



FINAL REPORT

I-710 CORRIDOR PROJECT TRAFFIC OPERATIONS ANALYSIS REPORT WBS ID: 160.10.35

Prepared for



Los Angeles County
Metropolitan Transportation Authority

January 2012

Prepared by:



LSA

2020 East First Street, Suite 400
Santa Ana, California 92705

This page intentionally left blank.

TABLE OF CONTENTS

<u>SECTION</u>	<u>PAGE</u>
1.0 INTRODUCTION.....	1-1
1.1 Purpose of This Traffic Operational Analysis Report (TOAR).....	1-3
2.0 BACKGROUND	2-1
2.1 Corridor History.....	2-2
2.2 Factors Affecting Future Traffic Volumes	2-2
3.0 NEED AND PURPOSE	3-1
4.0 TRAFFIC DATA COLLECTION, ASSUMPTIONS AND METHODOLOGY.....	4-1
4.1 Existing Traffic Data.....	4-1
4.2 Caltrans Data.....	4-6
4.3 Traffic Data Collection.....	4-7
4.4 Traffic Accident Data.....	4-20
4.5 Methodology for Evaluating Traffic Operating Conditions.....	4-34
4.6 Traffic Index (TI).....	4-45
5.0 EXISTING CONDITIONS ANALYSIS.....	5-1
5.1 Freeways	5-1
5.2 Intersections	5-17
6.0 FUTURE YEAR ALTERNATIVES AND TRAFFIC FORECASTS.....	6-1
6.1 Alternatives Description	6-1
6.2 Design Options	6-8
6.3 2035 Traffic Forecasts	6-8
7.0 FUTURE YEAR 2035 OPERATIONS ANALYSIS	7-1
7.1 Future Year 2035 Alternative 1 (No Build) Traffic Analysis.....	7-1
7.2 Future Year 2035 Alternative 5A Traffic Analysis	7-10
7.3 Future Year 2035 Alternative 6A Traffic Analysis	7-18
7.4 Future Year 2035 Alternative 6B Traffic Analysis	7-26
7.5 Future Year 2035 Alternative 6C Traffic Analysis.....	7-34
7.6 Future Year 2035 I-710 Northern Termini Freeway Analysis.....	7-42
7.7 Future Year 2035 I-710 Freight Corridor Analysis	7-52
8.0 ADJACENT FREEWAYS.....	8-1
8.1 Future Year 2035 Alternative 1 (No Build).....	8-1
8.2 Future Year 2035 Alternative 5A.....	8-9
8.3 Future Year 2035 Alternative 6A	8-23
8.4 Future Year 2035 Alternative 6B	8-36
8.5 Future Year 2035 Alternative 6C.....	8-49
9.0 FUTURE YEAR 2035 INTERCHANGE ANALYSIS	9-1
9.1 Pico Avenue/9 th Street Interchange.....	9-2
9.2 Anaheim Street Interchange	9-4
9.3 Pacific Coast Highway Interchange.....	9-8
9.4 Willow Street Interchange	9-11
9.5 Del Amo Boulevard Interchange	9-13
9.6 Long Beach Boulevard Interchange	9-17

9.7	Artesia Boulevard Interchange	9-19
9.8	Alondra Boulevard Interchange.....	9-21
9.9	Rosecrans Avenue Interchange	9-24
9.10	Imperial Highway Interchange.....	9-28
9.11	Firestone Boulevard Interchange	9-32
9.12	Florence Avenue Interchange	9-35
9.13	Slauson Avenue Interchange	9-38
9.14	Bandini Boulevard Interchange	9-41
9.15	Washington Boulevard Interchange	9-49
9.16	Interchanges North of Washington Boulevard	9-54
10.0	SUMMARY AND CONCLUSIONS.....	10-1
10.1	I-710 Freeway Segments	10-2
10.2	Adjacent Freeways	10-11
10.3	Intersections	10-41
10.4	Conclusions	10-55
11.0	REFERENCES.....	11-1

Appendices

Appendix A – Existing Traffic Counts
Appendix B – Existing (2008) I-710 Freeway Operations Analysis Worksheets
Appendix C – Existing (2008) Adjacent Freeway Operations Analysis Worksheets
Appendix D – Existing (2008) Intersection Analysis Worksheets
Appendix E – Future (2035) I-710 Freeway Operations Analysis Worksheets
Appendix F – Future (2035) Adjacent Freeway Operations Analysis Worksheets
Appendix G – Future (2035) I-710 Freeway Operations Schematic Diagrams
Appendix H – Future (2035) Adjacent Freeway Operations Schematic Diagrams
Appendix I – Future (2035) Interchange Analysis and Queuing Worksheets
Appendix J – VISSIM Microsimulation Results

List of Tables

Table 2-1 Forecast Growth in Population and Employment	2-3
Table 4-1 I-710 Northbound Peak Hour Existing (2008) Traffic Volume	4-2
Table 4-2 I-710 Southbound Peak Hour Existing (2008) Traffic Volume	4-4
Table 4-3 12-Hour Freeway Mainline Truck Classification	4-8
Table 4-4 12-Hour Freeway Mainline Traffic Volumes	4-8
Table 4-5 Northbound I-710 Ramp Truck Survey Summary	4-10
Table 4-6 Southbound I-710 Ramp Truck Survey Summary	4-11
Table 4-7 I-710 Screenline Locations	4-12
Table 4-8 Arterial Intersection	4-14
Table 4-9 Intersection Truck Survey Summary	4-18
Table 4-10 I-710 Northbound Accident Data	4-21
Table 4-11 I-710 Northbound Mainline: Truck Accident Rates	4-23
Table 4-12 I-710 Southbound Accident Data	4-27
Table 4-13 I-710 Southbound Mainline: Truck Accident Rates	4-29
Table 4-14 Accident Rates for I-710 Freeway Connectors	4-32
Table 4-15 Accidents on Adjacent Freeways	4-33
Table 4-16 LOS Criteria for Basic Freeway Segments	4-35
Table 4-17 LOS Criteria for Ramp Junctions	4-37
Table 4-18 Flow in Lane 5 of Freeway Approaching On-Ramp	4-38
Table 4-19 Flow in Lane 5 of Freeway Approaching Off-Ramp	4-38
Table 4-20 LOS Criteria for Weaving Segments	4-39
Table 4-21 LOS Criteria for Signalized Intersections	4-40
Table 4-22 LOS Criteria for All-Way Stop and Two Way Stop Controlled Intersections	4-42
Table 4-23 20-Year and 40-Year Traffic Index	4-46
Table 5-1 I-710 Northbound Peak Hour Existing Level of Service	5-2
Table 5-2 I-710 Southbound Peak Hour Existing Level of Service	5-4
Table 5-3 I-710 Peak Hour Existing Summary	5-7
Table 5-4 I-405 Existing Level of Service	5-10
Table 5-5 I-405 Peak Hour Existing Summary	5-11
Table 5-6 SR 91 Existing Level of Service	5-12
Table 5-7 SR 91 Peak Hour Existing Summary	5-13
Table 5-8 I-105 Existing Level of Service	5-14
Table 5-9 I-105 Peak Hour Existing Summary	5-15
Table 5-10 I-5 Existing Level of Service	5-15
Table 5-11 I-5 Peak Hour Existing Summary	5-17
Table 5-12 Arterial Intersections Existing Level of Service	5-18
Table 5-13 Arterial Ramp Intersection Existing Summary	5-18
Table 6-1 2035 Alternative 1 Average Daily Traffic Volumes	6-10
Table 6-2 2035 Alternative 5A Average Daily Traffic Volumes	6-11
Table 6-3 2035 Alternative 6A Average Daily Traffic Volumes	6-12
Table 6-4 2035 Alternative 6B Average Daily Traffic Volumes	6-13
Table 6-5 2035 Alternative 6C Average Daily Traffic Volumes	6-14
Table 7-1 I-710 Northbound 2035 Peak Hour Alternative 1 (No Build) Level of Service	7-1
Table 7-2 I-710 Southbound 2035 Peak Hour Alternative 1 (No Build) Level of Service	7-4
Table 7-3 I-710 2035 Peak Hour Alternative 1 (No Build) Summary	7-8
Table 7-4 I-710 Northbound 2035 Peak Hour Alternative 5A (Build) Level of Service	7-11
Table 7-5 I-710 Southbound 2035 Peak Hour Alternative 5A (Build) Level of Service	7-13
Table 7-6 I-710 2035 Peak Hour Alternative 5A (Build) Summary	7-16
Table 7-7 I-710 Northbound 2035 Peak Hour Alternative 6A (Build) Level of Service	7-18
Table 7-8 I-710 Southbound 2035 Peak Hour Alternative 6A (Build) Level of Service	7-21
Table 7-9 I-710 2035 Peak Hour Alternative 6A (Build) Summary	7-24
Table 7-10 I-710 Northbound 2035 Peak Hour Alternative 6B (Build) Level of Service	7-26
Table 7-11 I-710 Southbound 2035 Peak Hour Alternative 6B (Build) Level of Service	7-29
Table 7-12 I-710 2035 Peak Hour Alternative 6B (Build) Summary	7-32
Table 7-13 I-710 Northbound 2035 Peak Hour Alternative 6C (Build) Level of Service	7-34
Table 7-14 I-710 Southbound 2035 Peak Hour Alternative 6C (Build) Level of Service	7-36

Table 7-15 I-710 2035 Peak Hour Alternative 6C (Build) Summary	7-40
Table 7-16 I-710 Northern Termini Northbound 2035 Peak Hour Alternative 6A (Build) Level of Service	7-43
Table 7-17 I-710 Northern Termini Southbound 2035 Peak Hour Alternative 6A (Build) Level of Service	7-44
Table 7-18 I-710 Northern Termini 2035 Peak Hour Alternative 6A (Build Design Options 1 & 2) Summary	7-44
Table 7-19 I-710 Northern Termini Northbound 2035 Peak Hour Alternative 6B (Build) Level of Service	7-45
Table 7-20 I-710 Northern Termini Southbound 2035 Peak Hour Alternative 6B (Build) Level of Service	7-46
Table 7-21 I-710 Northern Termini 2035 Peak Hour Alternative 6B (Build Design Options 1 & 2) Summary	7-48
Table 7-22 I-710 Northern Termini 2035 Peak Hour Alternative 6B (Build Design Option 3) Summary	7-48
Table 7-23 I-710 Northern Termini Northbound 2035 Peak Hour Alternative 6C (Build) Level of Service	7-50
Table 7-24 I-710 Northern Termini Southbound 2035 Peak Hour Alternative 6C (Build) Level of Service	7-51
Table 7-25 I-710 Northern Termini 2035 Peak Hour Alternative 6C (Build) Summary	7-51
Table 7-26 I-710 Freight Corridor 2035 Peak Hour Alternative 6A (Build) Level of Service	7-53
Table 7-27 I-710 Freight Corridor 2035 Peak Hour Alternative 6A (Build Design Options 1 & 2) Summary	7-54
Table 7-28 I-710 Freight Corridor 2035 Peak Hour Alternative 6B (Build) Level of Service	7-54
Table 7-29 I-710 Freight Corridor 2035 Peak Hour Alternative 6B (Build) Summary	7-56
Table 7-30 I-710 Freight Corridor Northbound 2035 Peak Hour Alternative 6C (Build) Level of Service	7-57
Table 7-31 I-710 Freight Corridor 2035 Peak Hour Alternative 6C (Build) Summary	7-58
Table 7-32 I-710 Freight Corridor 2035 Intersection Analysis	7-59
Table 7-33 I-710 Freight Corridor 2035 Ramp Queuing Analysis	7-59
Table 8-1 I-405 2035 Alternative 1 (No Build) Level of Service	8-2
Table 8-2 I-405 2035 Peak Hour Alternative 1 (No Build) Summary	8-3
Table 8-3 SR-91 2035 Alternative 1 (No Build) Level of Service	8-4
Table 8-4 SR-91 2035 Peak Hour Alternative 1 (No Build) Summary	8-5
Table 8-5 I-105 2035 Alternative 1 (No Build) Level of Service	8-6
Table 8-6 I-105 2035 Peak Hour Alternative 1 (No Build) Summary	8-7
Table 8-7 I-5 2035 Alternative 1 (No Build) Level of Service	8-7
Table 8-8 I-5 2035 Peak Hour Alternative 1 (No Build) Summary	8-9
Table 8-9 I-405 2035 Alternative 5A (Build) Level of Service	8-11
Table 8-10 I-405 2035 Peak Hour Alternative 5A (Build) Summary	8-12
Table 8-11 I-405 2035 Alternative 5A Freeway Ramp Queuing Analysis	8-12
Table 8-12 I-405 2035 Alternative 5A Arterial Ramps Queuing Analysis	8-13
Table 8-13 SR-91 2035 Alternative 5A (Build) Level of Service	8-13
Table 8-14 SR-91 2035 Peak Hour Alternative 5A (Build) Summary	8-15
Table 8-15 SR-91 2035 Alternative 5A Freeway Ramp Queuing Analysis	8-16
Table 8-16 SR-91 2035 Alternative 5A Arterial Ramp Queuing Analysis	8-17
Table 8-17 I-105 2035 Alternative 5A (Build) Level of Service	8-17
Table 8-18 I-105 2035 Peak Hour Alternative 5A (Build) Summary	8-18
Table 8-19 I-105 2035 Alternative 5A Freeway Ramp Queuing Analysis	8-19
Table 8-20 I-5 2035 Alternative 5A (Build) Level of Service	8-20
Table 8-21 I-5 2035 Peak Hour Alternative 5A (Build) Summary	8-22
Table 8-22 I-5 2035 Alternative 5A Freeway Ramp Queuing Analysis	8-22
Table 8-23 I-405 2035 Alternative 6A (Build) Level of Service	8-24
Table 8-24 I-405 2035 Peak Hour Alternative 6A (Build) Summary	8-25
Table 8-25 I-405 2035 Alternative 6A Freeway Ramp Queuing Analysis	8-26
Table 8-26 I-405 2035 Alternative 6A Arterial Ramp Queuing Analysis	8-26
Table 8-27 SR-91 2035 Alternative 6A (Build) Level of Service	8-27

Table 8-28 SR-91 2035 Peak Hour Alternative 6A (Build) Summary	8-29
Table 8-29 SR-91 2035 Alternative 6A Freeway Ramp Queuing Analysis	8-30
Table 8-30 SR-91 2035 Alternative 6A Arterial Ramps Queuing Analysis	8-30
Table 8-31 I-105 2035 Alternative 6A (Build) Level of Service	8-31
Table 8-32 I-105 2035 Peak Hour Alternative 6A (Build) Summary	8-32
Table 8-33 I-105 2035 Alternative 6A Freeway Ramp Queuing Analysis	8-33
Table 8-34 I-5 2035 Alternative 6A (Build) Level of Service	8-33
Table 8-35 I-5 2035 Peak Hour Alternative 6A (Build)	8-35
Table 8-36 I-5 2035 Alternative 6A Freeway Ramp Queuing Analysis	8-36
Table 8-37 I-405 2035 Alternative 6B (Build) Level of Service	8-37
Table 8-38 I-405 2035 Peak Hour Alternative 6B (Build) Summary	8-38
Table 8-39 I-405 2035 Alternative 6B Freeway Ramp Queuing Analysis	8-39
Table 8-40 I-405 2035 Alternative 6B Arterial Ramp Queuing Analysis	8-40
Table 8-41 SR-91 2035 Alternative 6B (Build) Level of Service	8-40
Table 8-42 SR-91 2035 Peak Hour Alternative 6B (Build) Summary	8-42
Table 8-43 SR-91 2035 Alternative 6B Freeway Ramps Queuing Analysis	8-43
Table 8-44 SR-91 2035 Alternative 6B Arterial Ramp Queuing Analysis	8-43
Table 8-45 I-105 2035 Alternative 6B (Build) Level of Service	8-45
Table 8-46 I-105 2035 Peak Hour Alternative 6B (Build) Summary	8-45
Table 8-47 I-105 2035 Alternative 6B Freeway Ramp Queuing Analysis	8-46
Table 8-48 I-5 2035 Alternative 6B (Build) Level of Service	8-47
Table 8-49 I-5 2035 Peak Hour Alternative 6B (Build)	8-48
Table 8-50 I-5 2035 Alternative 6B Freeway Ramp Queuing Analysis	8-49
Table 8-51 I-405 2035 Alternative 6C (Build) Level of Service	8-50
Table 8-52 I-405 2035 Peak Hour Alternative 6C (Build)	8-51
Table 8-53 I-405 2035 Alternative 6C Freeway Ramp Queuing Analysis	8-52
Table 8-54 I-405 2035 Alternative 6C Arterial Ramp Queuing Analysis	8-53
Table 8-55 SR-91 2035 Alternative 6C (Build) Level of Service	8-53
Table 8-56 SR-91 2035 Peak Hour Alternative 6C (Build) Summary	8-55
Table 8-57 SR-91 2035 Alternative 6C Freeway Ramp Queuing Analysis	8-56
Table 8-58 SR-91 2035 Alternative 6C Arterial Ramp Queuing Analysis	8-57
Table 8-59 I-105 2035 Alternative 6C (Build) Level of Service	8-58
Table 8-60 I-105 2035 Peak Hour Alternative 6C (Build) Summary	8-59
Table 8-61 I-105 2035 Alternative 6C Freeway Ramps Queuing Analysis	8-59
Table 8-62 I-5 2035 Alternative 6C (Build) Level of Service	8-60
Table 8-63 I-5 2035 Peak Hour Alternative 6C (Build) Summary	8-61
Table 8-64 I-5 2035 Alternative 6C Freeway Ramp Queuing Analysis	8-62
Table 9-1 Pico Avenue 2035 Intersection Level of Service	9-3
Table 9-2 Pico Avenue 2035 Ramp Queuing Analysis	9-4
Table 9-3 Anaheim Street 2035 Intersection Level of Service	9-7
Table 9-4 Anaheim Street 2035 Intersection Queuing Analysis	9-7
Table 9-5 Anaheim Street 2035 Ramp Queuing Analysis	9-8
Table 9-6 Pacific Coast Highway 2035 Intersection Level of Service	9-9
Table 9-7 Pacific Coast Highway 2035 Intersection Queuing Analysis	9-10
Table 9-8 Pacific Coast Highway 2035 Ramp Queuing Analysis	9-11
Table 9-9 Willow Street 2035 Intersection Level of Service	9-12
Table 9-10 Willow Street 2035 Intersection Queuing Analysis	9-13
Table 9-11 Willow Street 2035 Ramp Queuing Analysis	9-13
Table 9-12 Del Amo Boulevard 2035 Intersection Level of Service	9-15
Table 9-13 Del Amo Boulevard 2035 Intersection Queuing Analysis	9-16
Table 9-14 Susana Road 2035 Intersection Queuing Analysis	9-16
Table 9-15 Del Amo Boulevard 2035 Ramp Queuing Analysis	9-17
Table 9-16 Long Beach Boulevard 2035 Intersection Level of Service	9-18
Table 9-17 Long Beach Boulevard 2035 Intersection Queuing Analysis	9-19
Table 9-18 Long Beach Boulevard 2035 Ramp Queuing Analysis	9-19
Table 9-19 Artesia Boulevard 2035 Intersection Level of Service	9-20
Table 9-20 Artesia Boulevard 2035 Intersection Queuing Analysis	9-21

Table 9-21 Artesia Boulevard 2035 Ramp Queuing Analysis.....	9-21
Table 9-22 Alondra Boulevard 2035 Intersection Level of Service.....	9-23
Table 9-23 Alondra Boulevard 2035 Intersection Queuing Analysis	9-24
Table 9-24 Alondra Boulevard 2035 Ramp Queuing Analysis	9-24
Table 9-25 Rosecrans Avenue 2035 Intersection Level of Service	9-26
Table 9-26 Rosecrans Avenue 2035 Intersection Queuing Analysis	9-27
Table 9-27 Rosecrans Avenue 2035 Ramp Queuing Analysis.....	9-27
Table 9-28 Imperial Highway 2035 Intersection Level of Service	9-29
Table 9-29 Imperial Highway 2035 Intersection Queuing Analysis	9-30
Table 9-30 Wright Road 2035 Intersection Queuing Analysis	9-31
Table 9-31 Imperial Highway 2035 Ramp Queuing Analysis	9-31
Table 9-32 Firestone Boulevard 2035 Intersection Level of Service	9-33
Table 9-33 Firestone Boulevard 2035 Intersection Queuing Analysis.....	9-34
Table 9-34 Firestone Boulevard 2035 Ramp Queuing Analysis.....	9-34
Table 9-35 Florence Avenue 2035 Intersection Level of Service	9-36
Table 9-36 Florence Avenue 2035 Intersection Queuing Analysis.....	9-37
Table 9-37 Florence Avenue 2035 Ramp Queuing Analysis.....	9-37
Table 9-38 Slauson Avenue 2035 Intersection Level of Service	9-39
Table 9-39 Slauson Avenue 2035 Intersection Queuing Analysis.....	9-40
Table 9-41 Bandini Boulevard 2035 Intersection Level of Service	9-45
Table 9-42 Bandini Boulevard 2035 Intersection Queuing Analysis.....	9-46
Table 9-43 Atlantic Boulevard and Bandini Boulevard 2035 Ramp Queuing Analysis	9-48
Table 9-44 Washington Boulevard 2035 Intersection Level of Service	9-52
Table 9-45 Washington Boulevard 2035 Intersection Queuing Analysis.....	9-53
Table 9-46 Washington Boulevard 2035 Ramp Queuing Analysis.....	9-54
Table 9-47 North of Washington Boulevard 2035 Intersection Level of Service	9-55
Table 9-48 North of Washington Boulevard 2035 Intersection Queuing Analysis.....	9-56
Table 9-49 North of Washington Boulevard 2035 Ramp Queuing Analysis.....	9-56
Table 10-1 I-405 Peak Hour Level of Service Summary – Existing & 2035 Alternative 1	10-12
Table 10-2 I-405 Peak Hour Level of Service Summary – 2035 Alternative 5A, 6A, 6B & 6C	10-13
Table 10-3 I-405 2035 Freeway Ramp Queuing Analysis Summary	10-18
Table 10-4 I-405 2035 Arterial Ramp Queuing Analysis Summary	10-18
Table 10-5 SR-91 Peak Hour LOS Summary – Existing & 2035 Alternative 1.....	10-19
Table 10-6 SR-91 Peak Hour Level of Service Summary – 2035 Alternatives 5A, 6A, 6B & 6C	10-20
Table 10-7 SR-91 2035 Freeway Ramp Queuing Analysis Summary	10-26
Table 10-8 SR-91 2035 Arterial Ramp Queuing Analysis Summary	10-26
Table 10-9 I-105 Peak Hour Level of Service Summary – Existing & 2035 Alternative 1	10-28
Table 10-10 I-105 Peak Hour Level of Service Summary – 2035 Alternatives 5A, 6A, 6B & 6C	10-30
Table 10-11 I-105 2035 Freeway Ramp Queuing Analysis Summary	10-33
Table 10-12 I-5 Peak Hour Level of Service Summary – Existing & 2035 Alternative 1	10-36
Table 10-13 I-5 Peak Hour Level of Service Summary – 2035 Alternatives 5A, 6A, 6B & 6C	10-37
Table 10-14 I-5 2035 Freeway Ramps Queuing Analysis	10-41
Table 10-15 I-710 Intersection Peak Hour Level of Service Summary.....	10-43
Table 10-16 I-710 Intersection Peak Hour Level of Service (LOS E or F).....	10-45
Table 10-17 I-710 Intersection Queuing Analysis	10-47
Table 10-18 I-710 Ramp Queuing Analysis.....	10-53

List of Figures

Figure 1-1 Regional Location	1-2
Figure 4-1 Mainline Count Locations	4-9
Figure 4-2 Screenline Count Locations.....	4-13
Figure 4-3 Study Intersection Locations	4-19
Figure 4-4 I-710 Northbound Mainline Primary Collision Type (South Terminus to I-405).....	4-24
Figure 4-5 I-710 Northbound Mainline Primary Collision Type (I-405 to SR-91)	4-24
Figure 4-6 I-710 Northbound Mainline Primary Collision Type (SR-91 Jct to I-105Jct).....	4-25
Figure 4-7 I-710 Northbound Mainline Primary Collision Type (I-105 to Leonis).....	4-25
Figure 4-8 I-710 Southbound Mainline Primary Collision Type (Southern Terminus to I-405).....	4-29
Figure 4-9 I-710 Southbound Mainline Primary Collision Type (I-405 to SR-91)	4-29
Figure 4-10 I-710 Southbound Mainline Primary Collision Type (SR-91 to I-105)	4-30
Figure 4-11 I-710 Southbound Mainline Primary Collision Type (I-105 to Leonis St).....	4-30
Figure 4-12 Level of Service Concept.....	4-41
Figure 5-1 I-710 Mainline Existing Summary	5-8
Figure 5-2 Existing Traffic Volumes – Pico Ave Interchange.....	5-19
Figure 5-3 Existing Traffic Volumes – Long Beach Blvd & Artesia Blvd Interchanges.....	5-20
Figure 5-4 Existing Traffic Volumes – Alondra Blvd & Rosecrans Ave Interchanges.....	5-21
Figure 5-5 Existing Traffic Volumes – Imperial Hwy, Firestone Blvd & Florence Ave Interchanges	5-22
Figure 5-6 Existing Traffic Volumes – Slauson Ave, Bandini Blvd & Washington Blvd Interchanges	5-23
Figure 5-7 Existing Traffic Volumes – Interchanges North of Washington Blvd	5-24
Figure 6-1 Peak Period Arterial Parking Restrictions	6-3
Figure 6-2 Conceptual I-710 Freight Corridor Ingress/Egress Points.....	6-6
Figure 6-3 2035 Average Daily Traffic Volumes – Alternative 1	6-15
Figure 6-4 2035 Average Daily Traffic Volumes – Alternative 5A.....	6-16
Figure 6-5 2035 Average Daily Traffic Volumes – Alternative 6A.....	6-17
Figure 6-6 2035 Average Daily Traffic Volumes – Alternative 6B	6-18
Figure 6-7 2035 Average Daily Traffic Volumes – Alternative 6C	6-19
Figure 6-8 2035 I-710 General Purpose Lane Truck Volumes	6-20
Figure 7-1 I-710 Mainline Alternative 1 Summary.....	7-9
Figure 7-2 I-710 Mainline Alternative 5A Summary	7-17
Figure 7-3 I-710 Mainline Alternative 6A Summary	7-25
Figure 7-4 I-710 Mainline Alternative 6B Summary	7-33
Figure 7-5 I-710 Mainline Alternative 6C Summary	7-41
Figure 9-1 Alternative 1 2035 Traffic Volumes – Pico Ave, Anaheim St & Pacific Coast Hwy Interchanges	9-57
Figure 9-2 Alternative 1 2035 Traffic Volumes – Long Beach Blvd & Artesia Blvd Interchanges	9-58
Figure 9-3 Alternative 1 2035 Traffic Volumes – Alondra Blvd & Rosecrans Ave Interchanges	9-59
Figure 9-4 Alternative 1 2035 Traffic Volumes – Imperial Hwy, Firestone Blvd & Florence Ave Interchanges	9-60
Figure 9-5 Alternative 1 2035 Traffic Volumes – Slauson Ave, Bandini Blvd & Washington Blvd Interchanges	9-61
Figure 9-6 Alternative 1 2035 Traffic Volumes – Interchanges North of Washington Blvd	9-62
Figure 9-7 Alternative 5A 2035 Traffic Volumes – Pico Ave, Anaheim St & Pacific Coast Hwy Interchanges	9-63
Figure 9-8 Alternative 5A 2035 Traffic Volumes – Willow St Interchange	9-64
Figure 9-9 Alternative 5A 2035 Traffic Volumes – Del Amo Blvd, Long Beach Blvd & Artesia Blvd Interchanges	9-65
Figure 9-10 Alternative 5A 2035 Traffic Volumes – Alondra Blvd & Rosecrans Ave Interchanges.....	9-66
Figure 9-11 Alternative 5A 2035 Traffic Volumes – Imperial Hwy, Firestone Blvd & Florence Ave Interchanges	9-67
Figure 9-12 Alternative 5A 2035 Traffic Volumes – Slauson Ave, Bandini Blvd & Washington Blvd Interchanges	9-68
Figure 9-13 Alternative 5A 2035 Traffic Volumes – Interchanges North of Washington Blvd	9-69
Figure 9-14 Alternative 6A 2035 Traffic Volumes – Pico Ave, Anaheim St & Pacific Coast Hwy Interchanges	9-70
Figure 9-15 Alternative 6A 2035 Traffic Volumes – Willow St Interchange	9-71

Figure 9-16 Alternative 6A 2035 Traffic Volumes – Del Amo Blvd, Long Beach Blvd & Artesia Blvd Interchanges	9-72
Figure 9-17 Alternative 6A 2035 Traffic Volumes – Alondra Blvd & Rosecrans Ave Interchanges.....	9-73
Figure 9-18 Alternative 6A 2035 Traffic Volumes – Imperial Hwy, Firestone Blvd & Florence Ave Interchanges (Sheet 1 of 2)	9-74
Figure 9-19 Alternative 6A 2035 Traffic Volumes – Imperial Hwy, Firestone Blvd & Florence Ave Interchanges (Sheet 2 of 2)	9-75
Figure 9-20 Alternative 6A 2035 Traffic Volumes – Option 1 Northern Terminus	9-76
Figure 9-21 Alternative 6A 2035 Traffic Volumes – Option 2 Northern Terminus	9-77
Figure 9-22 Alternative 6A 2035 Traffic Volumes – Interchanges North of Washington Blvd	9-78
Figure 9-23 Alternative 6B 2035 Traffic Volumes – Pico Ave, Anaheim St & Pacific Coast Hwy Interchanges	9-79
Figure 9-24 Alternative 6B 2035 Traffic Volumes – Willow St Interchange	9-80
Figure 9-25 Alternative 6B 2035 Traffic Volumes – Del Amo Blvd, Long Beach Blvd & Artesia Blvd Interchanges	9-81
Figure 9-26 Alternative 6B 2035 Traffic Volumes – Alondra Blvd & Rosecrans Ave Interchanges.....	9-82
Figure 9-27 Alternative 6B 2035 Traffic Volumes – Imperial Hwy, Firestone Blvd & Florence Ave Interchanges (Sheet 1 of 2)	9-83
Figure 9-28 Alternative 6B 2035 Traffic Volumes – Imperial Hwy, Firestone Blvd & Florence Ave Interchanges (Sheet 2 of 2)	9-84
Figure 9-29 Alternative 6B 2035 Traffic Volumes – Option 1 Northern Terminus	9-85
Figure 9-30 Alternative 6B 2035 Traffic Volumes – Option 2 Northern Terminus	9-86
Figure 9-31 Alternative 6B 2035 Traffic Volumes – Option 3 Northern Terminus	9-87
Figure 9-32 Alternative 6B 2035 Traffic Volumes – Interchanges North of Washington Blvd	9-88
Figure 9-33 Alternative 6B 2035 Traffic Volumes – Pico Ave, Anaheim St & Pacific Coast Hwy Interchanges	9-89
Figure 9-34 Alternative 6C 2035 Traffic Volumes – Willow St Interchange	9-90
Figure 9-35 Alternative 6C 2035 Traffic Volumes – Del Amo Blvd, Long Beach Blvd & Artesia Blvd Interchanges	9-91
Figure 9-36 Alternative 6C 2035 Traffic Volumes – Alondra Blvd & Rosecrans Ave Interchanges	9-92
Figure 9-37 Alternative 6C 2035 Traffic Volumes – Imperial Hwy, Firestone Blvd & Florence Ave Interchanges (Sheet 1 of 2)	9-93
Figure 9-38 Alternative 6C 2035 Traffic Volumes – Imperial Hwy, Firestone Blvd & Florence Ave Interchanges (Sheet 2 of 2)	9-94
Figure 9-39 Alternative 6C 2035 Traffic Volumes – Option 1 Northern Terminus	9-95
Figure 9-40 Alternative 6C 2035 Traffic Volumes – Option 2 Northern Terminus	9-96
Figure 9-41 Alternative 6C 2035 Traffic Volumes – Interchanges North of Washington Blvd	9-97
Figure 9-42 Alternative 1 2035 Level of Service – Pico Ave Interchange	9-98
Figure 9-43 Alternative 1 2035 Level of Service – Del Amo Blvd, Long Beach Blvd & Artesia Blvd Interchanges	9-99
Figure 9-44 Alternative 1 2035 Level of Service – Alondra Blvd & Rosecrans Ave Interchanges	9-100
Figure 9-45 Alternative 1 2035 Level of Service – Imperial Hwy & Firestone Blvd Interchanges	9-101
Figure 9-46 Alternative 1 2035 Level of Service – Atlantic Ave, Bandini Blvd & Washington Blvd Interchanges	9-102
Figure 9-47 Alternative 1 2035 Level of Service – Interchanges North of Washington Blvd	9-103
Figure 9-48 Alternative 5A 2035 Level of Service – Pico Ave Interchange	9-104
Figure 9-49 Alternative 5A 2035 Level of Service – Anaheim St & Pacific Coast Hwy Interchanges ...	9-105
Figure 9-50 Alternative 5A 2035 Level of Service – Willow St, Del Amo Blvd, Long Beach Blvd & Artesia Blvd Interchanges	9-106
Figure 9-51 Alternative 5A 2035 Level of Service – Alondra Blvd & Rosecrans Ave Interchanges	9-107
Figure 9-52 Alternative 5A 2035 Level of Service – Imperial Hwy, Firestone Blvd & Florence Ave Interchanges	9-108
Figure 9-53 Alternative 5A 2035 Level of Service – Slauson Ave, Atlantic Blvd, Bandini Blvd & Washington Blvd Interchanges	9-109
Figure 9-54 Alternative 5A 2035 Level of Service – Interchanges North of Washington Blvd	9-110
Figure 9-55 Alternative 6A 2035 Level of Service – Pico Ave Interchange	9-111
Figure 9-56 Alternative 6A 2035 Level of Service – Anaheim St & Pacific Coast Hwy Interchanges ...	9-112

Figure 9-57 Alternative 6A 2035 Level of Service – Willow St, Del Amo Blvd, Long Beach Blvd & Artesia Blvd Interchanges	9-113
Figure 9-58 Alternative 6A 2035 Level of Service – Alondra Blvd & Rosecrans Ave Interchanges	9-114
Figure 9-59 Alternative 6A 2035 Level of Service – Imperial Hwy, Firestone Blvd & Florence Ave Interchanges	9-115
Figure 9-60 Alternative 6A 2035 Level of Service – Slauson Ave, Atlantic Blvd, Bandini Blvd & Washington Blvd Interchanges (Option 1)	9-116
Figure 9-61 Alternative 6A 2035 Level of Service – Slauson Ave, Atlantic Blvd, Bandini Blvd & Washington Blvd Interchanges (Option 2)	9-117
Figure 9-62 Alternative 6A 2035 Level of Service – Interchanges North of Washington Blvd	9-118
Figure 9-63 Alternative 6B 2035 Level of Service – Pico Ave Interchange	9-119
Figure 9-64 Alternative 6B 2035 Level of Service – Anaheim St & Pacific Cost Hwy Interchanges	9-120
Figure 9-65 Alternative 6B 2035 Level of Service – Willow St, Del Amo Blvd, Long Beach Blvd & Artesia Blvd Interchanges	9-121
Figure 9-66 Alternative 6B 2035 Level of Service – Alondra Blvd & Rosecrans Ave Interchanges	9-122
Figure 9-67 Alternative 6B 2035 Level of Service – Imperial Hwy, Firestone Blvd & Florence Ave Interchanges	9-123
Figure 9-68 Alternative 6B 2035 Level of Service – Slauson Ave, Atlantic Blvd, Bandini Blvd & Washington Blvd Interchanges (Option 1)	9-124
Figure 9-69 Alternative 6B 2035 Level of Service – Slauson Ave, Atlantic Blvd, Bandini Blvd & Washington Blvd Interchanges (Option 2)	9-125
Figure 9-70 Alternative 6B 2035 Level of Service – Slauson Ave, Atlantic Blvd, Bandini Blvd & Washington Blvd Interchanges (Option 3)	9-126
Figure 9-71 Alternative 6B 2035 Level of Service – Interchanges North of Washington Blvd	9-127
Figure 9-72 Alternative 6C 2035 Level of Service – Pico Ave Interchange	9-128
Figure 9-73 Alternative 6C 2035 Level of Service – Anaheim St & Pacific Coast Hwy Interchanges	9-129
Figure 9-74 Alternative 6C 2035 Level of Service – Willow St, Del Amo Blvd, Long Beach Blvd & Artesia Blvd Interchanges	9-130
Figure 9-75 Alternative 6C 2035 Level of Service – Alondra Blvd & Rosecrans Ave Interchanges	9-131
Figure 9-76 Alternative 6C 2035 Level of Service – Imperial Hwy, Firestone Blvd & Florence Ave Interchanges	9-132
Figure 9-77 Alternative 6C 2035 Level of Service – Slauson Ave, Atlantic Blvd, Bandini Blvd & Washington Blvd Interchanges (Option 1)	9-133
Figure 9-78 Alternative 6C 2035 Level of Service – Slauson Ave, Atlantic Blvd, Bandini Blvd & Washington Blvd Interchanges (Option 2)	9-134
Figure 9-79 Alternative 6C 2035 Level of Service – Interchanges North of Washington Blvd	9-135
Figure 10-1 I-710 Northbound Peak Hour Level of Service Comparison	10-3
Figure 10-2 I-710 Southbound Peak Hour Level of Service Comparison	10-4
Figure 10-3 I-710 General Purpose Lanes Level of Service AM Peak Hour – Alternatives 1, 5A & 6A	10-5
Figure 10-4 I-710 General Purpose Lanes Level of Service AM Peak Hour – Alternatives 6A, 6B & 6C	10-6
Figure 10-5 I-710 General Purpose Lanes Level of Service PM Peak Hour – Alternatives 1, 5A & 6A	10-7
Figure 10-6 I-710 General Purpose Lanes Level of Service PM Peak Hour – Alternatives 6A, 6B & 6C	10-8
Figure 10-7 I-710 General Purpose Lanes Level of Service MD Peak Hour – Alternatives 1, 5A & 6A	10-9
Figure 10-8 I-710 General Purpose Lanes Level of Service MD Peak Hour – Alternatives 6A, 6B & 6C	10-10
Figure 10-9 I-405 Northbound Peak Hour Level of Service Comparison	10-15
Figure 10-10 I-405 Southbound Peak Hour Level of Service Comparison	10-16
Figure 10-11 SR-91 Eastbound Peak Hour Level of Service Comparison	10-22
Figure 10-12 SR-91 Westbound Peak Hour Level of Service Comparison	10-23
Figure 10-13 I-105 Eastbound Peak Hour Level of Service Comparison	10-31
Figure 10-14 I-105 Westbound Peak Hour Level of Service Comparison	10-32
Figure 10-15 I-5 Northbound Peak Hour Level of Service Comparison	10-39

This page intentionally left blank.

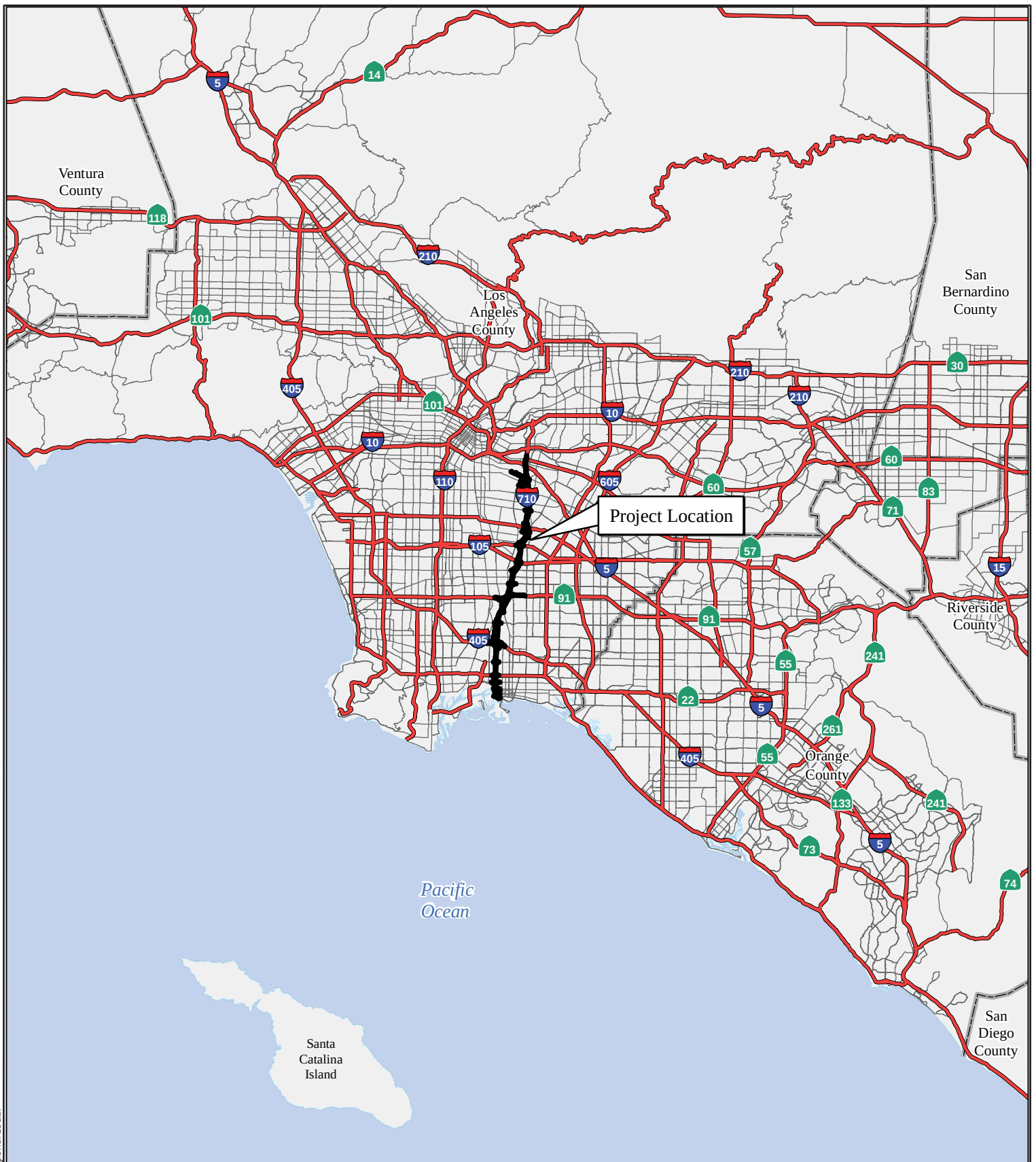
1.0 INTRODUCTION

The Interstate 710 (I-710) Corridor Project study area includes the portion of I-710 from Ocean Boulevard in Long Beach to State Route 60 (SR-60), a distance of approximately 18 miles (see **Figure 1-1**). At the freeway-to-freeway interchanges, the study area extends one mile east and west of I-710 for the Interstate 405 (I-405), State Route 91 (SR-91), Interstate 105 (I-105), and Interstate 5 (I-5) interchanges. The I-710 Corridor Project traverses portions of the cities of Bell, Bell Gardens, Carson, Commerce, Compton, Cudahy, Downey, Huntington Park, Lakewood, Long Beach, Lynwood, Maywood, Paramount, Signal Hill, South Gate, Vernon, and portions of unincorporated Los Angeles County, all within Los Angeles County, California.

I-710 (also known as the Long Beach Freeway) is a major north/south interstate freeway connecting the City of Long Beach to central Los Angeles. Within the I-710 Corridor Project study area, the freeway serves as the principal transportation connection for goods movement between the Port of Los Angeles (POLA)/Port of Long Beach (POLB) shipping terminals, Burlington Northern Santa Fe (BNSF)/Union Pacific Railroad (UP) rail yards in the cities of Commerce and Vernon, and destinations along I-710 as well as destinations north and east of I-710.

The I-710 Major Corridor Study (MCS), undertaken to address the mobility and safety needs of the I-710 Corridor and to explore possible solutions for transportation improvements, was completed in March 2005 and identified a community-based Locally Preferred Strategy (LPS) consisting of 10 general purpose (GP) lanes next to four separated freight movement lanes. The Los Angeles County Metropolitan Transportation Authority (Metro), the California Department of Transportation (Caltrans), the Gateway Cities Council of Governments (GCCOG), the Southern California Association of Governments (SCAG), POLA, POLB, and the Interstate 5 Joint Powers Authority (I-5 JPA) are collectively known as the I-710 Funding Partners. Through a cooperative agreement, these agencies are funding the preparation of preliminary engineering and environmental documentation for the I-710 Corridor Project to evaluate improvements along the I-710 Corridor from Ocean Boulevard in the City of Long Beach to SR-60 in East Los Angeles. The I-710 Funding Partners have continued this engineering and environmental study effort within the same broad, continuous community participation framework that was used for the MCS.

The environmental impacts of the I-710 Corridor Project will be assessed and disclosed in compliance with both the California Environmental Quality Act (CEQA) and the National Environmental Policy Act (NEPA). Caltrans is the Lead Agency for CEQA compliance and the lead agency for NEPA compliance pursuant to Section 6005 of the Safe, Accountable, Flexible, and Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) (23 United States Code [USC] 327).



0 5 10
Miles

LEGEND

 Project Location

Project: I-710 PA-ED

REGIONAL LOCATION

Figure 1-1

1.1 PURPOSE OF THIS TRAFFIC OPERATIONAL ANALYSIS REPORT (TOAR)

The purpose of this TOAR is to document and present the data collection efforts and base year traffic analyses performed, as well as the future traffic forecasting and operational analysis results for the I-710 Corridor Study. This report is an update to the Final TOAR document dated April 2010 that incorporates changes to geometric conditions and additional Build scenarios.

The key objectives of this TOAR include:

- Presentation and documentation of the traffic counts and turning movements collected for this project;
- Presentation and discussion of the data analysis methodology;
- Preparation and documentation of the baseline data for existing conditions and travel demand model forecasting;
- Preparation and documentation of the data for Future Year 2035 conditions for the No-Build and Build alternatives; and
- Presentation and documentation of existing and alternative analysis for Future Year 2035 conditions.

This page intentionally left blank.

2.0 BACKGROUND

Currently, the POLA/POLB complex is the sixth largest container port in the world with projections showing a substantial increase in the container volumes from port activity within the I-710 study area over the next 25 years. As a result of current port activity levels, a high volume of heavy duty truck traffic has been traveling along the I-710 freeway, which was designed and built prior to the containerization of oceangoing freight. Presently, on certain freeway segments within the City of Long Beach (between Ocean Boulevard and 9th St.), heavy duty trucks make up over thirty percent of the traffic stream during the day, as opposed to an average daily truck percentage of 6 to 13 percent on comparable freeways within Los Angeles County. In conjunction with a growth in population and employment along the corridor, these heavy duty truck volumes have exceeded the facility's existing capacity, rendering it unable to accommodate current or future traffic demands. The congestion problem is compounded by the freeway's outdated design and the high accidents rates created by the mix of heavy duty trucks and cars on the freeway.

The immediate situation is not only disruptive to corridor residents and commuters, but to regional trucking, manufacturing and other commercial interests as shipments are delayed and trucks are delayed in traffic. In order to address these issues, the I-710 MCS (March 2005) explored possible alternatives for transportation improvements. The outcome of this effort was the LPS proposing ten general purpose lanes next to four separated freight movement lanes, and was unanimously supported by the communities bordering the I-710.

Metro, in a cooperative effort involving Caltrans, GCCOG, SCAG, the Ports and the I-5 JPA, has proposed to improve I-710 in Los Angeles County from Ocean Boulevard in the City of Long Beach, to SR-60 in East Los Angeles consistent with the MCS recommendations. To begin this process, Caltrans and Metro (along with the funding partners) initiated an EIR/EIS for the project alternatives to inform the public and governmental decision-makers of possible environmental effects associated with the project alternatives and describe the measures that would be undertaken to avoid, minimize, or mitigate those effects.

While the I-710 EIR/EIS is being prepared, an EIR/EIS for I-5 from I-605 to North of I-710 is also being prepared concurrently. The I-5 EIR/EIS will address many of the local arterial highway intersections at the north end of the I-710 Corridor surrounding the I-5/I-710 interchanges along with the proposed freeway improvements for both I-5 and I-710 at this freeway interchange. The I-710 EIR/EIS includes the applicable portion for the improvements to I-710 not related to the proposed I-5 improvements between Washington Boulevard and the south end of the SR-60 and I-710 freeway interchange. The remaining improvements to I-710 not covered by the I-710 EIR/EIS will be included with the I-5 EIR/EIS. Additionally, the I-710 Build alternatives accommodate the future California High Speed Rail alternative alignment adjacent to the BNSF tracks at Hobart Yard.

2.1 CORRIDOR HISTORY

The I-710 Corridor is the principal truck transportation connection between East Los Angeles (including areas further inland in Los Angeles County and beyond) and the Ports of Long Beach and Los Angeles. It plays a vital role in the regional, statewide, and national transportation system, serving both person trips and goods movement needs. Based on the assessment of existing and future travel conditions, the I-710 Corridor is already experiencing serious performance problems.

Various segments of the I-710 Freeway were built over a twenty-one year period between 1954 and 1975. With the exception of the I-105 interchange completed in 1993 and the recently completed repaving and safety improvement project completed by Caltrans, no major improvements have been done on I-710 since it was built approximately 55 years ago. Since the completion of the I-710, the San Pedro Bay Ports of Long Beach and Los Angeles have grown to become one of the largest container ports in the United States. Together, the two separately administered ports are the sixth busiest in the world.

As a result, traffic volumes have inundated the existing design capacity of the interstate, particularly at the interchanges and freeway-to-freeway connections. Consequently, this has led to congestion and safety concerns along the full length of the facility.

2.2 FACTORS AFFECTING FUTURE TRAFFIC VOLUMES

The traffic volumes used as a basis of the traffic operations analyses in this report are based upon year 2035 forecast population, employment, land use and port cargo container volumes. Population and employment forecasts are the basis for future auto vehicle trips and port container volumes is the principal determinant in forecasting truck trips related to the transport of cargo related to international trade. Additionally, land use affects the location and intensity of both auto and truck travel.

2.2.1 Population and Employment

The County of Los Angeles has a population of over 10 million residents and over 3 million employees countywide. Within the I-710 Corridor, it encompasses 15 cities and unincorporated areas in Los Angeles County as well as numerous other neighborhoods and communities adjacent to the freeway corridor. Population and employment forecasts adopted by the Southern California Associations of Government (SCAG) for use in the 2008 Regional Transportation Plan (RTP) were used in traffic forecasts developed for the I-710 Corridor Project EIR/EIS. Regional population is forecast to grow by 27 percent, and I-710 study area population is forecast to grow by 11 percent. Employment follows a similar pattern as the region's growth is also 27 percent; whereas, study area employment grows by only 7 percent. Growth is lower in the study area because it is almost completely developed. New growth will be limited to smaller, infill-type developments.

Table 2-1 summarizes the growth for the entire SCAG model region and for the I-710 study area for both population and employment.

Table 2-1 Forecast Growth in Population and Employment

Category	Area	Year 2008	Year 2035	Percent Change
Population	Regional	18,904,711	24,049,676	27%
	Study Area	1,487,180	1,653,167	11%
Employment	Regional	8,115,208	10,283,947	27%
	Study Area	593,995	636,734	7%

Source: Southern California Association of Governments, 2008 Regional Transportation Plan.

2.2.2 Land Use

Land uses along I-710 Corridor are varied, with some residential developments directly adjacent to the interstate corridor and between interchanges at a few locations. Industrial and commercial land uses are concentrated around arterial interchanges along I-710 and extend along these arterials through local jurisdictions. Industrial uses also parallel the freeway at many locations. Schools and medical facility land uses are located throughout the Study Area. The Los Angeles River runs longitudinally west of the I-710 freeway between Port of Long Beach and Imperial Highway and east between Imperial Highway and Atlantic Boulevard. The Southern California Edison (SCE) transmission corridor runs longitudinally east of the I-710 freeway between I-405/I-710 and I-710/SR-91 interchanges. The Department of Water and Power (DWP) also has a transmission corridor that parallels the west side of the freeway from just north of Imperial Highway to north of Slauson Avenue.

The corridor also includes the Ports of Long Beach and Los Angeles, which combined are the sixth busiest cargo container port complex in the world, covering over 10,000 acres.

2.2.3 Port Container Cargo Growth

A number of key assumptions about port cargo growth, mode share of container transport, and trip distribution were critical inputs to the forecasts of future traffic volumes in the I-710 corridor. An Initial Feasibility Analysis¹ was conducted as an early study in this project to assess a variety of assumptions and limitations with respect to forecast year 2035 future port cargo container volumes and travel patterns. The following port growth assumptions were adopted by the I-710 Project Committee for use in all traffic forecasting performed for the I-710 EIR/EIS and are summarized below:

- 2035 annual cargo container throughput of both ports is forecast to be 43 million TEUs.
- 2008 cargo volumes and cargo mode share (local imports/exports, on-dock, and off-dock intermodal shares) were updated, based on data provided by the ports. This adjustment brought the 2008 and 2035 port truck trip tables into alignment with actual cargo volumes handled by the ports in 2008 and they reflect the observed growth and cargo mode share relationships at that time.

¹ Op cit, December 2008.

- On-dock intermodal share in 2035 is forecast to be 26 percent, while off-dock share (including empties) is forecast at 14 percent. On-dock railyard capacities are consistent with those reported in the Railroad Goods Movement Study prepared for the I-710 Corridor Project EIR/EIS.
- The proposed new BNSF Railroad Southern California International Gateway (SCIG) near-dock intermodal yard is assumed not to be approved and constructed. The proposed expansion of the UP Railroad near dock Intermodal Container Transfer Facility (ICTF) is not assumed to undergo any additional expansion.
- There is insufficient forecast off-dock railyard capacity to handle all of the combined off-dock international and domestic intermodal cargo in 2035. It is assumed that an amount of international cargo equivalent to that which would be handled at the proposed SCIG intermodal terminal (approximately 2.2 million annual TEUs) will need to be handled at a combination of the existing downtown intermodal rail yards and a new inland intermodal terminal. Approximately 1.9 million TEUS are assumed to be moved via the new inland intermodal terminal.
- Local import and export trips to and from the ports are expected to be distributed in the same way that they are today. This implies substantial growth in port truck trips to/from warehouses and transload facilities in the Gateway Cities. This assumption is consistent with the current port traffic forecasting model and the 2008 SCAG RTP model. Given the limited ability of existing warehouses in the Gateway Cities to increase their productivity to accommodate this growth, this truck trip distribution may be unrealistic. The assumptions about future warehouse locations in the SCAG model is the subject of a more in-depth study in the ongoing SCAG Comprehensive Regional Goods Movement Study.
- The 2035 No-Build Alternative includes increased port night gate operations and empty container re-use compared to today's operations.
- For additional details on the key assumptions underlying the future forecast of traffic volumes used in this report, the reader is referred to the following I-710 Corridor Project EIR/EIS technical reports:
 - o I-710 Alternatives Screening Methodology (12/16/2008);
 - o I-710 EIR/EIS Initial Feasibility Analysis (12/24/2008);
 - o I-710 Railroad Goods Movement Study (2/3/2009);
 - o I-710 Multimodal Review (3/4/2009);
 - o I-710 EIR/EIS Travel Demand Modeling Methodology (2/26/2010).

3.0 NEED AND PURPOSE

This section describes the need and purpose of the proposed project as described below.

The need for the I-710 Corridor Project is as follows:

- I-710 experiences high heavy duty truck volumes, resulting in high concentrations of diesel particulate emissions within the I-710 Corridor;
- I-710 experiences an accident rate that is well above the statewide average for freeways of this type, particularly for truck-related accidents;
- At many locations along I-710, the curves of on- and off-ramps do not meet current design standards and weaving sections between interchanges are of insufficient length;
- High volumes of both trucks and cars have led to existing traffic congestion throughout most of the day (6:00 a.m. to 7:00 p.m.) on I-710 as well as on the connecting freeways. This is projected to worsen over the next 25 years;
- Increases in population, employment, and goods movement between now and 2035 will lead to more traffic demand on I-710 and on the streets and roadways within the I-710 Corridor as a whole.

The purpose of the I-710 Corridor Project is to achieve the following within the I-710 Corridor:

- Improve air quality and public health;
- Improve traffic safety;
- Provide modern design for the I-710 mainline;
- Address projected traffic volumes;
- Address projected growth in population, employment, and activities related to goods movement (based on SCAG population projections and projected container volume increases at the two ports).

This page intentionally left blank.

4.0 TRAFFIC DATA COLLECTION, ASSUMPTIONS AND METHODOLOGY

This section documents and presents the traffic data collection, accident data, analysis assumptions and methodology used for base year traffic analyses, as well as the future traffic forecasting and operational analysis results for the I-710 Corridor Study.

4.1 EXISTING TRAFFIC DATA

The key task of the I-710 Corridor Project is the collection of existing traffic data to establish and define existing conditions, as well as develop future traffic volume projections. Where available, the main sources of existing traffic data include off-the-shelf traffic data from Caltrans' traffic count database, local jurisdictions along the I-710 corridor and the County of Los Angeles. New intersection and roadway segment traffic count data was collected to supplement the aforementioned sources. The study time periods are weekday 7-9 AM, 11-1 Middy, and 4-6 PM peak hours.

