B/2A/2B	470		125	141	147	138		258	243	278	270
38. Claus Road/Claribel Realigned South	NB-T	1A/1B/2A/2B	1,000		261	280	195	195		549	581	231	223
	NB-R	1A/1B/2A/2B	300		59	58	66	67		300	263	59	64
	SB-L	1A/1B/2A/2B	890		159	157	107	108		188	189	137	134
	SB-T	1A/1B/2A/2B	2,100		104	100	73	77		178	460	80	79
	WB-L	1A/1B/2A/2B	810		98	96	88	97		170	138	84	89
	WB-R	1A/1B/2A/2B	300		154	156	69	68		159	140	75	67
39. Stearns/Stearns Connection	NB-L	1B/2B	200		n/a	24	n/a	n/a		n/a	44	n/a	n/a
	NB-TR	1A/1B/2A	840 (1B - 730)		60	8	63			67	7	86	
	SB-L	1A/1B/2A	300 (1B- 200)		142	30	127			170	47	191	
	SB-T	1A/2A	840		21	n/a	18			20	n/a	18	
	SB-TR	1B	970		n/a	2	n/a			n/a	9	n/a	
	EB-TLR	1B	690			67					84		
	WB-L	1A/2A	960		61	n/a	56			77	n/a	68	
	WB-R	1A/2A	960		82		95			91		90	
	WB-TLR	1B	1,360		n/a	69	n/a			n/a	84	n/a	

Notes: Results in **bold** denote locations where storage length is exceeded.

1. NB-northbound, SB-southbound, EB-eastbound, WB-westbound, L-left turn movement, T-through movement, R-right turn movement

2. Storage length shown in feet. If there is a value in parentheses, it shows the different storage length that applies under the With Project scenario unless otherwise indicated.

Source: Fehr & Peers, 2015

TABLE 6-3
2042 PEAK HOUR QUEUING ANALYSIS

Intersection	Movement[1]	Scenario	Available Storage (ft)[2]	AM Peak Hour					PM Peak Hour				
				No Project	Alt 1A	Alt 1B	Alt 2A	Alt 2B	No Project	Alt 1A	Alt 1B	Alt 2A	Alt 2B
40. New Access Road/NCC- With Traffic Signal	NB-L	1B/2B	1,000	Does Not Exist		40	Does Not Exist	44	Does Not Exist		41	Does Not Exist	43
	NB-TR	1B/2B	1,000			44		44			50		44
	SB-L	1B/2B	1,000			47		42			41		43
	SB-TR	1B/2B	1,000			43		46			49		40
	EB-L	1B/2B	1,000			44		46			42		43
	EB-T	1B/2B	1,000			59		59			62		62
	EB-R	1B/2B	1,000			24		24			17		20
	WB-L	1B/2B	1,000			43		46			37		38
	WB-T	1B/2B	1,000			71		72			63		61
	WB-R	1B/2B	1,000			22		23			20		16
40. New Access Road/NCC - Roundabout	NB Approach	1B/2B	1,000			6		6			7		6
	SB Approach	1B/2B	1,000			6		5			6		6
	EB Approach	1B/2B	1,000			21		19			29		25
	WB Approach	1B/2B	1,000			24		21			21		19

Notes: Results in **bold** denote locations where storage length is exceeded.

1. NB-northbound, SB-southbound, EB-eastbound, WB-westbound, L-left turn movement, T-through movement, R-right turn movement

2. Storage length shown in feet. If there is a value in parentheses, it shows the different storage length that applies under the With Project scenario unless otherwise indicated.

Source: Fehr & Peers, 2015

6.4 URBAN STREET ANALYSIS

Three segments of SR 108 were analyzed using the HCM's urban street LOS methodology: from Pelandale Avenue to Ladd Avenue; between Oakdale Road and Claus Road; and between Oak Avenue and Maag Avenue. One segment on Kiernan Avenue (NCC) between Carver Road and McHenry Avenue was also analyzed with the urban street analysis. Table 6-4 presents the urban street LOS for the study segments. As shown in **Table 6-4**, in the No Project scenario all study segments operate at LOS C or better during the AM and PM peak hours with the exception of eastbound Kiernan Avenue between Carver Road and Tully Road which is expected to operate at LOS F in the PM peak hour and westbound SR108/SR 120 between Yosemite Avenue and Maag Avenue which is expected to operate at LOS E in the PM peak hour.