Table 4-1 and **Table 4-2** display the compilations of Caltrans data and new traffic counts collected for the I-710 freeway mainline and ramps for the AM, PM, and Middy peak hours under 2008 existing conditions. **Table 4-1** presents the existing data in the northbound direction of I-710 from the southerly terminus at Harbor Scenic Drive to the north at Washington Boulevard. Similarly, **Table 4-2** presents the data in the southbound direction along I-710 from Washington Boulevard to Harbor Scenic Drive. Within these tables, the freeway type (basic freeway segment, on- or off-ramp, or weaving type) and the mainline/ramp lanes are identified at each location along with the truck percentage and peak hour volumes along the mainline and ramps (where applicable) for each peak hour (AM, PM and midday). The comprehensive data collection effort conducted for this study is described in greater detail in the following sections.

In general, truck traffic is highest during midday peak hour on I-710 for both northbound and southbound directions. I-710 segments closest to the southern terminus also has the highest truck percentages; freight trucks dissipate to crossing freeways and local arterials as they travel further away from the Port area and general purpose vehicle increase on mainline I-710.

Table 4-1
I-710 Northbound Peak Hour Existing (2008) Traffic Volume

Location Description	Freeway Type	Lane		AM			PM			MD		
		ML	Ramp	T%	ML	Ramp	T%	ML	Ramp	T%	ML	Ramp
South of Harbor Scenic On	Basic	2	--	24%	938	0	24%	717	0	37%	359	0
Harbor Scenic	On	2	1	24%	938	418	24%	717	1051	37%	359	971
--	Basic	3	--	24%	1356	0	24%	1768	0	37%	1330	0
9th & Pier B & Pico	On	3	1	24%	1356	91	24%	1768	379	37%	1330	255
9th & Pier B & Pico On/ Anaheim EB Off	Weave B	3	--	24%	1447	0	24%	2147	0	37%	1585	0
Anaheim EB	Off	3	1	24%	1447	105	24%	2147	381	37%	1585	166
--	Basic	2	--	24%	1342	0	24%	1766	0	37%	1419	0
7th & 3rd & Shoreline	Major On	2	2	24%	1342	2897	24%	1766	1998	37%	1419	1773
--	Basic	4	--	24%	4239	0	24%	3764	0	37%	3192	0
Anaheim EB	On	4	1	24%	4239	607	24%	3764	655	37%	3192	784
Anaheim EB On / Anaheim WB Off	Weave A	5	--	24%	4846	0	24%	4419	0	37%	3976	0
Anaheim WB	Off	5	1	24%	4846	304	24%	4419	525	37%	3976	426
Anaheim WB	On	4	1	24%	4542	557	24%	3894	484	37%	3550	452
Anaheim WB On / PCH SB Off	Weave B	4	--	12%	5099	0	12%	4378	0	18%	4002	0
PCH SB	Off	4	1	12%	5099	171	12%	4378	321	18%	4002	104
PCH SB	On	3	1	12%	4928	559	12%	4057	847	18%	3898	911
PCH SB On / PCH NB Off	Weave A	4	--	12%	5487	0	12%	4904	0	18%	4809	0
PCH NB	Off	4	1	12%	5487	193	12%	4904	261	18%	4809	242
PCH NB	On	3	1	12%	5294	587	12%	4643	417	18%	4567	446
--	Basic	3	--	12%	5602	0	12%	4893	0	18%	4701	0
Willow EB	Off	3	1	12%	5602	107	12%	4893	144	18%	4701	98
Willow EB	On	3	1	12%	5495	427	12%	4749	392	18%	4603	309
Willow EB On / Willow WB Off	Weave A	4	--	12%	5922	0	12%	5141	0	18%	4912	0
Willow WB	Off	4	1	12%	5922	308	12%	5141	228	18%	4912	154
Willow WB	On	3	1	12%	5614	395	12%	4913	266	18%	4758	278
--	Basic	3	--	11%	6009	0	11%	5179	0	17%	5036	0
I-405	Major Off	4	2	11%	6009	2455	8%	5179	2015	19%	5036	2209
--	Basic	3	--	11%	3554	0	8%	3164	0	19%	2827	0
Wardlow / I-405 NB	On	3	1	11%	3554	1481	8%	3164	1640	19%	2827	1383
--	Basic	3	--	11%	5035	0	8%	4804	0	19%	4210	0
I-405 SB	Major On	3	2	11%	5035	1179	8%	4804	1734	19%	4210	1400
--	Basic	4	--	12%	6278	0	9%	6833	0	22%	4939	0
Del Amo EB	Off	4	1	12%	6278	351	9%	6833	589	22%	4939	391
Del Amo EB	On	4	1	12%	5927	259	9%	6244	640	22%	4548	542
Del Amo EB On / Del Amo WB Off	Weave A	5	--	12%	6186	0	9%	6884	0	22%	5090	0
Del Amo WB	Off	5	1	12%	6186	326	9%	6884	194	22%	5090	249
--	Basic	4	--	12%	5860	0	9%	6690	0	22%	4841	0
Del Amo WB	On	4	1	12%	5860	288	9%	6690	222	22%	4841	206
--	Basic	5	--	13%	6247	0	10%	7142	0	22%	5920	0
Long Beach	Off	5	1	13%	6247	456	10%	7142	326	22%	5920	219
Long Beach	On	5	1	13%	5791	658	10%	6816	629	22%	5701	561
Long Beach On / SR-91EB & Artesia Off	Weave C	6	--	12%	6449	0	9%	7445	0	22%	6262	0
Artesia & SR-91 EB	Off	6	2	13%	6449	816	10%	7445	1387	21%	6262	869
--	Basic	4	--	13%	5633	0	10%	6058	0	21%	5393	0

Table 4-1
I-710 Northbound Peak Hour Existing (2008) Traffic Volume

Location Description	Freeway Type	Lane		AM			PM			MD		
		ML	Ramp	T%	ML	Ramp	T%	ML	Ramp	T%	ML	Ramp
SR-91 WB	Off	4	1	13%	5633	594	10%	6058	553	21%	5393	632
--	Basic	3	--	13%	5039	0	10%	5505	0	21%	4761	0
SR-91 EB	On	4	1	13%	5039	0	10%	5505	0	21%	4761	0
--	Basic	5	--	13%	5039	0	10%	5505	0	21%	4761	0
SR-91	On	5	2	13%	5039	2906	10%	5505	3917	21%	4761	3697
SR-91 On / Alondra Off	Weave C	6	--	14%	7945	0	12%	9422	0	23%	8458	0
Alondra	Off	6	1	14%	7945	439	12%	9422	699	23%	8458	561
--	Basic	5	--	14%	7506	0	12%	8723	0	23%	7897	0
Alondra	On ⁴	5	1	14%	7506	732	12%	8723	657	23%	7897	663
--	Basic	6	--	14%	8238	0	11%	9380	0	23%	8560	0
Rosecrans	Off	6	1	14%	8238	799	11%	9380	942	23%	8560	679
--	Basic	6	--	14%	7439	0	11%	8438	0	23%	7881	0
I-105	Major Off	7	3	14%	7439	1741	11%	8438	2092	23%	7881	1804
--	Basic	4	--	14%	5698	0	11%	6346	0	23%	6077	0
Rosecrans	On	4	1	14%	5698	455	11%	6346	456	23%	6077	294
--	Basic	4	--	14%	6153	0	11%	6802	0	23%	6371	0
I-105	On	4	1	14%	6153	2458	11%	6802	2450	23%	6371	2458
I-105 On / Imperial Off	Weave A	5	--	13%	8611	0	11%	9252	0	22%	8829	0
Imperial	Off	5	1	12%	8611	1202	11%	9252	1634	21%	8829	1196
Imperial	On	4	1	12%	7409	1014	11%	7618	803	21%	7633	719
--	Basic	4	--	11%	5973	0	10%	5163	0	19%	5515	0
Firestone	Off	4	1	11%	5973	716	10%	5163	1605	19%	5515	1161
Firestone	On	4	1	11%	5257	1239	10%	3558	1084	19%	4354	1176
--	Basic	4	--	13%	7784	0	12%	7251	0	23%	7232	0
Florence	Off	4	1	13%	7784	850	12%	7251	1434	23%	7232	1265
Florence	On	4	1	13%	6934	1318	12%	5817	933	23%	5967	961
--	Basic	4	--	9%	8252	0	8%	6750	0	15%	6928	0
Atlantic NB	Off	4	2	9%	8252	487	8%	6750	331	15%	6928	360
Atlantic SB	Off	5	1	9%	7765	1050	8%	6419	427	15%	6568	634
Atlantic	On	5	1	9%	6715	834	8%	5992	1310	15%	5934	1300
--	Basic	5	--	9%	8093	0	8%	7854	0	15%	7138	0
Washington	Off	5	1	13%	8093	462	9%	7854	439	21%	7138	481
Washington	On	5	1	13%	7631	384	9%	7415	569	21%	6657	390
I-710 Northbound Collector Distributor Operations												
Wardlow	On	2	1	11%	2455	83	8%	2015	84	19%	2209	47
Wardlow On / I-405 SB Off	Weave A	3	--	11%	2,538	0	8%	2099	0	19%	2256	0
I-405 SB	Off	3	1	11%	2,538	998	8%	2099	1014	19%	2256	1135
Wardlow On / I-405 NB Off	Weave C	3	--	11%	1,540	0	8%	1085	0	19%	1121	0
I-405 NB Off	Off	2	1	11%	1,540	1,457	8%	1085	1001	19%	1121	1074
Imperial EB	On	1	1	12%	822	448	11%	1205	407	21%	812	384
Imperial EB On / Imperial WB Off	Weave A	2	--	12%	1,270	0	11%	1612	0	21%	1196	0
Imperial WB	Off	2	1	12%	1,270	822	11%	1612	1205	21%	1196	812
Florence EB	On	1	1	13%	434	581	12%	857	471	23%	697	453
Florence EB On / Florence WB Off	Weave A	2	--	13%	1015	0	12%	1328	0	23%	1150	0
Florence WB	Off	2	1	13%	1015	434	12%	1328	857	23%	1150	697

Table 4-2
I-710 Southbound Peak Hour Existing (2008) Traffic Volume

Location Description	Freeway Type	Lane No.		AM			PM			MD		
		ML	On/Off	T%	ML	On/Off	T%	ML	On/Off	T%	ML	On/Off
Washington	Off	5	1	13%	7369	567	9%	6530	264	21%	7213	427
Washington	On	5	1	13%	6802	304	9%	6266	659	21%	6786	436
Washington On / Atlantic Off	Weave B	5	--	9%	7106	0	8%	6925	0	15%	7222	0
Atlantic	Off	5	2	9%	7106	1856	8%	6925	1093	15%	7222	1213
Atlantic SB	On	4	1	9%	5250	350	8%	5832	462	15%	6009	488
Atlantic NB	On	4	1	9%	5600	403	8%	6294	819	15%	6497	600
--	Basic	4	--	9%	6003	0	8%	7113	0	15%	7097	0
Florence	Off	4	1	9%	6003	701	8%	7113	1101	15%	7097	924
Florence	On	4	1	9%	5302	1670	8%	6012	1641	15%	6173	1597
--	Basic	4	--	13%	6972	0	12%	7653	0	23%	7770	0
Firestone	Off	4	1	13%	6972	799	12%	7653	1383	23%	7770	1041
Firestone	On	4	1	13%	6173	1386	12%	6270	1168	23%	6729	1120
--	Basic	4	--	11%	7971	0	10%	7593	0	19%	7200	0
Wright	Off	4	1	11%	7971	422	10%	7593	423	19%	7200	401
Imperial EB	Off	4	1	11%	7549	321	10%	7170	344	19%	6799	269
Imperial	On	4	1	11%	7228	1357	10%	6826	1120	19%	6530	1198
Imperial On / MLK Off	Weave B	5	--	13%	8585	0	11%	7946	0	22%	7728	0
MLK	Off	5	1	13%	8585	283	11%	7946	460	22%	7728	378
Imperial On / I-105 Off	Weave B	5	--	13%	8302	0	11%	7486	0	22%	7350	0
I-105 Off	Off	4	2	13%	8302	2266	11%	7486	2521	22%	7350	2480
Rosecrans	Off	4	1	13%	6036	464	11%	4965	598	22%	4870	305
--	Basic	4	--	13%	5572	0	11%	4367	0	22%	4565	0
MLK	On	4	1	13%	5572	531	11%	4367	328	22%	4565	251
--	Basic	4	--	13%	6103	0	11%	4695	0	22%	4816	0
I-105	Major On	4	2	13%	6103	1760	11%	4695	1630	22%	4816	1592
--	Basic	6	--	13%	7863	0	11%	6325	0	22%	6408	0
Rosecrans WB	On	6	1	14%	7863	324	11%	6325	165	23%	6408	111
Rosecrans EB	On	6	1	14%	8187	616	11%	6490	403	23%	6519	376
--	Basic	6	--	14%	9487	0	11%	7922	0	23%	7349	0
Alondra WB	Off	6	1	14%	9487	506	11%	7922	427	23%	7349	376
--	Basic	5	--	14%	8981	0	11%	7495	0	23%	6973	0
Alondra EB	Off	5	1	14%	8981	280	11%	7495	356	23%	6973	287
Alondra	On	5	1	14%	8701	611	11%	7139	475	23%	6686	493
Alondra On / SR-91 EB Off	Weave B	6	--	14%	9312	0	12%	7614	0	23%	7179	0
SR-91 EB	Off	5	2	14%	9312	1805	12%	7614	2059	23%	7179	1990
--	Basic	4	--	14%	7507	0	12%	5555	0	23%	5189	0
SR-91 WB	Major Off	4	2	14%	7507	2831	12%	5555	1573	23%	5189	1797
--	Basic	3	--	14%	4676	0	12%	3982	0	23%	3392	0
SR-91 WB	On	3	1	14%	4676	2213	12%	3982	1751	23%	3392	1938
--	Basic	4	--	14%	6889	0	12%	5733	0	23%	5330	0
SR-91 EB & Artesia	On	4	1	14%	6375	1003	12%	5538	886	23%	5122	822
Artesia & SR-91 EB On / Long Beach NB Off	Weave B	5	--	12%	7378	0	9%	6424	0	22%	5944	0
Long Beach NB	Off	5	1	12%	7378	436	9%	6424	206	22%	5944	397

Table 4-2
I-710 Southbound Peak Hour Existing (2008) Traffic Volume

Location Description	Freeway Type	Lane No.		AM			PM			MD		
		ML	On/Off	T%	ML	On/Off	T%	ML	On/Off	T%	ML	On/Off
Artesia & SR-91 EB On / Long Beach SB Off	Weave A	5	--	12%	6942	0	9%	6218	0	22%	5547	0
Long Beach SB	Off	5	1	12%	6942	326	9%	6218	554	22%	5547	388
Long Beach	On	4	1	12%	6616	469	9%	5664	398	22%	5159	300
--	Basic	4	--	13%	7882	0	10%	5943	0	22%	6056	0
Susana	Off	4	1	13%	7882	1290	10%	5943	743	22%	6056	1011
Del Amo	On	4	1	13%	6592	968	10%	5200	776	22%	5045	705
--	Basic	4	--	12%	7560	0	9%	5976	0	22%	5750	0
I-405 / Wardlow	Major Off	4	2	12%	7560	3935	9%	5976	3364	22%	5750	2870
--	Basic	3	--	12%	3625	0	9%	2612	0	22%	2880	0
I-405 SB	On	3	1	12%	3625	1316	9%	2612	1444	22%	2880	1091
--	Basic	3	--	12%	4941	0	9%	4056	0	22%	3971	0
I-405 NB	On	3	1	12%	4941	855	9%	4056	914	22%	3971	876
--	Basic	3	--	11%	5796	0	11%	4970	0	17%	4847	0
Willow WB	Off	3	1	11%	5796	244	11%	4970	344	17%	4847	280
Willow WB	On	3	1	11%	5552	183	11%	4626	105	17%	4567	127
Willow WB On / Willow EB Off	Weave A	4	--	11%	5735	0	11%	4731	0	17%	4694	0
Willow EB	Off	4	1	11%	5735	265	11%	4731	484	17%	4694	338
Willow EB	On	3	1	11%	5470	255	11%	4247	235	17%	4356	168
--	Basic	3	--	12%	6926	0	12%	5876	0	18%	5481	0
PCH	Off	3	1	12%	6926	1168	12%	5876	1099	18%	5481	957
PCH	On	3	1	12%	5758	577	12%	4777	445	18%	4524	569
--	Basic	3	--	12%	6335	0	12%	5222	0	18%	5093	0
Anaheim WB	Off	3	1	24%	6335	1033	24%	5222	538	37%	5093	699
Anaheim WB	On	3	1	24%	5302	178	24%	4684	132	37%	4394	112
Anaheim WB On / Anaheim EB Off	Weave A	4	--	24%	5480	0	24%	4816	0	37%	4506	0
Anaheim EB	Off	4	1	24%	5480	367	24%	4816	468	37%	4506	386
--	Basic	5	--	24%	5113	0	24%	4348	0	37%	4120	0
6th & Broadway & Shoreline	Major Off	5	2	24%	5113	3151	24%	4348	2910	37%	4120	2504
--	Basic	3	--	24%	1962	0	24%	1438	0	37%	1616	0
Anaheim EB	On	3	1	24%	1962	662	24%	1438	236	37%	1616	479
--	Basic	3	--	24%	2624	0	24%	1674	0	37%	2095	0
Pico & 9th & Pier B	Off	3	1	24%	2624	337	24%	1674	238	37%	2095	281
--	Basic	3	--	24%	2287	0	24%	1436	0	37%	1814	0
Harbor Scenic	Major Off	3	2	24%	2287	1107	24%	1436	606	37%	1814	936
South of Harbor Scenic Off	Basic	2	--	24%	1180	0	24%	830	0	37%	878	0
I-710 Southbound Collector Distributor Traffic Volume												
Florence WB	On	1	1	9%	325	615	8%	761	685	15%	586	681
Florence WB On / Florence EB Off	Weave A	2	--	9%	940	0	8%	1446	0	15%	1267	0
Florence EB	Off	2	1	9%	940	325	8%	1446	761	15%	1267	586
Imperial WB	On	1	1	11%	321	499	10%	344	532	19%	269	520
Imperial WB On / Imperial EB Off	Weave A	2	--	11%	820	0	10%	876	0	19%	789	0
Imperial EB	Off	2	1	11%	820	321	10%	876	344	19%	789	269

Table 4-2
I-710 Southbound Peak Hour Existing (2008) Traffic Volume

Location Description	Freeway Type	Lane No.		AM			PM			MD		
		ML	On/Off	T%	ML	On/Off	T%	ML	On/Off	T%	ML	On/Off
MLK	On	1	1	13%	464	531	11%	598	328	22%	305	251
MLK On / Rosecrans Off	Weave A	2	--	13%	995	0	11%	926	0	22%	556	0
Rosecrans	Off	2	1	13%	995	464	11%	926	598	22%	556	305
I-405 NB	On	1	1	12%	1619	855	9%	3233	914	22%	1697	876
I-405 NB On / I-405 SB Off	Weave A	2	--	12%	2474	0	9%	4147	0	22%	2573	0
I-405 SB	Off	2	1	12%	2474	1557	9%	4147	2063	22%	2573	1615
PCH NB	On	1	1	12%	429	229	12%	613	94	18%	421	102
PCH NB On / PCH SB Off	Weave A	2	--	12%	658	0	12%	707	0	18%	523	0
PCH SB	Off	2	1	12%	658	429	12%	707	613	18%	523	421

4.2 CALTRANS DATA

4.2.1 Performance Management System (PeMS) Data

The Freeway Performance Measurement System (PeMS), is maintained by the Department of Electrical Engineering and Computer Sciences at the University of California, Berkeley, in cooperation with the California Department of Transportation, California Partners for Advanced Transit and Highways (PATH), and Berkeley Transportation Systems. The intent of PeMS is to compute the performance measures of California freeways by collecting historical and real-time freeway data.

The general boundaries used to collect data for PeMS included I-110 to the west, SR-60 to the north, I-605 to the east, and the Pacific Ocean to the south. Regionally and locally significant roadways traverse the study area. The PeMS data collected and compiled from Caltrans includes Roadway ADT, hourly traffic data, and truck percentages among other information. Dates of which the traffic data are selected fall between September 2007 and April 2008. Traffic volumes from healthy detectors were selected from typical weekdays (i.e. Tuesday, Wednesday, or Thursday) that do not coincide with national or school holidays.

4.2.2 Ramp and Mainline Freeway Traffic Data

In addition to the PeMS data, the most recent and available traffic data from the Caltrans District 7 traffic count database was obtained for the mainline freeway segments, all of the ramps on I-710 and freeway-to-freeway connections.

4.3 TRAFFIC DATA COLLECTION

4.3.1 Freeway Mainline Traffic Counts

New freeway mainline traffic counts were collected for each of the identified I-710 study segments during the period between May 21st and June 3rd, 2008 at the following locations:

- Willow Street overpass
- Long Beach Boulevard overpass
- Alondra Boulevard overpass
- Slauson Avenue overpass
- Third Street overpass

Traffic counts were recorded by lane and collected over a 12-hour period between 7:00 a.m. and 7:00 p.m. to capture peak hour traffic data. These traffic counts were conducted on a typical weekday (i.e., Tuesday, Wednesday, or Thursday) and aggregated into three peak period categories (am, midday, and pm peak).

The traffic counts were sorted into two vehicle type classifications: autos and heavy duty trucks. These classifications were based on the organization of data in the 2008 SCAG Regional Transportation Plan (RTP) travel demand model. Auto vehicle types are classified by occupancy: drive alone (DA), shared ride with one person (SR2), and shared ride with 2 or more passengers (SR3). Heavy duty trucks are classified as light-heavy, medium-heavy, and heavy-heavy trucks. Light-heavy trucks are 8,500 to 14,000 gross vehicle weight in pounds (GVW), medium-heavy trucks are 14,000 to 33,000 GVW, and heavy-heavy trucks are 33,000 GVW or more. While the travel demand model lists trucks in this manner, it is very difficult to count trucks based on weight. Therefore, for data collection purposes, these vehicles are reported as trucks with 5 or more axles, trucks with 4 axles, trucks with 3 axles and truck with 2 axles. These data will then be used to validate the transportation forecasting model by determining the percentage of trucks using I-710. **Table 4-3** and **Table 4-4** summarize the truck percentages and traffic volumes on mainline I-710 over the 12-hour count period, respectively. Truck percentages shown are based on total traffic volumes over the 12-hour count period. **Figure 4-1** displays the freeway mainline traffic count locations. **Appendix A** contains the complete 12-hour mainline truck classification counts collected.

Table 4-3
12-Hour Freeway Mainline Truck Classification

Mainline Location	Freeway Direction	Truck Classification			
		2-Axle	3-Axle	4-Axle	5-Axle
Willow St	NB	2.4%	2.5%	0.2%	13.5%
	SB	1.6%	2.6%	0.2%	16.6%
Long Beach Blvd	NB	2.5%	2.3%	0.1%	12.8%
	SB	2.7%	2.3%	0.1%	16.0%
Alondra	NB	2.9%	2.5%	0.1%	10.3%
	SB	2.5%	1.9%	0.5%	12.7%
Slauson Ave	NB	2.2%	1.7%	0.1%	9.9%
	SB	3.4%	1.8%	0.1%	9.4%
Third St	NB	2.4%	0.6%	0.1%	4.2%
	SB	3.3%	0.6%	0.1%	3.8%

Notes: 12-Hour counts collected during the period between May 21st and June 3rd, 2008.

Table 4-4
12-Hour Freeway Mainline Traffic Volumes

Mainline Location	Freeway Direction	Cars, Pickups, Buses and All Other (Volumes)	Truck Classification (Truck Volumes)				TOTAL VOLUMES
			2-Axle	3-Axle	4-Axle	5-Axle	
Willow St	NB	44,966	1,333	1,397	115	7,446	55,257
	SB	42,584	847	1,413	85	8,952	53,881
Long Beach Blvd	NB	52,069	1,591	1,481	67	8,077	63,285
	SB	50,831	1,771	1,508	40	10,289	64,439
Alondra	NB	64,162	2,191	1,893	88	7,846	76,180
	SB	65,910	1,959	1,510	418	10,140	79,937
Slauson Ave	NB	65,850	1,696	1,278	98	7,609	76,531
	SB	65,455	2,641	1,370	77	7,254	76,797
Third St	NB	39,872	1,026	275	42	1,803	43,018
	SB	40,662	1,438	281	36	1,657	44,074

Notes: 12-Hour counts collected during the period between May 21st and June 3rd, 2008.

4.3.2 Freeway Ramp Traffic Counts

New freeway ramp traffic counts along I-710 were collected at selected interchanges where recent traffic counts and truck classification were not available from the existing Caltrans and PeMS database. These traffic counts were recorded over a 24-hour period on a typical weekday during the period of November 6 and December 4, 2008, and sorted by truck classifications similar to the freeway mainline truck classifications as described in **Section 4.3.1**.

Table 4-5 and **Table 4-6** show the percentage of trucks in relation to total vehicle traffic at the selected freeway ramps. See **Appendix A** for the complete freeway ramp truck classification volumes collected.

**Table 4-5
Northbound I-710 Ramp Truck Survey Summary**

Ramp Location	Ramp Type	AM Peak	MD Peak	PM Peak
EB Anaheim St	Off	13.6%	21.1%	12.8%
EB Anaheim St	On	57.8%	49.4%	24.2%
WB Anaheim St	Off	63.6%	76.2%	39.9%
WB Anaheim St	On	7.5%	10.2%	7.0%
EB PCH	Off	10.9%	26.6%	13.9%
EB PCH	On	35.9%	38.4%	28.4%
WB PCH	Off	18.3%	18.8%	10.4%
WB PCH	On	6.8%	12.8%	11.0%
EB Willow St	Off	6.2%	11.8%	7.1%
EB Willow St	On	5.4%	9.8%	7.8%
WB Willow St	Off	2.2%	2.0%	5.6%
WB Willow St	On	2.8%	5.7%	4.4%
WB Del Amo Blvd	Off	8.6%	40.5%	41.4%
WB Del Amo Blvd	On	2.4%	6.5%	2.4%
EB Del Amo Blvd	Off	3.1%	2.2%	3.3%
EB Del Amo Blvd	On	40.2%	36.2%	18.4%
EB Florence Ave	Off	3.9%	8.6%	4.9%
EB Florence Ave	On	5.8%	6.0%	5.5%
WB Florence Ave	Off	5.7%	8.0%	5.4%
WB Florence Ave	On	10.2%	7.0%	4.0%
EB Imperial Hwy	Off	12.7%	18.5%	11.4%
EB Imperial Hwy	On	5.9%	7.5%	6.2%
WB Imperial Hwy	Off	5.6%	9.8%	7.9%
WB Imperial Hwy	On	8.8%	12.9%	6.5%

Table 4-6
Southbound I-710 Ramp Truck Survey Summary

Ramp Location	Ramp Type	AM Peak	MD Peak	PM Peak
WB Anaheim St	Off	15.7%	35.6%	35.8%
WB Anaheim St	On	51.7%	60.8%	55.8%
EB Anaheim St	Off	6.3%	7.6%	4.0%
EB Anaheim St	On	45.1%	73.6%	75.4%
WB PCH	Off	17.8%	32.1%	28.3%
WB PCH	On	17.7%	8.6%	4.0%
EB PCH	Off	8.8%	11.4%	7.9%
EB PCH	On	22.5%	28.7%	6.3%
WB Willow St	Off	7.9%	4.1%	3.9%
WB Willow St	On	22.8%	20.9%	11.9%
EB Willow St	Off	3.4%	1.9%	3.0%
EB Willow St	On	0.8%	2.9%	1.6%
Del Amo Blvd	Off	0.0%	28.5%	15.6%
Del Amo Blvd	On	24.5%	28.0%	20.0%
WB Florence Ave	Off	8.8%	8.1%	4.5%
WB Florence Ave	On	15.1%	13.7%	12.5%
EB Florence Ave	Off	6.8%	10.2%	10.1%
EB Florence Ave	On	4.5%	6.1%	7.1%
WB Imperial Hwy	Off	9.6%	8.1%	6.9%
WB Imperial Hwy	On	7.6%	11.7%	4.9%
EB Imperial Hwy	Off	6.3%	18.9%	4.9%
EB Imperial Hwy	On	5.4%	7.2%	7.7%

4.3.3 Screenline Traffic Counts

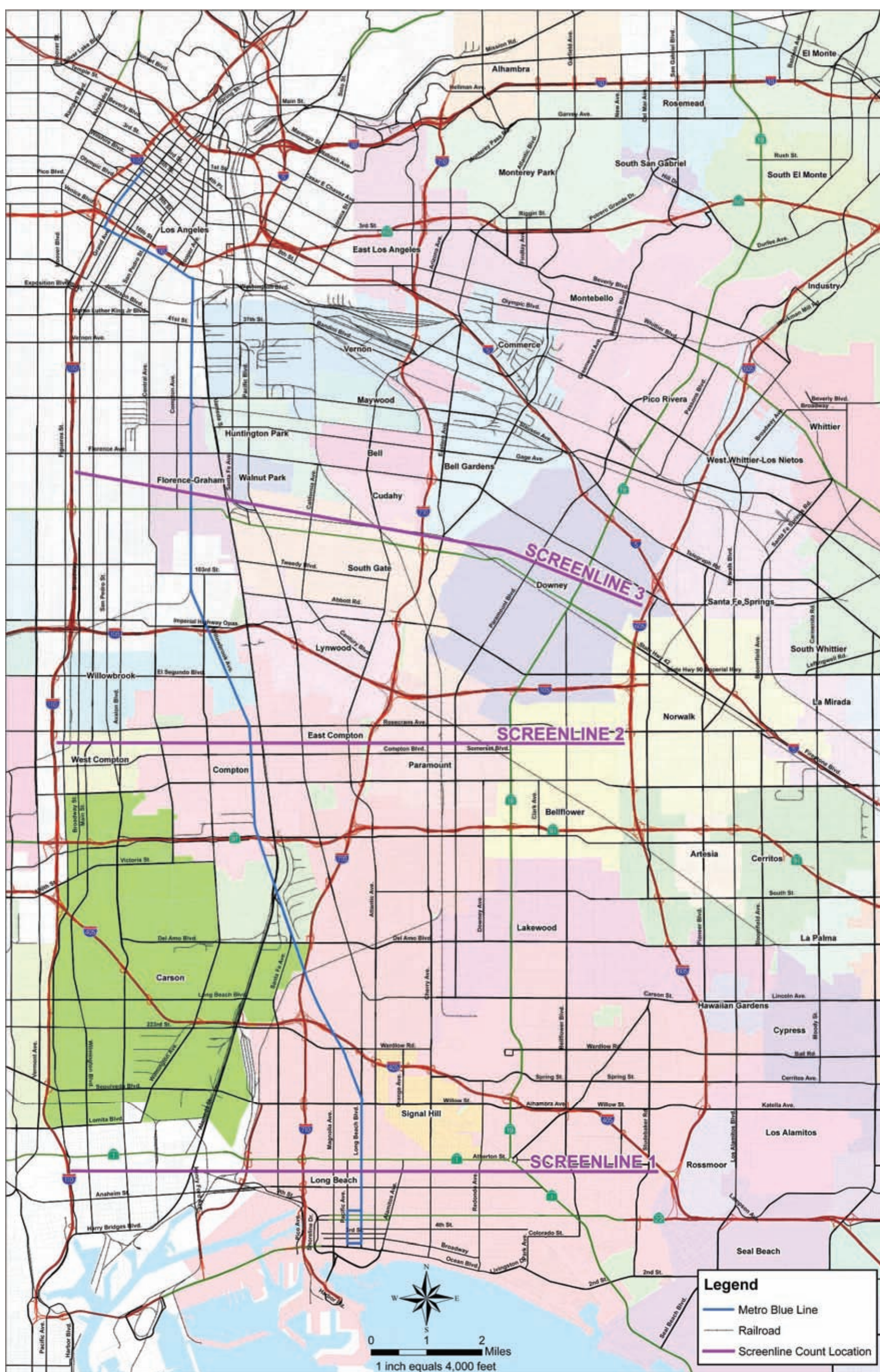
24-hour Average Daily Traffic (ADT) volumes were collected at 41 screenline locations within the study area. Screenlines provide a snapshot of traffic movements occurring over a wide swath of bisected study area roadways. Additionally, they serve as a means of validating the transportation forecast model that compares model generated traffic volumes to actual traffic counts taken on study area streets. The traffic model will be calibrated to adjust for better agreement between the model output and actual base year counts. **Table 4-7** shows the east-west screenline locations and the key north-south arterials which they bisect.

Table 4-7
I-710 Screenline Locations

Screenline 1 South of Pacific Coast Hwy	Screenline 2 South of Rosecrans	Screenline 3 North of Firestone /Manchester
Studebaker	-	-
Bellflower Blvd	Bellflower Blvd	-
Pacific Coast Highway	-	-
Redondo	-	-
-	Lakewood	Lakewood
-	Paramount	Paramount
Cherry	Garfield	Garfield
-	-	California
Atlantic	Atlantic	Atlantic
Long Beach Blvd	Long Beach Blvd	Long Beach Blvd
Santa Fe	-	-
Terminal Island Freeway	-	-
Alameda	Alameda	Alameda
Wilmington	Wilmington	Wilmington
-	Central	Central
Avalon	Avalon	Avalon
-	San Pedro	San Pedro
-	Main	Main
-	Broadway	Broadway
Figueroa	Figueroa	Figueroa

As shown in **Table 4-7**, at least seven north-south arterials were traversed by all three project screenlines within the study area. The screenlines listed above represent the major traffic carrying facilities within the study area and provide a gauge of overall traffic distribution. The above screenline locations are shown on **Figure 4-2**. See **Appendix A** for the complete 12-hour ADT volumes collected at the screenline locations.

This page intentionally left blank.



4.3.4 Intersections

During the project study process, there were 168 initial study intersection locations identified for analysis in the current I-710 study. These intersections have been geocoded with Geographic Information Systems (GIS) software and Thomas Brother Map centerlines, as well as cross-referenced with Google Earth and Virtual Earth mapping. In addition, aerial photo documentation and a field geometric review/traffic operations assessment summary has been created for each intersection. Where available, recent off-the-shelf traffic volumes and turn movements were collected from local cities and agencies, while missing or older traffic data was supplemented with new traffic counts. All study intersection locations are shown on **Figure 4-3**

It must also be noted that 45 of the aforementioned study intersections were initially identified to be included in the I-5 Corridor Study currently underway by Caltrans. Therefore, these intersections were removed from the list of study intersections to be analyzed by the I-710 Project with the intent that the LOS results for these intersections from the I-5 Corridor Study would be presented within the I-710 reports for reference purposes. However, only eighteen of these intersections have ultimately been analyzed by the I-5 Corridor Study and included for reference purposes within the I-710 reports. **Table 4-8** lists the arterial intersections to be studied and included in the I-710 EIR/EIS Analysis.

Table 4-8
Arterial Intersection

ID	Main Street	Cross Street	City	Control
1	Shoreline Dr	Queens Way	Long Beach	Signalized
2	Ocean Blvd	Magnolia Ave	Long Beach	Signalized
3	Broadway	Maine Ave	Long Beach	Signalized
4	Broadway	Magnolia Ave	Long Beach	Unsignalized
5	6th St	Daisy Ave	Long Beach	Signalized
6	6th St	Magnolia Ave	Long Beach	Signalized
7	7th St	Daisy Ave	Long Beach	Unsignalized
8	7th St	Magnolia Ave	Long Beach	Signalized
9	10th St	Magnolia Ave	Long Beach	Signalized
10	Pier B St.	9th St	Long Beach	Signalized
11	Anaheim St	Alameda St	Los Angeles (Wilmington)	Signalized
12	Anaheim St	Santa Fe Ave	Long Beach	Signalized
13	Anaheim St	Magnolia Ave	Long Beach	Signalized
14	Anaheim St	Pacific Ave	Long Beach	Signalized
15	Anaheim St	Long Beach Blvd	Long Beach	Signalized
16	Anaheim St	Cherry Ave	Long Beach	Signalized
17	PCH	Alameda St (@O St)	Los Angeles (Wilmington)	Signalized
18	Alameda St	O St	Los Angeles (Wilmington)	Signalized
19	PCH	Santa Fe Ave	Long Beach	Signalized
20	PCH	Pacific Ave	Long Beach	Signalized
21	PCH	Long Beach Blvd	Long Beach	Signalized
22	PCH	Atlantic Ave	Long Beach	Signalized
23	PCH	Cherry Ave	Long Beach	Signalized
24	Alameda St	Sepulveda Blvd (Ramp)	Carson	Signalized

**Table 4-8
Arterial Intersection**

ID	Main Street	Cross Street	City	Control
25	Sepulveda Blvd	Alameda St (Ramp)	Carson	Signalized
26	Willow St	Santa Fe Ave	Long Beach	Signalized
27	Willow St	Pacific Ave	Long Beach	Signalized
28	Willow St	Long Beach Blvd	Long Beach	Signalized
29	Willow St	Atlantic Ave	Long Beach	Signalized
30	Willow St	Cherry Ave	Signal Hill	Signalized
31	Del Amo Blvd	Wilmington Ave	Carson	Signalized
32	Alameda St	Del Amo Blvd (Ramp)	Carson	Signalized
33	Del Amo Blvd	Alameda Street (Ramp)	Carson	Signalized
34	Del Amo Blvd	Santa Fe Ave	Carson	Signalized
35	Del Amo Blvd	Long Beach Blvd	Long Beach	Signalized
36	Del Amo Blvd	Atlantic Ave	Long Beach	Signalized
37	Del Amo Blvd	Cherry Ave	Long Beach	Signalized
38	Del Amo Blvd	Lakewood Blvd	Lakewood	Signalized
39	Artesia Blvd	Long Beach Blvd	Long Beach	Signalized
40	Alondra Blvd	Alameda St (West Link)	Compton	Signalized
401	Alondra Blvd	Alameda St (East Link)	Compton	Signalized
41	Alondra Blvd	Santa Fe Ave	Compton	Signalized
42	Alondra Blvd	Long Beach Blvd	Compton	Signalized
43	Alondra Blvd	Atlantic Ave	Compton	Signalized
44	Alondra Blvd	Garfield Ave	Paramount	Signalized
45	Alondra Blvd	Paramount Blvd	Paramount	Signalized
46	Rosecrans Ave	Willowbrook Ave	Compton	Signalized
461	Rosecrans Ave	Mona/Willowbrook Ave	Compton	Signalized
47	Rosecrans Ave	Alameda St (West Link)	Compton	Signalized
471	Rosecrans Ave	Alameda St (East Link)	Compton	Signalized
48	Rosecrans Ave	Santa Fe Ave	Compton	Signalized
49	Rosecrans Ave	Long Beach Blvd	Compton	Signalized
50	Rosecrans Ave	Atlantic Ave	Compton	Signalized
51	Rosecrans Ave	Garfield Ave	Paramount	Signalized
52	Rosecrans Ave	Paramount Blvd	Paramount	Signalized
53	Imperial Highway	Alameda St	Lynwood	Signalized
54	Imperial Highway	Long Beach Blvd	Lynwood	Signalized
55	Imperial Highway	Atlantic Ave	Lynwood	Signalized
56	Imperial Highway	Garfield Ave	South Gate	Signalized
57	Imperial Highway	Paramount Blvd	Downey	Signalized
58	Firestone Blvd	Long Beach Blvd	South Gate	Signalized
59	Firestone Blvd	California Ave	South Gate	Signalized
60	Firestone Blvd	Atlantic Ave	South Gate	Signalized
61	Firestone Blvd	Garfield Ave	South Gate	Signalized
62	Firestone Blvd	Paramount Blvd	Downey	Signalized
63	Florence Ave	Alameda St (West Link)	Huntington Park	Signalized
631	Florence Ave	Alameda St (East Link)	Huntington Park	Signalized
64	Florence Ave	Atlantic Ave	Bell	Signalized
65	Florence Ave	Eastern Ave	Bell Gardens	Signalized
66	Florence Ave	Garfield Ave	Bell Gardens	Signalized

**Table 4-8
Arterial Intersection**

ID	Main Street	Cross Street	City	Control
68	Slauson Ave	Alameda St (West Link)	Huntington Park	Signalized
681	Slauson Ave	Alameda St (East Link)	Huntington Park	Signalized
69	Slauson Ave	Soto St	Huntington Park	Signalized
70	Slauson Ave	Atlantic Blvd	Maywood	Signalized
71	Slauson Ave	Eastern Ave	Commerce	Signalized
73	Garfield Ave	Slauson	Commerce	Signalized
74	Bandini Blvd	Atlantic Blvd	Vernon	Signalized
75	Bandini Blvd	Eastern Ave	Bell	Signalized
78	Washington Blvd	Atlantic Blvd	Commerce	Signalized
79	Washington Blvd	Eastern Ave	Commerce	Signalized
109	I-710 SB	Golden Shore St (Off)	Long Beach	Unsignalized
110	I-710 NB	3 rd St (On @ Golden Ave)	Long Beach	Signalized
111	I-710 SB	Del Amo Blvd (On/Off @ Susana Rd)	Rancho Dominguez	Signalized
112	I-710 NB	Long Beach Blvd (On/Off)	Long Beach	Signalized
113	I-710 SB	Long Beach Blvd (On/Off)	Long Beach	Signalized
114	I-710 NB	E. Artesia Blvd (Off)	Long Beach	Signalized
115	I-710 SB	E. Artesia Blvd (On)	Long Beach	Unsignalized
116	I-710 NB	Alondra Blvd (On/Off)	Compton	Signalized
117	I-710 SB	Alondra Blvd (On)	Compton	Unsignalized
118	I-710 NB	Rosecrans Ave (Off)	Paramount	Signalized
119	I-710 SB	Rosecrans Ave (Off)	Paramount	Signalized
120	I-710 SB	Imperial (Off@Wright Rd)	South Gate	Signalized
121	I-710 NB	Firestone Blvd (Off)	South Gate	Signalized
122	I-710 SB	Firestone Blvd.	South Gate	Signalized
124	I-710 SB	Bandini Blvd (Off)	Vernon	Signalized
125	I-710 NB	Washington Blvd (On/Off)	E. LA (unincorp.)	Signalized
126	I-710 SB	Washington Blvd (On/Off)	E. LA (unincorp.)	Signalized
139	Shoreline Dr	Golden Shore St (On)	Long Beach	Unsignalized
140	Ocean Blvd	Golden Shore St	Long Beach	Signalized
141	3 rd St	Magnolia Ave	Long Beach	Signalized
142	7 th St	Maine Ave (North)	Long Beach	Unsignalized
144	Alameda St	41 st St	Los Angeles	Signalized
145	Alameda St	Gage (West Link)	Huntington Park	Signalized
1451	Alameda St	Gage (East Link)	Huntington Park	Unsignalized
146	Santa Fe Ave	223 rd St	Carson	Signalized
147	Wardlow Rd	Magnolia Ave	Long Beach	Signalized
148	Wardlow Rd	Cherry Ave	Long Beach	Signalized
149	Pacific Blvd	Florence Ave	Huntington Park	Signalized
150	Firestone Blvd	Compton Ave	Los Angeles (Walnut Park)	Signalized
151	Slauson Ave	Santa Fe Ave	Huntington Park	Signalized
152	Pacific Blvd	Gage Ave	Huntington Park	Signalized
153	Santa Fe Ave	Gage Ave	Huntington Park	Signalized
154	Alameda St	223 rd St (Ramp)	Carson	Signalized
155	Wilmington Ave	223 rd St	Carson	Signalized
156	Alameda St Ramp	223 rd St	Carson	Signalized
157	Garfield Ave	Gage Ave	Bell Gardens/Commerce	Signalized

**Table 4-8
Arterial Intersection**

ID	Main Street	Cross Street	City	Control
158	37 th St	Santa Fe Ave	Vernon	Signalized
159	38 th St	Santa Fe Ave	Vernon	Signalized
160	Garfield Ave	Washington Blvd	Commerce	Signalized
161	Del Amo Blvd	Susana Rd	Carson	Signalized
162	Alameda St	Carson St (Ramp)	Carson	Signalized
163	Carson St	Alameda St (Ramp)	Carson	Signalized

See **Appendix A** for the study intersection turning movement volume counts collected and used for the analysis of this Project.

Due to the study area's proximity to the POLB and POLA, port staff was consulted in identifying 21 intersections for a more detailed traffic and truck data collection effort. Turning movement counts with truck classifications for the identified 21 intersections were conducted during the month of September 2008. The traffic count specifications required the following classifications:

- Autos
- Bob-Tail
- Chassis
- Container
- Other

These classification fields are consistent with the type of information generally used and preferred in the preparation of trucking and goods movement studies performed by the POLB and POLA for proposed projects.

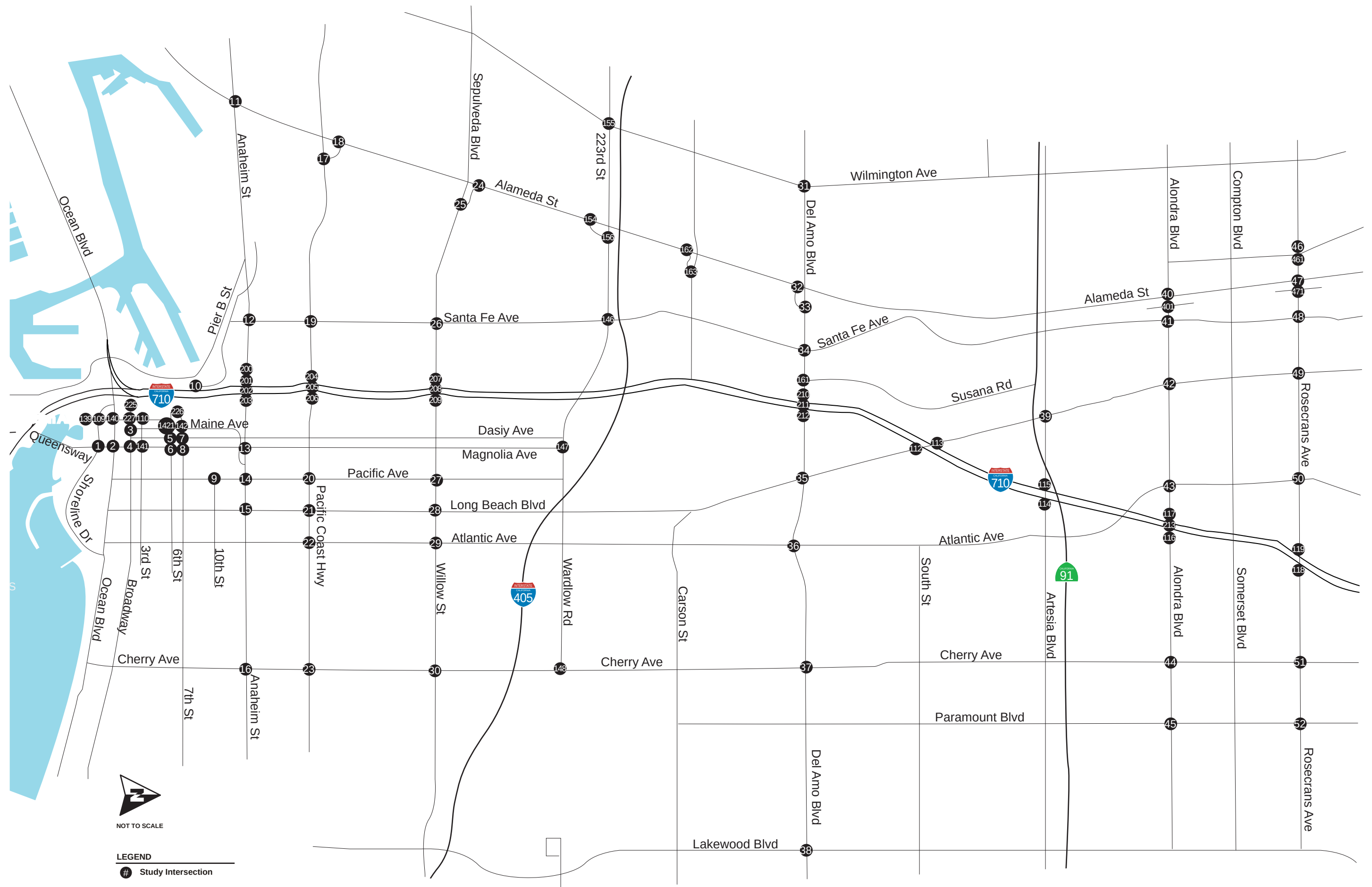
Table 4-9 shows the percentage of trucks in relation to total vehicle traffic at selected intersections. The results from the truck classification counts were subsequently used in the establishment of a truck-vehicle mix within the study area. **Appendix A** includes the truck classification counts collected for the selected 21 intersections.

Table 4-9
Intersection Truck Survey Summary

ID	Intersection Location	Existing (2008) Truck Percent	
		AM Peak	PM Peak
11	Anaheim St / Alameda St	19.4	13.8
12	Anaheim St / Santa Fe Ave	14.6	13.7
17	Anaheim St (Ramp) / O St & PCH	8.9	8.4
18	Alameda St / O St	28.3	25.8
24	Alameda St / Sepulveda Blvd (Ramp)	27.9	21.6
25	Alameda St (Ramp) / Sepulveda Blvd	24.4	18.6
26	Willow St / Santa Fe Ave	0.3	0.4
32	Alameda St / Del Amo Blvd (Ramp)	13.5	14.5
33	Alameda St (Ramp) / Del Amo Blvd	9.3	7.2
40 E	Alameda St (East) / Alondra Blvd	3.0	2.5
40 W	Alameda St (West) / Alondra Blvd	4.7	2.8
47 E	Alameda St (East) / Rosecrans Ave	6.1	9.6
47 W	Alameda St (West) / Rosecrans Ave	5.3	3.5
53 E	Alameda St (East) / Imperial Hwy	1.5	2.7
53	Alameda St (West) / Imperial Hwy	3.8	4.4
63 E	Alameda St (East) / Florence Ave	1.5	0.6
63 W	Alameda St (West) / Florence Ave	3.7	1.6
68 E	Alameda St (East) / Slauson Ave	4.5	3.2
68 W	Alameda St (West) / Slauson Ave	4.5	3.1
144 E	Alameda St (East) / 41st St	7.7	7.9
144 W	Alameda St (West) / 41st St	7.8	4.5
145 E	Alameda St (East) / Gage Ave	1.5	0.4
145 W	Alameda St (West) / Gage Ave	4.0	1.2
154	Alameda St / 223rd St (Ramp)	20.6	18.0
156	Alameda St (Ramp) / 223rd St	9.0	7.3
162	Alameda St / Carson St (Ramp)	11.5	13.9
163	Alameda St (Ramp) / Carson St	7.6	5.1
164	Alameda St / Artesia Blvd (Ramp)	5.9	5.0
165	Alameda St (Ramp) / Artesia	5.6	3.6
166	Alameda St / Firestone Blvd	3.5	1.4
167	Alameda St / Washington Blvd	9.3	2.8

This page intentionally left blank.

K:\2011\I-710\TOAR\Fig 4-3.a Study Inter Loc.ai



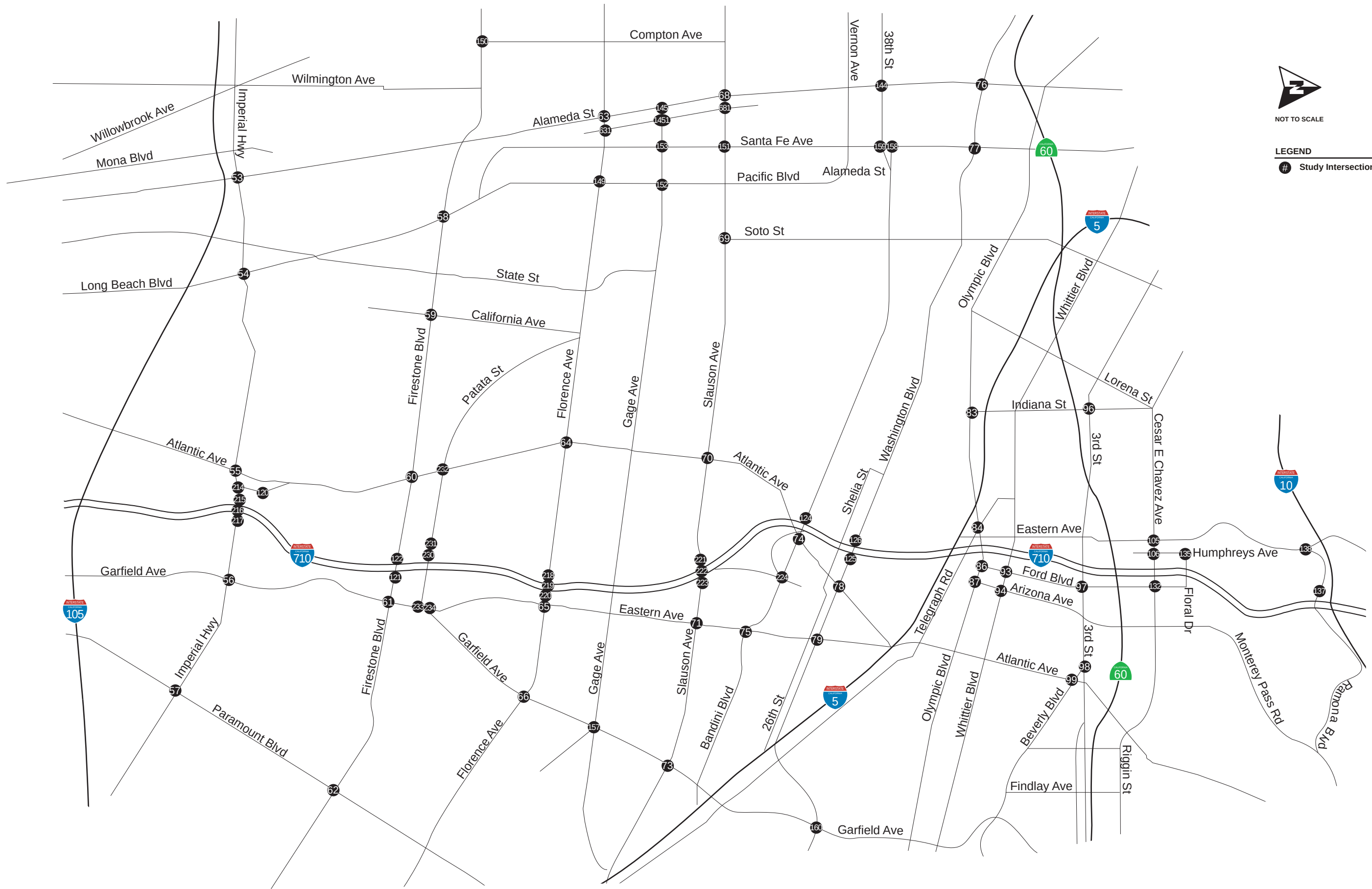
Project: I-710 PA-ED

STUDY INTERSECTION LOCATIONS

Figure 4 -3.a



KK\2011\I-710\TOAR\Fig 4-3.b Study Inter Loc.ai



4.4 TRAFFIC ACCIDENT DATA

This section presents the results of the safety review analysis, which examined accident data collected on the I-710 mainline and ramp terminals within the study area over a 36-month period from October 1, 2004 to September 30, 2007. The accident data was provided by Caltrans' Traffic Accident Surveillance and Analysis System (TASAS) database. The following TASAS information was collected for this study:

- TASAS Selective Accident Retrieval (TSAR) Individual Accident Summary Tables
- TASAS Table B (Selective Accident Rate Calculation and Accident Records)
- TASAS Table C Potential Investigation Locations (dry and wet conditions)

The reported actual accident rates (number of accidents per million vehicle miles) are compared with average accident rates for similar highway facilities throughout the State. The following discussion summarizes the accident analysis results for both I-710 mainline directions and associated freeway ramp junctions.

4.4.1 I-710 Northbound Accident Data

Table 4-10 summarizes the I-710 mainline and ramp TASAS data for the northbound direction. I-710 accident data collected within the project study limits includes freeway mainline segments and ramps from the southern termini of I-710 and Leonis Street, to the north near Washington Boulevard.

As shown in **Table 4-10** of the four I-710 mainline study segments, two segments have higher accident rates as compared to the state average and three have higher fatal accident rates as compared to the state average. The high heavy vehicle volumes may account for the severity of accidents occurring along the study corridor. The TASAS ramp accident data also shows that out of the 59 I-710 study area ramp locations, 31 have higher accident rates as compared to the state average.

An analysis of truck accident data summarized in **Table 4-11** shows that for northbound I-710, truck-related accidents account for 31 percent of the TASAS reported mainline accidents. As shown in **Table 4-11**, truck related accidents range from 29 to 32 percent with minimal variation throughout the I-710 mainline study segments.

Table 4-10
I-710 Northbound Accident Data

Post Mile	Location	Statistical Data			Actual Accident Rates ²			Average Accident Rates ³			Actual Rate > Average Rate?
		Total Accidents	Fatal	Injury	Fatal	Fatal + Injury	Total	Fatal	Fatal + Injury	Total	
I-710 Northbound Links											
4.96 - 9.411	Southern Terminus to I-405	353	5	79	0.016	0.27	1.14	0.006	0.33	1.06	Yes
9.411 - 12.970	I-405 to SR-91	321	1	93	0.003	0.26	0.89	0.005	0.32	1.02	No
12.970 - 15.672	SR-91 to I-105	253	2	79	0.006	0.24	0.75	0.005	0.31	1.01	No
15.692 - 22.607	I-105 to Leonis St	993	8	236	0.010	0.30	1.20	0.006	0.35	1.12	Yes
I-710 Northbound Ramps											
5.057	EB Ocean Blvd Off	6	0	1	0.000	0.06	0.38	0.006	0.35	0.90	No
5.522	EB Harbor Scenic Dr On	4	0	1	0.000	0.09	0.37	0.004	0.13	0.40	No
5.980	Pico Ave On	10	0	3	0.000	0.42	1.38	0.003	0.32	0.85	Yes
6.212	EB Anaheim St Off	5	0	0	0.000	0.00	3.38	0.006	0.33	0.90	Yes
6.228	Shoreline Dr On	2	0	1	0.000	0.03	0.06	0.004	0.13	0.40	No
6.287	EB Anaheim St On	5	0	1	0.000	0.13	0.63	0.001	0.24	0.70	No
6.476	WB Anaheim St Off	11	0	2	0.000	0.60	3.29	0.006	0.33	0.90	Yes
6.510	WB Anaheim St On	5	0	1	0.000	0.12	0.59	0.003	0.22	0.60	No
6.773	SB Route 1 Off	3	0	1	0.000	0.52	1.57	0.004	0.15	0.45	Yes
6.800	SB Route 1 Off	2	0	1	0.000	0.51	1.02	0.006	0.33	0.90	Yes
6.835	SB Route 1 On	5	0	2	0.000	0.18	0.46	0.003	0.22	0.75	No
6.956	NB Route 1 Off	6	0	1	0.000	0.29	1.71	0.004	0.26	0.90	Yes
7.010	NB Route 1 On	0	0	0	0.000	0.00	0.00	0.004	0.13	0.40	No
7.719	EB Willow St Off	3	0	1	0.000	0.59	1.77	0.006	0.33	0.90	Yes
7.811	EB Willow St On	3	0	0	0.000	0.00	0.55	0.001	0.24	0.70	No
7.945	WB Willow St Off	4	0	1	0.000	0.37	1.46	0.003	0.42	1.25	Yes
8.061	WB Willow St On	3	0	0	0.000	0.00	0.57	0.003	0.22	0.60	No
9.595	Wardlow Rd On	2	0	0	0.000	0.00	0.05	0.002	0.10	0.35	No
9.620	Pacific Pl Off	2	0	0	0.000	0.00	0.05	0.002	0.10	0.35	No

² Accident Rates expressed as: # of accidents/Million vehicle miles

³ Average accident rates for similar highway facilities throughout the State.

Table 4-10
I-710 Northbound Accident Data

Post Mile	Location	Statistical Data			Actual Accident Rates ²			Average Accident Rates ³			Actual Rate > Average Rate?
		Total Accidents	Fatal	Injury	Fatal	Fatal + Injury	Total	Fatal	Fatal + Injury	Total	
10.687	EB Del Amo Blvd Off	9	0	4	0.000	0.56	1.26	0.006	0.33	0.90	Yes
10.745	EB Del Amo Blvd On	2	0	0	0.000	0.00	0.37	0.001	0.24	0.70	No
10.922	WB Del Amo Blvd Off	9	0	4	0.000	1.24	2.79	0.003	0.42	1.25	Yes
11.071	WB Del Amo Blvd On	4	0	1	0.000	0.25	0.99	0.003	0.22	0.60	Yes
11.819	Long Beach Blvd Off	3	0	1	0.000	0.19	0.58	0.005	0.61	1.50	No
12.135	Long Beach Blvd On	9	0	4	0.000	0.39	0.88	0.002	0.32	0.80	Yes
12.780	Artesia Blvd Off	13	0	4	0.000	0.72	2.33	0.005	0.61	1.50	Yes
13.112	Atlantic On	2	0	1	0.000	0.22	0.43	0.004	0.13	0.40	Yes
13.811	Alondra Blvd Off	18	0	9	0.000	1.07	2.14	0.005	0.61	1.50	Yes
14.096	Alondra Blvd On	8	0	1	0.000	0.08	0.65	0.002	0.32	0.80	No
14.761	Rosecrans Ave Off	12	0	1	0.000	0.09	1.06	0.005	0.61	1.50	No
15.329	EB Rosecrans On	9	0	5	0.000	1.05	1.89	0.001	0.24	0.70	Yes
15.330	WB Rosecrans On	3	0	1	0.000	0.26	0.79	0.003	0.22	0.60	Yes
15.597	Garfield Ave Off	2	0	1	0.000	0.23	0.46	0.001	0.06	0.20	Yes
15.941	Rosecrans Blvd On	1	0	0	0.000	0.00	0.12	0.002	0.08	0.25	No
16.744	Imperial Hwy Off	4	0	3	0.000	0.11	0.15	0.002	0.08	0.25	No
16.862	EB Imperial Hwy Off	14	2	4	0.315	0.94	2.20	0.006	0.33	0.90	Yes
16.863	WB Imperial Hwy Off	10	0	2	0.000	0.11	0.55	0.003	0.42	1.25	No
17.113	WB Imperial Hwy On	7	0	2	0.000	0.37	1.28	0.003	0.22	0.60	Yes
17.114	EB Imperial Hwy On	9	0	0	0.000	0.00	1.25	0.001	0.24	0.70	Yes
17.193	Imperial Hwy On	7	0	1	0.000	0.07	0.49	0.002	0.08	0.25	Yes
19.504	Florence Off	9	0	2	0.000	0.07	0.33	0.002	0.07	0.25	Yes
19.620	WB Florence Off	9	0	3	0.000	0.20	0.61	0.003	0.42	1.25	No
19.621	EB Florence Off	16	0	4	0.000	0.38	1.51	0.006	0.33	0.90	Yes
19.880	WB Florence On	12	0	3	0.000	0.28	1.13	0.003	0.22	0.60	Yes
19.881	EB Florence On	11	0	1	0.000	0.06	0.71	0.001	0.24	0.70	Yes
19.946	Florence On	3	0	0	0.000	0.00	0.15	0.002	0.08	0.25	No
21.808	EB Atlantic Blvd Off	35	0	5	0.000	0.58	4.05	0.006	0.33	0.90	Yes
21.886	WB Atlantic Blvd On	2	0	0	0.000	0.00	0.22	0.001	0.24	0.70	No
22.068	WB Atlantic Blvd Off	8	0	2	0.000	0.19	0.75	0.004	0.50	1.35	No
22.154	EB Atlantic Blvd On	32	0	5	0.000	0.21	1.36	0.002	0.32	0.80	Yes

Table 4-10
I-710 Northbound Accident Data

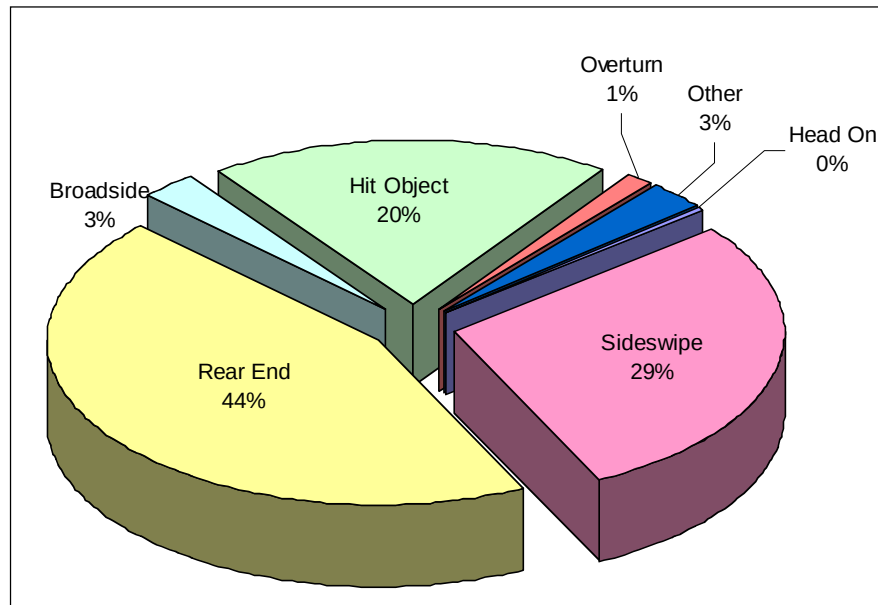
Post Mile	Location	Statistical Data			Actual Accident Rates ²			Average Accident Rates ³			Actual Rate > Average Rate?
		Total Accidents	Fatal	Injury	Fatal	Fatal + Injury	Total	Fatal	Fatal + Injury	Total	
22.488	Washington Blvd Off	7	0	2	0.000	0.22	0.78	0.004	0.50	1.35	No
22.567	Washington Blvd On	7	0	1	0.000	0.11	0.80	0.002	0.32	0.80	No
23.313	Olympic Blvd Off	5	0	2	0.000	0.21	0.54	0.005	0.61	1.50	No
23.574	Olympic Blvd On	15	0	3	0.000	0.39	1.93	0.002	0.32	0.80	Yes
24.316	Ford Blvd Off	2	0	0	0.000	0.00	0.59	0.005	0.39	1.15	No
24.441	Ford Blvd On	0	0	0	0.000	0.00	0.00	0.002	0.20	0.60	No
24.816	Cesar Chavez/New York Off	15	0	2	0.000	0.26	1.99	0.005	0.39	1.15	Yes
25.348	Floral Dr On	6	0	1	0.000	0.12	0.71	0.002	0.32	0.80	No
26.173	Ramona/Corporate Center Off	12	0	0	0.000	0.00	1.59	0.005	0.39	1.15	Yes

Table 4-11
I-710 Northbound Mainline: Truck Accident Rates

Location (Postmile)	Description	Total Truck Accident	Total Accident	% Truck Accident
4.96 - 9.411	Southern Terminus to I-405	101	353	29%
9.411 - 12.970	I-405 to SR-91	97	321	30%
12.970 - 15.672	SR-91 to I-105	81	253	32%
15.692 - 22.607	I-105 to Leonis St	314	993	32%
Entire Northbound Length (4.96 - 22.607)		593	1920	31%

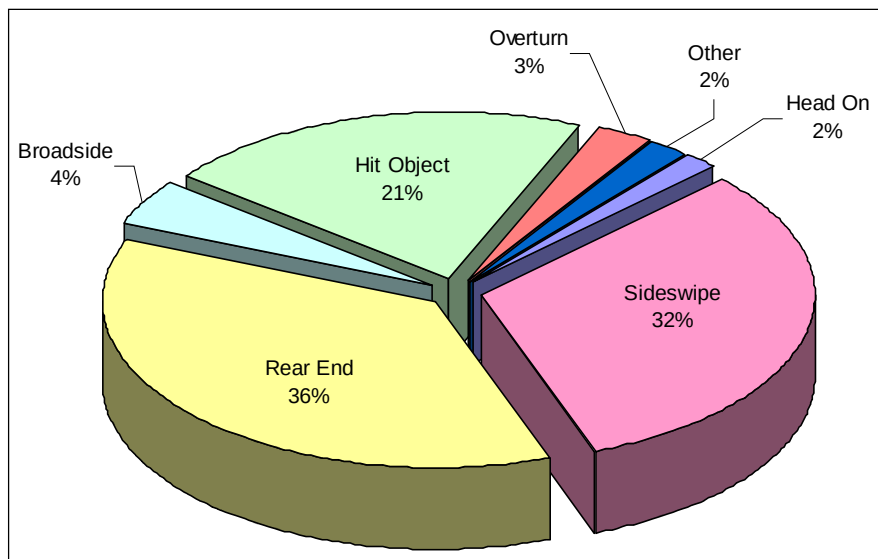
The following charts illustrated in **Figure 4-4** through **Figure 4-7**, summarize the accident data by type of collision within the project study segments. As seen on the charts, rear end collisions and sideswipes make-up approximately 60 to 70 percent of all collisions that occurred on northbound I-710.

Figure 4-4
I-710 Northbound Mainline Primary Collision Type (South Terminus to I-405)



As shown in **Figure 4-4**, rear end and sideswipe type collisions account for 73 percent of accidents occurring along the Northbound I-710 mainline segment between the Southern terminus and I-405.

Figure 4-5
I-710 Northbound Mainline Primary Collision Type (I-405 to SR-91)



The collision data shown in **Figure 4-5** indicates that on the Northbound I-710 mainline segment from I-405 to SR-91, rear end and sideswipe type collisions are still the predominant forms of accidents accounting for 68 percent of the recorded collision data. Although rear end type collisions decrease by 8 percent as compared to **Figure 4-4**, sideswipe type collisions increase by 3 percent.

Figure 4-6
I-710 Northbound Mainline Primary Collision Type (SR-91 Jct to I-105Jct)

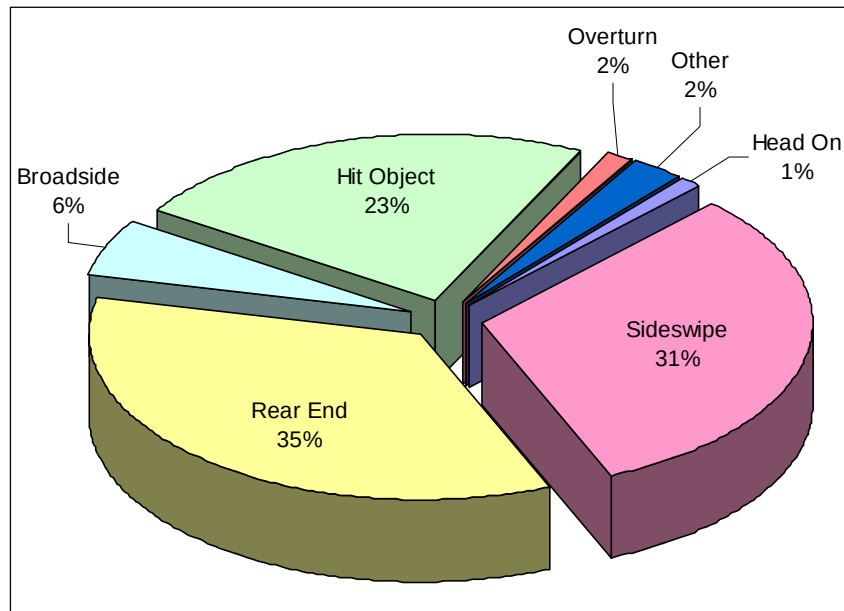
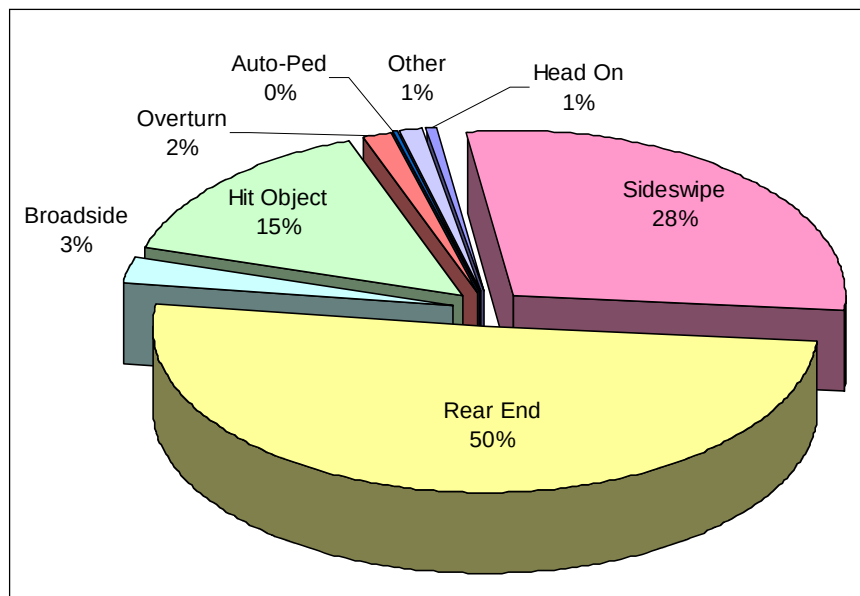


Figure 4-7
I-710 Northbound Mainline Primary Collision Type (I-105 to Leonis)



Based on the results in **Figure 4-6**, the combined total of rear end and sideswipe type collisions is still within the 60 to 70 percent range of the recorded collision data. The total of hit objects at 23 percent is slightly higher than the percentages reported on the two previous figures.

Compared to the collision data of the previous three figures, **Figure 4-7** shows a 7 to 12 percent increase in the combined total of rear end and sideswipe type collisions on the Northbound I-710 mainline segment between I-105 and Leonis Street. The total of hit objects, however, is the lowest among all four freeway sections at 15 percent.

4.4.2 I-710 Southbound Accident Data

Just as with the northbound direction, TASAS data from the study area was obtained for the I-710 southbound mainline lanes and ramps over a 36-month period from October 1, 2004 to September 30, 2007. **Table 4-12** presents the summary of the southbound mainline I-710 TASAS data. The table shows that of the four I-710 southbound freeway mainline study segments, one segment has a higher accident rate than the statewide average.

The TASAS ramp accident data also shows that 2 of the 54 I-710 southbound ramp locations within the project study area have higher accident rates when compared to the state average.

An analysis of the truck accident data summarized in **Table 4-13** reveals that for southbound I-710, truck-related accidents account for 31 percent of the TASAS reported southbound ramp accidents within the project study area. Additionally, **Table 4-13** shows that truck related accidents range from 29 to 36 percent with minimal variation throughout the I-710 mainline study segments.

Figure 4-8 through **Figure 4-11** summarize the accident data by type of collision within the project study segments. As indicated by the charts, rear end collisions and sideswipes make-up approximately 70 percent of all collisions that occurred on southbound I-710.

Table 4-12
I-710 Southbound Accident Data

PostMile	Location	Statistical Data			Actual Accident Rates ¹			Average Accident Rates ²			Actual > Average?
		Total Accidents	Fatal	Injury	Fatal	Fatal + Injury	Total	Fatal	Fatal + Injury	Total	
I-710 Southbound Links											
4.96 - 9.411	Southern Terminus to I-405	262	4	81	0.013	0.27	0.84	0.006	0.33	1.06	No
9.411 - 12.970	I-405 to SR-91	430	3	124	0.008	0.35	1.19	0.005	0.32	1.02	Yes
12.970 - 15.672	SR-91 to I-105	336	3	102	0.009	0.31	0.99	0.005	0.31	1.01	No
15.692 - 22.607	I-105 to Leonis St	879	8	230	0.010	0.29	1.06	0.006	0.35	1.12	No
I-710 Southbound Ramps											
5.111	Pico Ave On	1	0	0	0.000	0.00	0.28	0.002	0.32	0.80	No
5.199	WB Ocean Blvd On	3	0	0	0.000	0.00	0.26	0.003	0.17	0.45	No
5.544	WB Harbor Scenic Dr Off	3	0	1	0.000	0.09	0.27	0.006	0.21	0.60	No
6.000	Pico Ave Off	9	0	2	0.000	0.28	1.26	0.004	0.50	1.35	No
6.272	Shoreline Dr Off	2	0	1	0.000	0.03	0.06	0.006	0.21	0.60	No
6.273	EB Anaheim St On	2	0	0	0.000	0.00	0.49	0.003	0.22	0.60	No
6.331	EB Anaheim St Off	8	0	1	0.000	0.14	1.11	0.003	0.42	1.25	No
6.427	WB Anaheim St On	1	0	0	0.000	0.00	0.91	0.003	0.22	0.60	Yes
6.475	WB Anaheim St Off	5	0	2	0.000	0.25	0.63	0.003	0.42	1.25	No
6.783	SB Route 1 On	1	0	0	0.000	0.00	0.16	0.004	0.13	0.40	No
6.959	NB Route 1 Off	4	0	1	0.000	0.11	0.45	0.004	0.15	0.45	No
7.014	SB/NB Route 1 Off	2	0	2	0.000	0.12	0.12	0.002	0.08	0.25	No
7.728	EB Willow St On	3	0	1	0.000	0.36	1.07	0.003	0.22	0.60	Yes
7.825	EB Willow St Off	25	0	2	0.000	0.32	4.01	0.003	0.42	1.25	Yes
7.964	WB Willow St On	1	0	0	0.000	0.00	0.63	0.001	0.24	0.70	No
8.055	WB Willow St Off	22	0	3	0.000	0.64	4.67	0.006	0.33	0.90	Yes
9.048	Wardlow Rd Off	3	0	1	0.000	0.68	2.03	0.003	0.42	1.25	Yes
10.920	WB Del Amo Blvd On	11	0	4	0.000	0.43	1.20	0.003	0.32	0.85	Yes
11.001	Del Amo Blvd Off	6	0	4	0.000	0.38	0.58	0.005	0.39	1.15	No
11.861	Long Beach Blvd On	10	0	4	0.000	0.74	1.85	0.002	0.32	0.80	Yes
12.031	SB Long Beach Blvd Off	8	0	1	0.000	0.14	1.12	0.003	0.42	1.25	No
12.156	NB Long Beach Blvd Off	5	0	0	0.000	0.00	1.52	0.006	0.33	0.90	Yes
12.769	Artesia On	5	0	2	0.000	0.38	0.95	0.002	0.32	0.80	Yes

¹ Accident Rates expressed as: # of accidents/Million vehicle miles.

² Average accident rates for similar highway facilities throughout the State.

Table 4-12
I-710 Southbound Accident Data

PostMile	Location	Statistical Data			Actual Accident Rates ¹			Average Accident Rates ²			Actual > Average?
		Total Accidents	Fatal	Injury	Fatal	Fatal + Injury	Total	Fatal	Fatal + Injury	Total	
13.822	Alondra Blvd On	9	0	1	0.000	0.12	1.05	0.002	0.32	0.80	Yes
13.885	EB Alondra Blvd Off	1	0	0	0.000	0.00	0.17	0.003	0.42	1.25	No
14.027	WB Alondra Blvd Off	1	0	1	0.000	0.13	0.13	0.006	0.33	0.90	No
14.691	EB Rosecrans On	4	0	2	0.000	0.25	0.50	0.003	0.22	0.60	No
14.921	WB Rosecrans On	2	0	1	0.000	0.37	0.75	0.001	0.24	0.70	Yes
15.437	Rosecrans Blvd Off (CD road)	13	0	3	0.000	0.37	1.58	0.005	0.61	1.50	Yes
15.438	Martin Luther King Blvd On	2	0	1	0.000	0.08	0.16	0.002	0.10	0.35	No
15.907	Martin Luther King Blvd On	4	0	1	0.000	0.20	0.80	0.002	0.32	0.80	No
15.980	Rosecrans Blvd Off (mainline)	5	0	1	0.000	0.13	0.67	0.001	0.06	0.20	Yes
16.428	Martin Luther King Blvd Off	4	0	0	0.000	0.00	0.70	0.005	0.61	1.50	No
16.797	Imperial Hwy On	1	0	0	0.000	0.00	0.04	0.002	0.08	0.25	No
16.879	WB Imperial Hwy On	4	0	1	0.000	0.15	0.61	0.001	0.24	0.70	No
16.880	EB Imperial Hwy On	12	0	2	0.000	0.13	0.75	0.003	0.22	0.60	Yes
17.054	EB Imperial Hwy Off	5	0	2	0.000	0.47	1.19	0.003	0.42	1.25	No
17.248	Wright/Imperial Off	7	0	2	0.000	0.33	1.16	0.005	0.61	1.50	No
18.196	Firestone Blvd On	8	0	3	0.000	0.15	0.40	0.002	0.08	0.25	Yes
18.313	EB Firestone Blvd On	10	0	2	0.000	0.20	1.02	0.004	0.13	0.40	Yes
18.314	WB Firestone Blvd On	17	0	2	0.000	0.20	1.71	0.003	0.22	0.75	Yes
18.663	Firestone Blvd Off	27	0	1	0.000	0.05	1.41	0.005	0.61	1.50	No
19.501	Florence On	6	0	2	0.000	0.08	0.24	0.002	0.08	0.25	No
19.567	EB Florence On	11	0	2	0.000	0.15	0.80	0.003	0.22	0.60	Yes
19.568	WB Florence On	6	0	1	0.000	0.09	0.55	0.001	0.24	0.70	No
19.892	WB Florence Ave Off	22	0	4	0.000	0.55	3.04	0.006	0.33	0.90	Yes
19.893	EB Florence Ave Off	9	0	3	0.000	0.18	0.55	0.003	0.42	1.25	No
20.023	Florence Ave Off	4	0	1	0.000	0.06	0.22	0.002	0.08	0.25	No
21.689	EB Atlantic Blvd On	2	0	1	0.000	0.14	0.28	0.003	0.22	0.60	No
21.931	Bandini Blvd Off	11	0	1	0.000	0.10	1.10	0.005	0.39	1.15	No
21.932	Atlantic Blvd Off	5	0	0	0.000	0.00	0.28	0.006	0.33	0.90	No
22.063	Bandini Blvd/Atlantic Blvd Off	29	0	3	0.000	0.10	0.98	0.002	0.08	0.25	Yes
22.498	Washington Blvd On	7	0	0	0.000	0.00	0.72	0.003	0.32	0.85	No
22.583	Washington Blvd Off	7	0	2	0.000	0.24	0.85	0.005	0.61	1.50	No

Table 4-13
I-710 Southbound Mainline: Truck Accident Rates

Location (Postmile)	Description	Total Truck Accident	Total Accident	% Truck Accident
4.96 – 9.411	Southern Terminus to I-405	78	262	30%
9.411 – 12.970	I-405 to SR-91	156	430	36%
12.970 – 15.672	SR-91 to I-105	114	336	34%
15.692 – 22.607	I-105 to Leonis St	251	879	29%
Entire Southbound Length (4.96 – 22.607)		599	1907	31%

Figure 4-8
I-710 Southbound Mainline Primary Collision Type (Southern Terminus to I-405)

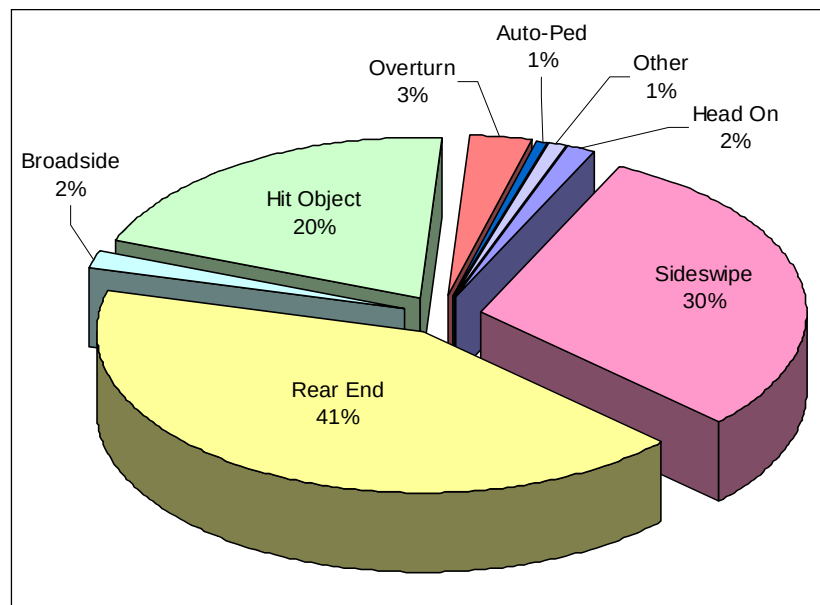


Figure 4-9
I-710 Southbound Mainline Primary Collision Type (I-405 to SR-91)

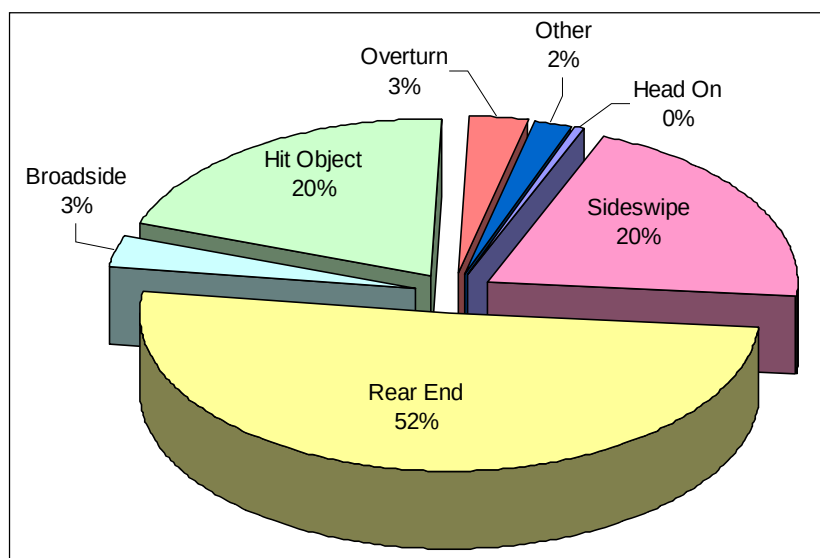


Figure 4-8 shows that rear end and sideswipe collisions account for 71 percent of the recorded collision data on Southbound I-710 between the southern terminus and I-405.

Based on the collision data shown in **Figure 4-9**, rear end collisions and sideswipes are the predominant types of accidents, accounting for 72 percent of the recorded collisions on Southbound I-710 between I-405 and SR-91. Although sideswipe type collisions went down 10 percent as compared to **Figure 4-8**, rear end type collisions increased by 11 percent.

Figure 4-10
I-710 Southbound Mainline Primary Collision Type (SR-91 to I-105)

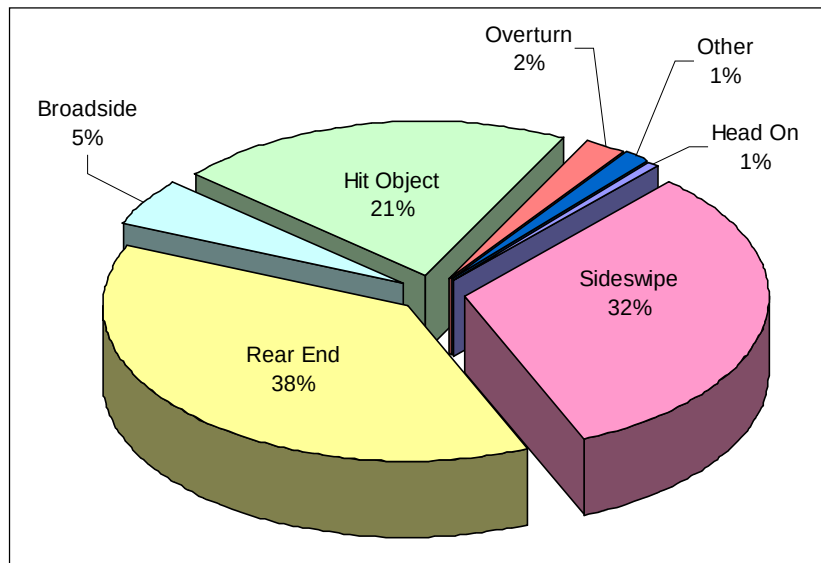
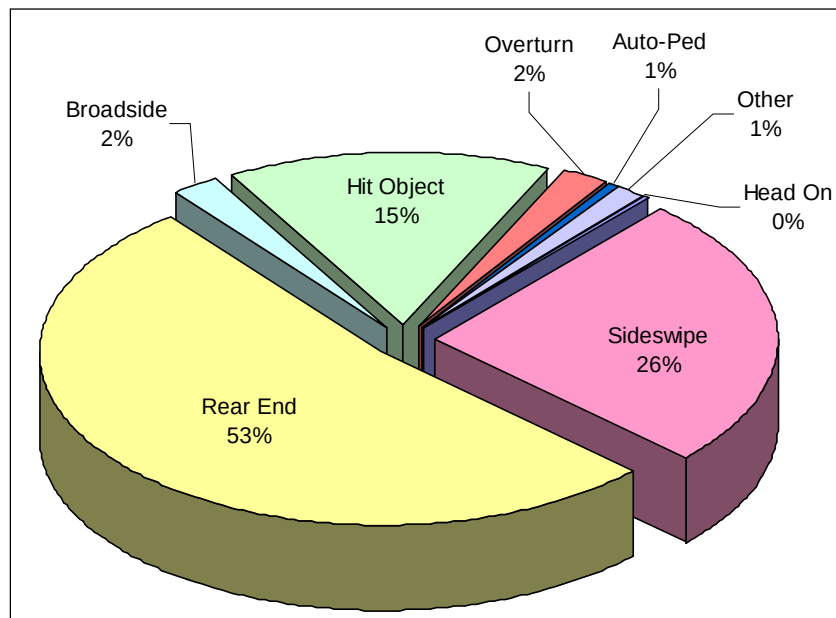


Figure 4-11
I-710 Southbound Mainline Primary Collision Type (I-105 to Leonis St)



Based on the results illustrated in **Figure 4-10** the combined total of rear end and sideswipe type collisions totals is still approximately 70 percent of the recorded collision data. The total of hit objects at 21 percent is slightly higher than the 20 percent reported on the two previous figures. Compared to the collision data of the previous three figures, **Figure 4-11** shows a 5 to 6 percent increase in the combined total of rear end and sideswipe type collisions on Southbound I-710 between I-105 and Leonis St. The total of hit objects, however, is the lowest among all four freeway sections at 15 percent.

4.4.3 Freeway-to-Freeway Connectors and Adjacent Freeway Accident Data

Available traffic accident data was collected at the freeway-to-freeway connectors serving I-710 as well as adjacent freeway segments at I-405, SR-91 and I-105.

Table 4-14 shows the accident rate comparison for the freeway-to-freeway connector ramps, many of which have rates higher than the statewide average. It should be noted that only three of the ten I-105 ramp connectors have accident rates below the statewide average.

Traffic accident data was also obtained for adjacent freeways segments with interchanges at I-710 as mentioned above. Based on the information in **Table 4-15**, only the adjacent segments at SR-91 have accidents rates higher than the statewide average.

Table 4-14
Accident Rates for I-710 Freeway Connectors

PostMile	Location	Statistical Data			Actual Accident Rates			Average Accident Rates			Actual > Average?
		Total Accidents	Fatal	Injury	Fatal	Fatal + Injury	Total	Fatal	Fatal + Injury	Total	
I-710 Connectors to I-405											
9.143	NB Off to I-405	3	0	0	0.000	0.00	0.09	0.002	0.10	0.35	No
9.305	NB Off to I-405 SB	19	0	8	0.000	0.49	1.17	0.004	0.15	0.45	Yes
9.306	NB Off to I-405 NB	19	0	8	0.000	0.41	0.98	0.004	0.26	0.90	Yes
9.408	NB/SB Off to I-405 SB	2	0	0	0.000	0.00	0.05	0.002	0.10	0.35	No
9.624	SB Off to I-405 SB	34	0	6	0.000	0.26	1.49	0.004	0.26	0.90	Yes
9.625	SB Off to I-405 NB	9	0	2	0.000	0.10	0.45	0.004	0.15	0.45	No
9.723	NB On from I-405 NB/Wardlow	10	0	1	0.000	0.04	0.35	0.002	0.08	0.25	Yes
9.741	SB Off to I-405/Wardlow	7	0	0	0.000	0.00	0.15	0.002	0.08	0.25	No
9.840	NB On from I-405 SB/Wardlow	7	0	1	0.000	0.06	0.40	0.006	0.19	0.55	No
I-710 Connectors to SR-91											
12.638	NB Off to SR-91 EB/Artesia	16	0	8	0.000	0.24	0.49	0.002	0.08	0.25	Yes
12.681	SB On from SR-91 EB/Artesia	6	0	3	0.000	0.20	0.40	0.002	0.08	0.25	Yes
12.871	SB On from SR-91 WB	32	1	15	0.034	0.55	1.10	0.006	0.19	0.55	Yes
13.082	NB Off to SR-91 WB	11	0	3	0.000	0.31	1.14	0.004	0.26	0.90	Yes
13.115	SB Off to SR-91 WB	7	0	4	0.000	0.16	0.28	0.004	0.15	0.45	No
13.185	NB On from SR-91 EB	8	0	1	0.000	0.04	0.28	0.006	0.19	0.55	No
13.264	NB On from SR-91 WB/Atlantic	5	0	3	0.000	0.11	0.19	0.002	0.08	0.25	No
13.339	SB Off to SR-91 EB/Atlantic	27	0	11	0.000	0.33	0.81	0.006	0.21	0.60	Yes
I-710 Connectors to I-105											
15.187	NB Off to I-105	7	0	5	0.000	0.12	0.16	0.002	0.08	0.25	No
15.199	SB On from I-105	12	0	6	0.000	0.15	0.30	0.002	0.08	0.25	Yes
15.441	NB Off to I-105 EB/Garfield	2	0	1	0.000	0.08	0.16	0.002	0.10	0.35	No
15.489	SB On from I-105 EB	23	1	9	0.049	0.49	1.14	0.004	0.13	0.40	Yes
15.490	SB On from I-105 WB	5	0	1	0.000	0.05	0.25	0.006	0.19	0.55	No
15.899	NB On from I-105 EB	37	0	3	0.000	0.14	1.75	0.006	0.19	0.55	Yes
15.900	NB On from I-105 WB	10	0	5	0.000	0.21	0.42	0.004	0.13	0.40	Yes
16.004	SB Off to I-105 EB/Garfield	10	0	3	0.000	0.13	0.45	0.002	0.08	0.25	Yes
16.166	NB On from I-105	14	0	4	0.000	0.09	0.30	0.002	0.08	0.25	Yes
16.210	SB Off to I-105	20	0	7	0.000	0.15	0.42	0.002	0.08	0.25	Yes

Table 4-15
Accidents on Adjacent Freeways

PostMile	Location	Statistical Data			Actual Accident Rates			Average Accident Rates			Actual > Average?
		Total Accidents	Fatal	Injury	Fatal	Fatal + Injury	Total	Fatal	Fatal + Injury	Total	
12.058 - 14.650	I-105 EB	273	2	87	0.006	0.28	0.87	0.005	0.32	1.03	No
12.058 - 14.650	I-105 WB	292	0	81	0.000	0.26	0.94	0.005	0.32	1.03	No
10.812 - 13.857	SR-91 EB	537	0	131	0.000	0.33	1.34	0.004	0.30	0.97	Yes
10.812 - 13.857	SR-91 WB	459	4	135	0.010	0.35	1.15	0.004	0.30	0.97	Yes
6.340 - 8.759	I-405 NB	413	2	117	0.005	0.31	1.06	0.005	0.35	1.15	No
6.340 - 8.759	I-405 SB	256	2	71	0.005	0.19	0.66	0.005	0.35	1.15	No

4.5 METHODOLOGY FOR EVALUATING TRAFFIC OPERATING CONDITIONS

This section describes the methodology used to evaluate the existing and future traffic operating conditions of I-710 from its southern termini in the City of Long Beach to the northern study limits near Washington Boulevard. As part of the I-5 EIR/EIS coordination effort, freeway segment and interchange analysis of I-710 from north of Washington Boulevard to the SR-60 are also included. Both freeway and intersection operations are analyzed.

4.5.1 Freeways

As described in Chapter 13 (“Freeway Concepts”) of the *Highway Capacity Manual (HCM) 2000*, I-710 was divided into segments for analysis. Explanations of the various freeway segments and the methodologies used to analyze them are described below.

4.5.1.1 Basic Freeway Segments

A basic freeway segment is a section of the freeway mainline which is not within a ramp influence area (i.e., within 1,500 feet of a ramp) or weaving segment. Adding or dropping a lane results in the termination of a basic freeway segment. Peak hour volumes on basic freeway segments are analyzed using the methodology described in the *HCM* Chapter 23 (“Basic Freeway Segments”) and Highway Capacity Software (HCS+, Release 5.2) calculations. **Table 4-16** provides LOS criteria for basic freeway segments at free-flow speeds of 55 mph, 60 mph, 65 mph, 70 mph, and 75 mph or greater. To be within a given LOS, the density (pc/mi/ln) criterion must be met.

Where an on- or off-ramp results in a lane addition or lane drop, the upstream and downstream freeway segments are analyzed as basic freeway segments with the appropriate number of lanes. Analysis is limited to checking the upstream and downstream capacity and no separate merge and diverge analysis is required. This is consistent with the *HCM* Chapter 25 (“Ramps and Ramp Junctions”).

Due to HCS+ and *HCM* methodology limitations on the input for truck percentage (P_T) at 25%, the passenger-car equivalents for trucks/buses (E_T) factor was adjusted to calculate the heavy-vehicle adjustment factor (f_{HV}) for level terrain conditions. Where freeway segment truck percentages exceed the threshold of 25%, the following calculations were conducted:

In order to calculate the correct f_{HV} value, the P_T is set at 25% and a required calculated value is entered for E_T . The adjustment factor, f_{HV} , is determined by the following equation:

$$f_{HV} = 1 / (1 + P_T (E_T - 1) + P_R (E_R - 1))$$

E_R and P_R are passenger-car equivalents and percentage of recreational vehicles, respectively. P_R values are assumed to be zero since they are negligible compared to the high percentage of trucks in the study corridor and E_R is 1.2 and E_T is 2.

An example of this scenario in the study corridor is along the I-710 northbound freeway segment between the Alondra On-ramp and Rosecrans Off-ramp for the midday peak hour. The

projected truck percentage is 30%, which exceeds the threshold of 25%. If HCS+ does not have the truck percentage limitation, the 30% can be entered and the calculated f_{HV} value would equal:

$$f_{HV} = 1 / (1 + 0.3 (2 - 1) + 0(1.2-1)) = 0.769$$

However, due to the 25% threshold, the E_T value is set to 2.2 and the P_T value is set at 25%. These values are then entered into the HCS+ and the calculated f_{HV} value would be equal to the same calculated value as mentioned above. The following equation shows the calculated f_{HV} value as follows: $f_{HV} = 1 / (1 + 0.25 (2.2 - 1) + 0(1.2-1)) = 0.769$

The above mentioned calculation approach is also applied to analysis for ramp merge/diverge areas and freeway mainline and on- and off-ramps that are included as part of a weave segment.

Table 4-16
LOS Criteria for Basic Freeway Segments

Criteria	LOS				
	A	B	C	D	E
FFS = 75 mph					
Maximum density (pc/mi/ln)	11	18	26	35	45
Minimum speed (mph)	75.0	74.8	70.6	62.2	53.3
Maximum v/c	0.34	0.56	0.76	0.90	1.00
Maximum service flow rate (pc/h/ln)	820	1350	1830	2170	2400
FFS = 70 mph					
Maximum density (pc/mi/ln)	11	18	26	35	45
Minimum speed (mph)	70.0	70.0	68.2	61.5	53.3
Maximum v/c	0.32	0.53	0.74	0.90	1.00
Maximum service flow rate (pc/h/ln)	770	1260	1770	2150	2400
FFS = 65 mph					
Maximum density (pc/mi/ln)	11	18	26	35	45
Minimum speed (mph)	65.0	65.0	64.6	59.7	52.2
Maximum v/c	0.30	0.50	0.71	0.89	1.00
Maximum service flow rate (pc/h/ln)	710	1170	1680	2090	2350
FFS = 60 mph					
Maximum density (pc/mi/ln)	11	18	26	35	45
Minimum speed (mph)	60.0	60.0	60.0	57.6	51.1
Maximum v/c	0.29	0.47	0.68	0.88	1.00
Maximum service flow rate (pc/h/ln)	660	1080	1560	2020	2300
FFS = 55 mph					
Maximum density (pc/mi/ln)	11	18	26	35	45
Minimum speed (mph)	55.0	55.0	55.0	54.7	50.0
Maximum v/c	0.27	0.44	0.64	0.85	1.00
Maximum service flow rate (pc/h/ln)	600	990	1430	1910	2250

Source: Exhibit 23-2 from Highway Capacity Manual 2000.
FFS = Free- Flow Speed

Determining free-flow speed

Two methods can be used to determine the free-flow speed (FFS) of a basic freeway segment: field measurement and estimation with guidelines provided in *HCM*.

Field measurement was used to determine the FFS of a basic freeway segment for existing traffic conditions. As discussed previously, the PeMS data collected and compiled from Caltrans includes Roadway ADT, hourly traffic data and truck percentages among other information. The collected and compiled hourly traffic data include observed hourly traffic speeds for each designated freeway segment. Since the dates of the traffic data fall between September 2007 and April 2008, the average hourly speeds were used. Traffic hourly speeds from healthy detectors were selected from typical weekdays (i.e. Tuesday, Wednesday, or Thursday) that do not coincide with national or school holidays.

Because *HCM* Basic Freeway methodologies are limited to facilities with free-flow speeds between 55 mph and 75 mph, where the collected average traffic hourly speed collected from PeMS at these facilities during the corresponding peak hour is lower than 55 mph; the junction is assumed to be oversaturated and were not analyzed. Where traffic hourly speed is not available, 55 mph free-flow speed was assumed.

Under Future Year 2035 No Build conditions, the overall future demand will exceed existing capacity; therefore, on a more conservative approach, the lowest FFS of 55 mph is used for No Build condition analysis. However, under Future Year 2035 Build conditions, based on freeway design speed, a FFS of 65 mph is used for the Build condition analyses. This assumption is based upon improved future traffic operations as a result of geometric enhancements along the I-710 freeway.

4.5.1.2 Ramp Merge/Diverge Areas

The methodology used to analyze ramp merge and diverge areas consists of three primary steps based on the *HCM* defined procedures. The first step calculates the traffic flow entering the outer two lanes of the freeway immediately upstream of the merge influence area or at the beginning of the deceleration lane within the diverge influence area. The influence area for ramps and ramp junctions is 1,500 feet, including the acceleration and deceleration lane along with the outer two lanes of the freeway. Chapter 25 ("Ramps and Ramp Junctions") of the *HCM* indicates that other freeway lanes may be affected by merging or diverging maneuvers, but the defined area within the 1,500 feet generally experiences the greatest impacts across all Level of Service. Based on Figures 504.2A and 504.2B in the *Highway Design Manual (HDM)*, as per California design standards, the default acceleration and deceleration lengths employed in the evaluation of ramp merge and diverge areas are 600 feet and 141 feet, respectively.

The second step compares capacity values with the demand flows in order to determine potential for congestion. There are several capacity values evaluated which include: maximum total flow approaching a diverge area on the freeway, maximum total flow departing from a merge or diverge area on the freeway, maximum total flow entering the ramp influence area, and maximum flow on a ramp. The capacity of a merge or diverge area is controlled by the

capacity of the freeway segments upstream and downstream of the ramps or by the capacity of the ramp itself.

The third step calculates the traffic flow density within the ramp influence area and uses it to determine the LOS. These density values are represented by LOS A through E, which assume stable operation and no breakdown within the merge influence area. A LOS F can occur when the total demand flow exceeds any of the capacity checks and no density is predicted for such case. LOS criteria for merge and diverge areas are listed in **Table 4-17**.

Table 4-17
LOS Criteria for Ramp Junctions

LOS	Density (pc/mi/ln)
A	≤ 10
B	$> 10-20$
C	$> 20-28$
D	$> 28-35$
E	> 35
F	Demand exceeds capacity

Source: Exhibit 25-4 from Highway Capacity Manual 2000.

The *HCM* has special cases for merge areas that include a section for major merges. A major merge is one in which two primary roadways or freeways, each having multiple lanes, merge to form a single freeway segment as shown on page 25-9 in the *HCM*. There are no effective models of performance for a major merge area; therefore, the analysis is limited to checking capacities on approaching legs and departing freeway. The capacity of each entering leg and the departing freeway is computed based on values provided in Exhibit 25-7 of the *HCM*. For this study, LOS F is assigned if demand exceeds capacity for any entering/departing legs.

The *HCM* also has special cases for diverge areas that include a section for major diverge. A major diverge is where a single freeway segment splits into two different roadways or freeways. The principal analysis of a major diverge area is based on density calculation and LOS criteria as provided in Equation 25-12 of and Exhibit 25-4 of the *HCM*.

For single-lane additions and single-lane drops, the upstream and downstream freeway segments are analyzed as basic freeway segments and no separate merge or diverge analysis is performed.

The *HCM* merge or diverge analysis methodology provides capacities for various merge or diverge areas for freeway segments up to four-lanes. There are several merge or diverge areas within the I-710 study corridor where five or more lanes of traffic exist. In the case where the number of lanes within the merge or diverge areas exceeds the *HCM* limitation, a procedure is utilized to estimate and deduct the flow rate in Lane 5 of the freeway from the total approaching freeway flow. Once the total approaching flow rate is adjusted to comparable four-lane flow, the standard merge or diverge procedures for analysis are used.

The *HCM* flow estimate in Lane 4 of the freeway for on-ramps is used for flow estimates in Lane 5 of the freeway; flow values are shown in **Table 4-18**.

Table 4-18
Flow in Lane 5 of Freeway Approaching On-Ramp

Total Approaching Freeway Flow, v_F (pc/hr)	Approaching Freeway Flow in Lane 5, v_5 (pc/hr)
$\geq 8,500$	2500
7,500 – 8,499	$0.285 v_F$
6,500 – 7,499	$0.270 v_F$
5,500 – 6,499	$0.240 v_F$
$< 5,500$	$0.220 v_F$

Source: Exhibit 25-11 from Highway Capacity Manual 2000.

The *HCM* flow estimate in Lane 4 of the freeway for off-ramps is used for flow estimates in lane 5 of the freeway; flow values are shown in **Table 4-19**.

Table 4-19
Flow in Lane 5 of Freeway Approaching Off-Ramp

Total Approaching Freeway Flow, v_F (pc/hr)	Approaching Freeway Flow in Lane 5, v_5 (pc/hr)
$\geq 7,000$	$0.200 v_F$
5,500 – 6,999	$0.150 v_F$
4,000 – 5,499	$0.100 v_F$
$< 4,000$	0

Source: Exhibit 25-18 from Highway Capacity Manual 2000.

For freeway segments where six or more lanes of traffic exist in each direction, a similar procedure was applied: the estimated flow rate in lane 6 is deducted from the total approach freeway flow and procedures for the five-lane freeway as described above are utilized. The *HCM* provides flow estimates for lane 5 only, flow estimates for lane 6 and above are limited to even flow distribution assumptions (i.e. lane 6 consist of one-sixth of the total approach freeway flow).

Determining free-flow speed

The method used to determine the FFS of an on- or off-ramp was estimated based on guidelines provided in *HCM*. Based on *HDM*, the recommended ramp design speed ranges from 25 mph to 50 mph and are adjusted based on geometric constraints and other factors.

Under existing and Future Year 2035 No Build condition, the overall future demand will exceed existing capacity at ramp junctions. Using a conservative approach, a FFS of 35 mph for an on- or off-ramp was used for existing and Future Year 2035 No Build analysis. Under Future Year 2035 Build conditions, a FFS of 45 mph is assumed based on higher freeway ramp design speeds. This assumption is based upon improved future traffic operations as a result of geometric enhancements along the I-710 freeway.

4.5.1.3 Weave Segments

A weaving segment is a freeway mainline segment in which two streams of traffic must cross within less than 2,500 feet, such as in an auxiliary lane connecting an upstream on-ramp to a downstream off-ramp. Peak hour volumes in freeway weaving sections are analyzed using the methodology contained in *HCM* Chapter 24 (“Freeway Weaving”). A weaving segment, in which both weaving movements require a single lane change, such as in an auxiliary lane between a single-lane on-ramp and single-lane off-ramp, is a “Type A” weaving segment. A weaving segment in which one weaving movement requires a single lane change and the other weaving movement can be made without any lane change, such as in an auxiliary lane between a single-lane on-ramp and a two-lane off-ramp, is a “Type B” weaving segment. A weaving segment in which one weaving movement requires two or more lane changes while the other weaving movement can be made without any lane change, such as a segment between a single-lane on-ramp and a two-lane off-ramp and two mainline lane drops occur at the off-ramp, is a “Type C” weaving segment. Consistent with *HCM* procedures, a segment consisting of a one-lane on-ramp closely followed by a one-lane off-ramp without connecting auxiliary lane is not analyzed as a weaving segment, but as separate merge and diverge areas. LOS criteria for weaving segments are listed in **Table 4-20**.

Table 4-20
LOS Criteria for Weaving Segments

LOS	Density (pc/mi/ln)	
	Freeway Weaving Segment	Multilane and Collector-Distributor Weaving Segments
A	≤ 10.0	≤ 12.0
B	> 10.0-20.0	> 12.0-24.0
C	> 20.0-28.0	> 24.0-32.0
D	> 28.0-35.0	> 32.0-36.0
E	> 35.0-43.0	> 36.0-40.0
F	> 43.0	> 40.0

Source: Exhibit 24-2 from Highway Capacity Manual 2000.

The *HCM* weaving analysis methodology provides capacities for various weaving segments up to five-lane segments. There are several weaving segments within the I-710 study corridor where six lanes of traffic exist. In the case where the number of lanes within the weaving segment exceeds the *HCM* limitation, a procedure is utilized to estimate and deduct the flow rate in lane 6 of the freeway from the total approaching freeway flow. Once the total approaching flow rate is adjusted to comparable five-lane flow, the standard weaving procedures for analysis are used. Similar to the merge/diverge methodology, the *HCM* provides flow estimates for lane 5 only. Flow estimates for lane 6 and above are limited to even flow distribution assumptions (i.e. lane 6 consist of one-sixth of the total approach freeway flow).

Where an on- or off-ramp results in a weave, the analysis is limited to checking the weaving segment capacity and no separate merge and diverge analysis is required. This is consistent with the *HCM* Chapter 24 (“Freeway Weaving”).

Determining free-flow speed

The method used to determine the FFS for weave segment analysis are as described in **Section 4.6.1** for basic freeways and in **Section 4.6.2** for on- or off-ramps. These estimates are based on guidelines provided in *HCM* and *HDM*.

4.5.2 Intersections

This section presents methodology used to analyze signalized and unsignalized (all-way and two-way stop control) intersections.

Signalized Intersections

Intersection Levels of Service (LOS) were calculated according to the analysis methodologies described in the *HCM*. *Synchro 6* software (*HCM* methodology), which accounts for the effects of signal coordination and platoon formation on intersection operations, was used to optimize traffic signal timing. To determine LOS, network cycle lengths of 100 seconds for arterial intersections and 60 seconds for freeway ramp intersections were evaluated using a saturation flow rate of 1600 vehicles per hour and the peak hour factor from the existing traffic counts. Truck percentages from the freeway counts were used for intersections near the freeway.

The average control delay per vehicle is estimated for all lane groups and aggregated for each approach and the intersection as a whole. The control delay value is directly related to LOS based on a set of criteria listed in **Table 4-21**.

Table 4-21
LOS Criteria for Signalized Intersections

LOS	Control Delay per Vehicle (s/veh)
A	≤ 10
B	> 10-20
C	> 20-35
D	> 35-55
E	> 55-80
F	> 80

Source: Exhibit 16-2 from Highway Capacity Manual 2000.
s/veh = delay per vehicle in seconds

Figure 4-12 presents a more detailed explanation of each letter (A to F) representing an LOS. This figure also shows visual representation of cars on roadways associated with each LOS.

All Way Stop Controlled Intersections

The HCM analysis method for evaluating All Way Stop Controlled (AWSC) intersections is based on the degree of conflict for each independent approach created by the opposing approach and each conflicting approach. The LOS for AWSC intersections is also based on the average control delay. However, AWSC intersections have different threshold values than those applied to signalized intersections. This is based on the rationale that drivers expect AWSC intersections to carry lower traffic volumes than at signalized intersections. Therefore, a longer delay is acceptable at a signalized intersection for the same LOS.

Figure 4-12
Level of Service Concept

LEVEL OF SERVICE	INTERSECTION CONDITIONS	AVERAGE STOPPED DELAY PER VEHICLE (SECONDS)
A 	LOS A describes primarily free-flow operations at average travel speeds, usually about 90 percent of the free-flow speed for the arterial classification. Vehicles are completely unimpeded in their ability to maneuver within the traffic stream.	< 10
B 	LOS B represents reasonably unimpeded operations at average travel speeds, usually about 70 percent of the free-flow speed for the arterial classification. The ability to maneuver within the traffic stream is only slightly restricted and stopped delays are not bothersome. Drivers are not generally subjected to appreciable tension.	10.1 - 20.0
C 	LOS C represents stable operations; however, ability to maneuver and change lanes in midblock locations may be more restricted than at LOS B, and longer queues, may contribute to lower average travel speeds of about 50 percent of the average free-flow speed for the arterial classification. Motorists will experience appreciable tension while driving.	20.1 - 35.0
D 	LOS D borders on a range in which small increases in flow may cause substantial increase in delay and hence decreases in arterial speed. Average travel speeds are about 40 percent of free-flow speed.	35.1 - 55.0
E 	LOS E is characterized by significant delays and average travel speeds of one-third the free-flow speed or less. Such operations are caused by some combination of adverse progression, high density and high volumes.	55.1 - 80.0
F 	LOS F characterizes arterial flow at extremely low speeds below one-third to one-fourth of the free-flow speed. Intersection congestion is likely at critical signalized locations, with high delays and extensive queuing. Adverse progression is frequently a contributor to this condition.	> 80.0
Level of Service Interpretation		

Two Way Stop Controlled Intersections

The HCM analysis method for evaluating Two Way Stop Controlled (TWSC) intersections is based on gap acceptance and conflicting traffic for vehicles stopped on the minor-street approaches. The critical gap (or minimum gap that would be acceptable) is defined as the minimum time interval in the major-street traffic stream that allows intersection entry for one minor-street vehicle. Average control delay and LOS for the “worst approach” are reported. LOS is not defined for the intersection as a whole.