The four Project alternatives would reduce the peak hour demand volume along SR 108, thus generally increasing the average travel speed along the study corridor. All four Project alternatives either improve or maintain at least LOS D operations along the study segments. The technical analysis worksheets are provided in Appendix U.

TABLE 6-4
2042 URBAN STREET ANALYSIS

Segment	Direction[1]	Class Type	No Project[2]		Alt. 1A[2]		Alt. 1B[2]		Alt. 2A[2]		Alt. 2B[2]	
			AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
1. Kiernan Avenue (NCC) between Carver Road and Tully Road	EB	I	27 - C	**11 - F**	29 - C	23 - D	29 - C	23 - D	30 - C	23 - D	30 - C	23 - D
	WB	I	25 - D	27 - C	25 - D	26 - D	25 - D	26 - D	26 - D	26 - D	26 - D	25 - D
2. Kiernan Avenue (NCC) between Tully Road and McHenry Avenue	EB	I	40 - B	36 - B	Analyzed as Expressway							
	WB	I	38 - B	31 - C								
3. SR 108 between Ladd Road and Kiernan Avenue	NB	I	33 - C	32 - C	31 - C	30 - C	31 - C	30 - C	31 - C	30 - C	31 - C	30 - C
	SB	I	33 - C	34 - C	36 - B	35 - B	36 - B	35 - B	36 - B	36 - B	36 - B	36 - B
4. SR 108 between Kiernan Avenue and Pelandale Avenue	NB	II	26 - C	29 - B	28 - B	24 - C	28 - B	24 - C	29 - B	25 - C	29 - B	25 - C
	SB	II	28 - B	18 - D	23 - C	21 - D	23 - C	21 - D	24 - C	21 - D	24 - C	21 - D
14. SR 108 between Oakdale Road and 1st Street	EB	III	26 - B	24 - B	29 - B	31 - A	32 - A	30 - A	28 - B	30 - B	31 - A	30 - B
	WB	III	30 - B	30 - B	32 - A	27 - B	29 - B	26 - B	31 - A	26 - B	28 - B	25 - B
15. SR 108 between 1st Street and Claus Road	EB	III	29 - B	29 - B	33 - A	32 - A	32 - A	32 - A	31 - A	29 - B	31 - A	28 - B
	WB	III	24 - C	18 - C	25 - B	24 - C	25 - B	24 - C	24 - C	22 - C	23 - C	21 - C
28. SR 108 between Oak Avenue and SR 120	EB	IV	18 - C	20 - B	23 - B	23 - B	22 - B	22 - B	21 - B	22 - B	19 - B	20 - B
	WB	IV	25 - B	25 - B	26 - A	25 - A	25 - A	25 - A	26 - A	25 - A	26 - A	25 - A
32. SR 108/SR 120 between Yosemite Avenue and Maag Avenue	EB	III	25 - B	26 - B	27 - B	28 - B	26 - B	26 - B	26 - B	27 - B	26 - B	26 - B
	WB	III	20 - C	**13 - E**	21 - C	19 - C	18 - D	15 - D	23 - C	20 - C	23 - C	19 - C

Notes:

1. EB = Eastbound, WB = Westbound
2. Results in column are reported as: Average Speed (MPH) – LOS

Source: Fehr & Peers, 2015.

6.5 TWO-LANE HIGHWAY ANALYSIS

The rural segments of SR 108 east of McHenry Avenue and of SR 120 east of Maag Avenue were analyzed according to the HCM 2010 two-lane highway LOS methodology. **Table 6-5** presents the two-lane highway results. All study segments are expected to operate at LOS E under No Project conditions with the exception of SR 120 from Wamble Road to Lancaster Road, which would operate at LOS D or better. Construction of any of the four Project alternatives would decrease the volume demand along SR 108 and SR 120, which would either increase or have no effect on average travel speed and either decrease or have no effect on percent time spent following. Therefore, all of the Project alternatives would either maintain or improve the LOS reported for each segment. The technical analysis worksheets are provided in Appendix V.