The HCM analysis method for evaluating minor-street stop intersections is based on the average total delay for each impeded movement. For AWSC intersections, it is based on the average total delay for the entire intersection. As used here, total delay is defined as the total elapsed time from when a vehicle stops at the end of a queue until the vehicle departs from the stop line; this time includes the time required for the vehicle to travel from the last-in-queue to the first-in-queue position. The average total delay for any particular minor movement is a function of the service rate or capacity of the approach and the degree of saturation. The resulting delay is used to determine the LOS as shown in **Table 4-22**.

Table 4-22
LOS Criteria for All-Way Stop and Two Way Stop Controlled Intersections

LOS	Average Total Delay (seconds/vehicle)
A	0 – 10
B	> 10 – 15
C	> 15 – 25
D	> 25 – 35
E	> 35 – 50
F	> 50

Source: Exhibit 17-22 from Highway Capacity Manual 2000.

4.5.3 Interchange Analysis

SimTraffic 6 software was previously used to calculate the interchange measures of effectiveness (MOEs) for a group of intersections within each interchange. During the initial stages of the project, various interchange configurations were identified to be analyzed. The MOE analysis was conducted for the entire interchange (combined results of each individual intersection within that interchange) to assist in selecting the proposed interchange configuration that is presented in the geometric layout plans. The analysis, using both *Synchro* (to evaluate HCM delay) and *SimTraffic* (to evaluate delay and other measures of effectiveness) software packages, for this process was presented in the Final TOAR dated April 2010. This updated TOAR presents the analysis results for the proposed interchange configuration using the following MOEs:

- Total Delay – time vehicles are delayed by traffic control and other vehicles.
- Delay/Veh – amount of vehicles that are delayed by traffic control and other vehicles.

The following paragraphs describe the reasons for using initially using both *Synchro* and *SimTraffic* in selecting preferred configurations for each interchange.

Analysis of closely spaced signalized intersections (such as freeway ramp intersections in this situation) using *HCM 2000* methodology has some limitations. *HCM 2000* methodology does not completely account for the interactions between closely spaced intersections. The following statement from the *HCM 2000*, page 16-1 of Chapter 16, Signalized intersections, documented these limitations:

"LIMITATIONS TO THE METHODOLOGY: The methodology does not take into account the potential impact of downstream congestion on intersection operation. Nor does the methodology detect and adjust for the impacts of turn-pocket overflows on through traffic and intersection operation."

Since, most of the interchanges presented in **Section 9.0** are comprised of two or more closely spaced ramp intersections, *SimTraffic* simulation was also used to overcome the above mentioned limitations of the *HCM 2000* methodology. Differences between *Synchro* (*HCM 2000* methodology) and *SimTraffic* models are documented in the following description obtained from the TrafficWare (developer of *SimTraffic*) training manual:

"Synchro is a macroscopic traffic software program that replicates the signalized intersection capacity analysis as specified in the 2000 Highway Capacity Manual (HCM). Macroscopic level models represent traffic in terms of aggregate measures for each movement at the intersections. Equations are used to determine measures of effectiveness such as delay and queue length. These models do not account for "bottleneck" situations where upstream traffic deficiencies reduce the amount of traffic reaching downstream intersections....."

"When it comes to SimTraffic, this is a microscopic simulation model. Each vehicle in the traffic system is individually tracked through the model and comprehensive operational measures of effectiveness are collected on every vehicle during each 0.1-second of the simulation. Driver behavior characteristics (ranging from passive to aggressive) are assigned to each vehicle by the model, affecting the vehicle's free-flow speed, queue discharge headways, and other behavioral attributes. The variation of each vehicle's behavior is simulated in a manner reflecting real- world operations. Since SimTraffic is a microscopic model, the full impact of queuing and blocking would be measured by the model....."

4.5.4 Ramp Metering Analysis

Ramp metering analyses were conducted for ramp metering conditions for Alternatives 5A, 6A, 6B and 6C, respectively. The ramp metering analysis spreadsheets are set up to consider all three (morning, evening, and midday) peak hour conditions. However, the highest volume for each ramp from these three peak hours was used in the analysis, which was equally distributed across the one hour time period. Additionally, the ramp lanes, an average vehicle length, and the ramp storage length are input for each ramp. The proposed ramp lanes do not include the HOV preferential lane in the calculations nor are the projected peak hour volumes decreased for the HOV preferential lane, thereby analyzing the worst case scenario.

A ramp metering discharge rate (vehicles per hour per lane) between 240 and 900 vph/lane is input using a trial and method until the calculated queue per lane is less than the available storage provided per lane. If the initial queue analysis based on the above mentioned discharge rate shows maximum queue will exceed available storage, then a higher discharge rate was used. Based on the Caltrans Ramp Metering field rates, the following discharge rates were used to determine the maximum queue length on heavy volume On-ramps: maximum discharge rate for 2 and 3 cars per green per lane is 1200 vph/lane and 1380 vph/lane, respectively.

As provided in **Appendix I**, the ramp metering analysis spreadsheets show the following calculations for each five minute interval for the following:

- Arrival count per lane is the total arrival count divided by the number of lanes;
- Maximum allowable discharge count is the maximum allowable discharge rate per lane divided by sixty minutes and multiply for every five minutes;
- Queue accumulation is the difference between the arrival count per lane and the maximum allow discharge;
- Instantaneous additional queue is the difference between the arrival count per lane and the maximum allow discharge only if the arrival count per lane is greater than the maximum allowable discharge;
- Arrival rate per lane is arrival count per lane multiply by sixty minutes for every five minutes;
- Total arrival count is the maximum peak hour volume divided by twelve for each five minute interval within one hour period;
- Maximum allowable discharge rate per lane is the assumed maximum discharge rate;
- Suggested meter rate (to prevent queues) is the sum of the arrival count per lane and queue accumulation multiply by twelve;
- Suggested meter rate (to prevent storage overflow) is the sum of the arrival count per lane, queue accumulation and the storage overflow divided by the average vehicle length. This product is then multiplied by twelve for each five minute interval within one hour period. This is applicable if the calculated storage overflow is greater than zero;
- Ramp storage provided is the assumed ramp length for each lane;
- Queue per lane is the queue accumulation multiply by the average vehicle length;
- Storage overflow is the difference between the calculated queue per lane and the assumed ramp storage provided. This is applicable if the queue accumulation is greater than zero and queue per lane is greater than the ramp storage provided;
- Total vehicles delayed is the arrival count per lane only if the queue accumulation is greater than zero;
- Delay is the queue accumulation divided by twelve (vehicle-hour).

4.5.5 Queuing Analysis

Queuing analyses are conducted for intersection conditions for all future Build Alternatives. The queuing analysis compare the minimum required storage lengths to the storage lengths provided for the analyzed intersections. Where denoted as not applicable (NA), the movement analyzed is yield controlled or is not part of the scenario.

The minimum required storage lengths are based on the 95th percentile queue lengths as calculated in the Synchro queuing worksheets. Synchro reports the 95th percentile queue length for a single lane of a lane group (highest queue length considering all lanes of the lane group) and not the total queue length of all lanes in that lane group.

Storage Lengths

The provided storage lengths for an intersection are measured from the limit line to the end of the bay taper for turn movements. For on-ramps, the provided storage lengths are measured from the crosswalk to the limit line for ramp metering. This storage length is associated with the Ramp Metering Analysis as discussed in the previous section.

For off-ramps, the provided storage lengths are measured from the off-ramp exit gore point to the crosswalk if it is a continuous lane. If turn lane (left or right) pockets are provided at the end of the off-ramp, then the provided storage lengths are measured from the stop line to the end of the bay taper for that turn lane.

At single point intersections, it is noted that intersection queuing analysis results generated by Synchro models may indicate zero queue length for the right turn lanes due to the yield (or no) control coded in the models. As a result, unreported vehicles queuing on some yield controlled or free-flow right turns lanes may occur on extremely congested intersections.

4.6 TRAFFIC INDEX (TI)

The Traffic Index (TI) is a measure of the number of the projected equivalent single axle loads (ESALs) expected in the traffic lane over the pavement design life. This index is used to determine minimum pavement thickness required to carry the truck traffic loads expected during the facility service life. Traffic information required for the TI calculation includes the current year annual average daily truck traffic (AADTT) and projected volume for truck and bus vehicles by axle classifications (2-, 3-, 4-, and 5-axles or more) as described in **Section 4.3.1**. Traffic Indexes are calculated using the methodology described in *HDM Section 613.3 Traffic Index Calculation*. **Table 4-23** summarizes the 20-year and 40-year TI values prepared for mainline I-710 at major freeway interchanges. Caltrans published 2007 Daily Truck Traffic data were compared with newly collected truck classification counts displayed in **Table 4-3** and revealed only minor differences. Caltrans published truck classifications were therefore utilized in the TI calculations for this report.

Table 4-23
20-Year and 40-Year Traffic Index

Description	Lane/ Dir	AADTT (One- Way) ^{1,2}	Truck Classification ¹				Traffic Index (TI)									
			2-Axle	3-Axle	4-Axle	5-Axle	20 Year					40 Year				
							Lane 1	Lane 2	Lane 3	Lane 4	Lane 5	Lane 1	Lane 2	Lane 3	Lane 4	Lane 5
N. of PCH Interchange	3	21106	12.0%	17.2%	1.2%	69.6%	14.0	16.5	16.5	--	--	15.5	18.0	18.0	--	--
N. of I-405 Interchange	4	14260	17.9%	13.8%	1.3%	67.0%	13.5	13.5	16.0	16.0	--	14.5	14.5	17.0	17.0	--
N. of SR-91 Interchange	5	15255	24.3%	12.3%	2.8%	60.7%	13.5	13.5	13.5	16.0	16.0	14.5	14.5	14.5	17.0	17.0
N. of I-105 Interchange	4	13673	25.0%	16.6%	2.1%	56.3%	13.0	13.0	15.5	15.5	--	14.5	14.5	17.0	17.0	--
N. of I-5 Interchange	4	7334	29.7%	14.4%	5.4%	50.5%	12.0	12.0	14.5	14.5	--	13.0	13.0	15.5	15.5	--

Notes:

¹ 2007 Annual Average Daily Truck Traffic on the California State Highway System, Caltrans, September 2008.² Caltrans published AADTT are two-way traffic. For the purpose of TI calculation, AADTT are halved to represent one-way traffic at the given location.

This page intentionally left blank.

5.0 EXISTING CONDITIONS ANALYSIS

5.1 FREEWAYS

This section presents the existing conditions freeway analysis evaluated for the following facilities during the morning, midday and evening peak hours:

- Freeway mainline (basic segments);
- Critical weaving areas;
- Major merge and diverge areas;
- On and off-ramp locations.

In addition to I-710, adjacent freeway segments at the I-405, SR-91, I-105 and I-5 interchanges were also evaluated. Operational analysis worksheets for the I-710 freeway under existing conditions are contained in **Appendix B** and the operational analysis worksheets for adjacent freeways under existing conditions are contained in **Appendix C**.

5.1.1 I-710 Freeway Segments

Table 5-1 and **Table 5-2** show the existing LOS for the various segments of I-710. As these tables illustrate, many segments operate at LOS E or F throughout the day, creating chokepoints and causing congestion on other segments. **Table 5-3** presents the summary of the existing I-710 freeway operations and the following statements describe key findings of the analysis:

For Northbound I-710:

- The number of basic freeway segments with poor operating conditions are highest during the evening peak hour when 36 percent (12 out of 33) of the segments are operating at poor LOS E or F;
- The LOS for the majority of the merge and diverge areas operate at acceptable levels with the exception to the morning peak hour when 33 percent (9 out of 27) of the merge and diverge areas are operating at poor LOS E or F;
- Throughout the peak analysis hours, at least half of the weaving areas will operate with an acceptable LOS D or better.

For Southbound I-710:

- Approximately 47 percent (14 out of 30) of the basic freeway segments are operating at poor LOS E or F during the morning peak hour;
- The LOS for the merge and diverge areas experience LOS E or F on 32-44% of the segments during the three peak hours;

- Throughout the peak analysis hours, the weaving areas operate at acceptable levels with the exception to the evening peak hour when 60 percent (9 out of 15) of the weaving areas operate at LOS E or F.

**Table 5-1
I-710 Northbound Peak Hour Existing Level of Service**

Location Description	Freeway Type	Lane		AM		PM		MD	
		ML	Ramp	Density / V/C ¹	LOS	Density / V/C ¹	LOS	Density / V/C ¹	LOS
North of SR-60 On (4 Lanes)	Basic	4	--	22.9	C	31.0	D	22.6	C
North of SR-60 On (5 Lanes)	Basic	5	--	18.3	C	24.8	C	18.1	C
SR-60	Major On ²	3	2	0.43	N/A	0.58	N/A	0.42	N/A
--	Basic	3	--	26.1	D	33.0	D	23.9	C
New York	Off	3	1	28.4	D	35.8	E	24.5	C
--	Basic	3	--	28.7	D	37.4	E	26.7	D
Ford	On	3	1	28.6	D	37.1	E	26.3	C
--	Basic	3	--	27.1	D	34.5	D	25.9	C
S. Ford	Off ⁴	4	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	4	--	20.7	C	28.4	D	20.0	C
SR-60	Off	5	2	N/A	N/A	N/A	N/A	N/A	N/A
Olympic On / SR-60 Off	Weave B	5	--	40.4	E	45.1	F	38.5	E
Olympic	On	4	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	4	--	30.8	D	38.7	E	29.4	D
I-5 NB	On ⁴	3	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	3	--	30.5	D	36.9	E	29.4	D
Olympic	Off	3	1	31.5	D	35.2	E	30.4	D
--	Basic	3	--	34.1	D	44.4	E	32.5	D
I-5 NB	Major Off ³	5	2	30.0	D	30.9	D	30.1	D
--	Basic	5	--	31.2	D	32.1	D	31.3	D
Washington	On	5	1	23.7	C	22.8	C	23.7	C
Washington	Off	5	1	35.2	E	33.8	D	36.2	E
--	Basic	5	--	33.8	D	32.1	D	34.9	D
Atlantic	On	5	1	21.2	C	21.5	C	22.8	C
Atlantic SB	Off	5	1	35.5	E	27.7	C	32.9	D
Atlantic NB	Off	4	2	-- [*]	F	10.7	B	-- [*]	F
--	Basic	4	--	-- [*]	F	34.6	D	-- [*]	F
Florence	On	4	1	-- [*]	F	23.1	C	-- [*]	F
Florence EB On / Florence WB Off	Weave A ⁵	2	--	29.7	C	40.1	F	43.0	F
Florence	Off	4	1	-- [*]	F	-- [*]	F	-- [*]	F
--	Basic	4	--	-- ⁶	F	38.2	E	-- [*]	F
Firestone	On	4	1	23.3	C	18.9	B	23.3	C
Firestone	Off	4	1	33.2	D	34.4	D	39.4	E
--	Basic	4	--	31.7	D	26.9	D	34.8	D
Imperial	On	4	1	-- ⁶	F	-- ⁶	F	-- ⁶	F
Imperial EB On / Imperial WB Off	Weave A ⁵	2	--	43.7	F	56.2	F	51.5	F
Imperial	Off	5	1	N/A	N/A	N/A	N/A	N/A	N/A
I-105 On / Imperial Off	Weave A	5	--	47.4	F	-- ⁶	F	56.9	F

Table 5-1
I-710 Northbound Peak Hour Existing Level of Service

Location Description	Freeway Type	Lane		AM		PM		MD	
		ML	Ramp	Density / VIC ¹	LOS	Density / VIC ¹	LOS	Density / VIC ¹	LOS
I-105	On	4	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	4	--	33.6	D	38.2	E	--*	F
Rosecrans	On	4	1	23.9	C	26.1	C	28.6	D
--	Basic	4	--	31.1	D	35.0	D	42.0	E
I-105	Major Off ³	7	3	22.3	C	25.5	C	28.2	D
--	Basic	6	--	27.1	D	30.9	D	34.3	D
Rosecrans	Off	6	1	31.4	D	35.9	E	37.1	E
--	Basic	6	--	23.8	C	-- ⁶	F	36.0	E
Alondra	On ⁴	5	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	5	--	26.5	D	-- ⁶	F	43.6	E
Alondra	Off	6	1	N/A	N/A	N/A	N/A	N/A	N/A
SR-91 On / Alondra Off	Weave C	6	--	30.6	D	45.3	F	52.0	F
SR-91	On	5	2	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	5	--	16.0	B	19.6	C	20.9	C
SR-91 EB	On ⁴	4	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	3	--	36.9	E	42.7	E	44.3	E
SR-91 WB	Off ⁴	4	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	4	--	30.5	D	32.9	D	34.6	D
Artesia & SR-91 EB	Off	6	2	N/A	N/A	N/A	N/A	N/A	N/A
Long Beach On/ SR-91EB & Artesia Off	Weave C	6	--	25.6	C	27.1	C	25.9	C
Long Beach	On	5	1	N/A	N/A	N/A	N/A	N/A	N/A
Long Beach	Off	5	1	28.2	D	29.1	D	27.4	C
--	Basic	5	--	22.3	C	-- ⁶	F	23.7	C
Del Amo WB	On ⁴	4	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	4	--	26.9	D	31.7	D	24.2	C
Del Amo WB	Off	5	1	N/A	N/A	N/A	N/A	N/A	N/A
Del Amo EB On / Del Amo WB Off	Weave A	5	--	28.7	D	33.9	D	26.8	C
Del Amo EB	On	4	1	N/A	N/A	N/A	N/A	N/A	N/A
Del Amo EB	Off	4	1	21.9	C	22.8	C	17.3	B
--	Basic	4	--	35.4	E	35.1	E	30.4	D
I-405 SB	Major On ²	3	2	0.84	N/A	0.81	N/A	0.78	N/A
--	Basic	3	--	38.1	E	32.4	D	32.3	D
Wardlow / I-405 NB	On	3	1	35.1	E	31.4	D	31.2	D
--	Basic	3	--	26.3	D	21.3	C	21.7	C
Wardlow On / I-405 NB Off	Weave C ⁵	3	--	18.8	B	11.1	A	13.4	B
Wardlow On / I-405 SB Off	Weave A ⁵	3	--	35.0	D	27.0	C	31.7	C
I-405	Major Off ³	4	2	32.1	D	25.2	C	25.3	C
--	Basic	3	--	--*	F	36.8	E	40.0	E
Willow WB	On	3	1	--*	F	29.2	D	30.7	D
Willow WB	Off	4	1	N/A	N/A	N/A	N/A	N/A	N/A
Willow EB On / Willow WB Off	Weave A	4	--	43.9	F	42.6	E	37.9	E
Willow EB	On	3	1	N/A	N/A	N/A	N/A	N/A	N/A
Willow EB	Off	3	1	36.1	E	33.5	D	34.5	D

Table 5-1
I-710 Northbound Peak Hour Existing Level of Service

Location Description	Freeway Type	Lane		AM		PM		MD	
		ML	Ramp	Density / V/C ¹	LOS	Density / V/C ¹	LOS	Density / V/C ¹	LOS
--	Basic	3	--	40.7	E	34.7	D	36.6	E
PCH NB	On	3	1	32.5	D	28.9	D	30.8	D
PCH NB	Off	4	1	N/A	N/A	N/A	N/A	N/A	N/A
PCH SB On / PCH NB Off	Weave A	4	--	46.2	F	45.2	F	53.8	F
PCH SB	On	3	1	N/A	N/A	N/A	N/A	N/A	N/A
PCH SB	Off	4	1	N/A	N/A	N/A	N/A	N/A	N/A
Anaheim WB On / PCH SB Off	Weave B	4	--	28.1	D	24.8	C	24.1	C
Anaheim WB	On	4	1	N/A	N/A	N/A	N/A	N/A	N/A
Anaheim WB	Off	5	1	N/A	N/A	N/A	N/A	N/A	N/A
Anaheim EB On / Anaheim WB Off	Weave A	5	--	28.8	D	28.8	D	31.3	D
Anaheim EB	On	4	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	4	--	24.4	C	22.1	C	21.5	C
7th & 3rd & Shoreline	Major On ²	2	2	0.53	N/A	0.50	N/A	0.46	N/A
--	Basic	2	--	15.4	B	20.7	C	19.1	C
Anaheim EB	Off	3	1	N/A	N/A	N/A	N/A	N/A	N/A
9th & Pier B & Pico On/ Anaheim EB Off	Weave B	3	--	11.1	B	19.6	B	17.1	B
9th & Pier B & Pico	On	3	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	3	--	10.4	A	13.8	B	11.9	B
Harbor Scenic	On ⁴	2	1	N/A	N/A	N/A	N/A	N/A	N/A
South of Harbor Scenic On	Basic	2	--	10.8	A	8.4	A	4.8	A

Notes:

¹ Density = passenger car/mile/lane; v/c = volume-to-capacity ratio. Shaded and bold cells indicate LOS E or F.² Major merge area; HCM methodology applied for analysis.³ Major diverge area; HCM methodology applied for analysis.⁴ Single-lane addition/drop; HCM methodology applied for analysis.⁵ Operation occurs on freeway collector/distributor.⁶ Observed speed at this location lower than 55mph; the junction is assumed to be oversaturated.

N/A = not applicable. LOS and/or density information are not shown for major merge areas, single-lane addition/drop, and merge/diverge operations within a weaving segment.

* = Demand exceeds capacity, no density is predicted.

Table 5-2
I-710 Southbound Peak Hour Existing Level of Service

Location Description	Freeway Type	Lane		AM		PM		MD	
		ML	Ramp	Density / V/C ¹	LOS	Density / V/C ¹	LOS	Density / V/C ¹	LOS
North of Caesar Chavez On	Basic	3	--	28.9	D	24.9	C	21.2	C
Caesar Chavez	On	3	1	28.9	D	24.9	C	22.2	C
--	Basic	3	--	32.8	D	28.1	D	24.5	C
Third	On	3	1	N/A	N/A	N/A	N/A	N/A	N/A
Third On / Eagle & Humphreys Off	Weave A	4	--	29.7	D	24.8	C	21.7	C
Eagle & Humphreys	Off	4	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	3	--	32.1	D	27.3	D	23.8	C
SR-60	On	3	1	N/A	N/A	N/A	N/A	N/A	N/A
SR-60 On/ Eastern & Whittier & Olympic Off	Weave A	5	--	43.3	F	49.3	F	32.5	D
Eastern & Whittier & Olympic	Off	5	1	N/A	N/A	N/A	N/A	N/A	N/A

Table 5-2
I-710 Southbound Peak Hour Existing Level of Service

Location Description	Freeway Type	Lane		AM		PM		MD	
		ML	Ramp	Density / V/C ¹	LOS	Density / V/C ¹	LOS	Density / V/C ¹	LOS
--	Basic	4	--	35.9	E	36.3	E	26.8	D
I-5 SB	Off ⁴	4	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	3	--	33.7	D	30.5	D	26.1	D
Eastern	On	3	1	32.7	D	30.4	D	26.7	C
--	Basic	3	--	37.5	E	33.8	D	29.1	D
I-5 SB	Major On ²	3	2	0.8	N/A	0.7	N/A	0.7	N/A
--	Basic	5	--	32.1	D	30.1	D	27.6	D
Washington	Off	5	1	31.6	D	26.7	C	33.8	D
Washington	On	5	1	N/A	N/A	N/A	N/A	N/A	N/A
Washington On / Atlantic Off	Weave B	5	--	33.3	D	31.3	D	36.2	E
Atlantic	Off	5	2	N/A	N/A	N/A	N/A	N/A	N/A
Atlantic SB	On	4	1	21.0	C	23.3	C	25.5	C
Atlantic NB	On	4	1	22.1	C	24.7	C	27.0	C
--	Basic	4	--	32.3	D	36.4	E	40.4	E
Florence	Off	4	1	31.8	D	39.0	E	--*	F
Florence WB On / Florence EB Off	Weave A ⁵	2	--	26.4	C	40.8	F	27.1	C
Florence	On	4	1	24.3	C	24.6	C	25.8	F
--	Basic	4	--	40.9	E	43.3	E	--*	F
Firestone	Off	4	1	40.3	E	--*	F	--*	F
Firestone	On	4	1	--*	F	25.2	C	--*	F
--	Basic	4	--	--*	F	38.2	E	41.7	E
Wright	Off	4	1	--*	F	39.7	E	--*	F
Imperial EB	Off	4	1	39.4	E	37.5	E	--*	F
Imperial WB On / Imperial EB Off	Weave A ⁵	2	--	25.8	C	25.6	C	25.7	C
Imperial	On	4	1	N/A	N/A	N/A	N/A	N/A	N/A
Imperial On / MLK Off	Weave B	5	--	47.1	F	39.4	E	44.2	F
MLK	Off	5	1	N/A	N/A	N/A	N/A	N/A	N/A
Imperial On / I-105 Off	Weave B	5	--	47.5	F	39.6	E	44.9	F
I-105 Off	Off	4	2	N/A	N/A	N/A	N/A	N/A	N/A
Rosecrans	Off	4	1	32.6	D	31.2	D	--*	F
MLK On / Rosecrans Off	Weave A ⁵	2	--	21.7	B	20.2	B	12.9	B
--	Basic	4	--	29.1	D	22.3	C	27.4	D
MLK	On	4	1	23.4	C	21.1	C	--*	F
--	Basic	4	--	33.0	D	25.7	C	31.1	D
I-105	Major On ²	4	2	0.71	N/A	0.61	N/A	0.85	N/A
--	Basic	6	--	28.30	D	23.10	C	27.50	D
Rosecrans WB	On	6	1	18.4	B	16.3	B	20.9	C
Rosecrans EB	On	6	1	19.8	B	18.0	B	21.7	C
--	Basic	6	--	31.7	D	23.8	C	26.6	D
Alondra WB	Off ⁴	6	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	5	--	36.6	E	28.3	D	34.0	D
Alondra EB	Off	5	1	10.2	B	5.4	A	8.1	A
Alondra	On	5	1	N/A	N/A	N/A	N/A	N/A	N/A

Table 5-2
I-710 Southbound Peak Hour Existing Level of Service

Location Description	Freeway Type	Lane		AM		PM		MD	
		ML	Ramp	Density / V/C ¹	LOS	Density / V/C ¹	LOS	Density / V/C ¹	LOS
Alondra On / SR-91 EB Off	Weave B	6	--	24.7	C	27.0	C	32.6	D
SR-91 EB	Off	5	2	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	4	--	--*	F	30.7	D	33.8	D
SR-91 WB	Major Off ³	4	2	29.6	D	23.7	C	26.0	C
--	Basic	3	--	35.3	E	29.4	D	29.4	D
SR-91 WB	On ⁴	3	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	4	--	40.7	E	31.7	D	34.8	D
SR-91 EB & Artesia	On	4	1	N/A	N/A	N/A	N/A	N/A	N/A
Artesia&SR-91 EB On/ Long Beach NB Off	Weave B	5	--	33.3	D	--6	F	30.4	D
Long Beach NB	Off	5	1	N/A	N/A	N/A	N/A	N/A	N/A
Artesia&SR-91 EB On/ Long Beach SB Off	Weave A	5	--	35.4	E	--6	F	30.0	D
Long Beach SB	Off	5	1	N/A	N/A	N/A	N/A	N/A	N/A
Long Beach	On	4	1	26.4	C	--6	F	25.1	C
--	Basic	4	--	--*	F	30.9	D	37.6	E
Susana	Off	4	1	--*	F	--6	F	--*	F
Del Amo	On	4	1	26.4	C	--6	F	24.9	C
--	Basic	4	--	41.8	E	--6	F	33.9	D
I-405 / Wardlow	Major Off ³	4	2	--*	F	29.7	D	35.7	E
--	Basic	3	--	25.9	C	18.0	B	24.8	C
I-405 NB On / I-405 SB Off	Weave A ⁵	2	--	132.3	F	115.9	F	127.8	F
I-405 SB	On	3	1	32.9	D	30.6	D	32.0	D
--	Basic	3	--	35.6	E	27.9	D	34.2	D
I-405 NB	On	3	1	--*	F	30.2	D	--*	F
--	Basic	3	--	--*	F	35.0	E	42.9	E
Willow WB	Off	3	1	--*	F	33.9	D	37.1	E
Willow WB	On	3	1	N/A	N/A	N/A	N/A	N/A	N/A
Willow WB On / Willow EB Off	Weave A	4	--	46.3	F	37.6	E	48.8	F
Willow EB	Off	4	1	N/A	N/A	N/A	N/A	N/A	N/A
Willow EB	On	3	1	32.2	D	26.2	C	30.0	D
--	Basic	3	--	--*	F	--*	F	--*	F
PCH	Off	3	1	--*	F	--*	F	--*	F
PCH NB On / PCH SB Off	Weave A ⁵	2	--	15.2	B	21.4	B	13.2	B
PCH	On	3	1	--*	F	37.3	E	--*	F
--	Basic	3	--	--*	F	--*	F	--*	F
Anaheim WB	Off	3	1	--*	F	--*	F	--*	F
Anaheim WB	On	3	1	N/A	N/A	N/A	N/A	N/A	N/A
Anaheim WB On / Anaheim EB Off	Weave A	4	--	52.4	F	46.7	F	51.4	F
Anaheim EB	Off	4	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	5	--	24.8	C	21.5	C	23.7	C
6th & Broadway & Shoreline	Major Off ³	5	2	29.8	D	25.9	C	27.2	C
--	Basic	3	--	15.9	B	11.9	B	15.5	B
Anaheim EB	On	3	1	19.2	B	12.3	B	17.6	B

Table 5-2
I-710 Southbound Peak Hour Existing Level of Service

Location Description	Freeway Type	Lane		AM		PM		MD	
		ML	Ramp	Density / V/C ¹	LOS	Density / V/C ¹	LOS	Density / V/C ¹	LOS
--	Basic	3	--	19.8	C	14.0	B	17.8	B
Pico & 9th & Pier B	Off	3	1	31.0	D	18.2	B	29.9	D
--	Basic	3	--	17.0	B	10.8	A	15.3	B
Harbor Scenic	Major Off ³	3	2	16.4	B	10.4	B	15.7	B
South of Harbor Scenic Off	Basic	2	--	11.5	B	8.8	A	10.3	A

Notes:

¹ Density = passenger car/mile/lane; v/c = volume-to-capacity ratio. Shaded and bold cells indicate LOS E or F.

² Major merge area; HCM methodology applied for analysis.

³ Major diverge area; HCM methodology applied for analysis.

⁴ Single-lane addition/drop; HCM methodology applied for analysis.

⁵ Operation occurs on freeway collector/distributor.

⁶ Observed speed at this location lower than 55mph; the junction is assumed to be oversaturated.

N/A = not applicable. LOS and/or density information are not shown for major merge areas, single-lane addition/drop, and merge/diverge operations within a weaving segment.

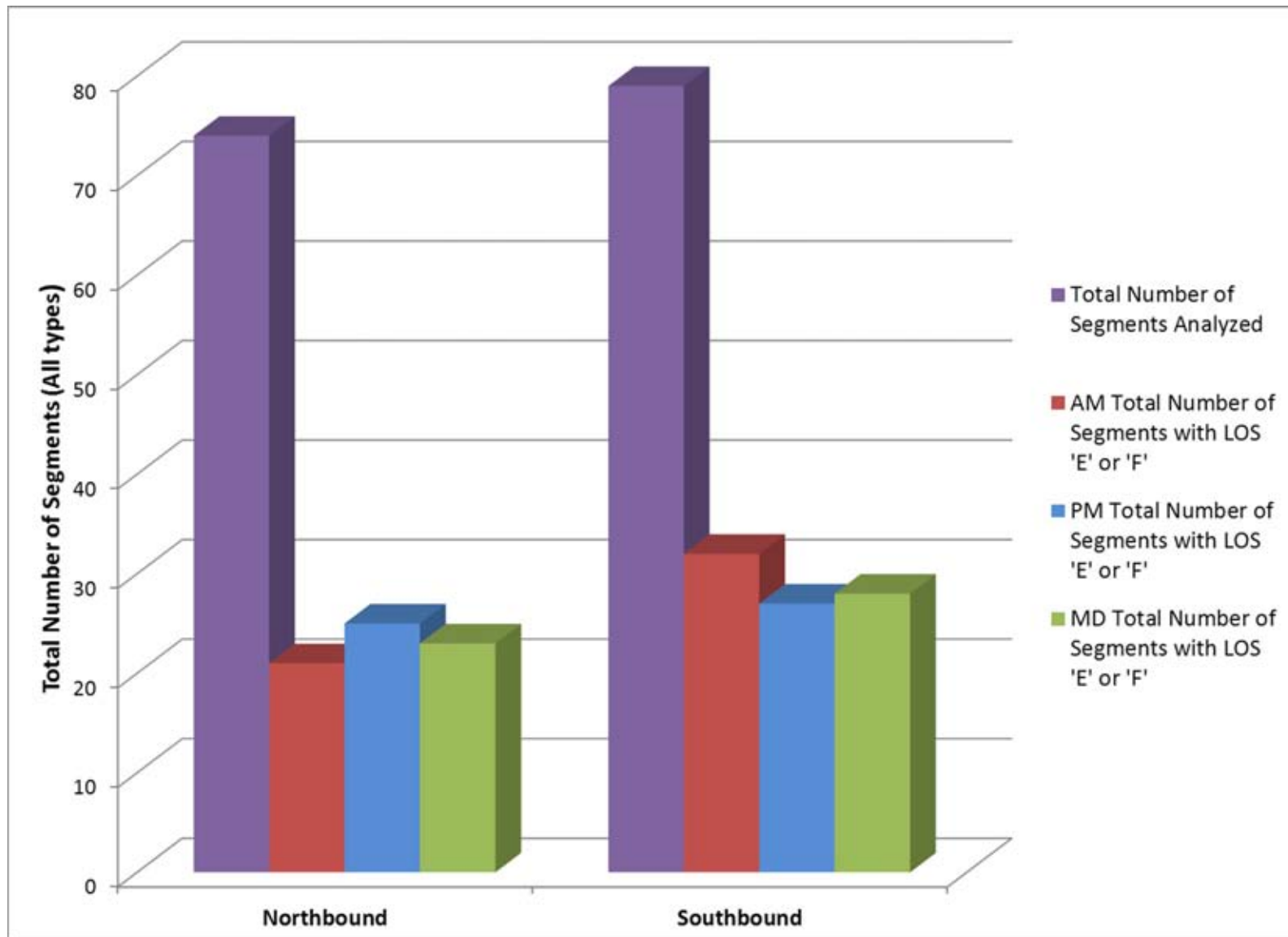
* = Demand exceeds capacity, no density is predicted.

Table 5-3
I-710 Peak Hour Existing Summary

Segment Type	Total Number of Segments	Number of Segments with LOS E or F			Percent of Segments with LOS E or F		
		AM Peak Hour	PM Peak Hour	MD Peak Hour	AM Peak Hour	PM Peak Hour	MD Peak Hour
Northbound							
Basic	33	7	12	9	21%	36%	27%
Merge / Diverge	27	9	6	7	33%	22%	26%
Weave	14	5	7	7	36%	50%	50%
Southbound							
Basic	30	14	8	7	47%	27%	23%
Merge / Diverge	34	11	10	15	32%	29%	44%
Weave	15	7	9	6	47%	60%	40%

Figure 5-1 presents a graphical summary of the existing I-710 freeway operations for both northbound and southbound directions. As shown, the northbound lanes show heavy traffic flows during the evening peak hour and southbound lanes show heavy traffic flows during the morning peak hour. This typically characterizes the general travel pattern where commuters go to work from home in the southbound direction during the morning and return in the northbound direction during the evening peak hours. Currently I-710 segments closest to the southern terminus has the highest truck percentages and low general purpose traffic relative to the rest of the I-710 corridor as shown in **Table 4-1** and **Table 4-2**. These segments generally experience acceptable LOS. However, general purpose traffic volumes increase on freeway segments further away from the Port while truck traffic volumes remain relatively high, resulting in increased traffic congestions at those locations.

**Figure 5-1
I-710 Mainline Existing Summary**



Based on the analysis and findings presented in this section, it can be concluded that the I-710 freeway corridor is currently operating at congested conditions during all three peak hours analyzed. The existing operating conditions are expected to deteriorate further without any improvements. This indicates a pressing need to take action on future improvements to increase capacity and make other improvements along the I-710 study corridor.

5.1.2 I-405 Freeway Segments

Table 5-4 shows the LOS for I-405 freeway segments adjacent to I-710 freeway under existing conditions. **Table 5-5** presents the summary of the existing I-405 freeway operations and the following statements describe key findings of the analysis:

For Northbound I-405:

- The number of basic freeway segments with poor operating conditions are highest during the morning peak hour when 50 percent (2 out of 4) of the segments are operating at poor LOS E or F;
- The only merge and diverge area analyzed operates at poor LOS E or F during the morning peak hour;
- The weaving areas experience heavy densities and poor LOS E or F during all three peak hours.

For Southbound I-405:

- 25 percent (1 out of 4) of the basic freeway segments are operating at poor LOS E or F during both midday and evening peak hours;
- The weaving areas experience heavy densities during the evening peak hour when 80 percent (4 out of 5) of the weaving areas are operating at poor LOS E or F.

In summary, the northbound lanes show heavy congestion during the morning peak hours and southbound lanes show heavy congestion during the evening peak hours. This typically characterizes the general travel pattern where commuters go to work from home in the northbound direction during the morning peak hours and return in the southbound direction during the evening peak hours.

**Table 5-4
I-405 Existing Level of Service**

Location Description	Freeway Type	Lane		AM		PM		MD	
		ML	Ramp	Density / VIC ¹	LOS	Density / VIC ¹	LOS	Density / VIC ¹	LOS
Northbound									
North of Alameda Off	Basic	5	--	34.0	D	24.6	C	27.0	D
Alameda	Off	--	--	N/A	N/A	N/A	N/A	N/A	N/A
I-710 & Santa Fe On / Alameda Off	Weave B	5	--	57.0	F	41.2	E	42.5	E
I-710 & Santa Fe	On	--	--	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	4	--	32.1	D	29.2	D	29.6	D
Santa Fe	On ⁵	2	1	35.8	E	23.6	C	24.1	C
I-710 SB On / Santa Fe Off	Weave A ⁵	3	--	68.0	F	31.6	D	33.4	D
I-710 NB On / I-710 SB Off	Weave A ⁵	2	--	85.1	F	61.9	F	64.9	F
I-710 SB & Santa Fe	Off	--	--	N/A	N/A	N/A	N/A	N/A	N/A
Pacific On / I-710 SB & Santa Fe Off	Weave A	5	--	44.8	F	39.0	E	37.8	E
Pacific	On	--	--	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	4	--	40.4	E	30.7	D	31.3	D
I-710 NB	Off	--	--	N/A	N/A	N/A	N/A	N/A	N/A
Wardlow On / I-710 NB Off	Weave C	6	--	40.6	E	35.4	E	33.9	D
Wardlow	On	5	--	N/A	N/A	N/A	N/A	N/A	N/A
South of Wardlow On	Basic	5	--	39.6	E	32.8	D	31.3	D
Southbound									
North of Alameda On	Basic	5	--	25.5	C	31.2	D	25.7	C
Alameda	On	5	1	N/A	N/A	N/A	N/A	N/A	N/A
Alameda On/Wardlow & I-710 NB Off	Weave B	5	--	38.8	E	44.8	F	39.9	E
I-710 NB & Wardlow	Off	5	2	N/A	N/A	N/A	N/A	N/A	N/A
Wardlow On/Off	Weave A ⁵	3	--	28.7	C	41.6	F	33.3	D
--	Basic	4	--	30.3	D	34.3	D	29.9	D
I-710 SB	Off ⁴	4	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	3	--	34.7	D	37.7	E	36.0	E
Wardlow	On	3	1	N/A	N/A	N/A	N/A	N/A	N/A
Wardlow On / Pacific Off	Weave B	4	--	32.1	D	37.8	E	33.4	D
Pacific	Off	4	1	N/A	N/A	N/A	N/A	N/A	N/A
I-710 NB On / Pacific Off	Weave A ⁵	3	--	22.6	B	27.6	C	27.8	C
--	Basic	4	--	28.5	D	31.3	D	29.7	D
I-710	On	4	1	N/A	N/A	N/A	N/A	N/A	N/A
I-710 On / Long Beach Off	Weave B	5	--	40.4	E	46.7	F	43.7	F

Notes:

¹ Density = passenger car/mile/lane; v/c = volume-to-capacity ratio. Shaded and bold cells indicate LOS E or F.⁴ Single-lane addition/drop; HCM methodology applied for analysis.⁵ Operation occurs on freeway collector/distributor.

N/A = not applicable. LOS and/or density information are not shown for major merge areas, single-lane addition/drop, and merge/diverge operations within a weaving segment.

* = Demand exceeds capacity, no density is predicted.

**Table 5-5
I-405 Peak Hour Existing Summary**

Segment Type	Total Number of Segments	Number of Segments with LOS E or F			Percent of Segments with LOS E or F		
		AM Peak Hour	PM Peak Hour	MD Peak Hour	AM Peak Hour	PM Peak Hour	MD Peak Hour
Northbound							
Basic Freeway	4	2	0	0	50%	0%	0%
Merge/Diverge	1	1	0	0	100%	0%	0%
Weaving	5	5	4	3	100%	80%	60%
Southbound							
Basic Freeway	4	0	1	1	0%	25%	25%
Merge/Diverge	0	0	0	0	0%	0%	0%
Weaving	5	2	4	2	40%	80%	40%

5.1.3 SR-91 Freeway Segments

Table 5-6 shows the LOS for SR-91 freeway segments adjacent to I-710 freeway under existing conditions. **Table 5-7** presents the summary of the existing SR-91 freeway operations and the following statements describe key findings of the analysis:

For Eastbound SR-91:

- Approximately 57 percent (4 out of 7) of the basic freeway segments are operating at poor LOS E or F during the three peak hours analyzed;
- All merge and diverge areas (2 out of 2) are operating at an acceptable LOS D or better, during the three peak hours analyzed;
- All weaving areas (2 out of 2) are operating at an acceptable LOS D or better during the three peak hours analyzed.

For Westbound SR-91:

- Approximately 83 percent (5 out of 6) of the basic freeway segments are operating at poor LOS E or F during the morning peak hour;
- All merge and diverge areas (4 out of 4) are operating at an acceptable LOS D or better, during the three peak hours analyzed;
- The weaving areas experience maximum densities during the morning peak hour when 50 percent (1 out of 2) of the weaving areas are operating at poor LOS E or F.

Table 5-6
SR 91 Existing Level of Service

Location Description	Freeway Type	Lane		AM		PM		MD	
		ML	Ramp	Density / VIC ¹	LOS	Density / VIC ¹	LOS	Density / VIC ¹	LOS
Eastbound									
West of Santa Fe On	Basic	5	--	25.7	C	29.7	D	31.8	D
Santa Fe	On	5	1	N/A	N/A	N/A	N/A	N/A	N/A
Santa Fe On / Long Beach Off	Weave A	6	--	24.0	C	32.4	D	34.1	D
Long Beach	Off	6	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	5	--	25.9	C	30.1	D	32.2	D
Long Beach	On	5	1	N/A	N/A	N/A	N/A	N/A	N/A
Long Beach On / I-710 SB Off	Weave A	6	--	24.8	C	32.4	D	34.4	D
I-710 SB	Off	6	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	5	--	-- ⁶	F	-- ⁶	F	-- ⁶	F
I-710 NB & Atlantic	Major Off ³	5	2	22.5	C	27.4	C	27.8	C
--	Basic	3	--	-- ⁶	F	-- ⁶	F	-- ⁶	F
I-710 NB	On ⁴	3	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	4	--	-- ⁶	F	-- ⁶	F	-- ⁶	F
I-710 SB	On ⁴	4	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	5	--	-- ⁶	F	-- ⁶	F	-- ⁶	F
Atlantic	On	5	1	21.5	C	21.5	C	20.9	C
East of Atlantic On	Basic	5	--	25.1	C	31.1	D	30.2	D
Westbound									
West of Santa Fe Off	Basic	4	--	34.0	D	23.4	C	26.7	D
Santa Fe	Off	6	2	N/A	N/A	N/A	N/A	N/A	N/A
Long Beach On / Santa Fe Off	Weave C	6	--	20.5	C	17.3	B	19.0	B
Long Beach	On	5	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	5	--	-- ⁶	F	17.8	B	-- ⁶	F
Long Beach	Off	6	1	N/A	N/A	N/A	N/A	N/A	N/A
I-710 SB On / Long Beach Off	Weave C	6	--	44.0	F	29.6	D	33.3	D
I-710 SB	On	4	2	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	4	--	-- ⁶	F	28.7	D	-- ⁶	F
I-710 NB & Atlantic	Major On ²	3	2	0.68	N/A	0.69	N/A	0.66	N/A
--	Basic	3	--	-- ⁶	F	27.9	D	-- ⁶	F
I-710	Major Off ³	5	3	23.4	C	24.5	C	22.0	C
--	Basic	5	--	-- ⁶	F	30.3	D	28.5	D
Atlantic	Off	5	2	18.0	B	10.6	B	9.4	A
--	Basic	5	--	-- ⁶	F	25.4	C	24.2	C
Cherry	On	5	1	21.8	C	21.3	C	20.4	C

Notes:

¹ Density = passenger car/mile/lane; v/c = volume-to-capacity ratio. Shaded and bold cells indicate LOS E or F.² Major merge area; HCM methodology applied for analysis.³ Major diverge area; HCM methodology applied for analysis.⁴ Single-lane addition/drop; HCM methodology applied for analysis.⁶ Observed speed at this location lower than 55mph; the junction is assumed to be oversaturated.

N/A = not applicable. LOS and/or density information are not shown for major merge areas, single-lane addition/drop, and merge/diverge operations within a weaving segment.

* = Demand exceeds capacity, no density is predicted.

Table 5-7
SR 91 Peak Hour Existing Summary

Segment Type	Total Number of Segments	Number of Segments with LOS E or F			Percent of Segments with LOS E or F		
		AM Peak Hour	PM Peak Hour	MD Peak Hour	AM Peak Hour	PM Peak Hour	MD Peak Hour
SR-91 Eastbound							
Basic Freeway	7	4	4	4	57%	57%	57%
Merge/Diverge	2	0	0	0	0%	0%	0%
Weaving	2	0	0	0	0%	0%	0%
SR-91 Westbound							
Basic Freeway	6	5	0	3	83%	0%	50%
Merge/Diverge	4	0	0	0	0%	0%	0%
Weaving	2	1	0	0	50%	0%	0%

In summary, the eastbound lanes show higher density during all three peak hours and westbound lanes show heavy congestion during the morning peak hours. This typically characterizes the general travel pattern where commuters go to work from home in the westbound direction during the morning peak hour and return in the eastbound direction during the evening peak hours. The existing operating conditions are expected to deteriorate further without any improvements.

5.1.4 I-105 Freeway Segments

Table 5-8 shows the LOS for I-105 freeway segments adjacent to I-710 freeway under existing conditions. **Table 5-9** presents the summary of the existing I-105 freeway operations and the following statements describe key findings of the analysis:

For Eastbound I-105:

- Approximately 50 percent (3 out of 6) of the basic freeway segments are currently operating at poor LOS E or F during both midday and evening peak hours;
- The LOS for the merge and diverge areas are operating at an acceptable LOS D or better during all three peak hours except for one segment during the PM peak hour;

For Westbound I-105:

- All basic freeway segments (6 out of 6) are operating at poor LOS E or F during the morning peak hour, while the evening and midday also experience poor operating conditions;
- All merge and diverge areas (3 out of 3) are operating at an acceptable LOS D or better, during the three peak hours analyzed.

In summary, the eastbound lanes show higher density during the evening peak hours and westbound lanes show heavy congestion during the morning peak hours. This typically characterizes the general travel pattern where commuters go to work from home in the

westbound direction during the morning peak hour and return in the eastbound direction during the evening peak hours.

Overall, the majority of congestion occurs along the I-105 corridor near the I-710 connectors. As shown, these areas are near or exceed capacity and operating under congested conditions. The existing operating conditions are expected to deteriorate further without any improvement.

Table 5-8
I-105 Existing Level of Service

Ramp	Freeway Type	Lane		AM		PM		MD	
		ML	Ramp	Density / VIC ¹	LOS	Density / VIC ¹	LOS	Density / VIC ¹	LOS
Eastbound									
West of I-710 Off (3 Lanes)	Basic	3	--	43.3	E	40.9	E	--*	F
West of I-710 Off (4 Lanes)	Basic	4	--	30.1	D	29.2	D	31.3	D
I-710	Major Off ³	4	2	29.0	D	28.1	D	30.1	D
--	Basic	3	--	22.5	C	20.9	C	21.4	C
Garfield	Off	3	2	11.3	B	9.4	B	9.4	A
--	Basic	3	--	22.9	C	20.5	C	23.4	C
I-710 NB	Major On ²	3	2	0.42	N/A	-- ⁶	F	0.40	N/A
--	Basic	5	--	17.5	B	-- ⁶	F	-- ⁶	F
I-710 SB	On	5	1	18.0	B	13.7	B	16.8	B
East of I-710 On	Basic	3	--	26.7	D	-- ⁶	F	-- ⁶	F
Westbound									
West of I-710 NB On (3 Lane)	Basic	3	--	-- ⁶	F	-- ⁶	F	--*	F
West of I-710 NB On (4 Lane)	Basic	4	--	-- ⁶	F	-- ⁶	F	28.9	D
I-710 NB	On ⁴	3	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	3	--	-- ⁶	F	36.8	E	35.8	E
I-710 SB	On	3	1	18.4	B	21.1	C	20.9	C
--	Basic	3	--	-- ⁶	F	-- ⁶	F	25.8	C
Garfield	On	3	1	19.0	B	20.6	C	21.6	C
--	Basic	3	--	-- ⁶	F	-- ⁶	F	-- ⁶	F
I-710	Major Off ³	5	2	22.1	C	18.7	B	20.5	C
East of I-710 Off	Basic	5	--	38.2	E	26.7	D	32.2	D

Notes:

¹ Density = passenger car/mile/lane; v/c = volume-to-capacity ratio. Shaded and bold cells indicate LOS E or F.

² Major merge area; HCM methodology applied for analysis.

³ Major diverge area; HCM methodology applied for analysis.

⁴ Single-lane addition/drop; HCM methodology applied for analysis.

⁶ Observed speed at this location lower than 55mph; the junction is assumed to be oversaturated.

N/A = not applicable. LOS and/or density information are not shown for major merge areas, single-lane addition/drop, and merge/diverge operations within a weaving segment.

* = Demand exceeds capacity, no density is predicted.

Table 5-9
I-105 Peak Hour Existing Summary

Segment Type	Total Number of Segments	Number of Segments with LOS E or F			Percent of Segments with LOS E or F		
		AM Peak Hour	PM Peak Hour	MD Peak Hour	AM Peak Hour	PM Peak Hour	MD Peak Hour
I-105 Eastbound							
Basic Freeway	6	1	3	3	17%	50%	50%
Merge/Diverge	4	0	1	0	0%	25%	0%
Weaving	0	0	0	0	N/A	N/A	N/A
I-105 Westbound							
Basic Freeway	6	6	5	3	100%	83%	50%
Merge/Diverge	3	0	0	0	0%	0%	0%
Weaving	0	0	0	0	N/A	N/A	N/A

5.1.5 I-5 Freeway Segments

Table 5-10 shows the LOS for I-5 freeway segments adjacent to the I-710 corridor under existing conditions. **Table 5-11** presents the summary of the existing I-5 freeway operations and the following statements describe key findings of the analysis:

For Northbound I-5:

- The number of basic freeway segments with poor operating conditions are highest during the midday peak hour when 67 percent (8 out of 12) of the segments are operating at poor LOS E or F;
- All merge and diverge areas (8 out of 8) are operating at an acceptable LOS D or better during the three peak hours analyzed.

For Southbound I-5:

- All basic freeway segments are operating at an acceptable LOS D or better during all peak hours, except for two segments during the midday peak hour;
- All merge and diverge areas (7 out of 7) are operating at an acceptable LOS D or better during the three peak hours analyzed.

Table 5-10
I-5 Existing Level of Service

Ramp/Weaving Sections	Freeway Type	Lane		AM		PM		MD	
		ML	Ramp	Density / VIC ¹	LOS	Density / VIC ¹	LOS	Density / VIC ¹	LOS
Northbound									
North of Dennison	Basic	5	--	31.3	D	20.5	C	38.2	E
Dennison On-Ramp	On	5	1	19.5	B	14.5	B	23.8	C
--	Basic	5	--	30.9	D	19.7	C	37.4	E
Ditman & Dennison	Off	5	1	28.6	D	21.1	C	32.3	D
--	Basic	5	--	31.7	D	20.3	C	37.4	E

Table 5-10
I-5 Existing Level of Service

Ramp/Weaving Sections	Freeway Type	Lane		AM		PM		MD	
		ML	Ramp	Density / V/C ¹	LOS	Density / V/C ¹	LOS	Density / V/C ¹	LOS
Telegraph & Downey	On	5	1	18.4	B	14.2	B	20.7	C
--	Basic	5	--	30.5	D	19.7	C	34.7	D
I-710 NB	On ⁴	4	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	4	--	24.3	C	15.0	B	28.6	D
I-710 NB	Off ⁴	5	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	5	--	25.7	C	20.3	C	28.8	D
McBride & Telegraph	Off	5	1	24.6	C	21.2	C	27.0	C
--	Basic	5	--	26.2	D	20.8	C	29.3	D
--	Basic	4	--	32.8	D	26.1	D	37.2	E
Woods & Telegraph	On	4	1	19.4	B	16.4	B	21.3	C
--	Basic	4	--	31.8	D	24.8	C	36.4	E
Woods & Telegraph	Off	4	1	30.6	D	25.0	C	32.9	D
--	Basic	4	--	32.9	D	26.1	D	36.4	E
Camfield & Telegraph	On	4	1	18.5	B	16.2	B	20.3	C
--	Basic	4	--	31.5	D	23.1	C	36.4	E
Camfield & Telegraph	Off	4	1	31.4	D	24.4	C	35.0	D
South of Camfield & Telegraph Off	Basic	4	--	34.2	D	25.7	C	40.2	E
Southbound									
North of Ditman Off	Basic	5	--	29.2	D	24.9	C	32.9	D
Ditman	Off	5	1	26.6	C	24.1	C	29.4	D
--	Basic	5	--	28.7	D	24.5	C	32.8	D
Ditman	On	5	1	17.7	B	16.0	B	19.9	B
--	Basic	5	--	29.2	D	25.2	C	32.8	D
Boswell	Off	5	1	27.4	C	25.4	C	30.4	D
--	Basic	5	--	28.6	D	24.6	C	32.3	D
I-710 SB	Major Off ³	5	3	27.6	D	23.6	C	31.1	D
--	Basic	3	--	31.1	D	24.7	C	37.0	E
I-710 SB	On ⁴	3	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	4	--	34	D	31.4	D	34.8	D
Triggs	Off	4	1	30.8	D	29.0	D	31.6	D
--	Basic	4	--	33.0	D	31.0	D	34.8	D
Triggs	On	4	1	19.2	B	18.5	B	19.9	B
--	Basic	4	--	34.4	D	32.5	D	35.2	E
Stevens & Eastern	Off	4	1	31.3	D	29.6	D	31.7	D
South of Stevens & Eastern Off	Basic	4	--	31.2	D	31.2	D	33.3	D

Notes:

¹ Density = passenger car/mile/lane; v/c = volume-to-capacity ratio. Shaded and bold cells indicate LOS E or F.³ Major diverge area; HCM methodology applied for analysis.⁴ Single-lane addition/drop; HCM methodology applied for analysis.

N/A = not applicable. LOS and/or density information are not shown for major merge areas, single-lane addition/drop, and merge/diverge operations within a weaving segment.

* = Demand exceeds capacity, no density is predicted.

Table 5-11
I-5 Peak Hour Existing Summary

Segment Type	Total Number of Segments	Number of Segments with LOS E or F			Percent of Segments with LOS E or F		
		AM Peak Hour	PM Peak Hour	MD Peak Hour	AM Peak Hour	PM Peak Hour	MD Peak Hour
I-5 Northbound							
Basic Freeway	12	0	0	8	0%	0%	67%
Merge/Diverge	8	0	0	0	0%	0%	0%
Weaving	0	0	0	0	N/A	N/A	N/A
I-5 Southbound							
Basic Freeway	9	0	0	2	0%	0%	22%
Merge/Diverge	7	0	0	0	0%	0%	0%
Weaving	0	0	0	0	N/A	N/A	N/A

Overall, the majority of the congestion occurs along the I-5 corridor in the vicinity of I-710 during the midday peak hour. However, field observations show severe congestion levels during both AM and PM peak hours. This indicates that these areas are near capacity and currently operating under congested conditions through this section. The existing operating conditions are expected to deteriorate further without any improvements.

5.2 INTERSECTIONS

Although the LOS analysis for all of the I-710 study area intersections are documented in the Intersection Traffic Impact Analysis Report, this section presents the LOS analysis for the I-710 On- and Off-ramp intersections along the I-710 Corridor. **Table 5-12** shows the existing LOS analysis results. As shown, four (4) intersections are currently operating at a LOS E or F during at least one of the peak hours analyzed. **Table 5-13** presents the summary of the existing arterial ramp intersections operating at LOS E or F. As shown in this table, the number of intersections with poor operating conditions is highest during the evening peak hour when approximately one-fifth of the intersections are operating at poor LOS E or F.

Several intersection along the following streets have also been identified as operating at a LOS E or F, which indicates a systematic capacity deficiency along these corridors: Firestone Boulevard, Atlantic Boulevard, Eastern Avenue and Artesia Boulevard.

The LOS worksheets for the study intersections under existing conditions are included in **Appendix D**. **Figure 5-2** through **Figure 5-7** depict the existing peak hour (morning, midday, and evening) turning movement volumes and lane geometrics, which are found at the end of this section.

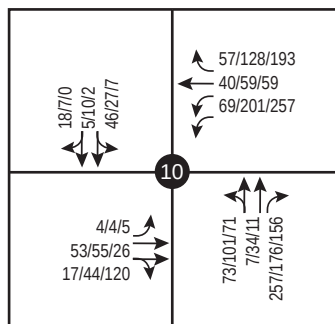
Table 5-12
Arterial Intersections Existing Level of Service

ID	Main Street	Cross Street	Traffic Control Device	AM Peak		PM Peak		MD Peak	
				Delay	LOS	Delay	LOS	Delay	LOS
10	Pico Ave./Pier B St.	I-710 Ramps/9th St	Signalized	16.3	B	16.6	B	19.2	B
65	Florence Ave	Eastern Ave	Signalized	36.4	D	33.1	C	30.8	C
74	Bandini Blvd	Atlantic Blvd	Signalized	48.8	D	64.3	E	47.7	D
111	I-710 SB	Del Amo Blvd (On/Off @ Susana Rd)	Signalized	14.1	B	11.5	B	12.2	B
112	I-710 NB	Long Beach Blvd (On/Off)	Signalized	34.2	C	23.3	C	14.9	B
113	I-710 SB	Long Beach Blvd (On/Off)	Signalized	16	B	22.7	C	12.9	B
114	I-710 NB	E. Artesia Blvd (Off)	Signalized	20	B	68.6	E	18.9	B
115	I-710 SB	E. Artesia Blvd (On)	Unsignalized	14.9	B	21.8	C	9.4	A
116	I-710 NB	Alondra Blvd (On/Off)	Signalized	18.3	B	27.4	C	19	B
117	I-710 SB	Alondra Blvd (On)	Unsignalized	17.6	C	18.2	C	17.1	C
118	I-710 NB	Rosecrans Ave (Off)	Signalized	13.2	B	14.3	B	14.7	B
119	I-710 SB	Rosecrans Ave (Off)	Signalized	11.5	B	16.7	B	8.5	A
120	I-710 SB	Imperial (Off@Wright Rd)	Signalized	18.6	B	26	C	17	B
121	I-710 NB	Firestone Blvd (Off)	Signalized	10.8	B	72.6	E	39.2	D
122	I-710 SB	Firestone Blvd.	Signalized	31.2	C	75.2	E	48.6	D
124	I-710 SB	Bandini Blvd (Off)	Signalized	15.5	B	13.7	B	16.3	B
125	I-710 NB	Washington Blvd (On/Off)	Signalized	15.9	B	20.9	C	17.2	B
126	I-710 SB	Washington Blvd (On/Off)	Signalized	18.6	B	15.6	B	17.2	B
161	Del Amo Blvd	Susana Road	Signalized	45.4	D	45.4	D	35.6	D
I-5/I-710 Study Intersections									
137	I-710 SB On-Ramp	Ramona Boulevard	Signalized	4.7	A	8.6	A	6.1	A
135	I-710 SB Off-Ramp - Humphreys Avenue	Floral Drive	Signalized	33.8	C	30.9	C	36.2	D
86	Ford Boulevard - I-710 NB Off-Ramp	Olympic Boulevard	Signalized	18.3	B	23.9	C	16.0	B

Notes: Shaded and bold cells indicate LOS E or F

Table 5-13
Arterial Ramp Intersection Existing Summary

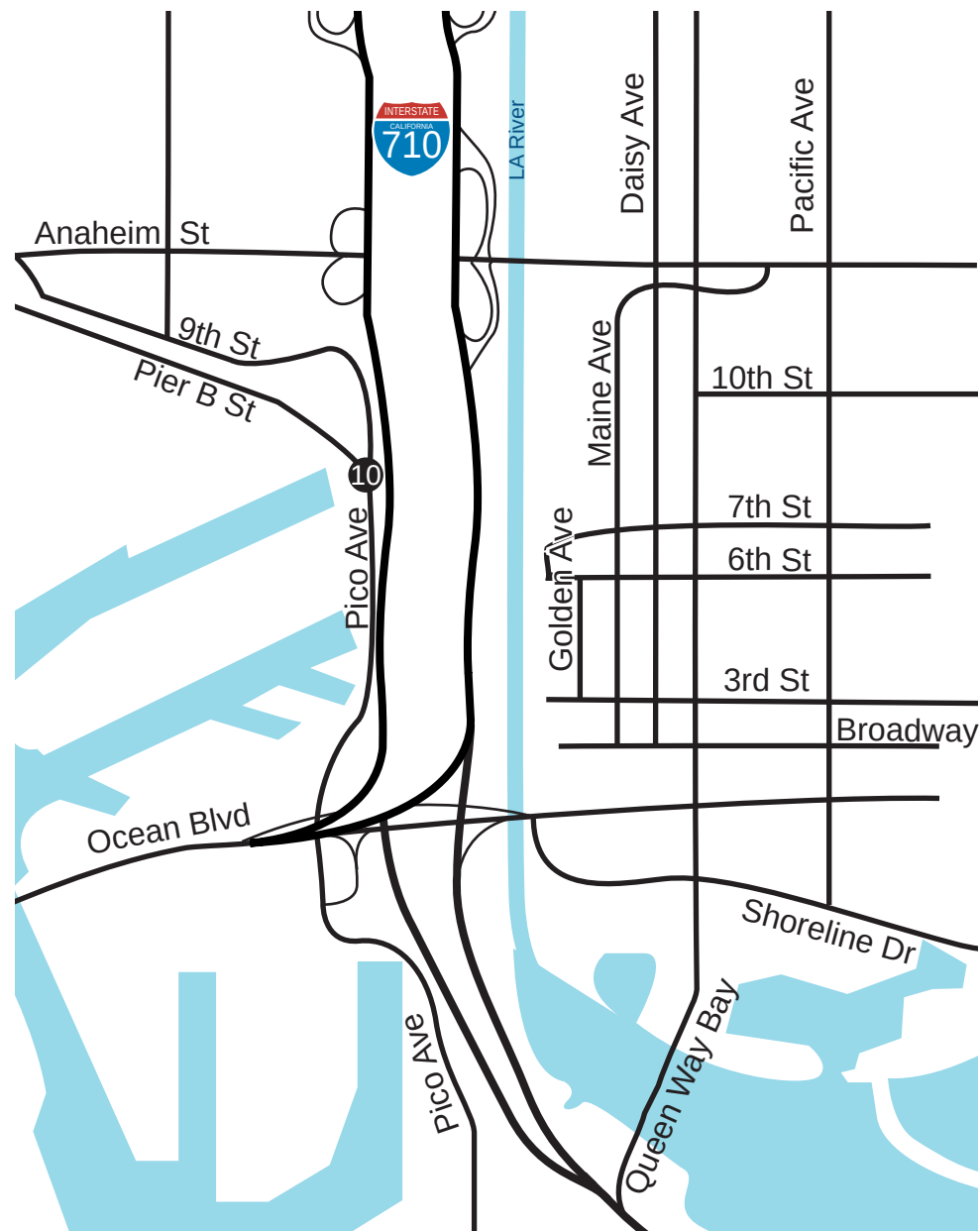
Total Number of Ramp Intersections Analyzed	Number of Intersections with LOS E or F			Percent of Intersections with LOS E or F		
	AM Peak Hour	PM Peak Hour	MD Peak Hour	AM Peak Hour	PM Peak Hour	MD Peak Hour
22	0	4	0	0%	18%	0%



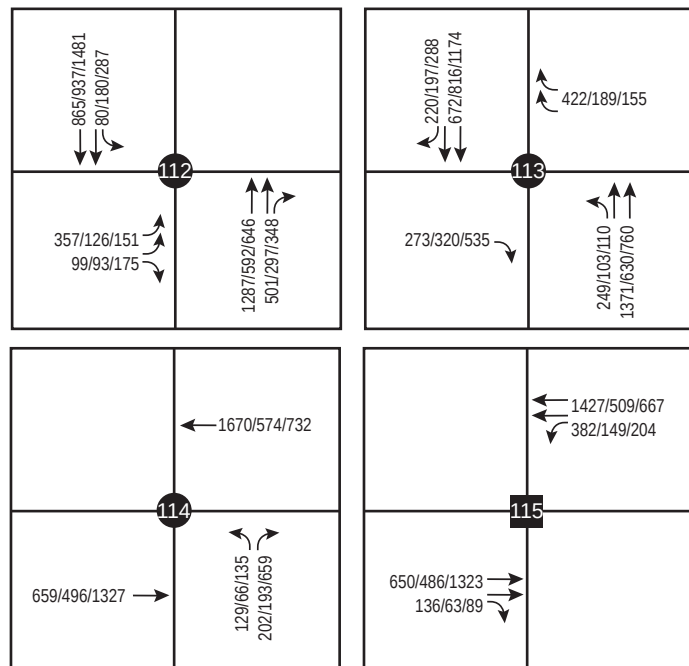
NOT TO SCALE

LEGEND

- # Signalized Intersection
- 25/10/30 AM/MD/PM Peak hour volumes



K:\2011\I-710\TOAR\EXISTING\Fig 5-3 Exist-Long Beach.ai



LEGEND

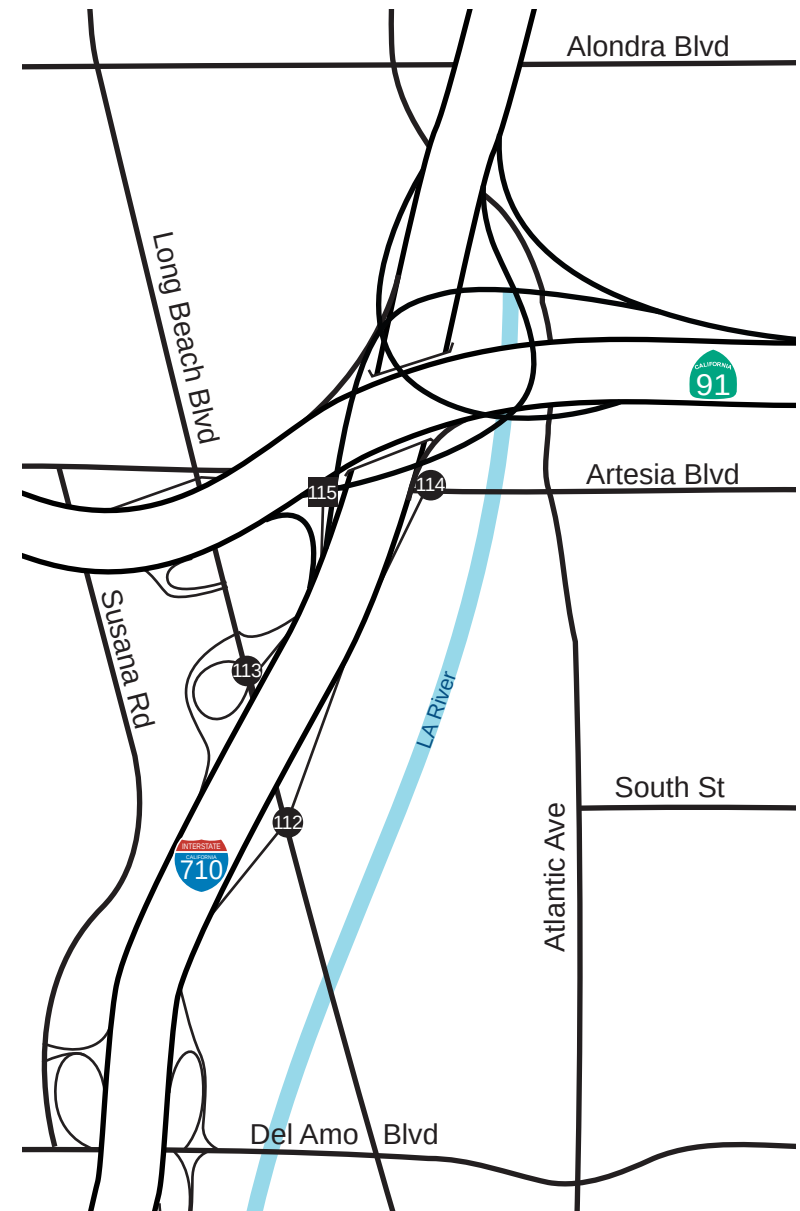


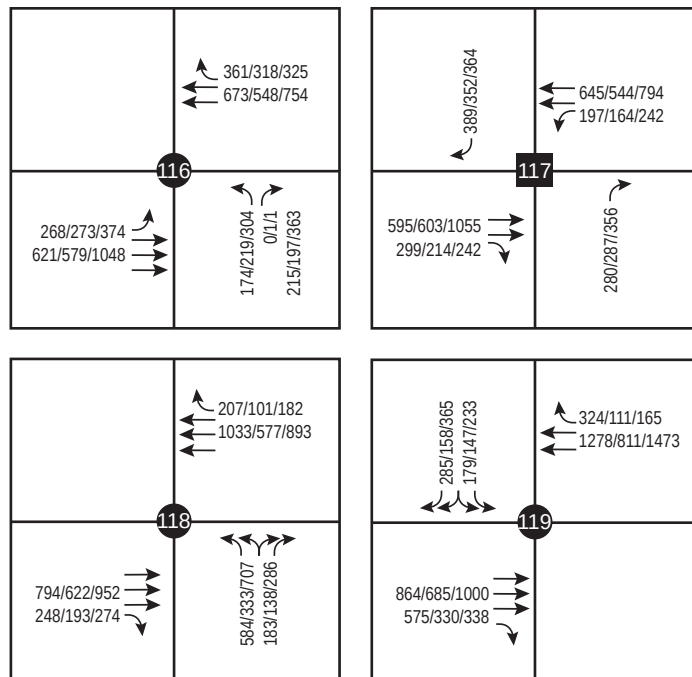
Signalized Intersection



Unsignalized Intersection

25/10/30 AM/MD/PM Peak hour volumes

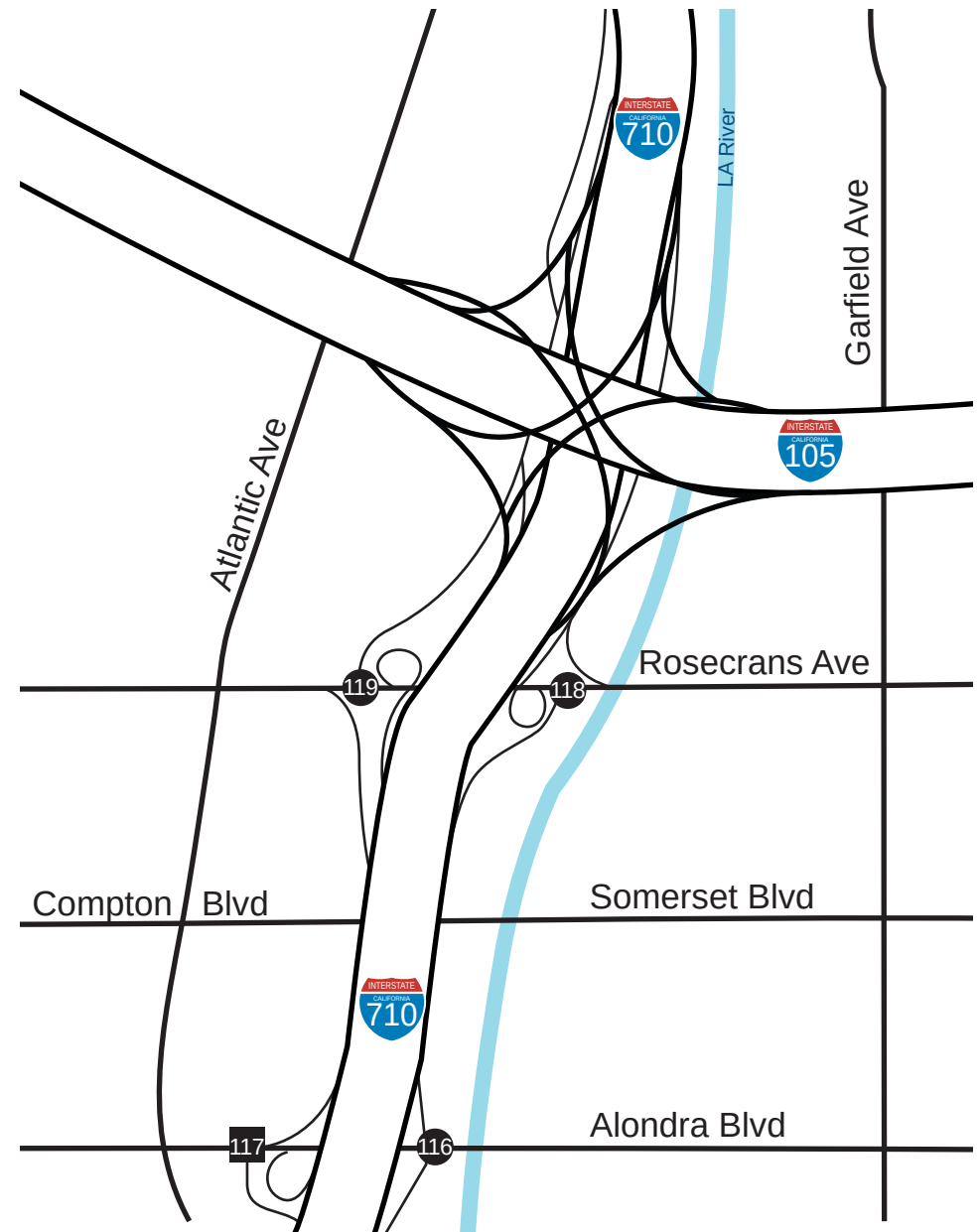




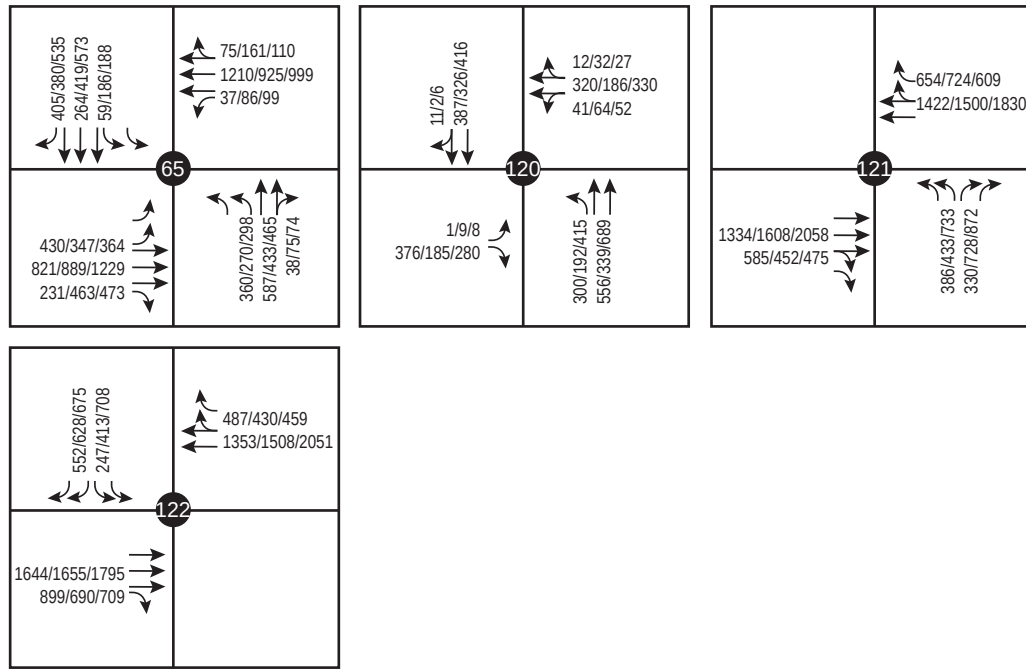
NOT TO SCALE

LEGEND

- Signalized Intersection
- Unsignalized Intersection
- 25/10/30 AM/MD/PM Peak hour volumes

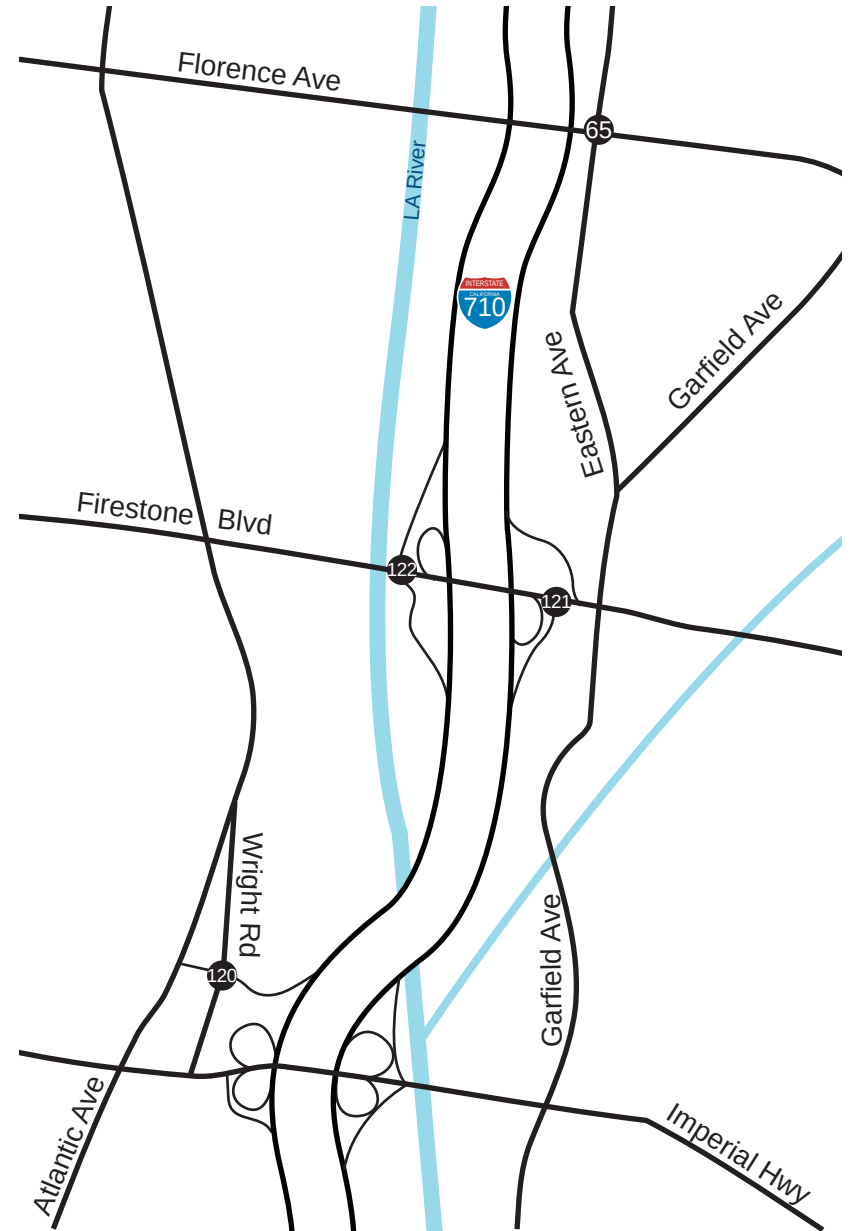


K:\2011\1-710\TOAR\EXISTING\Fig 5-5 Exist-Imperial.lai

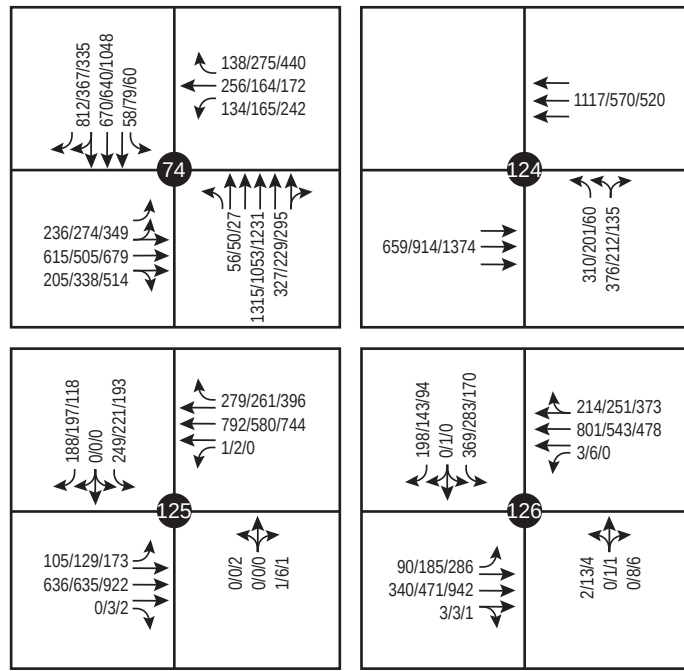


LEGEND

- # Signalized Intersection
- 25/10/30 AM/MD/PM Peak hour volumes

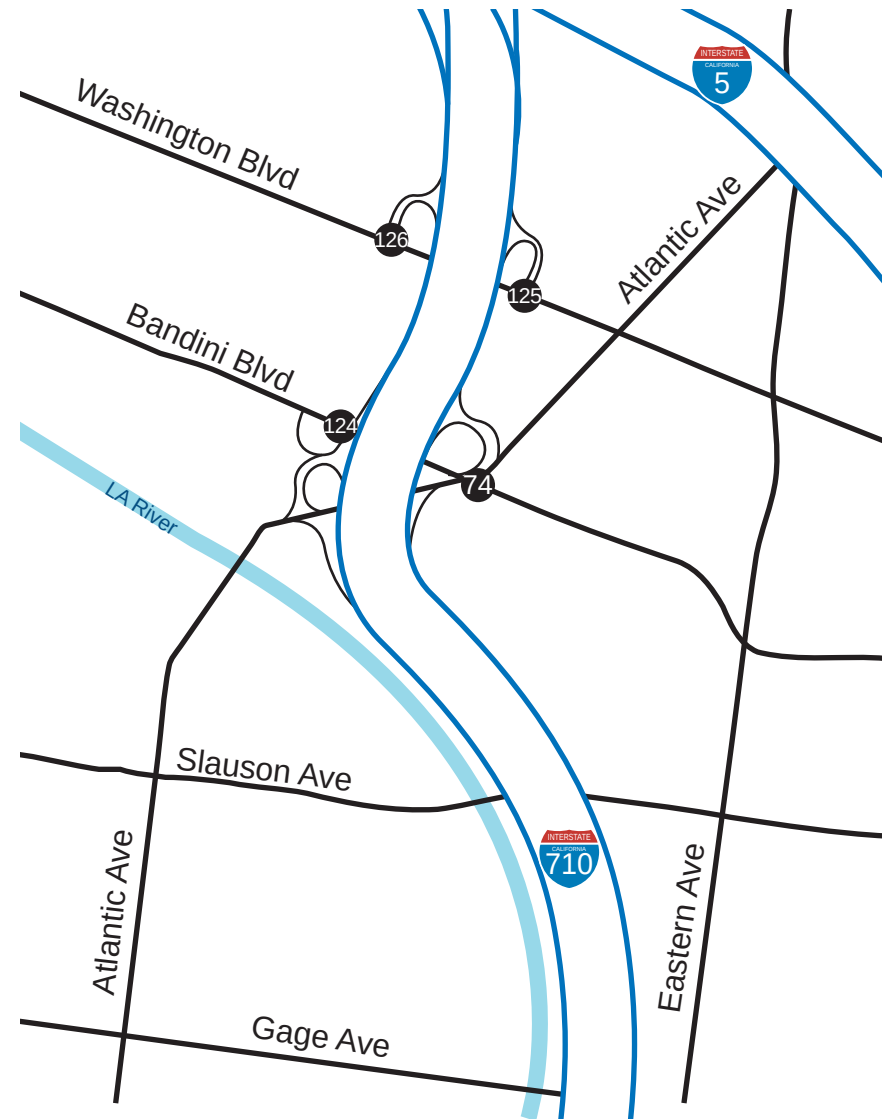


K:\2011\I-710\TOAR\EXISTING\Fig 5-6 Exist-Slauson.ai

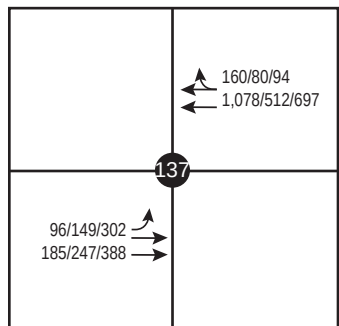
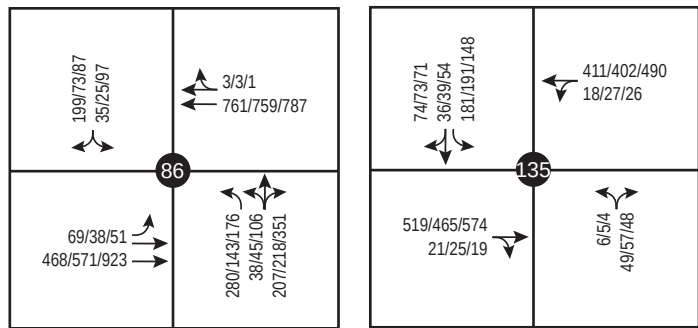


LEGEND

- # Signalized Intersection
- 25/10/30 AM/MD/PM Peak hour volumes



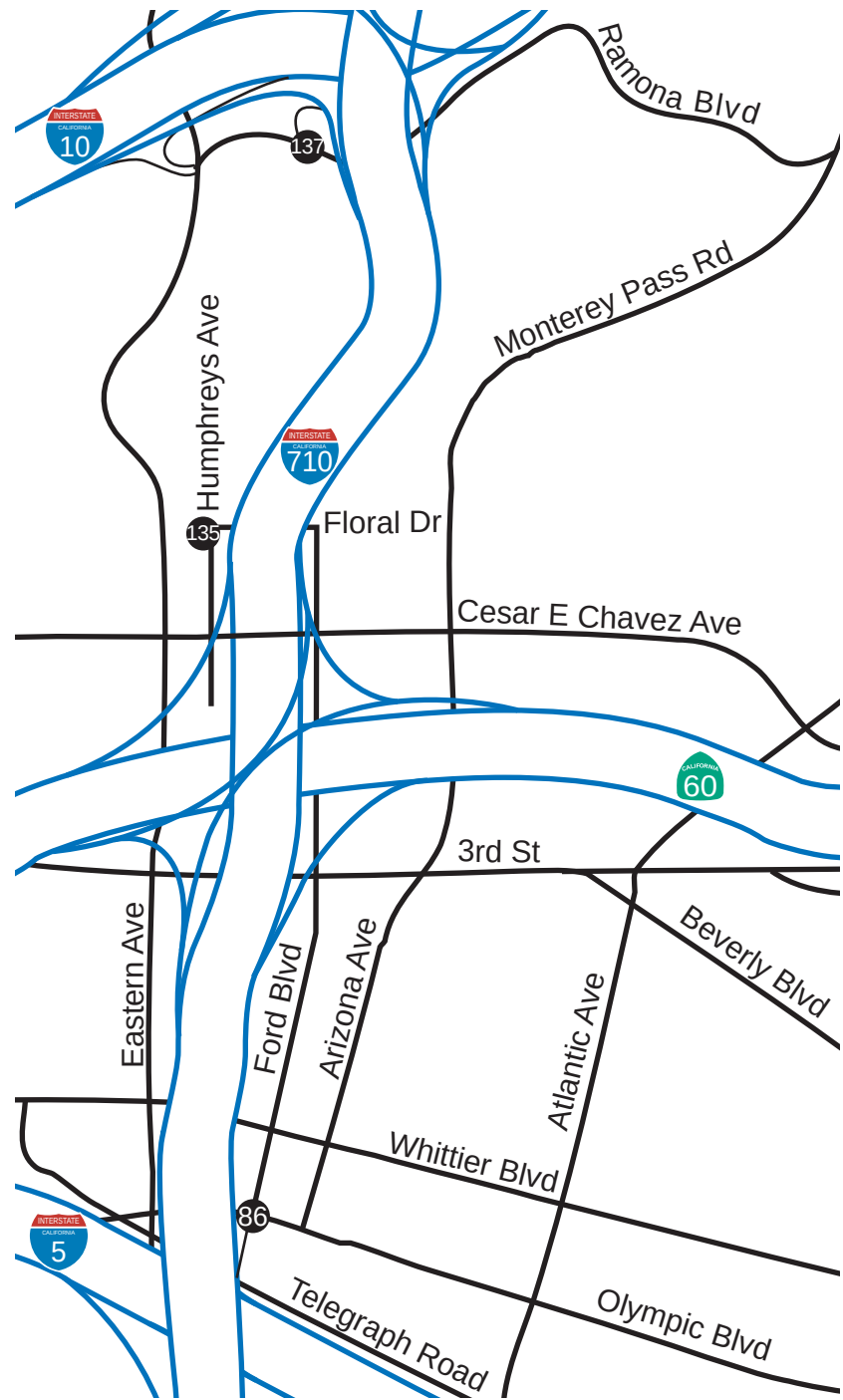
K:\2011\1-710\TOAR\EXISTING\Fig 5-7 Exist-Washington.ai



LEGEND

Signalized Intersection

25/10/30 AM/MD/PM Peak hour volumes



Project: I-710 PA-ED

EXISTING TRAFFIC VOLUMES INTERCHANGES NORTH OF WASHINGTON BLVD

Figure 5-7



6.0 FUTURE YEAR ALTERNATIVES AND TRAFFIC FORECASTS

This section presents the Reduced Set of Alternatives that are being analyzed in the I-710 Corridor Project EIR/EIS, including brief descriptions of each Alternative and the associated design options, and the future year 2035 traffic forecasts for each Alternative.

6.1 ALTERNATIVES DESCRIPTION

This section describes the alternatives based on the Major Corridor Study that were developed by a multidisciplinary technical team to achieve the I-710 Corridor Project purpose and subsequently were reviewed and concurred upon by the various committees involved in the I-710 Corridor Project community participation framework. Alternatives 2, 3, and 4 were considered but withdrawn from further environmental study as stand-alone alternatives but elements of these alternatives have been included in Build Alternatives 5A, 6A, 6B, and 6C. The alternatives are Alternative 1 (No Build Alternative), Alternative 5A (I-710 Widening up to 10 General Purpose [GP] Lanes), Alternative 6A (10 GP Lanes plus a Four-Lane Freight Corridor), Alternative 6B (10 GP Lanes plus a Zero-Emissions Four-Lane Freight Corridor), and Alternative 6C (10 GP Lanes plus a Four-Lane Freight Corridor Tolled).

Alternative 1 – No Build Alternative

The No Build Alternative does not include any improvements within the I-710 Corridor other than those projects that are already planned and committed to be constructed by or before the planning horizon year of 2035. The projects included in this alternative are based on Southern California Association of Governments (SCAG's) 2008 Regional Transportation Improvement Program (RTIP) project list, including freeway, arterial, and transit improvements within the SCAG region. This alternative also assumes that goods movement to and from the ports make maximum utilization of existing and planned railroad capacity within the I-710 Corridor. Alternative 1 conditions are the bases against which the Build alternatives proposed for the I-710 Corridor Project will be assessed. The existing I-710 mainline generally consists of eight GP lanes north of I-405 and six GP lanes south of I-405.

Alternative 5A – Freeway Widening up to 10 GP Lanes

Alternative 5A proposes to widen the I-710 mainline to up to ten GP lanes (northbound [NB] I-710 and southbound [SB] I-710). This alternative will:

- Provide an updated design at the I-405 and State Route 91 (SR-91) interchanges (no improvements to the I-710/Interstate 5 [I-5] interchange are proposed under Alternative 5A);
- Reconfigure all local arterial interchanges within the project limits that may include realignment of on- and off-ramps, widening of on- and off-ramps, and reconfiguration of interchange geometry;
- Eliminate local ramp connections over I-710 (9th to 6th Street and 7th to 10th Street) in the City of Long Beach;

- Eliminate a local interchange at Wardlow Avenue in the City of Long Beach;
- Add a local street connection under I-710 to Thunderbird Villas at Miller Way in the City of South Gate;
- Add a local connection (bridge) over I-710 at Southern Avenue in the City of South Gate;
- Add a local arterial interchange at I-710/Slauson Avenue in the City of Maywood; and
- Shift the I-710 centerline at several locations to reduce right-of-way requirements.

Additionally, various structures such as freeway connectors, ramps, and local arterial overcrossings, structures over the Los Angeles River and structures over the two rail yards throughout the project limits will be replaced, widened, or added as part of Alternative 5A.

In addition to improvements to the I-710 mainline and the interchanges, Alternative 5A also includes Transportation Systems/Transportation Demand Management (TSM/TDM), Transit, and Intelligent Transportation Systems (ITS) improvements. TSM improvements include provision of or future provision of ramp metering at all locations and the addition of improved arterial signage for access to I-710. Parking restrictions during peak periods (7:00 a.m.–9:00 a.m.; 4:00 p.m.–7:00 p.m.) will be implemented on four arterial roadways: Atlantic Boulevard between Pacific Coast Highway and SR-60; Cherry Avenue/Garfield Avenue between Pacific Coast Highway and SR-60; Eastern Avenue between Cherry Avenue and Atlantic Boulevard; and Long Beach Boulevard between San Antonio Drive and Firestone Boulevard. **Figure 6-1** shows the extent of the proposed peak period parking restrictions on the four arterial roadways described above.

Transit improvements that will be provided as part of the I-710 Corridor Project include increased service on all Metro Rapid routes and local bus routes in the study area. ITS improvements include updated fiber-optic communications to interconnect traffic signals along major arterial streets to provide for continuous, real-time adjustment of signal timing to improve traffic flow as well as other technology improvements.

Alternative 5A also includes improvements to 42 (presented and described in the Traffic Impact Analysis Report) local arterial intersections within the I-710 Corridor Project study area (based on congestion relief improvements analysis). These improvements generally consist of lane restriping or minimal widening to provide additional intersection turn lanes that will reduce traffic delay and improve intersection operations for those intersections with projected LOS F under the No Build Alternative.

K:\2011\I-710\TOAR\Fig 6-1 Peak Parking Restrictions.ai



LEGEND/LOCATIONS

Peak Period Parking Restrictions

Atlantic Ave./Atlantic Blvd. (PCH to SR-60)

Cherry Ave./Garfield Ave. (PCH to SR-60)

Eastern Ave. (Cherry Ave. to Atlantic Blvd.)

Long Beach Blvd. (San Antonio Dr. to Firestone Blvd.)

In addition to the transportation system improvements described above, Alternative 5A also includes:

- **Aesthetic Enhancements:** Landscaping and irrigation systems would be provided within the corridor where feasible. Urban design and aesthetic treatment concepts for community enhancement will be integrated into the design of the I-710 Corridor Project. These concepts will highlight unique community identities within a unified overall corridor theme; strengthen physical connections and access/mobility within and between communities; and implement new technologies and best practices to ensure maximum respect for the environment and natural resources. They will continue to evolve and be refined through future phases of project development.
- **Drainage/Water Quality Features:** Alternative 5A includes modifications to the Los Angeles River levee; new, extended, replacement, and additional bents and pier walls in the Los Angeles River; additional and extended bents and pier walls in the Compton Channel; modifications to existing pump stations or provision of additional pump stations; and detention basins and bioswales that will provide for treatment of surface water runoff prior to discharge into the storm drain system.

Alternative 6A – 10 GP Lanes plus a Four-Lane Freight Corridor

Alternative 6A includes all of the components of Alternatives 1 and 5A described above (the alignment of the GP lanes in Alternative 6A will be somewhat different from Alternative 5A in a few locations). In addition, this alternative includes a separated four-lane freight corridor (FC) from Ocean Boulevard north to its terminus near the UP and BNSF rail yards in the City of Commerce. The FC would be built to Caltrans highway design standards and would be restricted to the exclusive use of heavy duty trucks (5+ axles). In Alternative 6A these trucks are assumed to be conventional trucks (conventional trucks are defined to be newer [post-2007] diesel/fossil-fueled trucks [new or retrofitted engines required per new regulations and standards]).

The FC would be both at-grade and on elevated structure with two lanes in each direction. There are exclusive, truck only ingress and egress ramps (as shown in **Figure 6-2**) to or from the FC at the following locations:

- Harbor Scenic Drive (NB ingress only)
- Ocean Boulevard (NB ingress only)
- Pico Avenue (NB ingress and SB egress only)
- Anaheim Street (NB ingress and SB egress only)
- SB I-710 GP lanes just south of Pacific Coast Highway (SB egress only)
- NB I-710 GP lanes north of I-405 at 208th Street (NB ingress only)
- SB I-710 GP lanes north of I-405 at 208th Street (SB egress only)

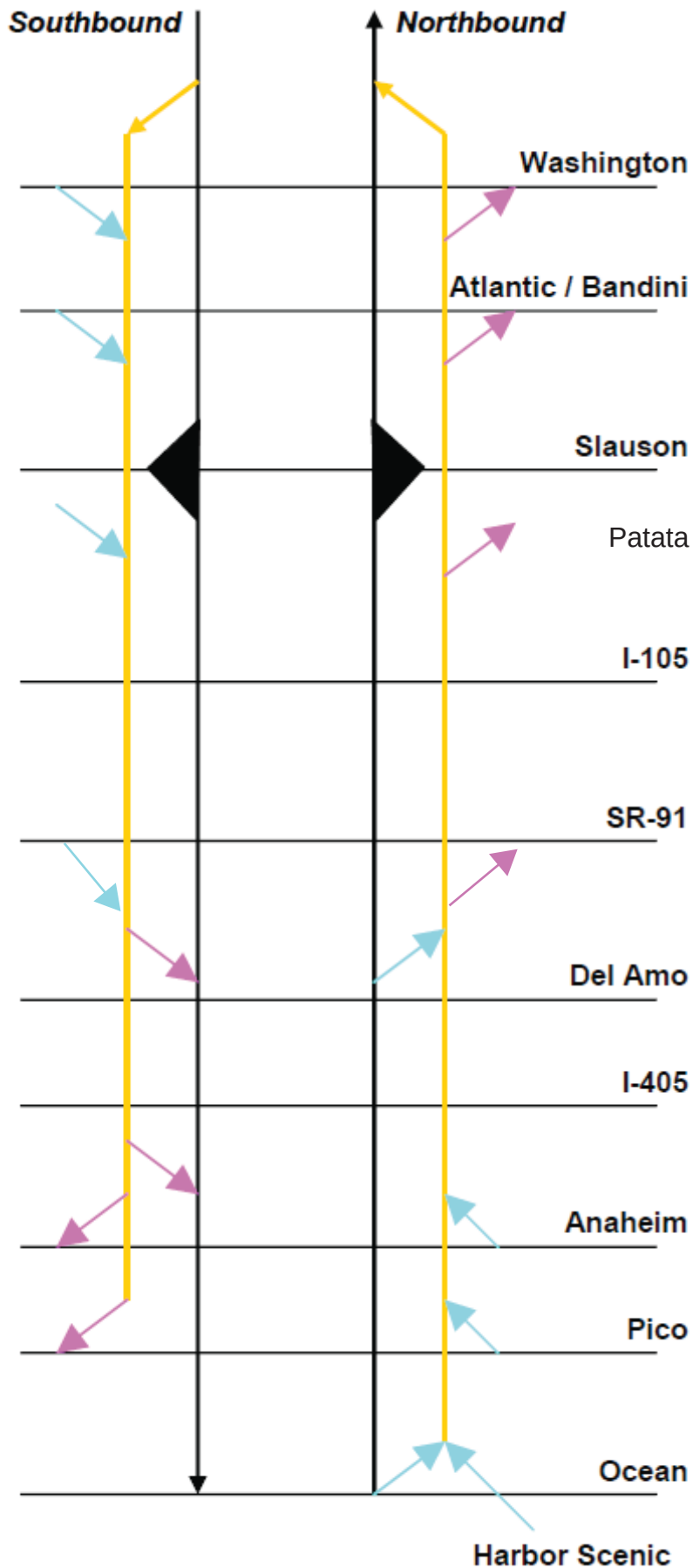
- Eastbound (EB) SR-91 (NB egress only)
- Westbound (WB) SR-91 (SB ingress only)
- Patata Street (NB egress and SB ingress only)
- SB I-710 GP lanes at Bandini Boulevard (SB ingress only)
- NB I-710 GP lanes at Bandini Boulevard (NB egress only)
- Washington Boulevard – (NB egress and SB ingress only) (Design Options 1 and 2)
- Washington Boulevard (NB egress and SB ingress via Indiana Avenue) (Design Option 3)
- Sheila Street – (NB egress only) (Design Option 3)

In addition to the FC feature, Alternative 6A includes:

- Partial modification to the I-5 interchange, notably the replacement of the NB I-710 to NB I-5 connector (right-side ramp replacement of left-side ramp) and a realigned SB I-5 to SB I-710 connector and 5 SB GP lanes from SR-60 to Washington Boulevard;
- 3 NB GP lanes from I-5 to SR-60;
- Retention of and modification to the I-710 SB on- and off-ramps at Eastern Avenue to slightly realign them;
- A local connection over I-710 at Patata Street in the cities of South Gate and Bell Gardens.

As with Alternative 5A, Alternative 6A will include additional aesthetic enhancements and drainage/water quality features as follows:

- **Aesthetic Enhancements:** In addition to the aesthetic enhancements described above for Alternative 5A, specific aesthetic treatments will be developed for the FC, including use of screen walls and masonry treatments on the FC structures.
- **Drainage/water quality features:** Alternative 6A includes features to capture and treat the additional surface water runoff from the FC, as well as some modifications to the Los Angeles River levees in order to accommodate electrical transmission line relocations.



Alternative 6B – 10 GP Lanes plus a Zero-Emissions Four-Lane Freight Corridor

Alternative 6B includes all of the components of Alternative 6A as described above, but would restrict the use of the FC to zero-emission trucks rather than conventional trucks. This proposed zero emission truck technology is assumed to consist of trucks powered by electric motors in lieu of internal combustion engines and producing zero tailpipe emissions while traveling on the FC. The specific type of electric motor is not defined, but feasible options include linear induction motors, linear synchronous motors or battery technology. The power systems for these electric propulsion trucks could include, but is not limited to, hybrid with dual-mode operation (ZEV Mode), Range Extender EV (Fuel Cell or Turbine with ZEV mode), Full EV (with fast charging or infrastructure power), road-connected power (e.g., overhead catenary electric power distribution system), alternative fuel hybrids, zero NOx dedicated fuel engines (CNG, RNG, H2 ICE), and range extender EV (turbine). For purposes of the I-710 environmental studies, the zero-emission electric trucks are assumed to receive electric power while traveling along the FC via an overhead catenary electric power distribution system (road-connected power).

Alternative 6B also includes the assumption that all trucks using the FC will have an automated control system that will steer, brake, and accelerate the trucks under computer control while traveling on the FC. This will safely allow for trucks to travel in “platoons” (e.g., groups of 6–8 trucks) and increase the capacity of the FC from a nominal 2,350 passenger car equivalents per lane per hour (pces/lh/hr) (as defined in Alternative 6A) to 3,000 pces/lh/hr in Alternative 6B.

The design of the FC will also allow for possible future conversion, or be initially constructed, as feasible (which may require additional environmental analysis and approval), of a fixed-track guideway family of alternative freight transport technologies (e.g., Maglev). However, this fixed-track family of technologies has been screened out of this analysis for the purposes of this study, as they have been determined to be inferior to electric trucks in terms of cost and ability to readily serve the multitude of freight origins and destinations served by trucks using the I-710 corridor.

Alternative 6C – 10 GP Lanes plus a Four-Lane Freight Corridor with Tolls

Alternative 6C includes all of the components of Alternative 6B as described above, but would toll trucks using the FC. Although tolling trucks in the FC could be done under either Alternative 6A or 6B; for analytical purposes, tolling has only been evaluated for Alternative 6B as this alternative provides for higher FC capacity than Alternative 6A due to the automated guidance feature of Alternative 6B.

Tolls would be collected using electronic transponders, which would require overhead sign bridges and transponder readers like the SR-91 toll lanes currently operating in Orange County. No cash toll lanes are provided on the FC. The toll pricing structure would provide for collection of higher tolls during peak travel periods.

6.2 DESIGN OPTIONS

For alternatives 6A, 6B, and 6C, three design options for the portion of I-710 between the I-710/Slauson Avenue interchange to just south of the I-710/I-5 interchange are under consideration. These configurations will be fully analyzed so that they can be considered in the future selection of a Preferred Alternative for the project. These options are as follows:

Design Option 1

Design Option 1 applies to Alternatives 6A, 6B and 6C and provides access to Washington Boulevard using three ramp intersections at Washington Boulevard.

Design Option 2

Design Option 2 applies to Alternatives 6A, 6B, and 6C and provides access from the NB FC to Washington Boulevard using two ramp intersections at Washington Boulevard.

Design Option 3

Design Option 3 applies only to Alternative 6B⁶ and removes access to Washington Boulevard at its current location. The ramps at the I-710/Washington Boulevard interchange would be removed to accommodate the proposed FC ramps in and out of the rail yards. The SB off-ramp and NB on-ramp access would be accommodated by Alternative 6B in the vicinity of the existing interchange by the proposed new SB off-ramp and NB on-ramp at Oak Street and Indiana Street. These two ramps are proposed as mixed-flow ramps (freight corridor ramps that would also allow automobile traffic). However, the SB on-ramp and NB off-ramp traffic that previously used the Washington Boulevard interchange would be required to access the Atlantic Boulevard /Bandini Boulevard interchange located south of the existing Washington Boulevard interchange to ultimately reach I-710.

6.3 2035 TRAFFIC FORECASTS

The I-710 Travel Demand Modeling Methodology Report dated February 26, 2010 presented detailed information about the processes and development of the future year 2035 forecast projections for each of the alternatives analyzed. The document presented a number of measures, including vehicle miles of travel, vehicular and truck (port and non-port) volumes on I-710, and screenline volumes within the corridor.

Table 6-1 to **Table 6-5** provide future year 2035 forecast bi-directional average daily traffic (ADT) volumes in passenger-car-equivalents (PCE) on the key I-710 freeway segments for Alternative 1, Alternative 5A, Alternative 6A, Alternative 6B and Alternative 6C, respectively. In addition, ADT volumes are graphically displayed on **Figure 6-3** through **Figure 6-7** for the five alternatives, respectively.

⁶ Design Option 3 only applies to Alternative 6B because it was not included in the travel demand modeling for either Alternative 6A or 6C.

As described in the I-710 Travel Demand Modeling Report, the ADT reported for the I-710 freeway are from the model post-processors. Total vehicle volumes for all vehicle classifications along the I-710 freeway are higher in Alternative 5A as compared to Alternative 1, and similarly the volumes presented in Alternatives 6A, 6B and 6C are higher than Alternative 5A. This is a direct result from the increased mainline I-710 capacity provided in Alternative 5A compared to Alternative 1 and the added capacity of Alternative 6A, 6B and 6C over Alternative 5A. Of the three Alternative 6 scenarios, Alternative 6B has the highest overall traffic volume, which is attributed to its added FC capacity. The toll imposed on the FC under Alternative 6C results in the lowest overall traffic volume between the three Alternative 6 scenarios.

Figure 6-8 graphically displays the truck volumes on the general purpose lanes for the five alternatives. As shown, the total truck volumes along the I-710 freeway are higher in Alternative 5A as compared to Alternative 1. This is a direct result of the increased mainline I-710 capacity provided in Alternative 5A compared to Alternative 1. In addition, the truck volumes presented in Alternatives 6A, 6B and 6C are lower than Alternative 5A. Again, this is a direct result from the addition of the FC provided in Alternatives 6A, 6B and 6C respectively. Of the Alternative 6 scenarios, Alternative 6B has the highest FC capacity and thus the lowest truck traffic on general purpose lanes south of Washington Boulevard. Although Alternative 6C has the same FC capacity as Alternative 6B, the FC toll imposition results in the highest truck traffic on the I-710 general purpose lanes south of Washington Boulevard.

The peak hour traffic volumes for each of the study alternatives are presented in greater detail in the succeeding sections of this document as part of the traffic operations analysis.

Table 6-1
2035 Alternative 1 Average Daily Traffic Volumes

I-710 Freeway		General Purpose Lanes		
Mainline Segment Description	Autos	Port Trucks	Non-Port Trucks	Total Truck %
North of SR-60	140,000	6,000	11,000	11%
Olympic Blvd to SR-60	123,000	6,000	10,000	12%
I-5 to Olympic Blvd	175,000	7,000	15,000	11%
Washington Blvd to I-5	208,000	9,000	17,000	11%
Washington Blvd Off Ramp to On Ramp	197,000	9,000	14,000	10%
Atlantic Blvd to Washington Blvd	208,000	12,000	16,000	12%
Atlantic Blvd Off Ramp to On Ramp	168,000	12,000	12,000	13%
Florence Ave to Atlantic Blvd	187,000	24,000	14,000	17%
Florence Ave Off Ramp to On Ramp	159,000	24,000	13,000	19%
Firestone Blvd to Florence Ave	192,000	25,000	14,000	17%
Firestone Blvd Off Ramp to On Ramp	162,000	25,000	12,000	19%
Imperial Hwy to Firestone Blvd	194,000	29,000	14,000	18%
Imperial Hwy Off Ramp to On Ramp	176,000	29,000	13,000	19%
I-105 to Imperial Hwy	168,000	30,000	11,000	20%
Rosecrans Ave to I-105	132,000	30,000	9,000	23%
Alondra Blvd to Rosecrans Ave	208,000	44,000	15,000	22%
Alondra Blvd Off Ramp to On Ramp	187,000	44,000	14,000	24%
SR-91 to Alondra Blvd	204,000	46,000	14,000	23%
SR-91 Off Ramp to On Ramp	101,000	44,000	8,000	34%
Long Beach Blvd to SR-91	164,000	62,000	12,000	31%
Del Amo Blvd to Long Beach Blvd	153,000	63,000	12,000	33%
I-405 to Del Amo Blvd	153,000	64,000	10,000	33%
Willow St to I-405	131,000	64,000	8,000	35%
Willow Off Ramp to On Ramp	120,000	64,000	8,000	38%
PCH to Willow St	114,000	64,000	8,000	39%
PCH Off Ramp to On Ramp	102,000	58,000	7,000	39%
Anaheim St to PCH	110,000	54,000	6,000	35%
Harbor Scenic Dr to Pico Ave	25,000	37,000	2,000	61%
South of Harbor Scenic Dr	12,000	19,000	1,000	63%

Note:

Average Daily Traffic Volumes are rounded to the nearest 1,000.

Table 6-2
2035 Alternative 5A Average Daily Traffic Volumes

I-710 Freeway		GP Lanes		
Mainline Segment Description	Autos	Port Trucks	Non-Port Trucks	Total Truck %
North of SR-60	154,000	7,000	13,000	11%
Olympic Blvd to SR-60	192,000	8,000	16,000	11%
I-5 to Olympic Blvd	234,000	9,000	19,000	11%
Washington Blvd to I-5	283,000	11,000	21,000	10%
Atlantic Blvd to Washington Blvd	276,000	11,000	19,000	10%
Slauson Ave to Atlantic Blvd	271,000	27,000	19,000	15%
Slauson Ave Off Ramp to On Ramp	236,000	27,000	17,000	16%
Florence Ave to Slauson Ave	256,000	28,000	18,000	15%
Florence Ave Off Ramp to On Ramp	236,000	28,000	17,000	16%
Firestone Blvd to Florence Ave	257,000	29,000	18,000	15%
Firestone Blvd Off Ramp to On Ramp	218,000	29,000	16,000	17%
Imperial Hwy to Firestone Blvd	248,000	33,000	17,000	17%
Imperial Hwy Off Ramp to On Ramp	217,000	33,000	15,000	18%
I-105 to Imperial Hwy	247,000	33,000	17,000	17%
Rosecrans Ave to I-105	171,000	33,000	11,000	20%
Alondra Blvd to Rosecrans Ave	246,000	48,000	17,000	21%
Alondra Blvd Off Ramp to On Ramp	196,000	48,000	14,000	24%
SR-91 to Alondra Blvd	163,000	49,000	11,000	27%
SR-91 Off Ramp to On Ramp	143,000	48,000	10,000	29%
Long Beach Blvd to SR-91	216,000	66,000	15,000	27%
Long Beach Blvd Off Ramp to On Ramp	193,000	66,000	13,000	29%
Del Amo Blvd to Long Beach Blvd	205,000	67,000	14,000	28%
Del Amo Off Ramp to On ramp	180,000	67,000	11,000	30%
I-405 to Del Amo Blvd	210,000	68,000	13,000	28%
I-405 Off Ramps to On ramp	106,000	62,000	6,000	39%
Willow St to I-405	170,000	68,000	9,000	31%
Willow St Off Ramp to On Ramp	127,000	68,000	9,000	38%
PCH to Willow St	141,000	68,000	9,000	35%
Anaheim St to PCH	116,000	57,000	6,000	35%
Harbor Scenic Dr to Pico Ave	31,000	40,000	2,000	58%
South of Harbor Scenic Dr	14,000	20,000	1,000	60%

Note:

Average Daily Traffic Volumes are rounded to the nearest 1,000.