TABLE 6-5
2042 TWO-LANE HIGHWAY ANALYSIS BASED ON HCM

Location	Peak Hour	BFFS	No Project			Alternative 1A			Alternative 1B			Alternative 2A			Alternative 2B		
			PTSF	ATS	LOS	PTSF	ATS	LOS	PTSF	ATS	LOS	PTSF	ATS	LOS	PTSF	ATS	LOS
SR 108 from McHenry Avenue to Oakdale Road	AM	55	**78**	**39**	**E**	52	43	D	54	42	D	**71**	**40**	**E**	**72**	**40**	**E**
	PM		**88**	**39**	**E**	**87**	**39**	**E**	**88**	**39**	**E**	**88**	**39**	**E**	**88**	**38**	**E**
SR 108 from Claus Road to Crane Road	AM	55	**85**	**36**	**E**	33	46	C	43	45	D	73	40	D	75	40	E
	PM		**87**	**37**	**E**	76	43	D	80	42	D	**86**	**39**	**E**	**88**	**38**	**E**
SR 108 from Crane Road to Oak Avenue	AM	45	**85**	**27**	**E**	**72**	**33**	**E**	**75**	**32**	**E**	**71**	**35**	**E**	**72**	**34**	**E**
	PM		**86**	**27**	**E**	**77**	**31**	**E**	**81**	**29**	**E**	**75**	**31**	**E**	**78**	**30**	**E**
SR 120 from Maag Avenue to Wamble Road	AM	50	**88**	**30**	**E**	**88**	**30**	**E**	**72**	**36**	**E**	**88**	**30**	**E**	**78**	**35**	**E**
	PM		**91**	**28**	**E**	**91**	**28**	**E**	**79**	**35**	**E**	**91**	**28**	**E**	**85**	**32**	**E**
SR 120 from Wamble Road to Lancaster Road	AM	55	57	47	C	57	47	C	57	47	C	57	47	C	57	47	C
	PM		65	46	D	65	46	D	65	46	D	65	46	D	65	46	D

Bold denotes locations that operate overall at unacceptable service levels.
1.BFFS = Base Free-Flow Speed, mph
2. PTSF = Percent Time Spent Following, %
3. ATS = Average Travel Speed, mph
Source: Fehr & Peers, 2015

6.6 NCC FREEWAY/EXPRESSWAY ANALYSIS

All four Project alternatives plan to construct a four- to six-lane freeway/expressway between Tully Road and SR 120. The planned facility would operate as a freeway between Tully Road and Roselle Avenue and as an expressway east of Roselle Avenue. To determine the year 2042 operations for the facility under each Project alternative, segments were analyzed with either HCM multilane analysis, Leisch weaving method, HCM freeway, or HCM ramp junction analysis. Leisch method was used for segments that would include an auxiliary lane.

Table 6-6 and **Table 6-7** present results for each alternative, in each direction. The planned NCC freeway/expressway would operate at LOS C or better during the AM and PM peak hours for each Project alternative. The technical analysis worksheets are provided in Appendix X.