Table 6-3
2035 Alternative 6A Average Daily Traffic Volumes

I-710 Freeway	General Purpose Lanes				Freight Corridor	
Mainline Segment Description	Auto	Port Trucks	Non-Port Trucks	Total Truck %	Port Trucks	Non-Port Trucks
North of SR-60	146,000	14,000	12,000	15%	-	-
Olympic Blvd to SR-60	226,000	23,000	21,000	16%	-	-
I-5 to Olympic Blvd	193,000	23,000	17,000	17%	-	-
Washington Blvd to I-5	179,000	23,000	14,000	17%	-	-
FC Ramps to Bandini Ramps	233,000	26,000	19,000	16%	10,000	3,000
Slauson Ave to FC Ramps	233,000	5,000	13,000	7%	31,000	8,000
Slauson Ave Off Ramp to On Ramp	238,000	6,000	14,000	8%	31,000	8,000
Florence Ave to Slauson Ave	267,000	8,000	16,000	8%	31,000	8,000
Florence Ave Off Ramp to On Ramp	250,000	7,000	15,000	8%	31,000	8,000
Firestone Blvd to Florence Ave	274,000	8,000	16,000	8%	31,000	8,000
Firestone Blvd Off Ramp to On Ramp	243,000	8,000	14,000	8%	33,000	9,000
Imperial Hwy to Firestone Blvd	271,000	8,000	15,000	8%	36,000	9,000
Imperial Hwy Off Ramp to On Ramp	245,000	8,000	14,000	8%	36,000	9,000
I-105 to Imperial Hwy	282,000	9,000	15,000	8%	36,000	9,000
I-105 Off Ramp to On Ramp	195,000	9,000	11,000	9%	36,000	9,000
Alondra Blvd to Rosecrans Ave	283,000	17,000	16,000	10%	36,000	9,000
SR-91 to Alondra Blvd	258,000	17,000	15,000	11%	36,000	9,000
Long Beach Blvd to SR-91	236,000	25,000	13,000	14%	44,000	10,000
Long Beach Blvd Off Ramp to On Ramp	211,000	25,000	12,000	15%	44,000	10,000
Del Amo Blvd to Long Beach Blvd	222,000	26,000	12,000	15%	44,000	10,000
Del Amo Blvd Off Ramp to On Ramp	193,000	26,000	9,000	15%	44,000	10,000
FC Ramps to Del Amo Blvd	224,000	28,000	11,000	15%	42,000	9,000
I-405 to FC Ramps	224,000	30,000	17,000	17%	42,000	4,000
I-405 Off Ramp to On Ramp	128,000	28,000	5,000	20%	42,000	4,000
Willow St to I-405	185,000	32,000	8,000	18%	42,000	4,000
Willow St Off Ramp to On Ramp	146,000	29,000	7,000	20%	42,000	4,000
PCH to Willow St	160,000	29,000	7,000	18%	42,000	4,000
Anaheim St to PCH St	132,000	20,000	5,000	16%	42,000	4,000
Harbor Scenic Dr to Anaheim St	32,000	24,000	2,000	45%	24,000	2,000
South of Harbor Scenic Dr	13,000	10,000	1,000	46%	19,000	1,000

Note:
Average Daily Traffic Volumes are rounded to the nearest 1,000.

Table 6-4
2035 Alternative 6B Average Daily Traffic Volumes

I-710 Freeway	General Purpose Lanes				Freight Corridor	
Mainline Segment Description	Auto	Port Trucks	Non-Port Trucks	Total Truck %	Port Trucks	Non-Port Trucks
North of SR-60	145,000	14,000	13,000	16%	-	-
Olympic Blvd to SR-60	224,000	23,000	21,000	16%	-	-
I-5 to Olympic Blvd	191,000	24,000	18,000	18%	-	-
Washington Blvd to I-5	177,000	24,000	14,000	18%	-	-
FC Ramps to Bandini Ramps	232,000	26,000	20,000	17%	10,000	3,000
Slauson Ave to FC Ramps	232,000	3,000	13,000	6%	34,000	9,000
Slauson Ave Off Ramp to On Ramp	237,000	4,000	14,000	7%	34,000	9,000
Florence Ave to Slauson Ave	266,000	5,000	16,000	7%	34,000	9,000
Florence Ave Off Ramp to On Ramp	249,000	5,000	15,000	7%	34,000	9,000
Firestone Blvd to Florence Ave	273,000	5,000	16,000	7%	34,000	9,000
Firestone Blvd Off Ramp to On Ramp	242,000	5,000	14,000	7%	36,000	9,000
Imperial Hwy to Firestone Blvd	271,000	6,000	15,000	7%	39,000	10,000
Imperial Hwy Off Ramp to On Ramp	245,000	6,000	14,000	8%	39,000	10,000
I-105 to Imperial Hwy	282,000	7,000	15,000	7%	39,000	10,000
I-105 Off Ramp to On Ramp	195,000	7,000	11,000	8%	39,000	10,000
Alondra Blvd to Rosecrans Ave	283,000	14,000	17,000	10%	39,000	10,000
SR-91 to Alondra Blvd	258,000	14,000	15,000	10%	39,000	10,000
Long Beach Blvd to SR-91	236,000	22,000	13,000	13%	48,000	11,000
Long Beach Blvd Off Ramp to On Ramp	212,000	22,000	12,000	14%	48,000	11,000
Del Amo Blvd to Long Beach Blvd	223,000	23,000	12,000	14%	48,000	11,000
Del Amo Blvd Off Ramp to On Ramp	193,000	23,000	10,000	15%	48,000	11,000
FC Ramps to Del Amo Blvd	224,000	25,000	11,000	14%	46,000	9,000
I-405 to FC Ramps	224,000	27,000	18,000	17%	46,000	4,000
I-405 Off Ramp to On Ramp	129,000	25,000	5,000	19%	46,000	4,000
Willow St to I-405	186,000	29,000	8,000	17%	46,000	4,000
Willow St Off Ramp to On Ramp	146,000	26,000	7,000	18%	46,000	4,000
PCH to Willow St	161,000	26,000	7,000	17%	46,000	4,000
Anaheim St to PCH St	132,000	17,000	5,000	14%	46,000	4,000
Harbor Scenic Dr to Anaheim St	32,000	21,000	2,000	42%	27,000	2,000
South of Harbor Scenic Dr	13,000	8,000	1,000	41%	22,000	1,000

Note:
Average Daily Traffic Volumes are rounded to the nearest 1,000.

Table 6-5
2035 Alternative 6C Average Daily Traffic Volumes

I-710 Freeway	General Purpose Lanes				Freight Corridor	
Mainline Segment Description	Auto	Port Trucks	Non-Port Trucks	Total Truck %	Port Trucks	Non-Port Trucks
North of SR-60	148,000	12,000	12,000	14%	-	-
Olympic Blvd to SR-60	229,000	20,000	20,000	15%	-	-
I-5 to Olympic Blvd	195,000	20,000	16,000	16%	-	-
Washington Blvd to I-5	181,000	20,000	13,000	15%	-	-
FC Ramps to Bandini Ramps	235,000	22,000	18,000	15%	9,000	2,000
Slauson Ave to FC Ramps	235,000	4,000	14,000	7%	27,000	6,000
Slauson Ave Off Ramp to On Ramp	239,000	5,000	14,000	7%	27,000	6,000
Florence Ave to Slauson Ave	267,000	8,000	16,000	8%	27,000	6,000
Florence Ave Off Ramp to On Ramp	250,000	8,000	15,000	8%	27,000	6,000
Firestone Blvd to Florence Ave	273,000	8,000	16,000	8%	27,000	6,000
Firestone Blvd Off Ramp to On Ramp	243,000	8,000	14,000	8%	29,000	7,000
Imperial Hwy to Firestone Blvd	271,000	10,000	15,000	8%	31,000	7,000
Imperial Hwy Off Ramp to On Ramp	245,000	10,000	14,000	9%	31,000	7,000
I-105 to Imperial Hwy	282,000	10,000	15,000	8%	31,000	7,000
I-105 Off Ramp to On Ramp	195,000	10,000	11,000	10%	31,000	7,000
Alondra Blvd to Rosecrans Ave	281,000	20,000	16,000	11%	31,000	7,000
SR-91 to Alondra Blvd	256,000	20,000	15,000	12%	31,000	7,000
Long Beach Blvd to SR-91	232,000	30,000	13,000	16%	37,000	8,000
Long Beach Blvd Off Ramp to On Ramp	208,000	30,000	12,000	17%	37,000	8,000
Del Amo Blvd to Long Beach Blvd	221,000	31,000	12,000	16%	37,000	8,000
Del Amo Blvd Off Ramp to On Ramp	193,000	31,000	9,000	17%	37,000	8,000
FC Ramps to Del Amo Blvd	223,000	33,000	11,000	16%	34,000	6,000
I-405 to FC Ramps	223,000	36,000	16,000	19%	34,000	2,000
I-405 Off Ramp to On Ramp	127,000	34,000	5,000	23%	34,000	2,000
Willow St to I-405	184,000	38,000	8,000	20%	34,000	2,000
Willow St Off Ramp to On Ramp	140,000	35,000	7,000	23%	34,000	2,000
PCH to Willow St	157,000	35,000	7,000	21%	34,000	2,000
Anaheim St to PCH St	131,000	25,000	5,000	19%	34,000	2,000
Harbor Scenic Dr to Anaheim St	33,000	25,000	2,000	45%	19,000	1,000
South of Harbor Scenic Dr	15,000	10,000	1,000	42%	14,000	1,000

Note:
Average Daily Traffic Volumes are rounded to the nearest 1,000.

This page intentionally left blank.



NOT TO SCALE

LEGEND

Autos: 200,000
Port Trucks: 15,000
Non-Port Trucks: 10,000

Note: Volumes are rounded to the nearest 1,000



K:\2011\I-710\TOAR\ALT 1\Fig 6-3 Alt 1-Daily Vol.ai



NOT TO SCALE

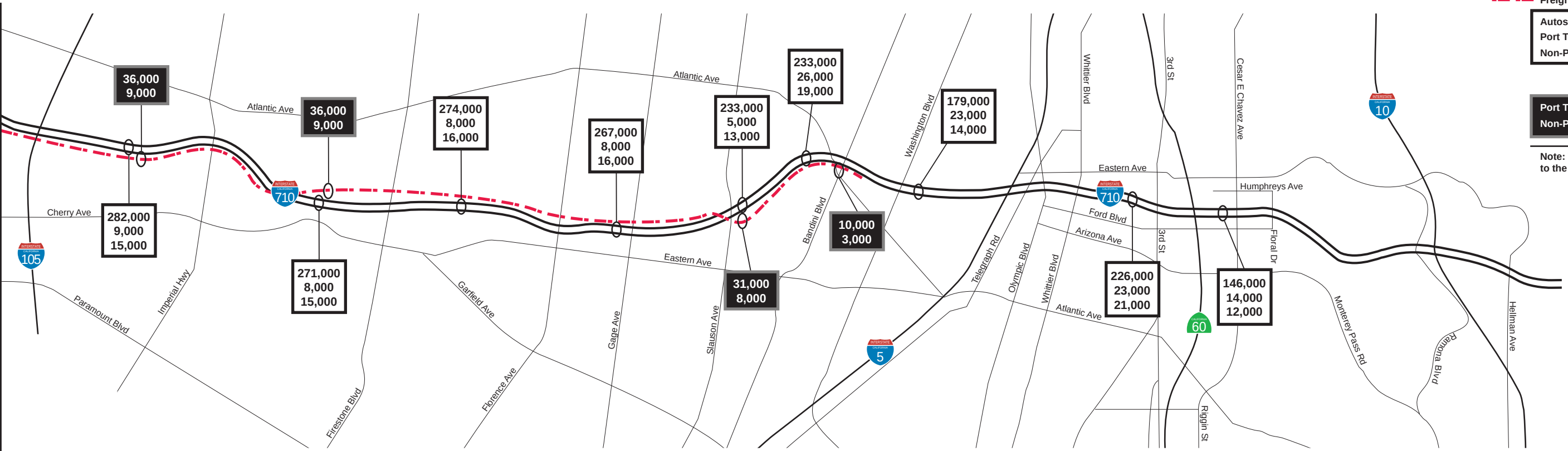
LEGEND

Autos: 200,000
Port Trucks: 15,000
Non-Port Trucks: 10,000

Note: Volumes are rounded to the nearest 1,000

K:\2011\I-710\TOAR\ALT 5A\Fig 6-4 Alt 5A-Daily Vol. ai





LEGEND

--- Freight Corridor

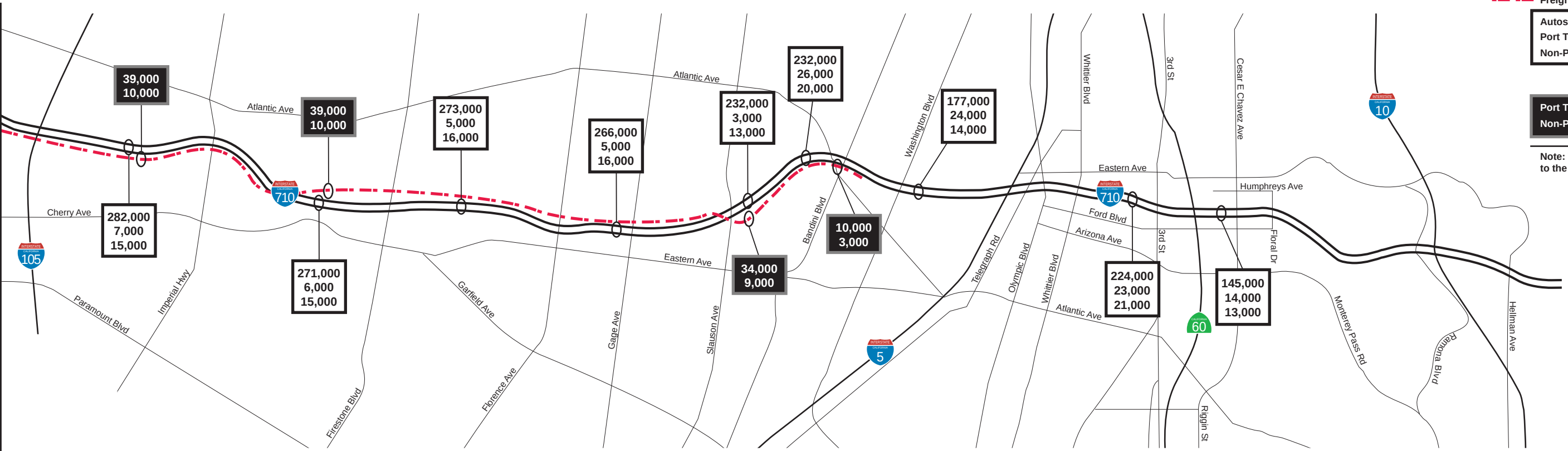
Autos: 200,000
Port Trucks: 15,000
Non-Port Trucks: 10,000

Port Trucks: 15,000
Non-Port Trucks: 10,000

Note: Volumes are rounded to the nearest 1,000



NOT TO SCALE



LEGEND

--- Freight Corridor

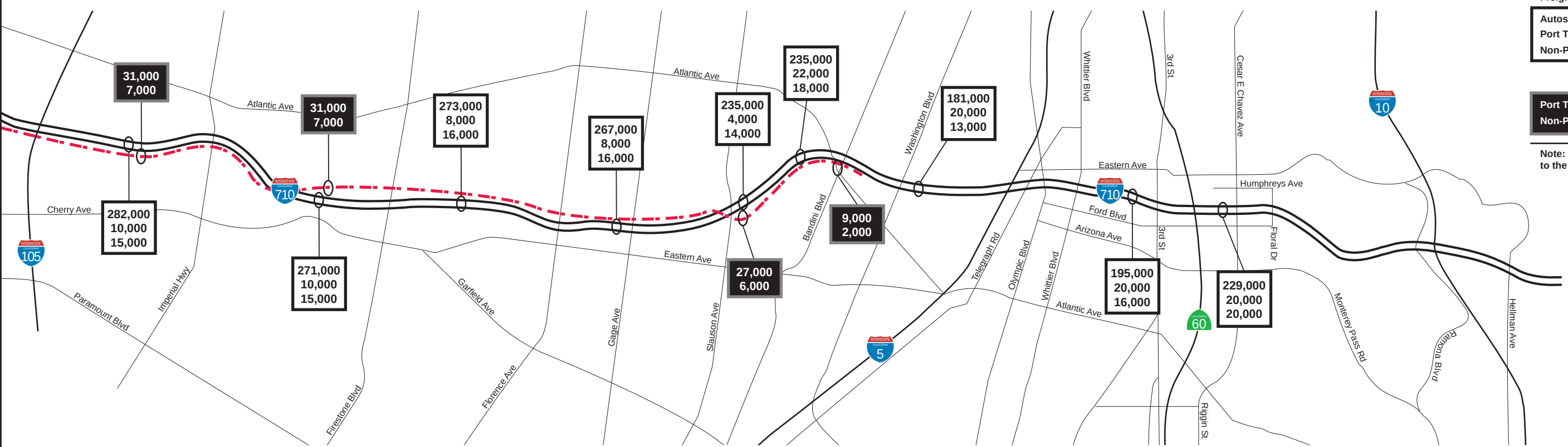
Autos: 200,000
Port Trucks: 15,000
Non-Port Trucks: 10,000

Port Trucks: 15,000
Non-Port Trucks: 10,000

Note: Volumes are rounded to the nearest 1,000



NOT TO SCALE



LEGEND

--- Freight Corridor

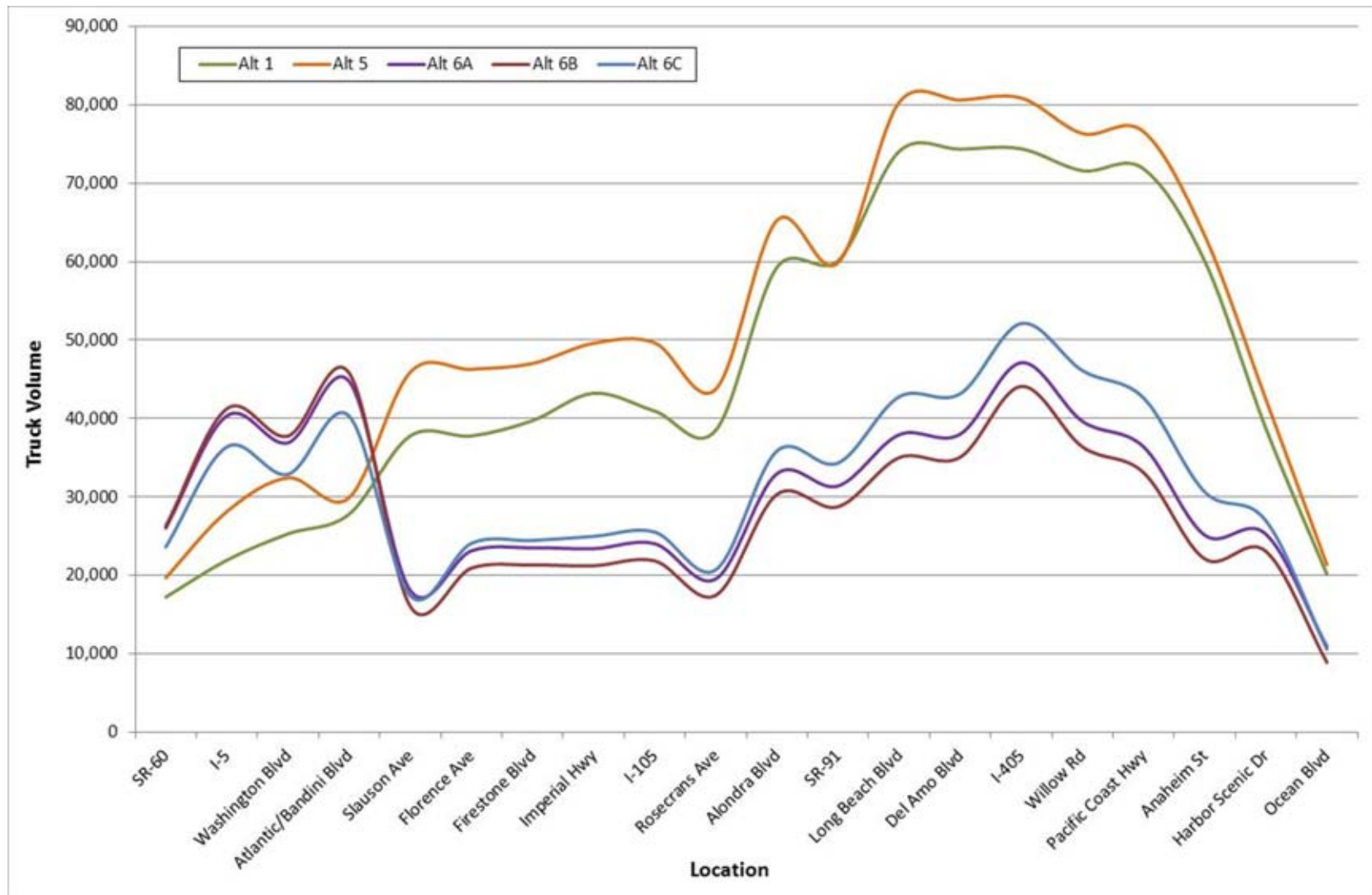
Autos: 200,000
Port Trucks: 15,000
Non-Port Trucks: 10,000

Port Trucks: 15,000
Non-Port Trucks: 10,000

Note: Volumes are rounded to the nearest 1,000



Figure 6-8
2035 I-710 General Purpose Lane Truck Volumes



This page intentionally left blank.

7.0 FUTURE YEAR 2035 OPERATIONS ANALYSIS

This section provides the 2035 Alternative 1 (No Build) and Future Year 2035 Build conditions of the I-710 freeway operations analysis. The following facilities were evaluated for the morning, midday and evening peak hours:

- Freeway mainline (basic segments);
- Critical weaving areas;
- Major merge and diverge areas;
- On- and off-ramp locations.

The supporting operational analysis worksheets for the I-710 freeway analysis under Future Year (2035) conditions are contained in **Appendix E** and the results of the analysis are depicted on the Freeway Operations Schematic Diagrams included in **Appendix G**.

The Freeway Operations Schematic Diagrams include the freeway mainline geometrics, peak hour volumes, truck percentages, and peak hour LOS on the I-710 freeway. It must be noted that the major merge locations illustrate volume to capacity (V/C) ratios in place of peak hour LOS according to the applicable *HCM* special cases described in **Section 4.0**. Where the values are denoted as N/A, these junctions are part of a comprehensive analysis segment (such as a weaving segment) and are not analyzed separately.

7.1 FUTURE YEAR 2035 ALTERNATIVE 1 (NO BUILD) TRAFFIC ANALYSIS

7.1.1 I-710 Freeway Segments

Table 7-1 and **Table 7-2** show the LOS for the various segments of I-710 under Alternative 1 (No Build) conditions.

Table 7-1
I-710 Northbound 2035 Peak Hour Alternative 1 (No Build) Level of Service

Location Description	Freeway Type	Lane		AM		PM		MD	
		ML	Ramp	Density / VIC ¹	LOS	Density / VIC ¹	LOS	Density / VIC ¹	LOS
North of SR-60 On (4 Lanes)	Basic	4	--	25.1	C	33.1	D	28.7	D
North of SR-60 On (5 Lanes)	Basic	5	--	20.1	C	26.5	D	22.9	C
SR-60	Major On ²	3	2	0.47	N/A	0.62	N/A	0.54	N/A
--	Basic	3	--	28.6	D	36.1	E	31.2	D
New York	Off	3	1	30.5	D	38.3	E	30.0	D
--	Basic	3	--	31.5	D	42.3	E	35.0	E
Ford	On	3	1	30.8	D	--*	F	34.8	D
--	Basic	3	--	29.6	D	37.8	E	34.1	D
S. Ford	Off ⁴	4	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	4	--	22.9	C	30.3	D	26.1	D
SR-60	Off	5	2	N/A	N/A	N/A	N/A	N/A	N/A

Table 7-1
I-710 Northbound 2035 Peak Hour Alternative 1 (No Build) Level of Service

Location Description	Freeway Type	Lane		AM		PM		MD	
		ML	Ramp	Density / VIC ¹	LOS	Density / VIC ¹	LOS	Density / VIC ¹	LOS
Olympic On / SR-60 Off	Weave B	5	--	43.5	F	49.3	F	45.2	F
Olympic	On	4	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	4	--	33.4	D	44.2	E	36.5	E
I-5 NB	On ⁴	3	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	3	--	33.6	D	42.4	E	39.5	E
Olympic	Off	3	1	33.4	D	37.4	E	36.2	E
--	Basic	3	--	37.7	E	--*	F	--*	F
I-5 NB	Major Off ³	5	2	32.2	D	--*	F	35.4	E
--	Basic	5	--	33.5	D	34.3	D	37.5	E
Washington	On	5	1	22.4	C	22.5	C	26.2	C
--	Basic	5	--	31.9	D	31.6	D	38.0	E
Washington	Off	5	1	34.9	D	34.8	D	40.2	E
--	Basic	5	--	34.6	D	34.4	D	43.4	E
Atlantic	On	5	1	22.5	C	22.6	C	24.5	C
--	Basic	5	--	29.6	D	28.1	D	32.8	D
Atlantic SB	Off	5	1	38.5	E	31.9	D	38.7	E
--	Basic	5	--	34.9	D	30.9	D	37.5	E
Atlantic NB	Off	4	2	--*	F	--*	F	--*	F
--	Basic	4	--	--*	F	--*	F	--*	F
Florence	On	4	1	--*	F	--*	F	--*	F
--	Basic	4	--	--*	F	37.0	E	--*	F
Florence EB On / Florence WB Off	Weave A ⁵	2	--	23.3	B	21.3	B	19.3	B
Florence	Off	4	1	--*	F	--*	F	--*	F
--	Basic	4	--	--*	F	--*	F	--*	F
Firestone	On	4	1	--*	F	26.3	C	--*	F
--	Basic	4	--	42.7	E	36.7	E	--*	F
Firestone	Off	4	1	--*	F	--*	F	--*	F
--	Basic	4	--	--*	F	--*	F	--*	F
Imperial	On	4	1	--*	F	--*	F	--*	F
--	Basic	4	--	41.1	E	43.9	E	--*	F
Imperial EB On / Imperial WB Off	Weave A ⁵	2	--	16.8	B	29.9	C	14.8	B
Imperial	Off	5	1	N/A	N/A	N/A	N/A	N/A	N/A
I-105 On / Imperial Off	Weave A	5	--	48.6	F	53.0	F	61.3	F
I-105	On	4	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	4	--	31.2	D	34.9	D	--*	F
Rosecrans	On	4	1	22.5	C	24.7	C	28.7	D
--	Basic	4	--	24.4	C	27.9	D	36.6	E
I-105	Major Off ³	7	3	22.7	C	25.3	C	30.9	D
--	Basic	6	--	27.5	D	30.7	D	38.5	E
Rosecrans	Off	6	1	32.5	D	37.3	E	40.5	E
--	Basic	6	--	30.3	D	34.6	D	42.9	E
Alondra	On ⁴	5	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	5	--	33.2	D	40.2	E	--*	F

Table 7-1
I-710 Northbound 2035 Peak Hour Alternative 1 (No Build) Level of Service

Location Description	Freeway Type	Lane		AM		PM		MD	
		ML	Ramp	Density / VIC ¹	LOS	Density / VIC ¹	LOS	Density / VIC ¹	LOS
Alondra	Off	6	1	N/A	N/A	N/A	N/A	N/A	N/A
SR-91 On / Alondra Off	Weave C	6	--	31.3	D	35.8	E	41.7	E
SR-91	On	5	2	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	5	--	29.7	D	36.1	E	--*	F
SR-91 EB	On ⁴	4	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	3	--	39.3	E	--*	F	--*	F
SR-91 WB	Off ⁴	4	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	4	--	31.9	D	34.4	D	--*	F
Artesia & SR-91 EB	Off	6	2	N/A	N/A	N/A	N/A	N/A	N/A
Long Beach On / SR-91EB & Artesia Off	Weave C	6	--	34.1	D	33.9	D	37.3	E
Long Beach	On	5	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	5	--	31.7	D	34.0	D	42.7	E
Long Beach	Off	5	1	33.7	D	33.7	D	38.5	E
--	Basic	5	--	34.1	D	35.2	E	44.8	E
Del Amo WB	On ⁴	4	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	4	--	44.1	E	--*	F	--*	F
Del Amo WB	Off	5	1	N/A	N/A	N/A	N/A	N/A	N/A
Del Amo EB On / Del Amo WB Off	Weave A	5	--	43.5	F	46.6	F	56.9	F
Del Amo EB	On	4	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	4	--	--*	F	44.5	E	--*	F
Del Amo EB	Off	4	1	--*	F	--*	F	--*	F
--	Basic	4	--	--*	F	--*	F	--*	F
I-405 SB	Major On ²	3	2	1.05	N/A	1.08	N/A	1.25	N/A
--	Basic	3	--	--*	F	--	F	--*	F
Wardlow & I-405 NB	On	3	1	--*	F	40.6	F	--*	F
--	Basic	3	--	36.2	E	33.3	D	--*	F
Wardlow On / I-405 NB Off	Weave C ⁵	3	--	31.1	C	22.5	B	34.8	D
Wardlow On / I-405 SB Off	Weave A ⁵	3	--	41.9	F	27.9	C	31.9	C
I-405	Major Off ³	4	2	38.8	E	34.5	D	--*	F
--	Basic	3	--	--*	F	--*	F	--*	F
Willow WB	On	3	1	--*	F	--*	F	--*	F
--	Basic	3	--	--*	F	--*	F	--*	F
Willow WB	Off	4	1	N/A	N/A	N/A	N/A	N/A	N/A
Willow EB On / Willow WB Off	Weave A	4	--	54.0	F	46.6	F	65.9	F
Willow EB	On	3	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	3	--	--*	F	--*	F	--*	F
Willow EB	Off	3	1	--*	F	--*	F	--*	F
--	Basic	3	--	--*	F	--*	F	--*	F
PCH NB	On	3	1	--*	F	--*	F	--*	F
--	Basic	3	--	--*	F	--*	F	--*	F
PCH NB	Off	4	1	N/A	N/A	N/A	N/A	N/A	N/A
PCH SB On / PCH NB Off	Weave A	4	--	62.3	F	48.6	F	78.6	F
PCH SB	On	3	1	N/A	N/A	N/A	N/A	N/A	N/A

Table 7-1
I-710 Northbound 2035 Peak Hour Alternative 1 (No Build) Level of Service

Location Description	Freeway Type	Lane		AM		PM		MD	
		ML	Ramp	Density / VIC ¹	LOS	Density / VIC ¹	LOS	Density / VIC ¹	LOS
--	Basic	3	--	--*	F	39.9	E	--*	F
PCH SB	Off	4	1	N/A	N/A	N/A	N/A	N/A	N/A
Anaheim WB On / PCH SB Off	Weave B	4	--	38.1	E	35.1	E	37.5	E
Anaheim WB	On	4	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	4	--	32.3	D	30.1	D	33.6	D
Anaheim WB	Off	5	1	N/A	N/A	N/A	N/A	N/A	N/A
Anaheim EB On / Anaheim WB Off	Weave A	5	--	33.5	D	32.5	D	41.6	E
Anaheim EB	On	4	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	4	--	30.7	D	29.6	D	29.9	D
7th & 3rd & Shoreline	Major On ²	2	2	0.76	N/A	0.72	N/A	0.73	N/A
--	Basic	2	--	29.7	D	35.1	E	41.6	E
Anaheim EB	Off	3	1	N/A	N/A	N/A	N/A	N/A	N/A
9th & Pier B & Pico On/ Anaheim EB Off	Weave B	3	--	23.1	C	30.5	D	30.5	D
9th & Pier B & Pico	On	3	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	3	--	19.8	C	21.9	C	22.7	C
Harbor Scenic	On ⁴	2	1	N/A	N/A	N/A	N/A	N/A	N/A
South of Harbor Scenic On	Basic	2	--	19.4	C	23.5	C	13.9	B

Notes:

¹ Density = passenger car/mile/lane; v/c = volume-to-capacity ratio. Shaded and bold cells indicate LOS E or F.² Major merge area; HCM methodology applied for analysis.³ Major diverge area; HCM methodology applied for analysis.⁴ Single-lane addition/drop; HCM methodology applied for analysis.⁵ Operation occurs on freeway collector/distributor.

N/A = not applicable. LOS and/or density information are not shown for major merge areas, single-lane addition/drop, and merge/diverge operations within a weaving segment.

* = Demand exceeds capacity, no density is predicted.

Table 7-2
I-710 Southbound 2035 Peak Hour Alternative 1 (No Build) Level of Service

Location Description	Freeway Type	Lane		AM		PM		MD	
		ML	Ramp	Density / VIC ¹	LOS	Density / VIC ¹	LOS	Density / VIC ¹	LOS
North of Caesar Chavez On	Basic	3	--	31.3	D	26.1	D	25.6	C
Caesar Chavez	On	3	1	29.6	D	25.9	C	26.1	C
--	Basic	3	--	35.9	E	29.4	D	29.1	D
Third	On	3	1	N/A	N/A	N/A	N/A	N/A	N/A
Third On / Eagle & Humphreys Off	Weave A	4	--	32.6	D	27.1	C	26.3	C
Eagle & Humphreys	Off	4	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	3	--	35.0	D	28.4	D	28.4	D
SR-60	On	3	1	N/A	N/A	N/A	N/A	N/A	N/A
SR-60 On / Eastern & Whittier & Olympic Off	Weave A	5	--	46.9	F	52.9	F	39.3	E
Eastern & Whittier & Olympic	Off	5	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	4	--	39.3	E	38.7	E	31.8	D

Table 7-2
I-710 Southbound 2035 Peak Hour Alternative 1 (No Build) Level of Service

Location Description	Freeway Type	Lane		AM		PM		MD	
		ML	Ramp	Density / VIC ¹	LOS	Density / VIC ¹	LOS	Density / VIC ¹	LOS
I-5 SB	Off ⁴	4	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	3	--	37.4	E	32.7	D	30.7	D
Eastern	On	3	1	35.2	E	32.4	D	30.2	D
--	Basic	3	--	43.2	E	36.3	E	34	D
I-5 SB	Major On ²	3	2	0.80	N/A	0.74	N/A	0.73	N/A
--	Basic	5	--	34.0	D	31.5	D	30.9	D
Washington	Off	5	1	35.0	E	32.1	D	33.0	D
--	Basic	5	--	32.2	D	30.4	D	30.5	D
Washington	On	5	1	N/A	N/A	N/A	N/A	N/A	N/A
Washington On / Atlantic Off	Weave B	5	--	40.4	E	38.3	E	38.6	E
Atlantic	Off	5	2	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	4	--	32.2	D	36.6	E	35.0	E
Atlantic SB	On	4	1	25.1	C	26.7	C	26.0	C
--	Basic	4	--	36.9	E	43.4	E	42.4	E
Atlantic NB	On	4	1	27.0	C	--*	F	28.8	F
--	Basic	4	--	40.2	E	--*	F	--	F
Florence	Off	4	1	40.0	E	--*	F	43.9	F
Florence WB On / Florence EB Off	Weave A ⁵	2	--	30.8	C	--*	F	38.1	E
--	Basic	4	--	33.4	D	41.4	E	39.0	E
Florence	On	4	1	25.5	F	--*	F	26.7	F
--	Basic	4	--	--*	F	--*	F	--*	F
Firestone	Off	4	1	41.7	F	--*	F	47.7	F
--	Basic	4	--	38.6	E	--*	E	--*	F
Firestone	On	4	1	26.7	F	--*	F	28.4	F
--	Basic	4	--	--*	F	--*	F	--*	F
Wright	Off	4	1	43.3	F	--*	F	45.0	F
--	Basic	4	--	--*	F	--*	F	--*	F
Imperial EB	Off	4	1	41.8	F	--*	F	42.9	F
Imperial WB On / Imperial EB Off	Weave A ⁵	2	--	41.3	F	28.6	C	9.1	A
--	Basic	4	--	--*	F	--*	F	--*	F
Imperial	On	4	1	N/A	N/A	N/A	N/A	N/A	N/A
Imperial On / MLK Off	Weave B	5	--	49.3	F	46.7	F	47.8	F
MLK	Off	5	1	N/A	N/A	N/A	N/A	N/A	N/A
Imperial On / I-105 Off	Weave B	5	--	47.4	F	45.9	F	45.9	F
I-105	Off	5	2	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	4	--	38.4	E	34.3	D	35.2	E
Rosecrans	Off	4	1	36.3	E	34.5	D	33.4	D
MLK On / Rosecrans Off	Weave A ⁵	2	--	21.7	B	18.7	B	10.3	A
--	Basic	4	--	35.0	D	31.0	D	33.6	D
MLK	On	4	1	26.0	C	23.7	C	25.3	C
--	Basic	4	--	39.0	E	32.8	D	35.2	E
I-105	Major On ²	4	2	0.84	N/A	0.69	N/A	0.78	N/A
--	Basic	6	--	34.7	D	28.2	D	32.0	D

Table 7-2
I-710 Southbound 2035 Peak Hour Alternative 1 (No Build) Level of Service

Location Description	Freeway Type	Lane		AM		PM		MD	
		ML	Ramp	Density / VIC ¹	LOS	Density / VIC ¹	LOS	Density / VIC ¹	LOS
Rosecrans WB	On	6	1	24.3	C	19.8	B	23.0	C
--	Basic	6	--	36.1	E	28.9	D	32.5	D
Rosecrans EB	On	6	1	25.3	C	20.7	C	22.8	C
--	Basic	6	--	40.3	E	30.4	D	34.0	D
Alondra WB	Off ⁴	6	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	5	--	--*	F	34.7	D	41.3	E
Alondra EB	Off	5	1	14.2	F	6.8	A	10.1	B
--	Basic	5	--	--*	F	33.1	D	38.6	E
Alondra	On	5	1	N/A	N/A	N/A	N/A	N/A	N/A
Alondra On / SR-91 EB Off	Weave B	6	--	40.5	E	31.2	D	35.8	E
SR-91 EB	Off	6	2	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	5	--	38.3	E	26.5	D	32.1	D
SR-91 WB	Major Off ³	4	2	35.9	E	25.5	C	30.9	D
--	Basic	3	--	44.3	E	32.3	D	43.0	E
SR-91 WB	On ⁴	3	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	4	--	--*	F	36.2	E	--*	F
SR-91 EB & Artesia	On	4	1	N/A	N/A	N/A	N/A	N/A	N/A
Artesia & SR-91 EB On / Long Beach NB Off	Weave B	5	--	43.9	F	33.9	D	43.5	F
Long Beach NB	Off	5	1	N/A	N/A	N/A	N/A	N/A	N/A
Artesia & SR-91 EB On / Long Beach SB Off	Weave A	5	--	43.4	F	35.3	E	44.4	F
Long Beach SB	Off	5	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	4	--	--*	F	36.8	E	--*	F
Long Beach	On	4	1	--*	F	27.0	C	--*	F
--	Basic	4	--	--*	F	40.0	E	--*	F
Susana	Off	4	1	--*	F	38.9	E	--*	F
--	Basic	4	--	--*	F	34.7	D	--*	F
Del Amo	On	4	1	--*	F	25.9	C	--*	F
--	Basic	4	--	--*	F	40.4	E	--*	F
I-405 & Wardlow	Major Off ³	4	2	--*	F	37.2	E	--*	F
I-405 NB On / I-405 SB Off	Weave A ⁵	2	--	95.1	F	86.4	F	69.5	F
--	Basic	3	--	38.1	E	28.7	D	--*	F
I-405 SB	On	3	1	--*	F	35.2	E	--*	F
--	Basic	3	--	--*	F	36.2	E	--*	F
I-405 NB	On	3	1	--*	F	--*	F	--*	F
--	Basic	3	--	--*	F	--*	F	--*	F
Willow WB	Off	3	1	--*	F	--*	F	--*	F
--	Basic	3	--	--*	F	--*	F	--*	F
Willow WB	On	3	1	N/A	N/A	N/A	N/A	N/A	N/A
Willow WB On / Willow EB Off	Weave A	4	--	60.2	F	45.3	F	71.2	F
Willow EB	Off	4	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	3	--	--*	F	--*	F	--*	F
Willow EB	On	3	1	--*	F	--*	F	--*	F

Table 7-2
I-710 Southbound 2035 Peak Hour Alternative 1 (No Build) Level of Service

Location Description	Freeway Type	Lane		AM		PM		MD	
		ML	Ramp	Density / V/C ¹	LOS	Density / V/C ¹	LOS	Density / V/C ¹	LOS
--	Basic	3	--	--*	F	--*	F	--*	F
PCH	Off	3	1	--*	F	--*	F	--*	F
PCH Off / PCH On	Weave A ⁵	2	--	15.5	B	23.6	B	32.4	D
--	Basic	3	--	--*	F	35.8	E	--*	F
PCH	On	3	1	--*	F	--*	F	--*	F
--	Basic	3	--	--*	F	--*	F	--*	F
Anaheim WB	Off	3	1	--*	F	--*	F	--*	F
--	Basic	3	--	--*	F	37.6	E	--*	F
Anaheim WB	On	3	1	N/A	N/A	N/A	N/A	N/A	N/A
Anaheim WB On / Anaheim EB Off	Weave A	4	--	60.2	F	41.9	F	63.4	F
Anaheim EB	Off	4	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	5	--	28.0	D	21.1	C	28.8	D
6th & Broadway & Shoreline	Major Off ³	5	2	27.0	C	20.3	C	27.7	C
--	Basic	3	--	25.8	C	15.6	B	32.7	D
Anaheim EB	On	3	1	24.3	C	17.6	B	30.7	D
--	Basic	3	--	28.3	D	18.7	C	38.0	E
Pico & 9th & Pier B	Off	3	1	36.3	E	27.3	C	--*	F
--	Basic	3	--	22.6	C	14.7	B	29.2	D
Harbor Scenic	Major Off ³	3	2	21.7	C	14.2	B	28.1	D
South of Harbor Scenic Off	Basic	2	--	20.3	C	12.0	B	23.4	C

Notes:

¹ Density = passenger car/mile/lane; v/c = volume-to-capacity ratio. Shaded and bold cells indicate LOS E or F.

² Major merge area; HCM methodology applied for analysis.

³ Major diverge area; HCM methodology applied for analysis.

⁴ Single-lane addition/drop; HCM methodology applied for analysis.

⁵ Operation occurs on freeway collector/distributor.

N/A = not applicable. LOS and/or density information are not shown for major merge areas, single-lane addition/drop, and merge/diverge operations within a weaving segment.

* = Demand exceeds capacity, no density is predicted.

Table 7-3 presents the summary of Alternative 1 I-710 freeway operations and the following statements describe key findings of the analysis:

For Northbound I-710:

- The number of basic freeway segments with poor operating conditions are highest during the midday peak hour when 78 percent (36 out of 45) of the segments are expected to operate at LOS E or F due primarily to the high volume of heavy duty trucks during that period;
- The LOS for the merge and diverge areas are also heaviest during the midday peak hour when 67 percent (18 out of 27) of the merge and diverge areas are expected to operate at LOS E or F;

- The weaving areas experience maximum densities during the midday peak hour when 64 percent (9 out of 14) of the weaving areas are expected to operate at LOS E or F.

For Southbound I-710:

- Approximately 72 percent (33 out of 46) of the basic freeway segments are expected to operate at LOS E or F during the morning peak hour, which is the heaviest peak hour among the three peak hours analyzed;
- The LOS for the merge and diverge areas are also heaviest during the morning peak hour when 68 percent (23 out of 34) of the merge and diverge areas are expected to operate at LOS E or F;
- The weaving areas experience maximum densities during both morning and midday peak hour when 73 percent (11 out of 15) of the weaving areas are expected to operate at LOS E or F.

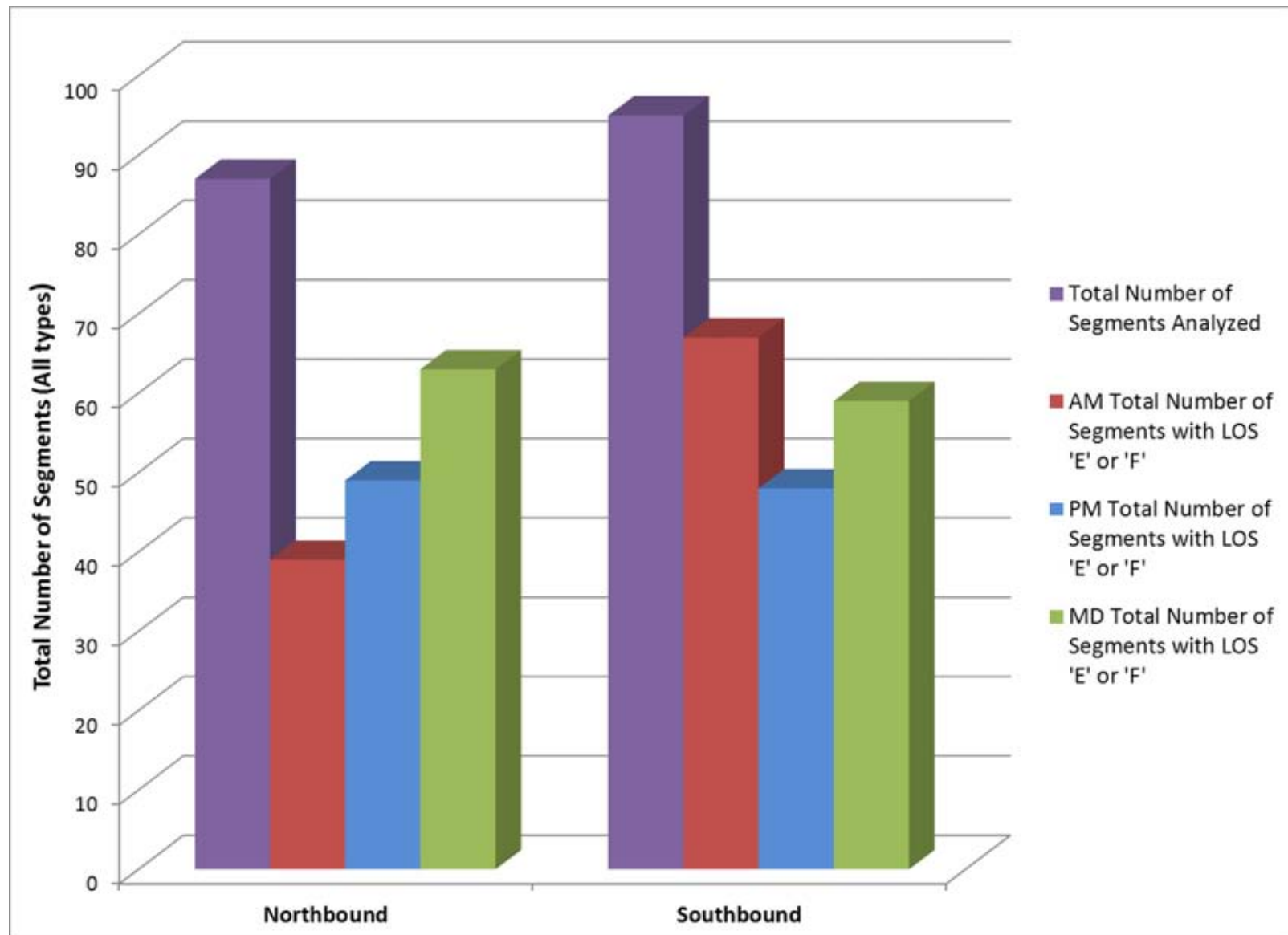
**Table 7-3
I-710 2035 Peak Hour Alternative 1 (No Build) Summary**

Segment Type	Total Number of Segments	Number of Segments with LOS E or F			Percent of Segments with LOS E or F		
		AM Peak Hour	PM Peak Hour	MD Peak Hour	AM Peak Hour	PM Peak Hour	MD Peak Hour
Northbound							
Basic	46	19	27	36	41%	59%	78%
Merge / Diverge	27	13	15	18	48%	56%	67%
Weave	14	7	7	9	50%	50%	64%
Southbound							
Basic	46	33	23	29	72%	50%	63%
Merge / Diverge	34	23	16	19	68%	47%	56%
Weave	15	11	9	11	73%	60%	73%

Figure 7-1 presents a graphical summary of Alternative 1 I-710 freeway operations for both northbound and southbound directions. As shown, the northbound direction is expected to experience heavy congestion during the midday and evening peak hours and southbound direction is expected to experience heavy congestion during the morning and midday peak hours.

Based on the analysis and findings presented in this section, it is expected that the I-710 freeway corridor will experience severe congestion under the 2035 Alternative 1 conditions. The poor operating conditions under 2035 Alternative 1 are expected to deteriorate further without any improvements. This indicates a need to take action for the future improvements to increase capacity along the I-710 study corridor.

**Figure 7-1
I-710 Mainline Alternative 1 Summary**



7.2 FUTURE YEAR 2035 ALTERNATIVE 5A TRAFFIC ANALYSIS

This section provides the 2035 Alternative 5A traffic analysis that consists of operational analysis of the Alternative 5A network as described in **Section 6**. The Alternative 5A network incorporates geometric enhancements applied to the I-710 freeway for improved traffic operations.

7.2.1 I-710 Freeway Segments

Table 7-4 and **Table 7-5** show the LOS for the various segments of I-710 under Alternative 5A (No Build) conditions. **Table 7-6** presents the summary of Alternative 5A I-710 freeway operations and the following statements describe key findings of the analysis:

For Northbound I-710:

- Approximately 83 percent (35 out of 42) of the basic freeway segments are expected to operate at poor LOS E or F during evening peak hour;
- The LOS for the merge and diverge areas are also heaviest during the evening peak hour when 74 percent (17 out of 23) of the merge and diverge areas are expected to operate at poor LOS E or F;
- The weaving areas experience poor operating conditions (LOS E or F) during midday and evening peak hours.

For Southbound I-710:

- Approximately 71 percent (34 out of 48) of the basic freeway segments are expected to operate at poor LOS E or F during the midday peak hour;
- The LOS for the merge and diverge areas are heaviest during the midday peak hour when 67 percent (20 out of 30) are expected to operate at poor LOS E or F;
- The weaving areas experience maximum densities during midday peak hour when 70 percent (7 out of 10) of the weaving areas are expected to operate at poor LOS E or F.

In general, the segments of I-710 freeway that experience poor LOS are located near the following freeway interchanges: I-405, Del Amo Boulevard, Long Beach Boulevard, Alondra Boulevard, Rosecrans Avenue, I-105/Imperial Highway, Firestone Boulevard, Florence Avenue, Slauson Avenue, and Washington Boulevard. Compared to Alternative 1 conditions, traffic conditions under Alternative 5A at these segments improved as a result of the geometric enhancements that include ramp braiding, modified interchange configuration, and auxiliary lane improvements.

Figure 7-2 presents a graphical summary of the Alternative 5A I-710 freeway operations for both northbound and southbound directions. As shown in the graph, the northbound direction is expected to experience more congestion during the evening and midday peak hours as compared to the morning peak hour. The southbound direction is expected to experience more congestion during the morning and midday peak hours as compared to evening peak hour.

Table 7-4
I-710 Northbound 2035 Peak Hour Alternative 5A (Build) Level of Service

Location Description	Type	Lane		AM		PM		MD	
		ML	Ramp	Density / V/C ¹	LOS	Density / V/C ¹	LOS	Density / V/C ¹	LOS
North of Floral On	Basic	4	--	22.2	C	--*	F	30.2	D
Floral	On	4	1	17.9	B	--*	F	22.8	C
--	Basic	4	--	21.1	C	42.9	E	29.1	D
SR-60	Major On ²	3	2	0.58	N/A	--*	F	0.79	N/A
--	Basic	3	--	25.6	C	--*	F	37.2	E
New York	Off	3	1	33.6	D	--*	F	--*	F
--	Basic	3	--	30.0	D	--*	F	--*	F
Ford	On	3	1	33.1	D	--*	F	--*	F
--	Basic	3	--	28.5	D	--*	F	--*	F
Ford	Off ⁴	4	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	4	--	22.0	C	--*	F	29.9	D
SR-60	Off	6	2	N/A	N/A	N/A	N/A	N/A	N/A
--	Weave C	6	--	35.0	E	40.4	E	39.6	E
Olympic	On	5	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	5	--	28.5	D	--*	F	36.2	E
I-5 NB	On ⁴	4	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	4	--	29.2	D	--*	F	39.3	E
Olympic	Off	4	1	33.0	D	--*	F	38.7	E
--	Basic	4	--	30.5	D	--*	F	42.0	E
I-5 NB	Off	6	2	N/A	N/A	N/A	N/A	N/A	N/A
Washington On / I-5 Off	Weave C	6	--	39.6	E	45.1	F	47.9	F
Washington	On	6	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	6	--	28.6	D	39.2	E	36.2	E
Washington	Off	7	2	N/A	N/A	N/A	N/A	N/A	N/A
Bandini On / Washington Off	Weave B	7	--	32.7	D	39.8	E	41.3	E
Bandini	On	6	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	6	--	26.7	D	33.8	D	31.1	D
Slauson	On ⁴	5	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	5	--	28.1	D	37.1	E	34.4	D
Bandini	Major Off ³	6	2	33.0	D	36.8	E	36.3	E
--	Basic	6	--	29.9	D	35.3	E	34.5	D
Slauson	Off	6	1	38.7	E	40.8	E	--*	F
--	Basic	6	--	33.9	D	40.1	E	39.5	E
Florence	On ⁴	5	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	5	--	41.4	E	--*	F	--*	F
Florence	Major Off ³	6	2	34.8	D	--*	F	--*	F
--	Basic	6	--	32.2	D	38.3	E	41.6	E
Firestone WB	On ⁴	5	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	5	--	36.8	E	44.4	E	--*	F
Firestone EB	On	5	1	23.2	C	26.6	C	--*	F
--	Basic	5	--	32.5	D	41.4	E	44.7	E
Firestone	Major Off ³	6	2	31.9	D	39.1	E	39.3	E
--	Basic	6	--	28.6	D	39.7	E	40.2	E

Table 7-4
I-710 Northbound 2035 Peak Hour Alternative 5A (Build) Level of Service

Location Description	Type	Lane		AM		PM		MD	
		ML	Ramp	Density / VIC ¹	LOS	Density / VIC ¹	LOS	Density / VIC ¹	LOS
Imperial	On ⁴	5	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	5	--	30.4	D	--*	F	--*	F
Imperial	Off	6	2	N/A	N/A	N/A	N/A	N/A	N/A
I-105 On / Imperial Off	Weave B	6	--	34.9	D	47.7	F	45.5	F
I-105	On	4	2	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	4	--	29.8	D	--*	F	--*	F
Rosecrans	On	4	1	21.9	C	--*	F	--*	F
--	Basic	4	--	27.1	D	--*	F	--*	F
I-105	Major Off ³	7	3	23.9	C	--*	F	--*	F
--	Basic	6	--	24.6	C	37.2	E	42.7	E
Rosecrans	Off	6	1	33.7	D	--*	F	--*	F
--	Basic	6	--	27.2	D	--*	F	--*	F
Alondra	On	6	1	19.6	B	--*	F	--*	F
--	Basic	6	--	24.9	C	40.6	E	43.8	E
SR-91 EB	Major On ²	5	2	0.69	N/A	0.96	N/A	0.99	N/A
--	Basic	5	--	25.1	C	40.1	E	43.7	E
SR-91 WB	On ⁴	4	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	4	--	25.9	C	--*	F	--*	F
Alondra	Major Off ³	5	2	25.2	C	--*	F	--*	F
--	Basic	5	--	22.1	C	34.6	D	35.4	E
SR-91 & Artesia	Off	7	2	N/A	N/A	N/A	N/A	N/A	N/A
Long Beach On / SR-91&Artesia Off	Weave B	7	--	32.4	D	41.8	E	37.8	E
Long Beach	On	6	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	6	--	25.9	C	39.4	E	36.8	E
Long Beach	Off	6	1	30.8	D	38.5	E	36.8	E
--	Basic	6	--	27.0	D	41.5	E	38.0	E
Del Amo	On ⁴	5	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	5	--	32.0	D	--*	F	--*	F
Del Amo	Major Off ³	6	2	33.2	D	--*	F	--*	F
--	Basic	6	--	30.2	D	44.4	E	41.7	E
I-405 SB	Major On ²	5	2	0.81	N/A	0.99	N/A	0.97	N/A
--	Basic	5	--	28.2	D	38.5	E	36.9	E
I-405 NB	Major On ²	4	2	0.77	N/A	0.94	N/A	0.92	N/A
--	Basic	4	--	26.8	D	36.4	E	35.6	E
I-405	Off	5	2	N/A	N/A	N/A	N/A	N/A	N/A
Willow On / I-405 Off	Weave B	5	--	34.9	D	37.6	E	43.7	F
Willow	On	5	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	5	--	24.6	C	28.8	D	33.5	D
Willow	Off	5	1	N/A	N/A	N/A	N/A	N/A	N/A
PCH On / Willow Off	Weave B	5	--	27.2	C	31.2	D	37.3	E
PCH	On	4	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	4	--	26.6	D	32.8	D	33.0	D
Anaheim	On	4	1	20.1	C	21.8	C	22.2	C

Table 7-4
I-710 Northbound 2035 Peak Hour Alternative 5A (Build) Level of Service

Location Description	Type	Lane		AM		PM		MD	
		ML	Ramp	Density / V/C ¹	LOS	Density / V/C ¹	LOS	Density / V/C ¹	LOS
--	Basic	4	--	21.1	C	25.5	C	22.1	C
7th & 3rd & Shoreline	Major On ²	2	2	0.59	N/A	--*	F	0.61	N/A
--	Basic	2	--	26.6	D	--*	F	33.6	D
9th & Pier B & Pico	On ⁴	1	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	1	--	--*	F	--*	F	--*	F
PCH	Off ⁴	2	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	2	--	24.2	C	37.8	E	25.4	C
Anaheim	Major Off ³	3	2	19.6	B	27.0	C	24.3	C
--	Basic	3	--	17.2	B	23.8	C	21.4	C
Harbor Scenic	On ⁴	2	1	N/A	N/A	N/A	N/A	N/A	N/A
South of Harbor Scenic On	Basic	2	--	13.6	B	23.4	C	10.2	A

Notes:

¹ Density = passenger car/mile/lane; v/c = volume-to-capacity ratio. Shaded and bold cells indicate LOS E or F.

² Major merge area; HCM methodology applied for analysis.

³ Major diverge area; HCM methodology applied for analysis.

⁴ Single-lane addition/drop; HCM methodology applied for analysis.

⁵ Operation occurs on freeway collector/distributor.

N/A = not applicable. LOS and/or density information are not shown for major merge areas, single-lane addition/drop, and merge/diverge operations within a weaving segment.

* = Demand exceeds capacity, no density is predicted.

Table 7-5
I-710 Southbound 2035 Peak Hour Alternative 5A (Build) Level of Service

Location Description	Type	Lane		AM		PM		MD	
		ML	Ramp	Density / V/C ¹	LOS	Density / V/C ¹	LOS	Density / V/C ¹	LOS
North of I-10 On	Basic	3	--	23.6	C	25.5	C	22.2	C
I-10 & Romona	Major On ²	3	2	0.75	N/A	0.79	N/A	0.71	N/A
--	Basic	4	--	27.6	D	29.5	D	25.7	C
Lane Drop	Basic	3	--	--*	F	--*	F	39.1	E
Floral & Humphries	Off	3	1	--*	F	--*	F	37.1	E
--	Basic	3	--	42.7	E	--*	F	36.8	E
SR-60	Major Off ³	5	2	24.2	C	25.2	C	22.5	C
--	Basic	3	--	35.8	E	35.7	E	31.3	D
Caesar Chavez	On	3	1	--*	F	35.6	E	34.6	D
--	Basic	3	--	--*	F	43.6	E	38.8	E
Third	On	3	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Weave A	4	--	34.7	D	37.8	E	31.4	D
Eagle	Off	4	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	3	--	--*	F	--*	F	38.3	E
SR-60	On	3	2	N/A	N/A	N/A	N/A	N/A	N/A
Lane Add	Weave C	6	--	44.3	F	50.9	F	44.7	F
Eastern	Off	6	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	5	--	39.2	E	--*	F	35.5	E

Table 7-5
I-710 Southbound 2035 Peak Hour Alternative 5A (Build) Level of Service

Location Description	Type	Lane		AM		PM		MD	
		ML	Ramp	Density / VIC ¹	LOS	Density / VIC ¹	LOS	Density / VIC ¹	LOS
I-5 SB	Off ⁴	5	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	4	--	39.7	E	42.2	E	38.3	E
Eastern	On	4	1	--*	F	--*	F	--*	F
--	Basic	4	--	--*	F	--*	F	--*	F
I-5 SB	On	4	2	--*	F	--*	F	--*	F
--	Basic	6	--	40.8	E	40.6	E	42.9	E
Lane Add	Basic	7	--	31.0	D	30.9	D	32.0	D
Washington	Off	7	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	6	--	36.8	E	38.0	E	38.9	E
Washington	On	6	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Weave B	7	--	40.0	E	41.1	E	40.7	E
Atlantic & Bandini	Off	7	2	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	5	--	43.8	E	--*	F	--*	F
Atlantic & Bandini	On	5	2	N/A	N/A	N/A	N/A	N/A	N/A
--	Weave C	7	--	38.3	E	48.4	F	47.2	F
Slauson	Off	7	2	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	6	--	30.3	D	38.8	E	39.0	E
Slauson	On	6	1	22.1	C	25.3	C	25.4	C
--	Basic	6	--	32.9	D	44.8	E	44.7	E
Florence	Major Off ³	6	2	35.3	E	--*	F	--*	F
--	Basic	5	--	43.2	E	--*	F	--*	F
Florence	On ⁴	5	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	6	--	34.4	D	--*	F	--*	F
Firestone	Major Off ³	6	2	36.2	E	--*	F	--*	F
--	Basic	5	--	40.4	E	--*	F	--*	F
Firestone WB	On	5	1	--*	F	--*	F	--*	F
--	Basic	5	--	--*	F	--*	F	--*	F
Firestone EB	On	5	1	--*	F	--*	F	--*	F
--	Basic	5	--	--*	F	--*	F	--*	F
Imperial & MLK	Off	5	2	--*	F	--*	F	--*	F
--	Basic	5	--	44.8	E	--*	F	--*	F
Imperial	On	5	1	N/A	N/A	N/A	N/A	N/A	N/A
Imperial On / I-105 Off	Weave C	6	--	50.3	F	52.1	F	53.9	F
I-105	Off	6	2	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	4	--	--*	F	--*	F	--*	F
Rosecrans	Off	4	1	--*	F	--*	F	--*	F
MLK On / Rosecrans Off	Weave A ⁵	2	--	23.2	B	22.1	B	11.0	A
--	Basic	4	--	43.7	E	42.7	E	42.6	E
MLK	On	4	1	--*	F	--*	F	--*	F
--	Basic	4	--	--*	F	--*	F	--*	F
I-105 EB On / Rosecrans Off	Weave B ⁵	3	--	31.4	C	20.7	B	31.8	C
I-105	Major On ²	4	2	--*	F	--*	F	--*	F
--	Basic	6	--	38.8	E	31.9	D	37.1	E

Table 7-5
I-710 Southbound 2035 Peak Hour Alternative 5A (Build) Level of Service

Location Description	Type	Lane		AM		PM		MD	
		ML	Ramp	Density / VIC ¹	LOS	Density / VIC ¹	LOS	Density / VIC ¹	LOS
Rosecrans WB	On	6	1	25.8	C	22.8	C	25.2	C
--	Basic	6	--	41.6	E	32.9	D	37.7	E
Rosecrans EB	On	6	1	--*	F	23.3	C	25.3	C
--	Basic	6	--	--*	F	35.1	E	41.6	E
Alondra	Off	6	1	--*	F	38.8	E	--*	F
--	Basic	6	--	41.2	E	31.3	D	35.0	D
SR-91 EB	Major Off ³	6	2	39.7	E	34.1	D	36.6	E
--	Basic	5	--	42.3	E	29.4	D	33.3	D
Alondra	On	5	1	N/A	N/A	N/A	N/A	N/A	N/A
Alondra On / SR-91 WB Off	Weave B	6	--	42.9	E	30.2	D	36.8	E
SR-91 WB	Off	6	2	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	4	--	40.4	E	35.7	E	36.8	E
SR-91 WB	Major On ²	4	2	--*	F	0.95	N/A	--*	F
--	Basic	5	--	--*	F	39.4	E	--*	F
SR-91 EB & Artesia	On	5	1	N/A	N/A	N/A	N/A	N/A	N/A
SR-91 EB On / Long Beach Off	Weave B	6	--	40.9	E	38.1	E	40.6	E
Long Beach	Off	6	2	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	5	--	--*	F	--*	F	--*	F
Long Beach	On ⁴	5	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	6	--	42.1	E	34.7	D	39.0	E
Del Amo & Susana	Major Off ³	6	2	--*	F	36.4	E	--*	F
--	Basic	5	--	--*	F	40.9	E	--*	F
Del Amo & Susana	On ⁴	5	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	6	--	39.4	E	33.6	D	38.1	E
I-405 SB	Major Off ³	6	2	38.9	E	35.7	E	38.3	E
--	Basic	5	--	30.8	D	28.2	D	33.8	D
I-405 NB	Major Off ³	5	2	33.7	D	31.5	D	35.8	E
--	Basic	4	--	32.4	D	30.7	D	40.3	E
I-405 SB	Major On ²	4	2	0.72	N/A	0.67	N/A	0.76	N/A
--	Basic	6	--	26.1	D	24.4	C	27.9	D
I-405 NB	Major On ²	6	2	0.70	N/A	0.64	N/A	0.77	N/A
--	Basic	7	--	25.6	C	23.3	C	28.5	D
Lane Drop	Basic	6	--	30.9	D	27.5	D	35.8	E
Willow	Major Off ³	6	2	33.8	D	30.9	D	37.1	E
--	Basic	5	--	32.3	D	28.0	D	41.5	E
Willow	On	5	1	N/A	N/A	N/A	N/A	N/A	N/A
Willow On / PCH Off	Weave B	6	--	34.9	D	30.5	D	38.0	E
PCH	Off	6	2	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	5	--	32.4	D	26.1	D	33.4	D
Shoreline	Major Off ³	5	2	34.9	D	29.5	D	35.6	E
--	Basic	3	--	29.5	D	23.1	C	37.0	E
Anaheim & Pico	Major Off ³	3	2	32.6	D	26.3	C	37.7	E
--	Basic	2	--	21.7	C	17.4	B	26.1	D

Table 7-5
I-710 Southbound 2035 Peak Hour Alternative 5A (Build) Level of Service

Location Description	Type	Lane		AM		PM		MD	
		ML	Ramp	Density / VIC ¹	LOS	Density / VIC ¹	LOS	Density / VIC ¹	LOS
PCH	On ⁴	2	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	3	--	15.9	B	13.2	B	20.2	C
Anaheim	On	3	1	20.8	C	18.2	B	26.0	C
--	Basic	3	--	19.1	C	16.4	B	24.5	C
Harbor Scenic	Major Off ³	3	2	21.8	C	18.7	B	27.8	C

Notes:

¹ Density = passenger car/mile/lane; v/c = volume-to-capacity ratio. Shaded and bold cells indicate LOS E or F.

² Major merge area; HCM methodology applied for analysis.

³ Major diverge area; HCM methodology applied for analysis.

⁴ Single-lane addition/drop; HCM methodology applied for analysis.

⁵ Operation occurs on freeway collector/distributor.

N/A = not applicable. LOS and/or density information are not shown for major merge areas, single-lane addition/drop, and merge/diverge operations within a weaving segment.

* = Demand exceeds capacity, no density is predicted.

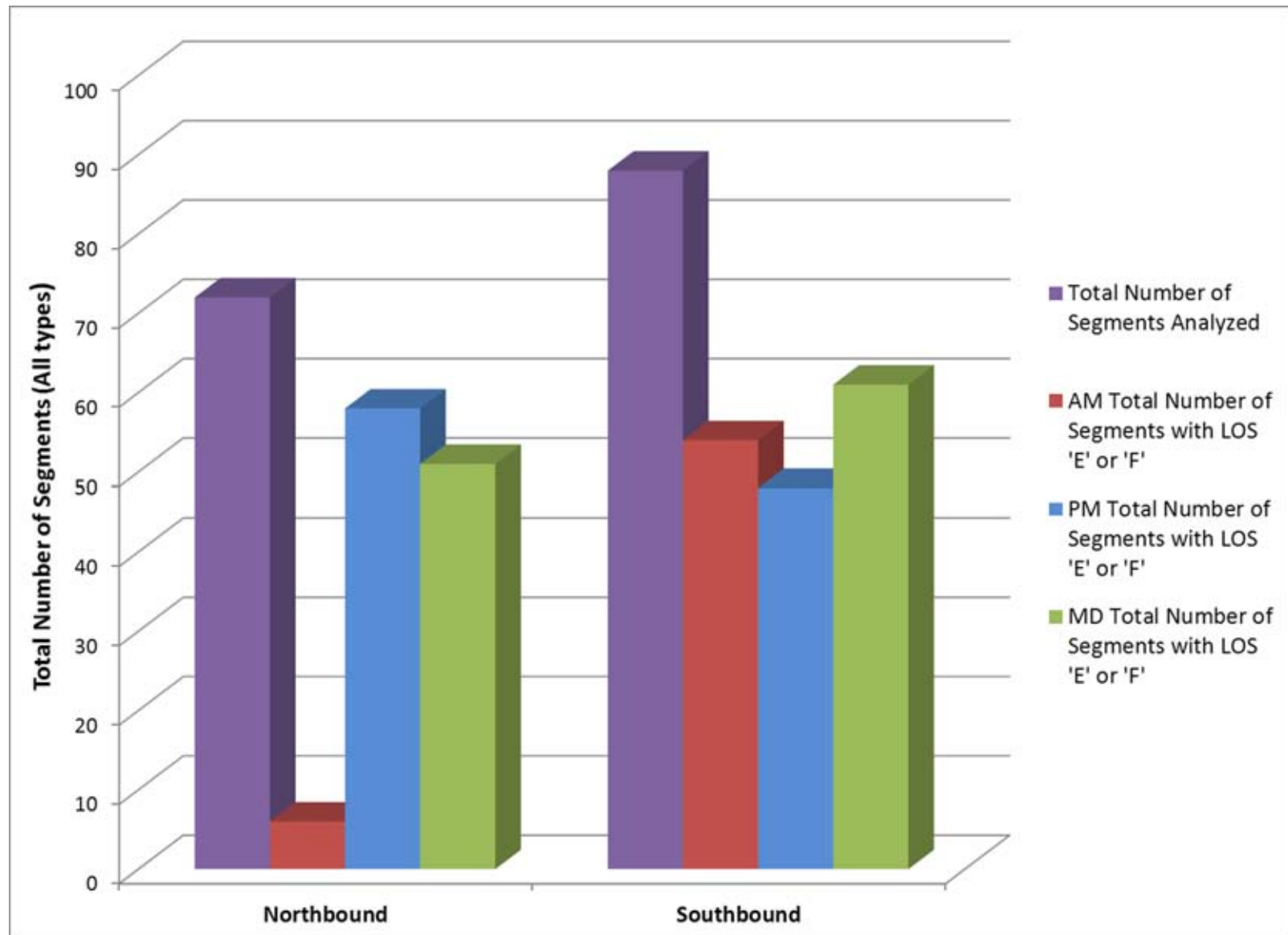
Table 7-6
I-710 2035 Peak Hour Alternative 5A (Build) Summary

Segment Type	Total Number of Segments	Number of Segments with LOS E or F			Percent of Segments with LOS E or F		
		AM Peak Hour	PM Peak Hour	MD Peak Hour	AM Peak Hour	PM Peak Hour	MD Peak Hour
Northbound							
Basic	42	3	35	29	7%	83%	69%
Merge / Diverge	23	1	17	15	4%	74%	65%
Weave	7	2	6	7	29%	86%	100%
Southbound							
Basic	48	30	27	34	63%	56%	71%
Merge / Diverge	30	18	15	20	60%	50%	67%
Weave	10	6	6	7	60%	60%	70%

In summary, based on the analysis and findings presented in this section, it is expected that under 2035 Alternative 5A conditions, future traffic operations along the I-710 freeway corridor for both northbound and southbound directions will improve when compared to the traffic operations under existing and Alternative 1 conditions. The morning peak hour benefits the most from the proposed Alternative 5A improvements in either direction. However, even with geometric enhancements, severe congestion still occurs during the evening peak hour because projected future traffic demand that include heavy duty truck traffic is expected to exceed future capacity.

In order to accommodate projected future traffic demand and further relieve congestion on the I-710 GP lanes, a dedicated freight corridor has been proposed in the additional Build alternatives under consideration. The next section presents the results and findings of the proposed dedicated freight corridor under 2035 Alternative 6A, 6B and 6C conditions.

Figure 7-2
I-710 Mainline Alternative 5A Summary



7.3 FUTURE YEAR 2035 ALTERNATIVE 6A TRAFFIC ANALYSIS

This section provides the 2035 Alternative 6A traffic analysis that consists of operational analysis of the Alternative 6A network as described in **Section 6**. The Alternative 6A network incorporates the geometric enhancements applied to the I-710 freeway for improved traffic operations. Examples of the geometric enhancements include ramp braiding, modified interchange configuration, and auxiliary lane improvements plus the proposed FC.

7.3.1 I-710 Freeway Segments

Table 7-7 and **Table 7-8** show the LOS for the various segments of I-710 under Alternative 6A conditions.

Table 7-7
I-710 Northbound 2035 Peak Hour Alternative 6A (Build) Level of Service

Location Description	Freeway Type	Lane		AM		PM		MD	
		ML	Ramp	Density / VIC ¹	LOS	Density / VIC ¹	LOS	Density / VIC ¹	LOS
North of Floral On	Basic	4	--	25.2	C	--*	F	38.8	E
Floral	On	4	1	20.0	B	--*	F	26.0	C
--	Basic	4	--	24.2	C	44.0	E	37.3	E
SR-60	Major On ²	3	2	0.67	N/A	--*	F	--*	F
--	Basic	3	--	31.4	D	--*	F	--*	F
New York	Off	3	1	37.4	E	--*	F	--*	F
--	Basic	3	--	38.0	E	--*	F	--*	F
Ford	On	3	1	--*	F	--*	F	--*	F
--	Basic	3	--	36.3	E	--*	F	--*	F
Ford	Off ⁴	4	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	4	--	25.6	C	--*	F	39.4	E
SR-60	Off	5	2	N/A	N/A	N/A	N/A	N/A	N/A
Olympic On / SR-60 Off	Weave B	5	--	41.4	E	49.0	F	49.6	F
Olympic	On	4	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	4	--	--*	F	--*	F	--*	F
I-5 NB	On ⁴	3	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	3	--	--*	F	--*	F	--*	F
Olympic	Off	3	1	--*	F	--*	F	--*	F
--	Basic	3	--	--*	F	--*	F	--*	F
See Section 7.6 for operational analysis results for northern terminus segments (between Slauson Ave and Washington Blvd) for Alternative 6A, 6B and 6C and their corresponding design options.									
Florence	On ⁴	5	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	5	--	35.6	E	34.3	D	36.4	E
Florence	Major Off ³	6	2	32.4	D	32.0	D	35.1	E
--	Basic	6	--	29.2	D	28.7	D	32.6	D
Firestone WB	On ⁴	5	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	5	--	32.2	D	32.2	D	37.1	E
Firestone EB	On	5	1	21.2	C	21.7	C	23.2	C
--	Basic	5	--	28.1	D	29.6	D	32.6	D

Table 7-7
I-710 Northbound 2035 Peak Hour Alternative 6A (Build) Level of Service

Location Description	Freeway Type	Lane		AM		PM		MD	
		ML	Ramp	Density / V/C ¹	LOS	Density / V/C ¹	LOS	Density / V/C ¹	LOS
Firestone	Major Off ³	6	2	28.8	D	32.9	D	33.3	D
--	Basic	6	--	25.5	C	29.8	D	30.3	D
Imperial	On ⁴	5	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	5	--	28.9	D	35.6	E	37.0	E
Imperial	Off	6	2	N/A	N/A	N/A	N/A	N/A	N/A
I-105 On / Imperial Off	Weave B	6	--	35.3	E	41.1	E	42.4	E
I-105	On	4	2	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	4	--	26.4	D	36.3	E	37.6	E
Rosecrans	On	4	1	20.3	C	24.4	C	24.9	C
--	Basic	4	--	24.0	C	32.7	D	34.1	D
I-105	Major Off ³	7	3	21.8	C	27.8	C	28.1	D
--	Basic	6	--	22.4	C	29.3	D	29.7	D
Rosecrans	Off	6	1	31.6	D	39.8	E	37.9	E
--	Basic	6	--	24.8	C	33.9	D	33.2	D
Alondra	On	6	1	18.8	B	22.6	C	22.0	C
--	Basic	6	--	22.5	C	31.4	D	30.0	D
SR-91 EB	On ⁴	5	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	5	--	22.1	C	29.5	D	28.3	D
SR-91 WB & Atlantic	On ⁴	4	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	4	--	21.0	C	29.4	D	28.7	D
Alondra	Major Off ³	5	2	20.7	C	28.7	D	27.6	C
--	Basic	5	--	18.2	C	25.3	C	24.3	C
SR-91 & Artesia	Off	7	2	N/A	N/A	N/A	N/A	N/A	N/A
Long Beach On / SR-91 & Artesia Off	Weave B	7	--	25.2	C	31.7	D	29.2	D
Long Beach	On	6	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	6	--	20.2	C	26.6	D	24.9	C
Long Beach	Off	6	1	N/A	N/A	N/A	N/A	N/A	N/A
Deal Amo On / Long Beach Off	Weave B	6	--	23.2	C	30.7	D	27.8	C
Del Amo	On	5	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	5	--	23.0	C	29.4	D	27.4	D
Del Amo	Major Off ³	6	2	26.2	C	32.2	D	30.3	D
--	Basic	6	--	23.1	C	29.0	D	26.9	D
I-710 FC NB	Off	6	1	32.2	D	34.0	D	32.5	D
--	Basic	6	--	25.4	C	30.6	D	28.3	D
I-405 SB	On ⁴	5	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	5	--	23.6	C	26.4	D	25.8	C
I-405 NB	On ⁴	4	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	4	--	21.8	C	24.4	C	24.1	C
I-405	Off	5	2	N/A	N/A	N/A	N/A	N/A	N/A
Willow On / I-405 Off	Weave B	5	--	30.3	D	28.4	D	33.2	D
Willow	On	5	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	5	--	20.0	C	20.0	C	22.7	C
Willow	Off	5	1	N/A	N/A	N/A	N/A	N/A	N/A

Table 7-7
I-710 Northbound 2035 Peak Hour Alternative 6A (Build) Level of Service

Location Description	Freeway Type	Lane		AM		PM		MD	
		ML	Ramp	Density / V/C ¹	LOS	Density / V/C ¹	LOS	Density / V/C ¹	LOS
PCH On / Willow Off	Weave B	5	--	23.0	C	23.4	C	29.1	D
PCH	On	4	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	4	--	21.1	C	21.4	C	20.4	C
Anaheim	On	4	1	17.8	B	18.0	B	18.8	B
--	Basic	4	--	16.3	B	16.8	B	13.9	B
Shoreline	Major On ²	2	2	0.45	N/A	0.46	N/A	0.39	N/A
--	Basic	2	--	10.7	A	14.9	B	10.9	A
Pico	On ⁴	1	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	1	--	16.2	B	20.7	C	16.1	B
PCH	On ⁴	2	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	2	--	12.6	B	13.2	B	10.9	A
Anaheim	Major Off ³	3	2	11.0	B	11.7	B	13.6	B
--	Basic	3	--	9.7	A	10.3	A	11.9	B
Harbor Scenic	On ⁴	2	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	2	--	8.5	A	8.8	A	5.3	A
I-710 FC NB	Off	2	1	20.8	C	25.7	C	13.6	B
From Ocean	Basic	2	--	15.9	B	20.2	C	10.0	A

Notes:

¹ Density = passenger car/mile/lane; v/c = volume-to-capacity ratio. Shaded and bold cells indicate LOS E or F.

² Major merge area; HCM methodology applied for analysis.

³ Major diverge area; HCM methodology applied for analysis.

⁴ Single-lane addition/drop; HCM methodology applied for analysis.

⁵ Operation occurs on freeway collector/distributor.

N/A = not applicable. LOS and/or density information are not shown for major merge areas, single-lane addition/drop, and merge/diverge operations within a weaving segment.

* = Demand exceeds capacity, no density is predicted.

Table 7-8
I-710 Southbound 2035 Peak Hour Alternative 6A (Build) Level of Service

Location Description	Freeway Type	Lane		AM		PM		MD	
		ML	Ramp	Density / VIC ¹	LOS	Density / VIC ¹	LOS	Density / VIC ¹	LOS
North of I-10 On	Basic	3	--	25.3	C	22.7	C	23.8	C
I-10 & Romona	Major On ²	3	2	0.80	N/A	0.74	N/A	0.76	N/A
--	Basic	4	--	29.5	D	27.2	D	28.0	D
Lane Drop	Basic	3	--	--*	F	44.0	E	--*	F
Floral & Humphries	Off	3	1	--*	F	38.3	E	--*	F
--	Basic	3	--	--*	F	41.5	E	44.1	E
SR-60	Major Off ³	5	2	--*	F	23.9	C	24.5	C
--	Basic	3	--	44.7	E	33.5	D	37.1	E
Caesar Chavez	On	3	1	--*	F	35.1	E	--*	F
--	Basic	3	--	--*	F	40.9	E	--*	F
Third	On	3	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Weave A	4	--	44.2	F	40.8	E	38.1	E
Eagle	Off	4	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	4	--	34.2	D	29.3	D	29.3	D
SR-60	On	4	2	N/A	N/A	N/A	N/A	N/A	N/A
--	Weave C	6	--	51.1	F	55.9	F	51.7	F
Eastern	Off	6	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	6	--	35.8	E	36.3	E	33.8	D
I-5 SB	Off ⁴	6	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	5	--	35.0	E	33.7	D	36.9	E
Eastern	On	5	1	24.1	C	23.6	C	24.7	C
--	Basic	5	--	41.2	E	39.0	E	44.7	E
See Section 7-6 for operational analysis results for northern terminus segments (between Slauson Ave and Washington Blvd) for Alternatives 6A, 6B and 6C and their corresponding design options.									
Florence	Major Off ³	6	2	34.0	D	--*	F	--*	F
--	Basic	5	--	39.9	E	--*	F	--*	F
Florence	Off ⁴	5	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	6	--	33.7	D	41.1	E	--*	F
Firestone	Major Off ³	6	2	35.8	E	--*	F	--*	F
--	Basic	5	--	39.9	E	--*	F	--*	F
Firestone WB	On	5	1	25.6	C	--*	F	--*	F
--	Basic	5	--	--*	F	--*	F	--*	F
Firestone EB	On	5	1	--*	F	--*	F	--*	F
--	Basic	5	--	--*	F	--*	F	--*	F
Imperial & MLK	Off	5	2	--*	F	--*	F	--*	F
--	Basic	5	--	--*	F	--*	F	--*	F
Imperial	On	5	1	N/A	N/A	N/A	N/A	N/A	N/A
Imperial On / I-105 Off	Weave C	6	--	55.7	F	51.5	F	58.8	F
I-105	Off	6	2	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	4	--	--*	F	--*	F	--*	F
Rosecrans	Off	4	1	--*	F	--*	F	--*	F
--	Basic	4	--	--*	F	43.4	E	--*	F

Table 7-8
I-710 Southbound 2035 Peak Hour Alternative 6A (Build) Level of Service

Location Description	Freeway Type	Lane		AM		PM		MD	
		ML	Ramp	Density / V/C ¹	LOS	Density / V/C ¹	LOS	Density / V/C ¹	LOS
MLK On / Rosecrans Off	Weave A ⁵	2	--	22.4	B	20.8	B	14.5	B
MLK	On	4	1	--*	F	28.0	C	--*	F
--	Basic	4	--	--*	F	--*	F	--*	F
I-105 EB On / Rosecrans Off	Weave B ⁵	3	--	27.1	C	19.6	B	25.6	C
I-105	Major On ²	4	2	--*	F	--*	F	--*	F
--	Basic	6	--	44.5	E	30.8	D	43.9	E
Rosecrans WB	On	6	1	--*	F	22.2	C	27.5	C
--	Basic	6	--	--*	F	31.5	D	44.9	E
Rosecrans EB	On	6	1	--*	F	22.6	C	--*	F
--	Basic	6	--	--*	F	33.0	D	--*	F
Alondra	Off	6	1	--*	F	38.4	E	--*	F
--	Basic	6	--	43.8	E	29.0	D	37.1	E
SR-91 EB	Major Off ³	6	2	40.7	E	32.2	D	37.8	E
--	Basic	5	--	40.0	E	25.7	C	31.3	D
Alondra	On	5	1	N/A	N/A	N/A	N/A	N/A	N/A
Alondra On / SR-91 WB Off	Weave B	6	--	45.1	F	29.1	D	37.8	E
SR-91 WB	Off	6	2	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	4	--	34.3	D	27.3	D	30.5	D
SR-91 WB	Major On ²	4	2	0.96	N/A	0.78	N/A	0.92	N/A
--	Basic	5	--	41.4	E	28.8	D	37.3	E
SR-91 EB & Artesia	On	5	1	N/A	N/A	N/A	N/A	N/A	N/A
SR-91 EB On / Long Beach Off	Weave B	6	--	38.0	E	31.4	D	36.8	E
Long Beach	Off	6	2	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	5	--	43.5	E	30.0	D	37.1	E
Long Beach	Off ⁴	5	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	6	--	34.1	D	25.8	C	30.2	D
Del Amo & Susana	Major Off ³	6	2	36.0	E	29.2	D	33.2	D
--	Basic	5	--	34.9	D	27.4	D	31.1	D
Del Amo & Susana	Off ⁴	5	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	6	--	31.5	D	25.0	C	28.6	D
I-710 SB FC	On	6	1	N/A	N/A	N/A	N/A	N/A	N/A
I-710 SB FC On / I-405 SB Off	Weave B	6	--	45.1	F	41.0	E	42.6	E
I-405 SB	Off	6	2	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	5	--	26.4	D	23.4	C	26.4	D
I-405 NB	Major Off ³	5	2	29.8	D	26.7	C	29.8	D
--	Basic	4	--	26.2	D	23.6	C	29.9	D
I-405 SB	Major On ²	4	2	0.63	N/A	0.56	N/A	0.65	N/A
--	Basic	6	--	23.0	C	20.4	C	23.4	C
I-405 NB	Major On ²	6	2	0.62	N/A	0.53	N/A	0.66	N/A
--	Basic	7	--	22.5	C	19.3	C	24.0	C
Lane Drop	Basic	6	--	26.4	D	22.5	C	28.5	D
Willow	Major Off ³	6	2	29.8	D	25.6	C	31.8	D
--	Basic	5	--	26.9	D	21.7	C	30.9	D

Table 7-8
I-710 Southbound 2035 Peak Hour Alternative 6A (Build) Level of Service

Location Description	Freeway Type	Lane		AM		PM		MD	
		ML	Ramp	Density / V/C ¹	LOS	Density / V/C ¹	LOS	Density / V/C ¹	LOS
Willow	On	5	1	N/A	N/A	N/A	N/A	N/A	N/A
Willow On / PCH Off	Weave B	6	--	31.5	D	25.4	C	33.1	D
PCH	Off	6	2	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	5	--	26.6	D	19.5	C	26.3	D
Shoreline	Major Off ³	5	2	--*	F	22.2	C	29.7	D
--	Basic	3	--	19.7	C	11.7	B	22.9	C
Anaheim	Major Off ³	3	2	22.4	C	13.3	B	26.1	C
--	Basic	2	--	14.7	B	5.7	A	17.5	B
PCH	On ⁴	2	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	3	--	11.0	A	5.4	A	14.6	B
I-710 SB FC	On	3	1	22.0	C	13.7	B	25.1	C
--	Basic	3	--	18.2	C	10.3	A	21.8	C
Anaheim	On	3	1	20.1	C	12.4	B	24.6	C
--	Basic	3	--	21.2	C	13.2	B	26.0	D
Harbor Scenic	Major Off ³	3	2	24.1	C	15.0	B	29.4	D
To Ocean	Basic	2	--	18.0	B	8.2	A	19.8	C

Notes:

¹ Density = passenger car/mile/lane; v/c = volume-to-capacity ratio. Shaded and bold cells indicate LOS E or F.

² Major merge area; HCM methodology applied for analysis.

³ Major diverge area; HCM methodology applied for analysis.

⁴ Single-lane addition/drop; HCM methodology applied for analysis.

⁵ Operation occurs on freeway collector/distributor.

N/A = not applicable. LOS and/or density information are not shown for major merge areas, single-lane addition/drop, and merge/diverge operations within a weaving segment.

* = Demand exceeds capacity, no density is predicted.

Table 7-9 presents the summary of the Alternative 6A I-710 freeway operations and the following statements describe key findings of the analysis:

For Northbound I-710:

- The northbound freeway segments would experience the most congestion during the midday peak hour when 34 percent of the segments are expected to operate at poor LOS E or F;
- Approximately 32 (6 out of 19) percent of the northbound merge and diverge areas are expected to operate at poor LOS E or F during the midday and PM peak hours;
- One-third (2 out of 6) of the weaving areas will experience poor LOS E or F conditions during all peak analysis hours.

For Southbound I-710:

- Approximately 50 percent of the basic freeway segments are expected to operate at poor LOS E or F during the morning and midday peak hours;

- Approximately 54 percent (15 out of 28) of the southbound merge and diverge areas will experience congested conditions during the AM peak hour;
- The weaving areas are most congested during the morning and midday peak hours when 67% percent (6 out of 9) of the weaving areas are expected to operate at poor LOS E or F.

Table 7-9
I-710 2035 Peak Hour Alternative 6A (Build) Summary

Segment Type	Total Number of Segments	Number of Segments with LOS E or F			Percent of Segments with LOS E or F		
		AM Peak Hour	PM Peak Hour	MD Peak Hour	AM Peak Hour	PM Peak Hour	MD Peak Hour
Northbound							
Basic	38	6	11	13	16%	29%	34%
Merge / Diverge	19	3	6	6	16%	32%	32%
Weave	6	2	2	2	33%	33%	33%
Southbound							
Basic	43	22	14	21	51%	33%	49%
Merge / Diverge	28	15	10	13	54%	36%	46%
Weave	9	6	4	6	67%	44%	67%

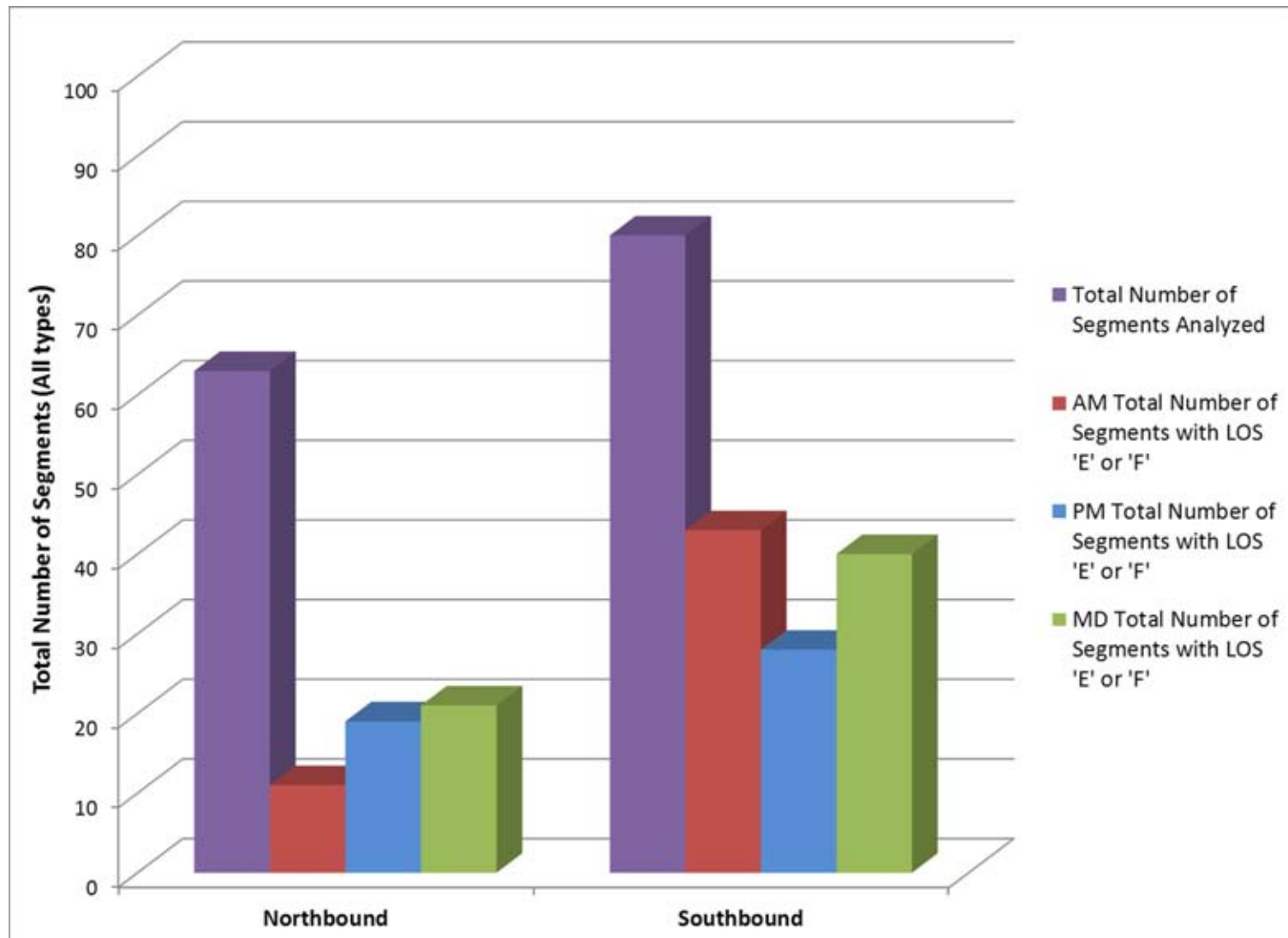
Note: Summary excludes results for northern terminus segments; see Section 7.6 for northern termini analysis results.

Figure 7-3 presents a graphical summary of Alternative 6A I-710 freeway operations for both northbound and southbound directions. As shown in the table, the southbound direction is expected to experience more congestion during the morning and midday peak hours as compared to the evening peak hour. The northbound direction is expected to experience more congestion during the midday and evening peak hours with less congestion during the morning peak hour.

Based on the analysis and findings presented in this section, it is expected that under 2035 Alternative 6A conditions the future traffic operations along the I-710 freeway corridor for both northbound and southbound directions will improve dramatically when compared to the traffic operations under Alternative 1 and an improvement (overall better performance during midday and evening peak hours) over Alternative 5A conditions.

In summary, the aforementioned operational improvements are the direct result of diverting the majority of the port truck traffic onto the FC. As shown in the succeeding tables, at the north segments, both northbound and southbound traffic experience severe congestion. This is a result of truck traffic entering/exiting from the FC to the freeway mainline as well as heavy vehicular volumes that include a high percentage of truck traffic during the peak hours (midday and evening primarily in the northbound direction).

Figure 7-3
I-710 Mainline Alternative 6A Summary



Note: Summary excludes results for northern terminus segments; see Section 7.6 for northern termini analysis results.

7.4 FUTURE YEAR 2035 ALTERNATIVE 6B TRAFFIC ANALYSIS

This section provides the 2035 Alternative 6B traffic analysis that consists of operational analysis of the Alternative 6B network as described in **Section 6**. The Alternative 6B network incorporates the geometric enhancements applied to the I-710 freeway for improved traffic operations. Examples of the geometric enhancements include ramp braiding, modified interchange configurations, and auxiliary lane improvements as well as the enhanced capacity on the freight corridor due to the addition of automated guidance technologies. Alternative 6B is similar to Alternative 6A but restricts the use of the FC to zero-emission trucks rather than conventional trucks.

7.4.1 I-710 Freeway Segments

Table 7-10 and **Table 7-11** show the LOS for the various segments of I-710 under Alternative 6B conditions.

Table 7-10
I-710 Northbound 2035 Peak Hour Alternative 6B (Build) Level of Service

Location Description	Freeway Type	Lane		AM		PM		MD	
		ML	Ramp	Density / VIC ¹	LOS	Density / VIC ¹	LOS	Density / VIC ¹	LOS
North of Floral On	Basic	4	--	25.5	C	--*	F	37.8	E
Floral	On	4	1	20.1	C	--*	F	25.3	C
--	Basic	4	--	24.4	C	43.3	E	36.3	E
SR-60	Major On ²	3	2	0.67	N/A	--*	F	--*	F
--	Basic	3	--	31.4	D	--*	F	--*	F
New York	Off	3	1	37.6	E	--*	F	--*	F
--	Basic	3	--	38.6	E	--*	F	--*	F
Ford	On	3	1	38.1	E	--*	F	--*	F
--	Basic	3	--	36.4	E	--*	F	--*	F
Ford	Off ⁴	4	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	4	--	25.6	C	--*	F	38.1	E
SR-60	Off	5	2	N/A	N/A	N/A	N/A	N/A	N/A
Olympic On / SR-60 Off	Weave B	5	--	41.5	E	49.1	F	49.4	F
Olympic	On	4	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	4	--	--*	F	--*	F	--*	F
I-5 NB	On ⁴	3	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	3	--	--*	F	--*	F	--*	F
Olympic	Off	3	1	--*	F	--*	F	--*	F
--	Basic	3	--	--*	F	--*	F	--*	F
See Section 7-6 for operational analysis results for northern terminus segments (between Slauson Ave and Washington Blvd) for Alternatives 6A, 6B and 6C and their corresponding design options.									
Florence	On ⁴	5	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	5	--	35.2	E	32.5	D	32.7	D
Florence	Major Off ³	6	2	32.2	D	30.6	D	33.1	D
--	Basic	6	--	29.0	D	27.2	D	30.0	D

Table 7-10
I-710 Northbound 2035 Peak Hour Alternative 6B (Build) Level of Service

Location Description	Freeway Type	Lane		AM		PM		MD	
		ML	Ramp	Density / V/C ¹	LOS	Density / V/C ¹	LOS	Density / V/C ¹	LOS
Firestone WB	On ⁴	5	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	5	--	31.8	D	30.1	D	33.6	D
Firestone EB	On	5	1	21.0	C	20.7	C	22.1	C
--	Basic	5	--	27.8	D	27.9	D	30.1	D
Firestone	Major Off ³	6	2	28.6	D	31.5	D	32.0	D
--	Basic	6	--	25.3	C	28.2	D	28.7	D
Imperial	On ⁴	5	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	5	--	28.8	D	33.0	D	33.4	D
Imperial	Off	6	2	N/A	N/A	N/A	N/A	N/A	N/A
I-105 On / Imperial Off	Weave B	6	--	35.2	E	39.9	E	40.7	E
I-105	On	4	2	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	4	--	26.4	D	33.6	D	33.3	D
Rosecrans	On	4	1	20.2	C	23.5	C	23.7	C
--	Basic	4	--	23.9	C	30.5	D	30.8	D
I-105	Major Off ³	7	3	21.7	C	26.7	C	26.5	C
--	Basic	6	--	22.2	C	27.8	D	27.5	D
Rosecrans	Off	6	1	31.5	D	38.9	E	36.5	E
--	Basic	6	--	24.7	C	32.3	D	30.8	D
Alondra	On	6	1	18.7	B	21.8	C	20.9	C
--	Basic	6	--	22.4	C	29.6	D	27.7	D
SR-91 EB	On ⁴	5	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	5	--	22.2	C	27.9	D	26.2	D
SR-91 WB & Atlantic	On ⁴	4	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	4	--	20.9	C	27.5	D	25.8	C
Alondra	Major Off ³	5	2	20.6	C	27.3	C	25.4	C
--	Basic	5	--	18.1	C	24.0	C	22.3	C
SR-91 & Artesia	Off	7	2	N/A	N/A	N/A	N/A	N/A	N/A
Long Beach On / SR-91 & Artesia Off	Weave B	7	--	24.9	C	30.7	D	28.1	D
Long Beach	On	6	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	6	--	20.1	C	25.4	C	23.4	C
Long Beach	Off	6	1	N/A	N/A	N/A	N/A	N/A	N/A
Del Amo On / Long Beach Off	Weave B	6	--	23.1	C	29.6	D	26.3	C
Del Amo	On	5	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	5	--	22.9	C	27.7	D	25.4	C
Del Amo	Major Off ³	6	2	25.9	C	30.9	D	28.6	D
--	Basic	6	--	22.8	C	27.5	D	25.2	C
I-710 FC NB	Off	6	1	31.5	D	32.6	D	30.6	D
--	Basic	6	--	25.1	C	28.9	D	26.4	D
I-405 SB	On ⁴	5	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	5	--	23.2	C	25.0	C	24.1	C
I-405 NB	On ⁴	4	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	4	--	21.3	C	22.6	C	21.7	C
I-405	Off	5	2	N/A	N/A	N/A	N/A	N/A	N/A

Table 7-10
I-710 Northbound 2035 Peak Hour Alternative 6B (Build) Level of Service

Location Description	Freeway Type	Lane		AM		PM		MD	
		ML	Ramp	Density / V/C ¹	LOS	Density / V/C ¹	LOS	Density / V/C ¹	LOS
Willow On / I-405 Off	Weave B	5	--	29.9	D	27.4	C	31.2	D
Willow	On	5	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	5	--	19.4	C	18.7	C	20.7	C
Willow	Off	5	1	N/A	N/A	N/A	N/A	N/A	N/A
PCH On / Willow Off	Weave B	5	--	22.4	C	21.9	C	28.0	D
PCH	On	4	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	4	--	20.5	C	19.9	C	17.8	B
Anaheim	On	4	1	17.5	B	17.3	B	17.6	B
--	Basic	4	--	15.9	B	15.0	B	11.7	B
Shoreline	Major On ²	2	2	0.44	N/A	0.42	N/A	0.32	N/A
--	Basic	2	--	9.8	A	11.3	B	6.5	A
Pico	On ⁴	1	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	1	--	14.6	B	13.6	B	7.1	A
PCH	Off ⁴	2	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	2	--	11.8	B	9.6	A	6.3	A
Anaheim	Major Off ³	3	2	10.4	B	9.0	A	10.1	B
--	Basic	3	--	9.1	A	7.9	A	8.8	A
Harbor Scenic	On ⁴	2	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	2	--	7.7	A	5.2	A	1.1	A
I-710 FC NB	Off	2	1	21.2	C	25.7	C	13.6	B
From Ocean	Basic	2	--	16.2	B	20.4	C	10.0	A

Notes:

¹ Density = passenger car/mile/lane; v/c = volume-to-capacity ratio. Shaded and bold cells indicate LOS E or F.

² Major merge area; HCM methodology applied for analysis.

³ Major diverge area; HCM methodology applied for analysis.

⁴ Single-lane addition/drop; HCM methodology applied for analysis.

⁵ Operation occurs on freeway collector/distributor.

N/A = not applicable. LOS and/or density information are not shown for major merge areas, single-lane addition/drop, and merge/diverge operations within a weaving segment.

* = Demand exceeds capacity, no density is predicted.

Table 7-11
I-710 Southbound 2035 Peak Hour Alternative 6B (Build) Level of Service

Location Description	Freeway Type	Lane		AM		PM		MD	
		ML	Ramp	Density / VIC ¹	LOS	Density / VIC ¹	LOS	Density / VIC ¹	LOS
North of I-10 On	Basic	3	--	25.3	C	22.8	C	23.8	C
I-10 & Romona	Major On ²	3	2	0.80	N/A	0.75	N/A	0.76	N/A
--	Basic	4	--	29.5	D	27.4	D	28.1	D
Lane Drop	Basic	3	--	--*	F	44.7	E	--*	F
Floral & Humphries	Off	3	1	--*	F	38.4	E	--*	F
--	Basic	3	--	--*	F	42.2	E	44.7	E
SR-60	Major Off ³	5	2	25.6	C	24.1	C	24.6	C
--	Basic	3	--	44.5	E	33.9	D	37.3	E
Caesar Chavez	On	3	1	--*	F	35.2	E	--*	F
--	Basic	3	--	--*	F	41.4	E	--*	F
Third	On	3	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Weave A	4	--	44.2	F	40.9	E	38.1	E
Eagle	Off	4	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	4	--	34.2	D	29.5	D	29.5	D
SR-60	On	4	2	N/A	N/A	N/A	N/A	N/A	N/A
--	Weave C	6	--	51.8	F	56.5	F	52.2	F
Eastern	Off	6	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	6	--	36.6	E	36.8	E	33.8	D
I-5 SB	Off ⁴	6	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	5	--	36.2	E	34.1	D	36.0	E
Eastern	On	5	1	24.5	C	23.8	C	24.4	C
--	Basic	5	--	43.0	E	39.3	E	43.6	E
See Section 7-6 for operational analysis results for northern terminus segments (between Slauson Ave and Washington Blvd) for Alternatives 6A, 6B and 6C and their corresponding design options.									
Florence	Major Off ³	6	2	33.1	D	--*	F	--*	F
--	Basic	5	--	37.6	E	--*	F	--*	F
Florence	On ⁴	5	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	6	--	32.3	D	40.7	E	42.6	E
Firestone	Major Off ³	6	2	34.9	D	--*	F	--*	F
--	Basic	5	--	37.7	E	--*	F	--*	F
Firestone WB	On	5	1	25.0	C	--*	F	--*	F
--	Basic	5	--	44.7	E	--*	F	--*	F
Firestone EB	On	5	1	--*	F	--*	F	--*	F
--	Basic	5	--	--*	F	--*	F	--*	F
Imperial & MLK	Off	5	2	--*	F	--*	F	--*	F
--	Basic	5	--	44.1	E	--*	F	--*	F
Imperial	On	5	1	N/A	N/A	N/A	N/A	N/A	N/A
Imperial On / I-105 Off	Weave C	6	--	54.6	F	51.1	F	56.7	F
I-105	Off	6	2	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	4	--	--*	F	--*	F	--*	F
Rosecrans	Off	4	1	--*	F	--*	F	--*	F
--	Basic	4	--	--*	F	43.0	E	--*	F

Table 7-11
I-710 Southbound 2035 Peak Hour Alternative 6B (Build) Level of Service

Location Description	Freeway Type	Lane		AM		PM		MD	
		ML	Ramp	Density / VIC ¹	LOS	Density / VIC ¹	LOS	Density / VIC ¹	LOS
MLK On / Rosecrans Off	Weave A ⁵	2	--	22.4	B	20.8	B	13.8	B
MLK	On	4	1	--*	F	27.9	C	--*	F
--	Basic	4	--	--*	F	44.9	E	--*	F
I-105 EB On / Rosecrans Off	Weave B ⁵	3	--	26.9	C	18.9	B	23.9	B
I-105	Major On ²	4	2	--*	F	0.81	N/A	--*	F
--	Basic	6	--	42.0	E	30.4	D	40.6	E
Rosecrans WB	On	6	1	26.7	C	21.9	C	26.6	C
--	Basic	6	--	--*	F	31.1	D	41.5	E
Rosecrans EB	On	6	1	--*	F	22.4	C	--*	F
--	Basic	6	--	--*	F	32.5	D	43.7	E
Alondra	Off	6	1	--*	F	38.2	E	--*	F
--	Basic	6	--	41.4	E	28.6	D	34.8	D
SR-91 EB	Major Off ³	6	2	39.8	E	31.8	D	36.5	E
--	Basic	5	--	37.7	E	25.3	C	29.0	D
Alondra	On	5	1	N/A	N/A	N/A	N/A	N/A	N/A
Alondra On / SR-91 WB Off	Weave B	6	--	44.9	F	28.7	D	36.1	E
SR-91 WB	Off	6	2	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	4	--	31.9	D	26.7	D	27.9	D
SR-91 WB	Major On ²	4	2	0.93	N/A	0.77	N/A	0.87	N/A
--	Basic	5	--	38.0	E	28.5	D	34.0	D
SR-91 EB & Artesia	On	5	1	N/A	N/A	N/A	N/A	N/A	N/A
SR-91 EB On / Long Beach Off	Weave B	6	--	36.6	E	31.0	D	35.1	E
Long Beach	Off	6	2	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	5	--	39.7	E	29.7	D	33.7	D
Long Beach	On ⁴	5	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	6	--	32.1	D	25.5	C	28.2	D
Del Amo & Susana	Major Off ³	6	2	34.7	D	28.9	D	31.5	D
--	Basic	5	--	32.4	D	27.1	D	29.0	D
Del Amo & Susana	On ⁴	5	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	6	--	30.1	D	24.7	C	26.7	D
I-710 SB FC	On	6	1	N/A	N/A	N/A	N/A	N/A	N/A
I-710 SB FC On / I-405 SB Off	Weave B	6	--	44.1	F	41.2	E	40.6	E
I-405 SB	Off	6	2	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	5	--	25.2	C	23.3	C	24.4	C
I-405 NB	Major Off ³	5	2	28.5	D	26.5	C	27.7	C
--	Basic	4	--	24.4	C	23.3	C	26.9	D
I-405 SB	Major On ²	4	2	0.60	N/A	0.56	N/A	0.61	N/A
--	Basic	6	--	21.6	C	20.2	C	22.0	C
I-405 NB	Major On ²	6	2	0.59	N/A	0.53	N/A	0.63	N/A
--	Basic	7	--	21.4	C	19.1	C	22.7	C
Lane Drop	Basic	6	--	25.0	C	22.3	C	26.7	D
Willow	Major Off ³	6	2	28.4	D	25.4	C	30.1	D
--	Basic	5	--	25.2	C	21.3	C	28.3	D

Table 7-11
I-710 Southbound 2035 Peak Hour Alternative 6B (Build) Level of Service

Location Description	Freeway Type	Lane		AM		PM		MD	
		ML	Ramp	Density / VIC ¹	LOS	Density / VIC ¹	LOS	Density / VIC ¹	LOS
Willow	On	5	1	N/A	N/A	N/A	N/A	N/A	N/A
Willow On / PCH Off	Weave B	6	--	30.1	D	24.9	C	31.2	D
PCH	Off	6	2	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	5	--	24.9	C	19.3	C	24.2	C
Shoreline	Major Off ³	5	2	--*	F	21.9	C	27.5	C
--	Basic	3	--	17.0	B	11.1	B	19.6	C
Anaheim	Major Off ³	3	2	19.4	B	12.6	B	22.2	C
--	Basic	2	--	10.9	A	4.9	A	12.8	B
PCH	On ⁴	2	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	3	--	8.5	A	4.9	A	11.6	B
I-710 SB FC	On	3	1	20.5	C	13.4	B	23.5	C
--	Basic	3	--	16.2	B	9.9	A	19.5	C
Anaheim	On	3	1	18.1	B	12.9	B	22.5	C
--	Basic	3	--	19.2	C	12.7	B	23.5	C
Harbor Scenic	Major Off ³	3	2	21.8	C	14.5	B	26.7	C
To Ocean	Basic	2	--	15.0	B	7.6	A	16.3	B

Notes:

¹ Density = passenger car/mile/lane; v/c = volume-to-capacity ratio. Shaded and bold cells indicate LOS E or F.

² Major merge area; HCM methodology applied for analysis.

³ Major diverge area; HCM methodology applied for analysis.

⁴ Single-lane addition/drop; HCM methodology applied for analysis.

⁵ Operation occurs on freeway collector/distributor.

N/A = not applicable. LOS and/or density information are not shown for major merge areas, single-lane addition/drop, and merge/diverge operations within a weaving segment.

* = Demand exceeds capacity, no density is predicted.

Table 7-12 presents the summary of Alternative 6B I-710 freeway operations and the following statements describe key findings of the analysis:

For Northbound I-710:

- The number of basic freeway segments with poor operating conditions are highest during the midday and evening peak hours when 24 percent (9 out of 38) of the segments are expected to operate at poor LOS E or F;
- The majority of the merge and diverge areas are expected to operate at an acceptable LOS D or better with the exception of 32 percent (6 out of 19) during the evening peak hour;
- The LOS for the weaving areas experience similar densities during all peak hours; 33 percent (2 out of 6) of the weaving areas are expected to operate at poor LOS E or F.

For Southbound I-710:

- Approximately 50 percent (22 out of 43) of the basic freeway segments are expected to operate at poor LOS E or F during the morning peak hour;

- The LOS for the merge and diverge areas are heaviest during the midday peak hour when 46 percent (13 out of 28) of the merge and diverge areas are expected to operate at poor LOS E or F;
- The weaving areas experience maximum densities during both morning and midday peak hours when 67 percent (6 out of 9) are expected to operate at poor LOS E or F.

Table 7-12
I-710 2035 Peak Hour Alternative 6B (Build) Summary

Segment Type	Total Number of Segments	Number of Segments with LOS E or F			Percent of Segments with LOS E or F		
		AM Peak Hour	PM Peak Hour	MD Peak Hour	AM Peak Hour	PM Peak Hour	MD Peak Hour
Northbound							
Basic	38	6	9	9	16%	24%	24%
Merge / Diverge	19	3	6	5	16%	32%	26%
Weave	6	2	2	2	33%	33%	33%
Southbound							
Basic	43	22	14	18	51%	33%	42%
Merge / Diverge	28	11	9	13	39%	32%	46%
Weave	9	6	4	6	67%	44%	67%

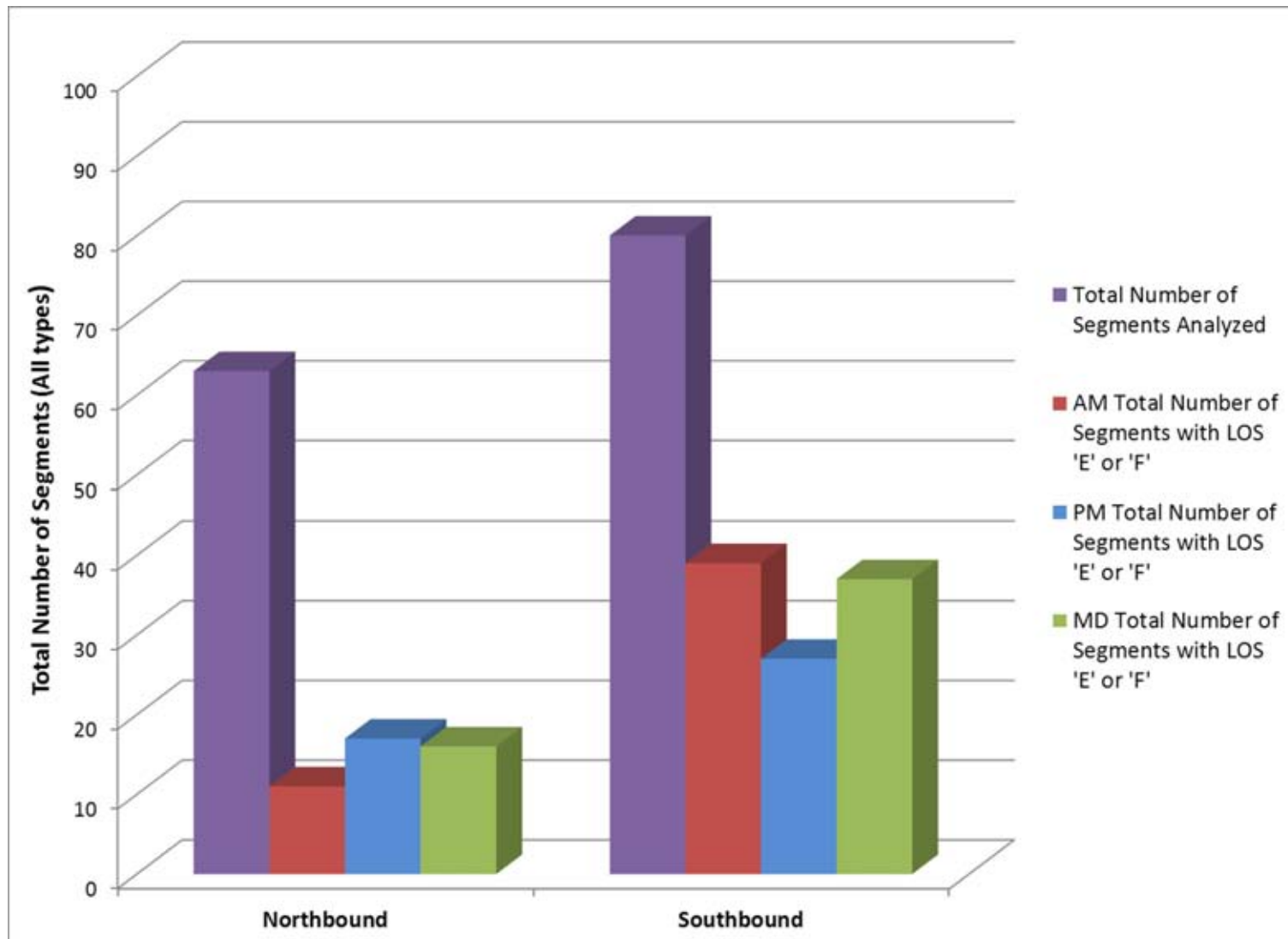
Note: Summary excludes results for northern terminus segments; see Section 7.6 for northern termini analysis results.