TABLE 6-6
2042 MULTILANE, FREEWAY, AND RAMP ANALYSIS BASED ON HCM - EASTBOUND

Location	Number of Lanes	Method	Peak Hour	Alt 1A		Alt 1B		Alt 2A		Alt 2B	
				Density[1]	LOS	Density[1]	LOS	Density[1]	LOS	Density[1]	LOS
Carver Road to Tully Road	3	Multilane	AM	9	A	9	A	8	A	8	A
			PM	14	B	14	B	13	B	13	B
Tully Road to McHenry Avenue	3+Aux	Weave	AM	Weave	A	Weave	A	Weave	A	Weave	A
			PM	Weave	A	Weave	A	Weave	A	Weave	A
McHenry Avenue Off-Ramp	3+Aux		AM	Weave	A	Weave	A	Weave	A	Weave	A
			PM	Weave	A	Weave	A	Weave	A	Weave	A
McHenry Avenue On-Ramp	3+Aux		AM	Weave	A	Weave	A	Weave	A	Weave	A
			PM	Weave	C	Weave	C	Weave	B	Weave	B
McHenry Avenue to Coffee Road	3+Aux		AM	Weave	A	Weave	A	Weave	A	Weave	A
			PM	Weave	C	Weave	C	Weave	B	Weave	B
Coffee Road Off-Ramp	3+Aux		AM	Weave	A	Weave	A	Weave	A	Weave	A
			PM	Weave	C	Weave	C	Weave	B	Weave	B
Coffee Road On-Ramp	3	Merge	AM	9	A	9	A	8	A	8	A
			PM	16	B	16	B	15	B	15	B
Coffee Road to Oakdale Road	3	Basic	AM	7	A	7	A	7	A	6	A
			PM	14	B	14	B	13	B	13	B
Oakdale Road Off-Ramp	2	Diverge	AM	3	A	3	A	1	A	1	A
			PM	14	B	14	B	13	B	13	B
Oakdale Road On-Ramp	2	Merge	AM	11	B	10	B	8	A	8	A
			PM	15	B	14	B	12	B	12	B
Oakdale Road to Roselle Avenue	2	Basic	AM	15	B	14	B	14	B	12	B
			PM	19	B	18	B	16	B	16	B
Roselle Avenue Off-Ramp	2	Diverge	AM	19	B	19	B	17	B	16	B
			PM	23	C	23	C	21	C	20	C
Roselle Avenue On-Ramp	2	Merge	AM	19	B	19	B	17	B	17	B
			PM	20	B	20	B	17	B	17	B
Roselle Avenue to Claus Road	2	Multilane	AM	20	C	20	C	18	C	18	B
			PM	21	C	21	C	19	C	18	B

Notes:
1. Multilane = HCM Multilane Highways Analysis; Basic = HCM Basic Freeway Analysis; Merge = HCM Merge Analysis; Diverge = HCM Diverge Analysis; Weave = Leisch Method
2. Density is in passenger cars per mile per lane
Source: Fehr & Peers, 2015

TABLE 6-6
2042 MULTILANE, FREEWAY, AND RAMP ANALYSIS BASED ON HCM - EASTBOUND

Location	Number of Lanes	Method	Peak Hour	Alt 1A		Alt 1B		Alt 2A		Alt 2B	
				Density[1]	LOS	Density[1]	LOS	Density[1]	LOS	Density[1]	LOS
Claus Road to Crane Road	2	Multilane	AM	19	C	19	C	13	B	12	B
			PM	19	C	18	B	15	B	13	B
Crane Road to Albers Road	2		AM	16	B	15	B	11	B	10	A
			PM	13	B	12	B	13	B	12	B
Albers Road to Stearns Road	2		AM	7	A	6	A	7	A	5	A
			PM	11	A	8	A	10	A	6	A
Stearns Road to SR 120	2		AM	4	A	4	A	4	A	4	A
			PM	6	A	5	A	6	A	5	A

Notes:
1. Multilane = HCM Multilane Highways Analysis; Basic = HCM Basic Freeway Analysis; Merge = HCM Merge Analysis; Diverge = HCM Diverge Analysis; Weave = Leisch Method
2. Density is in passenger cars per mile per lane
Source: Fehr & Peers, 2015

TABLE 6-7
2042 MULTILANE, FREEWAY, AND RAMP ANALYSIS BASED ON HCM - WESTBOUND

Location	Number of Lanes	Method	Peak Hour	Alt 1A		Alt 1B		Alt 2A		Alt 2B	
				Density[1]	LOS	Density[1]	LOS	Density[1]	LOS	Density[1]	LOS
SR 120 to Stearns Road	2	Multilane	AM	6	A	5	A	5	A	4	A
			PM	5	A	4	A	4	A	4	A
Stearns Road to Albers Road	2		AM	8	A	6	A	8	A	5	A
			PM	8	A	6	A	9	A	5	A
Albers Road to Crane Road	2		AM	9	A	8	A	12	B	10	A
			PM	17	B	16	B	12	B	11	B
Crane Road to Claus Road	2		AM	18	B	17	B	12	B	11	B
			PM	22	C	21	C	16	B	15	B
Claus Road to Roselle Avenue	2		AM	20	C	20	C	20	C	16	B
			PM	23	C	23	C	19	C	18	C
Roselle Avenue Off-Ramp	2	Diverge	AM	22	C	21	C	19	B	18	B
			PM	24	C	24	C	20	C	20	C
Roselle Avenue On-Ramp	2	Merge	AM	18	B	18	B	16	B	16	B
			PM	21	C	20	C	17	B	17	B
Roselle Avenue to Oakdale Road	2	Basic	AM	17	B	16	B	16	B	14	B
			PM	19	C	18	C	15	B	15	B
Oakdale Road Off-Ramp	2	Diverge	AM	22	C	21	C	19	B	18	B
			PM	24	C	24	C	20	C	20	B
Oakdale Road On-Ramp	2	Merge	AM	21	C	21	C	19	B	19	B
			PM	20	B	20	B	17	B	17	B
Oakdale Road to Coffee Road	3	Basic	AM	13	B	13	B	12	B	12	B
			PM	12	B	12	B	11	A	10	A
Coffee Road Off-Ramp	3	Diverge	AM	19	B	19	B	18	B	18	B
			PM	18	B	18	B	16	B	16	B
Coffee Road On-Ramp	3+Aux	Weave	AM	Weave	B	Weave	B	Weave	A	Weave	A
			PM	Weave	A	Weave	A	Weave	A	Weave	A
Coffee Road to McHenry Avenue	3+Aux		AM	Weave	B	Weave	B	Weave	A	Weave	A
			PM	Weave	A	Weave	A	Weave	A	Weave	A
McHenry Avenue Off-Ramp	3+Aux		AM	Weave	B	Weave	B	Weave	A	Weave	A
			PM	Weave	A	Weave	A	Weave	A	Weave	A
McHenry Avenue On-Ramp	3	Merge	AM	16	B	16	B	15	B	15	B
			PM	14	B	14	B	13	B	13	B
McHenry Avenue to Tully Road	3	Multilane	AM	17	B	17	B	16	B	16	B
			PM	14	B	14	B	13	B	13	B
Tully Road to Carver Road	3		AM	14	B	14	B	13	B	13	B
			PM	14	B	14	B	13	B	13	B

Notes:
1. Multilane = HCM Multilane Highways Analysis; Basic = HCM Basic Freeway Analysis; Merge = HCM Merge Analysis; Diverge = HCM Diverge Analysis; Weave = Leisch Method
2. Density is in passenger cars per mile per lane
Source: Fehr & Peers, 2015

6.7 VOLUME-TO-CAPACITY ANALYSIS

Year 2042 No Project and Project peak hour roadway volumes were compared to hourly roadway segment capacities to determine the level of service of the same 23 study segments evaluated as part of Section 3.1.4. The technical analysis worksheets are provided in Appendix X.

Based on the acceptable level of service thresholds presented in Table 2-8 of this report, the following segments would operate below the acceptable threshold for at least one peak hour in the year 2042 No Project scenario:

- Kiernan Avenue from Tully Road to McHenry Avenue
- Claribel Road from SR 108 to Coffee Road
- Claratina Avenue from McHenry Avenue to Coffee Road
- SR 108 from 1st Street to Claus Road
- Yosemite Avenue from SR 108 to Patterson Road
- Albers Road from Patterson Road to Claribel Road

The Project would improve operations at several of the study segments. As listed above, the No Project scenario has 6 study segments that would operate below the acceptable level of service threshold for at least one peak hour. Implementation of the Project alternatives would result in two study segments operating below the acceptable threshold for at least one peak hour for Alternative 1A and 1B and three study roadway segments operating lower than the acceptable threshold for Alternative 2A and 2B.

6.8 SUMMARY OF 2042 OPERATIONS ANALYSIS

In summary, the results in this chapter indicate the following:

- With implementation of the Project, the number of intersections projected to operate below the applicable LOS standards would be reduced from 15 to eight. All of the intersections on existing SR 108 within the communities of Riverbank and Oakdale would be improved with the implementation of the Project.

- For the eight intersections that would continue to operate below the applicable standards, the intersection level of service that would be expected after Project implementation would be the same or improved compared to the No Project scenario.

- All of the intersections along the new NCC corridor are expected to operate at acceptable service levels.

- Evaluation of 95th percentile queues indicated that queue storage lengths would be exceeded on at least one movement at 13 intersections in the No Project scenario. With implementation of any of the Project alternatives, that number would be reduced to 11 intersections.

  Project removes queuing issues at:
  - SR 108/Kiernan Avenue
  - Coffee Road/Claribel Road
  - Claribel Road/Claus Road

- With implementation of the Project, 95th percentile queues that exceed the available storage are anticipated at two locations along North County Corridor (at Carver Road and at Tully Road).

- Several different roadway segment analysis techniques were used, depending on the requirements of the jurisdictions involved; in all cases, the With Project alternatives were found to maintain acceptable or improve the roadway operations compared to the No Project scenario.

CHAPTER 7. SUMMARY AND CONCLUSIONS

All of project alternatives would meet the purpose of the project. The following are the key project benefits:

- By year 2042 the daily traffic volume (including trucks) on existing SR 108 through the communities of Riverbank and Oakdale would be reduced between 11% and 27% depending on the alternative;
- By year 2022 the project would reduce the daily vehicle hours of delay in the project area by 8% to 21% depending on the alternative and by year 2042 the project would reduce the daily vehicle hours of delay by 12% to 34% depending on the alternative;
- By year 2022 the project would reduce the east-west travel time for travelers between Kiernan Avenue (SR 219) and SR 120/SR 108 east of Oakdale by 16% to 17% depending on the alternative and by year 2042 the project would reduce the east-west travel time by 19% to 20% depending on the alternative;
- The new NCC facility would be access controlled with a reduced number of conflict areas as compared to existing SR 108 and as result the average operating speed for trucks is anticipated to be between 50 and 55 mph and the reduced number of access locations would improve travel time reliability

The project alternatives are expected to reduce delay at many of the study locations; however, there will still be locations that continue to operate at unacceptable service levels in the future. Some of these locations are outside the State right-of-way. These issues have been discussed with the local agencies. The local agencies recognize and accept that several of the local road segments and intersections will have substandard level of service in the future. Note that at locations that operate at unacceptable service levels in the future all of the project alternatives either would result in no change to the level of service or would provide a slight improvement in operations. Therefore, none of the project alternatives would result in a degradation of traffic operations at any of the study locations.

APPENDIX A:
APPROVED TRAFFIC SCOPE OF WORK AND APPROVAL LETTER

APPENDIX B:
TRAFFIC COUNT DATA

APPENDIX C:
SIMTRAFFIC MODEL CALIBRATION AND VALIDATION

APPENDIX D:
EXISTING INTERSECTION ANALYSIS CALCULATION WORKSHEETS

APPENDIX E:
EXISTING SIGNAL WARRANT ANALYSIS WORKSHEETS

APPENDIX F:
EXISTING URBAN STREET ANALYSIS CALCULATION WORKSHEETS

APPENDIX G:
EXISTING HCM TWO-LANE HIGHWAYS ANALYSIS WORKSHEETS

APPENDIX H:
EXISTING ROADWAY SEGMENT ANALYSIS WORKSHEETS

APPENDIX I:
ACCIDENT HISTORY DATA

APPENDIX J:
FORECAST MEMOS AND APPROVAL LETTER

APPENDIX K:
ROUTE LAYOUTS FOR PROJECT ALTERNATIVES

APPENDIX L:
2022 SIGNAL WARRANT ANALYSIS WORKSHEETS

APPENDIX M:
2022 INTERSECTION ANALYSIS CALCULATION WORKSHEETS

APPENDIX N:
2022 URBAN STREETS ANALYSIS WORKSHEETS

APPENDIX O:
2022 HCM TWO-LANE ANALYSIS WORKSHEETS

APPENDIX P:
2022 NCC HCM FREEWAY/EXPRESSWAY ANALYSIS WORKSHEETS

APPENDIX Q:
2022 ROADWAY SEGMENT ANALYSIS WORKSHEETS

APPENDIX R:
ICE FACT SHEET AND SUPPORTING DOCUMENTATION

APPENDIX S:
2042 SIGNAL WARRANT ANALYSIS WORKSHEETS

APPENDIX T:
2042 INTERSECTION ANALYSIS CALCULATION WORKSHEETS

APPENDIX U:
2042 URBAN STREETS ANALYSIS WORKSHEETS

APPENDIX V:
2042 HCM TWO-LANE ANALYSIS WORKSHEETS

APPENDIX W:
2042 NCC HCM FREEWAY/EXPRESSWAY ANALYSIS WORKSHEETS

APPENDIX X:
2042 ROADWAY SEGMENT ANALYSIS WORKSHEETS