Figure 7-4 presents a graphical summary of Alternative 6B I-710 freeway operations for both northbound and southbound directions. As shown in the table, the southbound direction is expected to experience more congestion during the morning and midday peak hours compared to the evening peak hour. The northbound direction is expected to experience more congestion during the evening and midday peak hours with less congestion during the morning peak hour.

Based on the analysis and findings presented in this section, it is expected that under 2035 Alternative 6B conditions the future traffic operations along the I-710 freeway corridor for both northbound and southbound directions will improve dramatically when compared to the traffic operations under Alternative 1.

In summary, the aforementioned operational improvements are the direct result of diverting the majority of the conventional port truck traffic into zero-emission trucks out of general purpose lanes onto the FC with the addition of the automated guidance technology.

Figure 7-4
I-710 Mainline Alternative 6B Summary



Note: Summary excludes results for northern terminus segments; see Section 7.6 for northern termini analysis results.

7.5 FUTURE YEAR 2035 ALTERNATIVE 6C TRAFFIC ANALYSIS

This section provides the 2035 Alternative 6C traffic analysis that consists of operational analysis of the Alternative 6C network as described in **Section 6**. The Alternative 6C network incorporates the geometric enhancements applied to the I-710 freeway for improved traffic operations. Examples of the geometric enhancements include ramp braiding, modified interchange configurations, and auxiliary lane improvements. Alternative 6C includes all of the components of Alternative 6B described above, but would impose toll on all trucks using the FC.

7.5.1 I-710 Freeway Segments

Table 7-13 and **Table 7-14** show the LOS for the various segments of I-710 under Alternative 6C conditions.

Table 7-13
I-710 Northbound 2035 Peak Hour Alternative 6C (Build) Level of Service

Location Description	Freeway Type	Lane		AM		PM		MD	
		ML	Ramp	Density / VIC ¹	LOS	Density / VIC ¹	LOS	Density / VIC ¹	LOS
North of Floral On	Basic	4	--	24.6	C	--*	F	37.9	E
Floral	On	4	1	19.6	B	27.5	F	25.5	C
--	Basic	4	--	23.6	C	42.1	E	36.3	E
SR-60	Major On ²	3	2	0.65	N/A	--*	F	--*	F
--	Basic	3	--	29.8	D	--*	F	--*	F
New York	Off	3	1	36.7	E	--*	F	--*	F
--	Basic	3	--	36.0	E	--*	F	--*	F
Ford	On	3	1	36.8	E	--*	F	--*	F
--	Basic	3	--	34.1	D	--*	F	--*	F
Ford	Off ⁴	4	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	4	--	24.7	C	--*	F	38.4	E
SR-60	Off	5	2	N/A	N/A	N/A	N/A	N/A	N/A
Olympic On / SR-60 Off	Weave B	5	--	40.2	E	48.4	F	49.1	F
Olympic	On	4	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	4	--	--*	F	--*	F	--*	F
I-5 NB	On ⁴	3	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	3	--	--*	F	--*	F	--*	F
Olympic	Off	3	1	--*	F	--*	F	--*	F
--	Basic	3	--	--*	F	--*	F	--*	F
See Section 7-6 for operational analysis results for northern terminus segments (between Slauson Ave and Washington Blvd) for Alternatives 6A, 6B and 6C and their corresponding design options.									
Florence	On ⁴	5	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	5	--	33.9	D	32.2	D	34.5	D
Florence	Major Off ³	6	2	31.4	D	30.8	D	34.1	D
--	Basic	6	--	28.1	D	27.4	D	31.3	D
Firestone WB	On ⁴	5	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	5	--	30.6	D	30.2	D	35.4	E
Firestone EB	On	5	1	20.6	C	20.9	C	22.6	C

Table 7-13
I-710 Northbound 2035 Peak Hour Alternative 6C (Build) Level of Service

Location Description	Freeway Type	Lane		AM		PM		MD	
		ML	Ramp	Density / V/C ¹	LOS	Density / V/C ¹	LOS	Density / V/C ¹	LOS
--	Basic	5	--	26.8	D	28.2	D	31.2	D
Firestone	Major Off ³	6	2	27.8	C	31.7	D	32.7	D
--	Basic	6	--	24.5	C	28.3	D	29.6	D
Imperial	On ⁴	5	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	5	--	27.6	D	33.3	D	34.9	D
Imperial	Off	6	2	N/A	N/A	N/A	N/A	N/A	N/A
I-105 On / Imperial Off	Weave B	6	--	34.5	D	40.1	E	41.8	E
I-105	On	4	2	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	4	--	24.8	C	33.2	D	34.7	D
Rosecrans	On	4	1	19.4	B	223.3	E	24.0	C
--	Basic	4	--	22.6	C	29.9	D	31.7	D
I-105	Major Off ³	7	3	21.1	C	26.7	C	27.3	C
--	Basic	6	--	21.7	C	27.8	D	28.6	D
Rosecrans	Off	6	1	30.9	D	38.8	E	37.2	E
--	Basic	6	--	24.0	C	32.3	D	32.2	D
Alondra	On	6	1	18.4	B	21.8	C	21.5	C
--	Basic	6	--	21.8	C	29.6	D	28.8	D
SR-91 EB	On ⁴	5	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	5	--	21.8	C	27.8	D	27.0	D
SR-91 WB & Atlantic	On ⁴	4	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	4	--	20.2	C	27.5	D	26.8	D
Alondra	Major Off ³	5	2	20.1	C	27.2	C	26.2	C
--	Basic	5	--	17.7	B	23.9	C	23.1	C
SR-91 & Artesia	Off	7	2	N/A	N/A	N/A	N/A	N/A	N/A
Long Beach On / SR-91 & Artesia Off	Weave B	7	--	23.3	C	29.7	D	27.2	C
Long Beach	On	6	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	6	--	19.1	C	24.9	C	23.4	C
Long Beach	Off	6	1	N/A	N/A	N/A	N/A	N/A	N/A
Del Amo On / Long Beach Off	Weave B	6	--	23.2	C	30.0	D	28.3	D
Del Amo	On	5	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	5	--	22.5	C	27.6	D	26.7	D
Del Amo	Major Off ³	6	2	25.5	C	30.6	D	29.5	D
--	Basic	6	--	22.4	C	27.2	D	26.0	D
I-710 FC NB	Off	6	1	35.3	E	33.6	D	32.2	D
--	Basic	6	--	26.1	D	29.2	D	27.6	D
I-405 SB	On ⁴	5	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	5	--	24.4	C	25.2	C	25.3	C
I-405 NB	On ⁴	4	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	4	--	23.2	C	22.8	C	23.7	C
I-405	Off	5	2	N/A	N/A	N/A	N/A	N/A	N/A
Willow On / I-405 Off	Weave B	5	--	31.2	D	27.1	C	32.6	D
Willow	On	5	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	5	--	20.9	C	18.8	C	22.0	C

Table 7-13
I-710 Northbound 2035 Peak Hour Alternative 6C (Build) Level of Service

Location Description	Freeway Type	Lane		AM		PM		MD	
		ML	Ramp	Density / V/C ¹	LOS	Density / V/C ¹	LOS	Density / V/C ¹	LOS
Willow	Off	5	1	N/A	N/A	N/A	N/A	N/A	N/A
PCH On / Willow Off	Weave B	5	--	24.3	C	23.5	C	30.2	D
PCH	On	4	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	4	--	22.6	C	21.1	C	20.1	C
Anaheim	On	4	1	18.4	B	17.8	B	18.7	B
--	Basic	4	--	17.9	B	16.3	B	13.7	B
Shoreline	Major On ²	2	2	0.50	N/A	0.45	N/A	0.38	N/A
--	Basic	2	--	14.1	B	14.5	B	10.5	A
Pico	On ⁴	1	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	1	--	25.1	C	19.1	C	15.1	B
PCH	Off ⁴	2	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	2	--	16.8	B	12.1	B	10.2	A
Anaheim	Major Off ³	3	2	14.0	B	10.9	B	12.8	B
--	Basic	3	--	12.3	B	9.6	A	11.3	B
Harbor Scenic	On ⁴	2	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	2	--	10.8	A	7.2	A	3.6	A
I-710 FC NB	Off	2	1	20.3	C	25.9	C	13.5	B
From Ocean	Basic	2	--	15.6	B	20.4	C	10.0	A

Notes:

¹ Density = passenger car/mile/lane; v/c = volume-to-capacity ratio. Shaded and bold cells indicate LOS E or F.² Major merge area; HCM methodology applied for analysis.³ Major diverge area; HCM methodology applied for analysis.⁴ Single-lane addition/drop; HCM methodology applied for analysis.⁵ Operation occurs on freeway collector/distributor.

N/A = not applicable. LOS and/or density information are not shown for major merge areas, single-lane addition/drop, and merge/diverge operations within a weaving segment.

* = Demand exceeds capacity, no density is predicted.

Table 7-14
I-710 Southbound 2035 Peak Hour Alternative 6C (Build) Level of Service

Location Description	Freeway Type	Lane		AM		PM		MD	
		ML	Ramp	Density / V/C ¹	LOS	Density / V/C ¹	LOS	Density / V/C ¹	LOS
North of I-10 On	Basic	3	--	24.4	C	22.5	C	22.8	C
I-10 & Romona	Major On ²	3	2	0.78	N/A	0.73	N/A	0.75	N/A
--	Basic	4	--	29.0	D	26.8	D	27.2	D
Lane Drop	Basic	3	--	--*	F	42.7	E	44.0	E
Floral & Humphries	Off	3	1	--*	F	38.0	E	38.3	E
--	Basic	3	--	--*	F	40.5	E	42.5	E
SR-60	Major Off ³	5	2	25.3	C	23.6	C	24.1	C
--	Basic	3	--	41.5	E	32.5	D	35.3	E
Caesar Chavez	On	3	1	--*	F	34.5	D	--*	F
--	Basic	3	--	--*	F	39.2	E	--*	F
Third	On	3	1	N/A	N/A	N/A	N/A	N/A	N/A

Table 7-14
I-710 Southbound 2035 Peak Hour Alternative 6C (Build) Level of Service

Location Description	Freeway Type	Lane		AM		PM		MD	
		ML	Ramp	Density / VIC ¹	LOS	Density / VIC ¹	LOS	Density / VIC ¹	LOS
--	Weave A	4	--	43.0	F	40.2	E	36.9	E
Eagle	Off	4	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	4	--	33.0	D	28.6	D	28.5	D
SR-60	On	4	2	N/A	N/A	N/A	N/A	N/A	N/A
--	Weave C	6	--	50.9	F	55.7	F	50.6	F
Eastern	Off	6	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	6	--	34.8	D	35.5	E	32.0	D
I-5 SB	Off ⁴	6	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	5	--	33.8	D	32.0	D	34.3	D
Eastern	On	5	1	23.7	C	23.0	C	23.9	C
--	Basic	5	--	39.3	E	36.6	E	41.0	E
See Section 7-6 for operational analysis results for northern terminus segments (between Slauson Ave and Washington Blvd) for Alternatives 6A, 6B and 6C and their corresponding design options.									
Florence	Major Off ³	6	2	34.8	D	--*	F	--*	F
--	Basic	5	--	42.0	E	--*	F	--*	F
Florence	On ⁴	5	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	6	--	34.9	D	42.6	E	--*	F
Firestone	Major Off ³	6	2	36.5	E	--*	F	--*	F
--	Basic	5	--	41.9	E	--*	F	--*	F
Firestone WB	On	5	1	--*	F	--*	F	--*	F
--	Basic	5	--	--*	F	--*	F	--*	F
Firestone EB	On	5	1	--*	F	--*	F	--*	F
--	Basic	5	--	--*	F	--*	F	--*	F
Imperial & MLK	Off	5	2	--*	F	--*	F	--*	F
--	Basic	5	--	--*	F	--*	F	--*	F
Imperial	On	5	1	N/A	N/A	N/A	N/A	N/A	N/A
Imperial On / I-105 Off	Weave C	6	--	56.1	F	52.3	F	59.8	F
I-105	Off	6	2	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	4	--	--*	F	--*	F	--*	F
Rosecrans	Off	4	1	--*	F	--*	F	--*	F
--	Basic	4	--	--*	F	--*	F	--*	F
MLK On / Rosecrans Off	Weave A ⁵	2	--	22.4	B	21.1	B	13.6	B
MLK	On	4	1	--*	F	--*	F	--*	F
--	Basic	4	--	--*	F	--*	F	--*	F
I-105 EB On / Rosecrans Off	Weave B ⁵	3	--	26.9	C	19.1	B	23.8	B
I-105	Major On ²	4	2	--*	F	--*	F	--*	F
--	Basic	6	--	--*	F	31.4	D	--*	F
Rosecrans WB	On	6	1	--*	F	22.5	C	--*	F
--	Basic	6	--	--*	F	32.1	D	--*	F
Rosecrans EB	On	6	1	--*	F	22.9	C	--*	F
--	Basic	6	--	--*	F	33.7	D	--*	F
Alondra	Off	6	1	--*	F	38.8	E	--*	F

Table 7-14
I-710 Southbound 2035 Peak Hour Alternative 6C (Build) Level of Service

Location Description	Freeway Type	Lane		AM		PM		MD	
		ML	Ramp	Density / VIC ¹	LOS	Density / VIC ¹	LOS	Density / VIC ¹	LOS
--	Basic	6	--	--*	F	29.5	D	39.1	E
SR-91 EB	Major Off ³	6	2	--*	F	32.7	D	38.8	E
--	Basic	5	--	41.3	E	26.4	D	33.1	D
Alondra	On	5	1	N/A	N/A	N/A	N/A	N/A	N/A
Alondra On / SR-91 WB Off	Weave B	6	--	45.6	F	29.4	D	38.8	E
SR-91 WB	Off	6	2	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	4	--	35.7	E	27.9	D	33.3	D
SR-91 WB	Major On ²	4	2	0.98	N/A	0.80	N/A	0.95	N/A
--	Basic	5	--	42.8	E	29.5	D	40.2	E
SR-91 EB & Artesia	On	5	1	N/A	N/A	N/A	N/A	N/A	N/A
SR-91 EB On / Long Beach Off	Weave B	6	--	38.6	E	32.0	D	38.1	E
Long Beach	Off	6	2	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	5	--	--*	F	30.9	D	40.3	E
Long Beach	On ⁴	5	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	6	--	35.2	E	26.4	D	32.0	D
Del Amo & Susana	Major Off ³	6	2	36.7	E	29.8	D	34.6	D
--	Basic	5	--	37.2	E	28.3	D	34.1	D
Del Amo & Susana	On ⁴	5	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	6	--	33.3	D	25.7	C	30.8	D
I-710 SB FC	On	6	1	N/A	N/A	N/A	N/A	N/A	N/A
I-710 SB FC On / I-405 SB Off	Weave B	6	--	44.8	F	41.0	E	41.1	E
I-405 SB	Off	6	2	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	5	--	27.6	D	24.0	C	27.4	D
I-405 NB	Major Off ³	5	2	30.9	D	27.3	C	30.7	D
--	Basic	4	--	27.8	D	24.8	C	32.0	D
I-405 SB	Major On ²	4	2	0.66	N/A	0.59	N/A	0.68	N/A
--	Basic	6	--	23.8	C	21.1	C	24.6	C
I-405 NB	Major On ²	6	2	0.64	N/A	0.55	N/A	0.70	N/A
--	Basic	7	--	23.3	C	20.0	C	25.3	C
Lane Drop	Basic	6	--	27.5	D	23.3	C	30.4	D
Willow	Major Off ³	6	2	30.9	D	26.5	C	33.4	D
--	Basic	5	--	27.0	D	21.6	C	30.7	D
Willow	On	5	1	N/A	N/A	N/A	N/A	N/A	N/A
Willow On / PCH Off	Weave B	6	--	31.5	D	25.5	C	33.1	D
PCH	Off	6	2	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	5	--	27.0	D	20.0	C	26.6	D
Shoreline	Major Off ³	5	2	30.4	D	22.7	C	30.0	D
--	Basic	3	--	20.6	C	12.3	B	23.5	C
Anaheim	Major Off ³	3	2	23.4	C	14.0	B	26.7	C
--	Basic	2	--	16.2	B	6.6	A	18.4	C
PCH	On ⁴	2	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	3	--	12.0	B	6.0	A	15.6	B
I-710 SB FC	On	3	1	20.6	C	13.2	B	23.7	C

Table 7-14
I-710 Southbound 2035 Peak Hour Alternative 6C (Build) Level of Service

Location Description	Freeway Type	Lane		AM		PM		MD	
		ML	Ramp	Density / V/C ¹	LOS	Density / V/C ¹	LOS	Density / V/C ¹	LOS
--	Basic	3	--	17.6	B	10.2	A	21.1	C
Anaheim	On	3	1	19.3	B	12.3	B	24.1	C
--	Basic	3	--	20.6	C	13.0	B	25.3	C
Harbor Scenic	Major Off ³	3	2	23.4	C	14.8	B	28.7	D
To Ocean	Basic	2	--	17.4	B	8.2	A	18.9	C

Notes:

¹ Density = passenger car/mile/lane; v/c = volume-to-capacity ratio. Shaded and bold cells indicate LOS E or F.

² Major merge area; HCM methodology applied for analysis.

³ Major diverge area; HCM methodology applied for analysis.

⁴ Single-lane addition/drop; HCM methodology applied for analysis.

⁵ Operation occurs on freeway collector/distributor.

N/A = not applicable. LOS and/or density information are not shown for major merge areas, single-lane addition/drop, and merge/diverge operations within a weaving segment.

* = Demand exceeds capacity, no density is predicted.

Table 7-15 presents the summary of Alternative 6C I-710 freeway operations and the following statements describe key findings of the analysis:

For Northbound I-710:

- The number of basic freeway segments with poor operating conditions are highest during the midday peak hour when 26 percent (10 out of 36) of the segments are expected to operate at poor LOS E or F;
- The LOS for the merge and diverge areas are expected to operate at poor LOS E or F between 21 and 37 percent during the three peak hours;
- The weaving areas experience maximum densities during both midday and evening peak hours when 33 percent (2 out of 6) of the weaving areas are expected to operate at poor LOS E or F.

For Southbound I-710:

- The number of basic freeway segments with poor operating conditions are highest during the morning peak hour when 53 percent (23 out of 43) of the segments are expected to operate at poor LOS E or F;
- Approximately half (14 out of 28) of the merge and diverge areas are expected to operate at poor LOS E or F during morning and midday peak hours;
- The weaving areas experience highest densities during both morning and midday peak hour when 67 percent (6 out of 9) of the weaving areas are expected to operate at poor LOS E or F.

Table 7-15
I-710 2035 Peak Hour Alternative 6C (Build) Summary

Segment Type	Total Number of Segments	Number of Segments with LOS E or F			Percent of Segments with LOS E or F		
		AM Peak Hour	PM Peak Hour	MD Peak Hour	AM Peak Hour	PM Peak Hour	MD Peak Hour
Northbound							
Basic	38	4	9	10	11%	24%	26%
Merge / Diverge	19	4	7	5	21%	37%	26%
Weave	6	1	2	2	17%	33%	33%
Southbound							
Basic	43	23	14	20	53%	33%	47%
Merge / Diverge	28	14	10	14	50%	36%	50%
Weave	9	6	4	6	67%	44%	67%

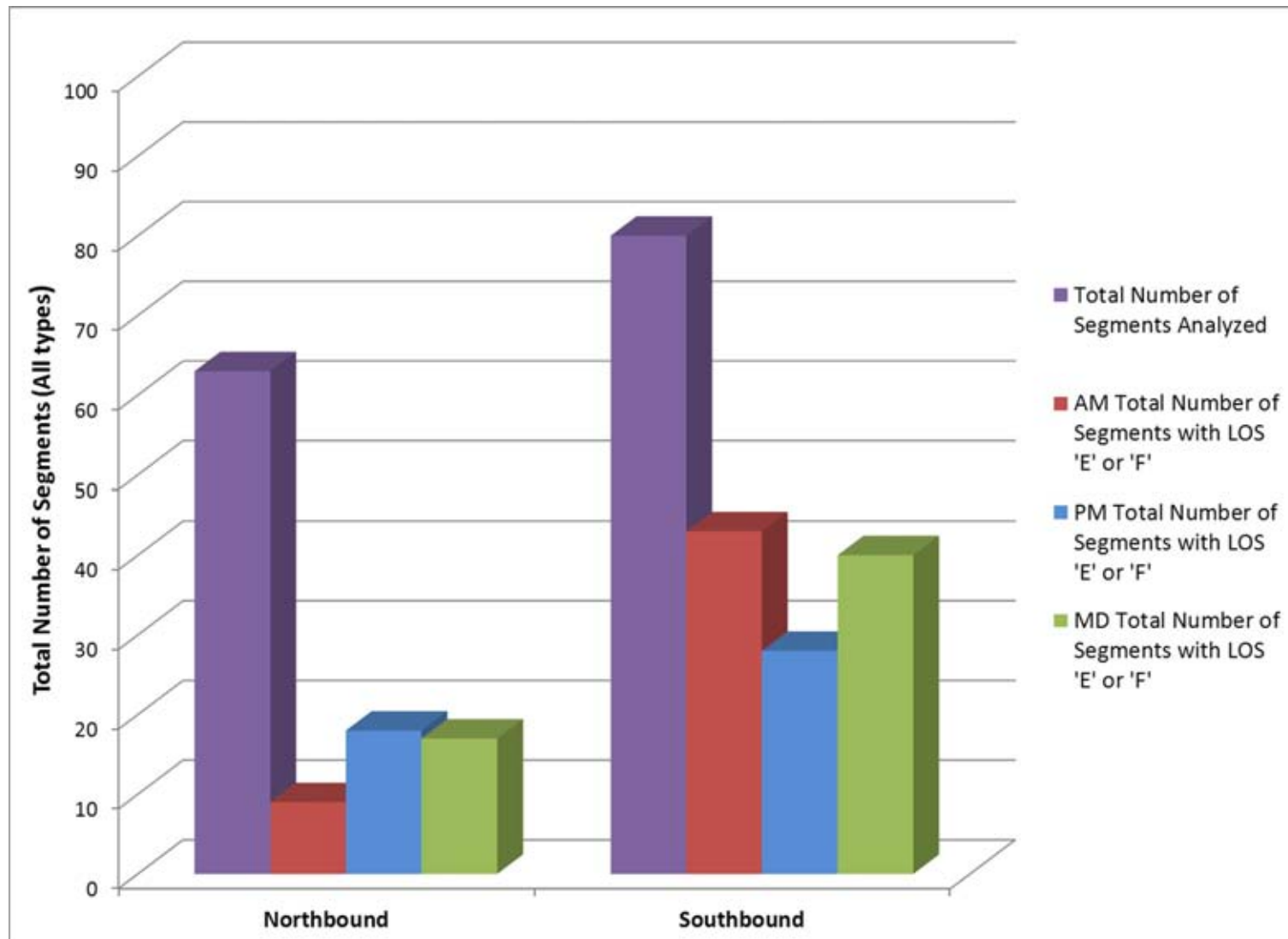
Note: Summary excludes results for northern terminus segments; see Section 7.6 for northern termini analysis results.

Figure 7-3 presents a graphical summary of Alternative 6C I-710 freeway operations for both northbound and southbound directions. As shown in the figure, the southbound direction is expected to experience more congestion during the morning and midday peak hours compared to the evening peak hour. The northbound direction is expected to experience more congestion during the evening and midday peak hours with less congestion during the morning peak hour.

Tolling on the FC under Alternative 6C conditions imposes substantial increase in both truck and general purpose traffic on mainline I-710 compared to non-tolling Alternative 6B. Particularly in the southbound direction, approximately one-fourth of the study segments experience worse delay and LOS under tolling conditions than non-tolling conditions during morning and midday peak hour. In addition, I-710 mainline segments south of I-405 interchange experience the most significant rise in total volume and truck percentage for all peak hours. Port trucks deterred from the FC due to toll imposition either remain on I-710 GP lanes or disperse onto adjacent freeways and arterial streets.

Based on the analysis and findings presented in this section, it is expected that under 2035 Alternative 6C conditions the future traffic operations along the I-710 freeway corridor for both northbound and southbound directions will improve dramatically when compared to the traffic operations under Alternative 1. In summary, the aforementioned operational improvements are the direct result of diverting port truck traffic onto the FC with a tolling option.

Figure 7-5
I-710 Mainline Alternative 6C Summary



Note: Summary excludes results for northern terminus segments; see Section 7.6 for northern termini analysis results.

7.6 FUTURE YEAR 2035 I-710 NORTHERN TERMINI FREEWAY ANALYSIS

This section provides the operational analysis of project Alternatives 6A, 6B and 6C at the northern termini of the I-710 Corridor Project, which is defined as the portion of I-710 between the I-710/Slauson Avenue interchange and just south of the I-710/I-5 interchange. Three design options have been analyzed according to the description presented in **Section 6.2**.

7.6.1 Northern Termini I-710 Freeway Segments – Alternative 6A

Table 7-16 and **Table 7-17** show the LOS for the northern termini segments of I-710 under Alternative 6A for Design Options 1 and 2.

Table 7-18 presents the summary of the Alternative 6A Northern Termini freeway segment operations and the following statements describe key findings of the analysis:

For Northbound I-710 (Design Option 1 and 2):

- The number of basic freeway segments with poor operating conditions are the highest during the midday peak hour when 29 percent (2 out of 7) of the segments are expected to operate at poor LOS E or F;
- The LOS for the merge and diverge areas are expected to operate at LOS E or F with 50 percent (2 out of 4) during all three peak hours;
- The weaving areas equally experience maximum densities during all three peak hours the only weaving area is expected to operate at poor LOS E or F.

For Southbound I-710 (Design Option 1 and 2):

- The number of basic freeway segments with poor operating conditions are highest during the midday peak hour when 100 percent (7 out of 7) of the segments are expected to operate at poor LOS E or F;
- The merge and diverge areas would experience unacceptable LOS E or F operations during the morning and midday peak hours 67 percent (4 out of 6) of the time;

The only operational variation between Design Option 1 and Option 2 on the I-710 mainline occur at Washington & Bandini diverge junction in the northbound direction. Under Design Option 2, an additional auxiliary lane is introduced approximately 1200 feet upstream of the diverge junction. The Washington & Bandini major diverge is expected to operate at acceptable LOS D or better under both design options under Alternative 6A conditions.

Table 7-16
I-710 Northern Termini Northbound 2035 Peak Hour Alternative 6A (Build) Level of Service

Location Description	Freeway Type	Lane		AM		PM		MD	
		ML	Ramp	Density / VIC ¹	LOS	Density / VIC ¹	LOS	Density / VIC ¹	LOS
Design Option 1									
Washington	On	3	1	--*	F	--*	F	--*	F
Lane Drop	Basic	3	--	--*	F	--*	F	--*	F
--	Basic	5	--	24.6	C	31.8	D	34.7	D
I-5 NB	Off	6	2	N/A	N/A	N/A	N/A	N/A	N/A
Bandini On / I-5 NB Off	Weave B	6	--	39.7	E	41.5	E	50.0	F
Bandini	On	6	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	6	--	27.8	D	30.3	D	35.7	E
I-710 FC NB	On ⁴	5	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	5	--	27.5	D	28.8	D	34.2	D
Slauson	On	5	1	19.6	B	20.0	B	21.8	C
--	Basic	5	--	24.9	C	26.1	D	29.2	D
Washington & Bandini	Major Off ³	6	2	28.5	D	28.4	D	30.0	D
--	Basic	6	--	25.1	C	25.0	C	26.5	D
Slauson	Off	6	1	37.3	E	36.5	E	37.4	E
--	Basic	6	--	29.3	D	28.7	D	30.5	D
Design Option 2									
Washington	On	3	1	--*	F	--*	F	--*	F
Lane Drop	Basic	3	--	--*	F	--*	F	--*	F
--	Basic	5	--	24.6	C	31.8	D	34.7	D
I-5 NB	Off	6	2	N/A	N/A	N/A	N/A	N/A	N/A
Bandini On / I-5 NB Off	Weave B	6	--	39.7	E	41.5	E	50.0	F
Bandini	On	6	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	6	--	27.8	D	30.3	D	35.7	E
I-710 FC NB	On ⁴	5	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	5	--	27.5	D	28.8	D	34.2	D
Slauson	On	5	1	19.6	B	20.0	B	21.8	C
--	Basic	5	--	24.9	C	26.1	D	29.2	D
Washington & Bandini	Major Off ³	7	3	24.4	C	24.3	C	25.7	C
--	Basic	6	--	25.1	C	25.0	C	26.5	D
Slauson	Off	6	1	37.3	E	36.5	E	37.4	E
--	Basic	6	--	29.3	D	28.7	D	30.5	D

Table 7-17
I-710 Northern Termini Southbound 2035 Peak Hour Alternative 6A (Build) Level of Service

Location Description	Freeway Type	Lane		AM		PM		MD	
		ML	Ramp	Density / VIC ¹	LOS	Density / VIC ¹	LOS	Density / VIC ¹	LOS
Design Options 1 & 2									
Washington	Off	5	1	40.4	E	38.7	E	40.8	E
--	Basic	5	--	36.1	E	35.6	E	39.8	E
I-5 SB	Major On ²	5	2	0.88	N/A	0.85	N/A	0.95	N/A
--	Basic	7	--	34.4	D	32.5	D	39.4	E
Bandini & Atlantic	Major Off ³	7	2	36.2	E	35.0	D	--*	F
--	Basic	6	--	37.9	E	36.8	E	--*	F
I-710 SB FC	Major Off ³	6	2	38.2	E	37.6	E	--*	F
--	Basic	5	--	36.0	E	35.6	E	--*	F
Slauson	Off	5	1	39.1	E	39.2	E	--*	F
--	Basic	5	--	31.4	D	30.8	D	39.7	E
Washington & Bandini & Atlantic	On ⁴	5	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	6	--	28.1	D	31.4	D	36.0	E
Slauson	On	6	1	21.2	C	22.8	C	24.3	C
--	Basic	6	--	31.2	D	36.7	E	42.2	E

Table 7-18
I-710 Northern Termini 2035 Peak Hour Alternative 6A (Build Design Options 1 & 2) Summary

Segment Type	Total Number of Segments	Number of Segments with LOS E or F			Percent of Segments with LOS E or F		
		AM Peak Hour	PM Peak Hour	MD Peak Hour	AM Peak Hour	PM Peak Hour	MD Peak Hour
Northbound							
Basic	7	1	1	2	14%	14%	29%
Merge / Diverge	4	2	2	2	50%	50%	50%
Weave	1	1	1	1	100%	100%	100%
Southbound							
Basic	7	3	4	7	43%	57%	100%
Merge / Diverge	6	4	3	4	67%	50%	67%
Weave	0	0	0	0	0%	0%	0%

7.6.2 Northern Termini I-710 Freeway Segments – Alternative 6B

Table 7-19 and **Table 7-20** show the LOS for the northern termini segments of I-710 under Alternative 6B for Design Options 1, 2 and 3.

Table 7-19
I-710 Northern Termini Northbound 2035 Peak Hour Alternative 6B (Build) Level of Service

Location Description	Freeway Type	Lane		AM		PM		MD	
		ML	Ramp	Density / VIC ¹	LOS	Density / VIC ¹	LOS	Density / VIC ¹	LOS
Design Option 1									
Washington	On	3	1	--*	F	--*	F	--*	F
Lane Drop	Basic	3	--	--*	F	--*	F	--*	F
--	Basic	5	--	24.9	C	32.0	D	33.8	D
I-5 NB	Off	6	2	N/A	N/A	N/A	N/A	N/A	N/A
Bandini On / I-5 NB Off	Weave B	6	--	40.2	E	41.2	E	50.8	F
Bandini	On	6	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	6	--	28.2	D	30.2	D	35.2	E
I-710 FC NB	On ⁴	5	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	5	--	27.2	D	27.2	D	30.9	D
Slauson	On	5	1	19.5	B	19.4	B	20.6	C
--	Basic	5	--	24.6	C	24.8	C	26.9	D
Washington & Bandini	Major Off ³	6	2	28.3	D	27.1	C	28.1	D
--	Basic	6	--	25.0	C	23.9	C	24.7	C
Slauson	Off	6	1	37.2	E	35.4	E	35.8	E
--	Basic	6	--	29.1	D	27.3	D	28.2	D
Design Option 2									
Washington	On	3	1	--*	F	--*	F	--*	F
Lane Drop	Basic	3	--	--*	F	--*	F	--*	F
--	Basic	5	--	24.9	C	32.0	D	33.8	D
I-5 NB	Off	6	2	N/A	N/A	N/A	N/A	N/A	N/A
Bandini On / I-5 NB Off	Weave B	6	--	40.2	E	41.2	E	50.8	F
Bandini	On	6	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	6	--	28.2	D	30.2	D	35.2	E
I-710 FC NB	On ⁴	5	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	5	--	27.2	D	27.2	D	30.9	D
Slauson	On	5	1	19.5	B	19.4	B	20.6	C
--	Basic	5	--	24.6	C	24.8	C	26.9	D
Washington & Bandini	Major Off ³	7	3	24.3	C	23.3	C	24.1	C
--	Basic	6	--	25.0	C	23.9	C	24.7	C
Slauson	Off	6	1	37.2	E	35.4	E	35.8	E
--	Basic	6	--	29.1	D	27.3	D	28.2	D
Design Option 3									
Washington	On	3	1	--*	F	--*	F	--*	F
Lane Drop	Basic	3	--	--*	F	--*	F	--*	F
--	Basic	5	--	25.4	C	33.5	D	35.1	E
I-5 NB	Off	7	2	N/A	N/A	N/A	N/A	N/A	N/A
Bandini On / I-5 NB Off	Weave B	7	--	36.1	E	38.5	E	46.3	F

Table 7-19
I-710 Northern Termini Northbound 2035 Peak Hour Alternative 6B (Build) Level of Service

Location Description	Freeway Type	Lane		AM		PM		MD	
		ML	Ramp	Density / V/C ¹	LOS	Density / V/C ¹	LOS	Density / V/C ¹	LOS
Bandini	On	7	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	7	--	23.9	C	26.1	D	28.5	D
I-710 FC NB	On ⁴	6	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	6	--	23.2	C	23.2	C	25.4	C
Slauson	On ⁴	5	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	5	--	25.1	C	25.3	C	27.4	D
Bandini	Major Off ³	6	2	28.9	D	27.5	C	28.4	D
--	Basic	6	--	25.5	C	24.2	C	25.0	C
Slauson	Off	6	1	37.3	E	32.4	D	33.1	D
--	Basic	6	--	29.4	D	27.5	D	28.8	D

Notes:

¹ Density = passenger car/mile/lane; v/c = volume-to-capacity ratio. Shaded and bold cells indicate LOS E or F.³ Major diverge area; HCM methodology applied for analysis.⁴ Single-lane addition/drop; HCM methodology applied for analysis.

N/A = not applicable. LOS and/or density information are not shown for major merge areas, single-lane addition/drop, and merge/diverge operations within a weaving segment.

* = Demand exceeds capacity, no density is predicted.

Table 7-20
I-710 Northern Termini Southbound 2035 Peak Hour Alternative 6B (Build) Level of Service

Location Description	Freeway Type	Lane		AM		PM		MD	
		ML	Ramp	Density / V/C ¹	LOS	Density / V/C ¹	LOS	Density / V/C ¹	LOS
Design Option 1,2									
Washington	Off	5	1	--*	F	38.7	E	40.4	E
--	Basic	5	--	37.4	E	35.9	E	39.0	E
I-5 SB	Major On ²	5	2	0.9	N/A	0.9	N/A	0.9	N/A
--	Basic	7	--	35.1	E	32.7	D	39.5	E
Bandini & Atlantic	Major Off ³	7	2	36.7	E	35.1	E	--*	F
--	Basic	6	--	37.0	E	36.8	E	--*	F
I-710 SB FC	Major Off ³	6	2	37.7	E	37.6	E	--*	F
--	Basic	5	--	34.1	D	35.3	E	43.6	E
Slauson	Off	5	1	38.1	E	39.0	E	--*	F
--	Basic	5	--	29.6	D	30.5	D	36.1	E
Washington & Bandini & Atlantic	On ⁴	5	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	6	--	27.1	D	31.2	D	33.4	D
Slauson	On	6	1	20.6	C	22.7	C	23.5	C
--	Basic	6	--	30.0	D	36.3	E	38.7	E
Design Option 3									
Washington	Off	5	1	38.0	E	36.6	E	38.5	E
--	Basic	5	--	39.4	E	34.3	D	39.9	E
I-5 SB	Major On ²	5	2	0.93	N/A	0.85	N/A	0.96	N/A
--	Basic	7	--	37.3	E	32.8	D	40.4	E
Bandini & Atlantic	Major Off ³	7	2	37.9	E	35.2	E	--*	F
--	Basic	6	--	42.6	E	35.1	E	--*	F

Table 7-20
I-710 Northern Termini Southbound 2035 Peak Hour Alternative 6B (Build) Level of Service

Location Description	Freeway Type	Lane		AM		PM		MD	
		ML	Ramp	Density / V/C ¹	LOS	Density / V/C ¹	LOS	Density / V/C ¹	LOS
I-710 SB FC	Major Off ³	6	2	40.3	E	36.7	E	--*	F
--	Basic	5	--	38.1	E	31.9	D	43.1	E
Bandini & Atlantic	On	5	2	N/A	N/A	N/A	N/A	N/A	N/A
Bandini & Atlantic On / Slauson Off	Weave C	7	--	33.5	D	39.5	E	38.5	E
Slauson	Off	7	2	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	6	--	29.9	D	29.5	D	33.3	D
Slauson	On	6	1	20.6	C	20.6	C	20.6	C
--	Basic	6	--	33.9	D	34.4	D	39.7	E

Notes:

¹ Density = passenger car/mile/lane; v/c = volume-to-capacity ratio. Shaded and bold cells indicate LOS E or F.

² Major merge area; HCM methodology applied for analysis.

³ Major diverge area; HCM methodology applied for analysis.

⁴ Single-lane addition/drop; HCM methodology applied for analysis.

N/A = not applicable. LOS and/or density information are not shown for major merge areas, single-lane addition/drop, and merge/diverge operations within a weaving segment.

* = Demand exceeds capacity, no density is predicted.

Similar to Alternative 6A, the only operational variation between Design Option 1 and Option 2 on I-710 mainline occur at Washington & Bandini diverge junction in the northbound direction. The Washington & Bandini major diverge is expected to operate at acceptable LOS D or better under both design options under Alternative 6B conditions.

Design Option 3 differs from Design Option 1 and 2 just north of Slauson on-ramp on I-710 in the northbound direction and south of Freight Corridor on-ramp in the southbound direction. On northbound I-710 under Design Option 3, Slauson On-ramp introduces an additional auxiliary lane that carries through until it exits with I-5 northbound off-ramp. **Table 7-19** shows minor LOS improvements for basic freeway operations between Slauson on-ramp and I-5 northbound off-ramp under Design Option 3. In the southbound direction, the weave segment between Bandini/Atlantic on-ramp and Slauson off-ramp is eliminated under Design Option 1 and 2, and LOS during evening peak hour is improved over Design Option 3 at that location.

Table 7-21 and **Table 7-22** present the summary of the Alternative 6B Northern Termini freeway segment operations and the following statements describe key findings of the analysis:

For Northbound I-710 (Design Options 1, 2 & 3):

- The number of basic freeway segments with poor operating conditions are highest during the midday peak hour when 29 percent (2 out of 7) of the segments are expected to operate at poor LOS E or F;
- Approximately half of the merge and diverge areas are expected to operate at an acceptable LOS D or better during the three peak hours under Design Options 1 & 2 while 67 percent (2 out of 3) of the areas are expected to operate at poor LOS E or F during the morning peak hour under Design Option 3;

- The weaving areas equally experience maximum densities during all three peak hours when the only weaving area is expected to operate at poor LOS E or F.

For Southbound I-710 (Design Options 1, 2 & 3):

- The number of basic freeway segments with poor operating conditions are highest during the midday peak hour when 86 percent (Design Options 1 & 2) and 83 percent (Design Option 3) of the segments are expected to operate at poor LOS E or F;
- Most of the merge and diverge areas are expected to operate at an unacceptable LOS E or F during the morning and midday peak hours under Design Options 1 & 2 and during all three peak hours under Design Option 3;
- The weaving areas equally experience maximum delay during the evening and midday peak hours when the only weaving area is expected to operate at poor LOS E or F (Design Option 3).

Table 7-21

I-710 Northern Termini 2035 Peak Hour Alternative 6B (Build Design Options 1 & 2) Summary

Segment Type	Total Number of Segments	Number of Segments with LOS E or F			Percent of Segments with LOS E or F		
		AM Peak Hour	PM Peak Hour	MD Peak Hour	AM Peak Hour	PM Peak Hour	MD Peak Hour
Northbound							
Basic	7	1	1	2	14%	14%	29%
Merge / Diverge	4	2	2	2	50%	50%	50%
Weave	1	1	1	1	100%	100%	100%
Southbound							
Basic	7	3	4	6	43%	57%	86%
Merge / Diverge	6	4	4	4	67%	67%	67%
Weave	0	0	0	0	0%	0%	0%

Table 7-22

I-710 Northern Termini 2035 Peak Hour Alternative 6B (Build Design Option 3) Summary

Segment Type	Total Number of Segments	Number of Segments with LOS E or F			Percent of Segments with LOS E or F		
		AM Peak Hour	PM Peak Hour	MD Peak Hour	AM Peak Hour	PM Peak Hour	MD Peak Hour
Northbound							
Basic	7	1	1	2	14%	14%	29%
Merge / Diverge	3	2	1	1	67%	33%	33%
Weave	1	1	1	1	100%	100%	100%
Southbound							
Basic	6	4	1	5	67%	17%	83%
Merge / Diverge	5	3	3	3	60%	60%	60%
Weave	1	0	1	1	0%	100%	100%

7.6.3 Northern Termini I-710 Freeway Segments – Alternative 6C

Table 7-23 and **Table 7-24** show the LOS for the northern termini segments of I-710 under Alternative 6C for Design Options 1, 2 and 3. **Table 7-25** presents the summary of the Alternative 6C Northern Termini freeway segment operations and the following statements describe key findings of the analysis:

For Northbound I-710:

- The number of basic freeway segments with poor operating conditions (LOS E or F) are 14 percent (1 out of 7) during all three peak hours;
- The merge and diverge areas are expected to operate at poor LOS E or F at 50 percent (2 out of 4) during all three peak hours;
- The weaving areas equally experience maximum densities during all three peak hours when the only weaving area is expected to operate at poor LOS E or F.

For Southbound I-710:

- The number of basic freeway segments with poor operating conditions are highest during the midday peak hour when all seven (7) of the segments are expected to operate at poor LOS E or F;
- The LOS for the merge and diverge areas is heaviest during midday peak hour when 83 percent (5 out of 6) of the merge and diverge areas are expected to operate at poor LOS E or F.

Similar to Alternatives 6A and 6B, the only operational variation between Design Option 1 and Option 2 on the I-710 mainline occurs at Washington & Bandini diverge junction in the northbound direction. The Washington & Bandini major diverge is expected to operate at acceptable LOS D or better under both design options under Alternative 6C conditions.

Table 7-23
I-710 Northern Termini Northbound 2035 Peak Hour Alternative 6C (Build) Level of Service

Location Description	Freeway Type	Lane		AM		PM		MD	
		ML	Ramp	Density / V/C ¹	LOS	Density / V/C ¹	LOS	Density / V/C ¹	LOS
Design Option 1									
Washington	On	3	1	--*	F	--*	F	--*	F
Lane Drop	Basic	3	--	--*	F	--*	F	--*	F
--	Basic	5	--	23.9	C	31.5	D	33.0	D
I-5 NB	Off	6	2	N/A	N/A	N/A	N/A	N/A	N/A
Bandini On / I-5 NB Off	Weave B	6	--	39.0	E	41.2	E	50.6	F
Bandini	On	6	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	6	--	26.8	D	29.5	D	34.2	D
I-710 FC NB	On ⁴	5	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	5	--	26.8	D	27.7	D	32.8	D
Slauson	On	5	1	19.3	B	19.6	B	21.4	C
--	Basic	5	--	24.0	C	24.8	C	28.2	D
Washington & Bandini	Major Off ³	6	2	27.8	C	27.1	C	29.4	D
--	Basic	6	--	24.4	C	23.8	C	26.0	C
Slauson	Off	6	1	36.5	E	35.4	E	36.7	E
--	Basic	6	--	28.3	D	27.4	D	29.7	D
Design Option 2									
Washington	On	3	1	--*	F	--*	F	--*	F
Lane Drop	Basic	3	--	--*	F	--*	F	--*	F
--	Basic	5	--	23.9	C	31.5	D	33.0	D
I-5 NB	Off	6	2	N/A	N/A	N/A	N/A	N/A	N/A
Bandini On / I-5 NB Off	Weave B	6	--	39.0	E	41.2	E	50.6	F
Bandini	On	6	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	6	--	26.8	D	29.5	D	34.2	D
I-710 FC NB	On ⁴	5	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	5	--	26.8	D	27.7	D	32.8	D
Slauson	On	5	1	19.3	B	19.6	B	21.4	C
--	Basic	5	--	24.0	C	24.8	C	28.2	D
Washington & Bandini	Major Off ³	7	3	23.8	C	23.2	C	25.2	C
--	Basic	6	--	24.4	C	23.8	C	26.0	C
Slauson	Off	6	1	36.5	E	35.4	E	36.7	E
--	Basic	6	--	28.3	D	27.4	D	29.7	D

Notes:

¹ Density = passenger car/mile/lane; v/c = volume-to-capacity ratio. Shaded and bold cells indicate LOS E or F.³ Major diverge area; HCM methodology applied for analysis.

N/A = not applicable. LOS and/or density information are not shown for major merge areas, single-lane addition/drop, and merge/diverge operations within a weaving segment.

* = Demand exceeds capacity, no density is predicted.

Table 7-24
I-710 Northern Termini Southbound 2035 Peak Hour Alternative 6C (Build) Level of Service

Location Description	Freeway Type	Lane		AM		PM		MD	
		ML	Ramp	Density / V/C ¹	LOS	Density / V/C ¹	LOS	Density / V/C ¹	LOS
Design Options 1 & 2									
Washington	Off	5	1	39.9	E	37.6	E	39.7	E
--	Basic	5	--	34.6	D	33.6	D	36.7	E
I-5 SB	Major On ²	5	2	0.9	N/A	0.8	N/A	0.9	N/A
--	Basic	7	--	33.1	D	31.3	D	36.9	E
Bandini & Atlantic	Major Off ³	7	2	35.4	E	34.1	D	--*	F
--	Basic	6	--	36.1	E	35.4	E	--*	F
I-710 SB FC	Major Off ³	6	2	37.2	E	36.8	E	--*	F
--	Basic	5	--	37.5	E	36.0	E	--*	F
Slauson	Off	5	1	39.9	E	39.5	E	--*	F
--	Basic	5	--	32.3	D	30.9	D	41.7	E
Washington & Bandini & Atlantic	On ⁴	5	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	6	--	29.0	D	32.2	D	37.2	E
Slauson	On	6	1	21.6	C	23.1	C	--*	F
--	Basic	6	--	32.2	D	37.6	E	--*	F

Notes:

¹ Density = passenger car/mile/lane; v/c = volume-to-capacity ratio. Shaded and bold cells indicate LOS E or F.³ Major diverge area; HCM methodology applied for analysis.⁴ Single-lane addition/drop; HCM methodology applied for analysis.

N/A = not applicable. LOS and/or density information are not shown for major merge areas, single-lane addition/drop, and merge/diverge operations within a weaving segment.

* = Demand exceeds capacity, no density is predicted.

Table 7-25
I-710 Northern Termini 2035 Peak Hour Alternative 6C (Build) Summary

Segment Type	Total Number of Segments	Number of Segments with LOS E or F			Percent of Segments with LOS E or F		
		AM Peak Hour	PM Peak Hour	MD Peak Hour	AM Peak Hour	PM Peak Hour	MD Peak Hour
Northbound							
Basic	7	1	1	1	14%	14%	14%
Merge / Diverge	4	2	2	2	50%	50%	50%
Weave	1	1	1	1	100%	100%	100%
Southbound							
Basic	7	2	3	7	29%	43%	100%
Merge / Diverge	6	4	3	5	67%	50%	83%
Weave	0	0	0	0	0%	0%	0%

7.7 FUTURE YEAR 2035 I-710 FREIGHT CORRIDOR ANALYSIS

This section provides the 2035 Freight Corridor (FC) operational analysis of project Alternatives 6A, 6B and 6C of the I-710 Corridor Project between the southern terminus at Ocean Boulevard/Harbor Scenic Drive and the northern terminus near the rail yards at Washington Boulevard. Similar to the previous section, the segment between Slauson Avenue and Washington Boulevard contains design options for the FC.

7.7.1 I-710 Freight Corridor Segments Analysis

7.7.1.1 I-710 Freight Corridor Segments – Alternative 6A

Table 7-26 shows the LOS for the various segments of the I-710 FC under Alternative 6A conditions. **Table 7-27** presents the summary of Alternative 6A FC operations and the following statements describe key findings of the analysis:

For Northbound FC:

- The number of basic FC freeway segments with poor operating conditions are highest during the evening peak hour when 43 percent (3 out of 7) of the FC segments are expected to operate at poor LOS E or F;
- The number of merge and diverge areas with poor operating conditions are expected to be highest during the evening peak hour when approximately 80 percent (4 out of 5) of the FC merge and diverge areas are expected to operate at poor LOS E or F.

For Southbound FC:

- All basic FC freeway segments are expected to operate at poor LOS D or better during all three peak hours, except for one segment during the midday peak hour;
- Only 25 percent (1 out of 4) of the merge and diverge areas are expected to operate at poor LOS E or F for each of the three peak hours analyzed.

In general, demand on the Freight Corridor is highest within the two-mile segment just south of the SR-91 FC connectors. An influx of non-port trucks gain access to northbound FC through the General Purpose (GP) on-ramp near the Del Amo Boulevard interchange and the FC operates at near capacity until SR-91 eastbound off-ramp. Similarly on southbound FC, non-port trucks exit the FC from the GP off-ramp just north of Del Amo Boulevard thus relieving congestion on the FC.

Table 7-26
I-710 Freight Corridor 2035 Peak Hour Alternative 6A (Build) Level of Service

Location Description	Freeway Type	Lane		AM		PM		MD	
		ML	Ramp	Density / VIC ¹	LOS	Density / VIC ¹	LOS	Density / VIC ¹	LOS
Northbound Design Options 1 & 2									
To I-710 NB GP	Basic	2	--	14.1	B	17.3	B	18.2	C
Washington	Major Off ³	3	2	18.4	B	20.9	C	20.1	C
Lane Add	Basic	3	--	16.1	B	18.3	C	17.6	B
--	Basic	2	--	24.3	C	27.9	D	26.7	D
Patata	Off	2	1	33.5	D	39.4	E	38.3	E
--	Basic	2	--	27.7	D	35.8	E	34.0	D
SR-91 EB	Off	2	1	--*	F	--*	F	--*	F
--	Basic	2	--	38.6	E	--*	F	--*	F
I-710 NB GP	On	2	1	35.6	E	--*	F	--*	F
--	Basic	2	--	26.9	D	39.4	E	36.4	E
Anaheim	On	2	1	28.4	D	36.0	E	34.5	D
--	Basic	2	--	20.0	C	27.3	D	23.3	C
From Pico	On ⁴	1	--	N/A	N/A	N/A	N/A	N/A	N/A
From Ocean & HSD	On ⁴	1	--	N/A	N/A	N/A	N/A	N/A	N/A
From Ocean	On ⁴	1	--	N/A	N/A	N/A	N/A	N/A	N/A
Southbound Design Options 1 & 2									
From I-710 SB GP	Basic	2	--	19.4	C	18.0	C	20.3	C
Washington	On ⁴	2	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	3	--	16.5	B	15.8	B	17.9	B
Lane Drop	Basic	2	--	24.8	C	23.7	C	27.1	D
Patata	On	2	1	29.8	D	27.6	C	28.9	D
--	Basic	2	--	28.4	D	25.8	C	31.2	D
SR-91 WB	On	2	1	33.0	D	31.2	D	35.0	D
--	Basic	2	--	33.0	D	30.3	D	36.7	E
FC to GP (Del Amo)	Off	2	1	37.7	E	35.7	E	39.9	E
--	Basic	2	--	25.9	C	20.3	C	25.4	C
FC to GP (PCH)	On	2	1	31.7	D	25.7	C	31.3	D
--	Basic	2	--	14.8	B	12.9	B	14.5	B
Anaheim	Off ⁴	1	--	N/A	N/A	N/A	N/A	N/A	N/A
Pico	Off ⁴	1	--	N/A	N/A	N/A	N/A	N/A	N/A

Notes:

¹ Density = passenger car/mile/lane; v/c = volume-to-capacity ratio. Shaded and bold cells indicate LOS E or F.³ Major diverge area; HCM methodology applied for analysis.⁴ Single-lane addition/drop; HCM methodology applied for analysis.

N/A = not applicable. LOS and/or density information are not shown for major merge areas, single-lane addition/drop, and merge/diverge operations within a weaving segment.

* = Demand exceeds capacity, no density is predicted.

GP = General Purpose; I-710 mainline freeway. FC = Freight Corridor

Table 7-27
I-710 Freight Corridor 2035 Peak Hour Alternative 6A (Build Design Options 1 & 2) Summary

Segment Type	Total Number of Segments	Number of Segments with LOS E or F			Percent of Segments with LOS E or F		
		AM Peak Hour	PM Peak Hour	MD Peak Hour	AM Peak Hour	PM Peak Hour	MD Peak Hour
Northbound							
Basic Freeway	7	1	3	2	14%	43%	29%
Merge/Diverge	5	2	4	3	40%	80%	60%
Southbound							
Basic Freeway	7	0	0	1	0%	0%	14%
Merge/Diverge	4	1	1	1	25%	25%	25%

7.7.1.2 I-710 Freight Corridor Segments – Alternative 6B

Table 7-28 shows the LOS for the various segments of I-710 FC under Alternative 6B conditions.

Table 7-28
I-710 Freight Corridor 2035 Peak Hour Alternative 6B (Build) Level of Service

Location Description	Freeway Type	Lane		AM		PM		MD	
		ML	Ramp	Density / VIC ¹	LOS	Density / VIC ¹	LOS	Density / VIC ¹	LOS
Northbound Design Options 1 & 2									
To I-710 NB GP	Basic	2	--	11.6	B	15.2	B	16.6	B
Washington	Major Off ³	3	2	N/A	N/A	N/A	N/A	N/A	N/A
Lane Add	Basic	3	--	12.7	B	15.6	B	15.2	B
--	Basic	2	--	19.1	C	23.6	C	23.0	C
Patata	Off	2	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	2	--	21.5	C	28.3	D	28.3	D
SR-91 EB	Off	2	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	2	--	27.3	D	36.5	E	37.3	E
I-710 NB GP	On	2	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	2	--	21.5	C	31.5	D	32.1	D
Anaheim	On	2	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	2	--	16.2	B	23.7	C	21.4	C
From Pico	On ⁴	1	--	N/A	N/A	N/A	N/A	N/A	N/A
From Ocean & HSD	On ⁴	1	--	N/A	N/A	N/A	N/A	N/A	N/A
From Ocean	On ⁴	1	--	N/A	N/A	N/A	N/A	N/A	N/A
Northbound Design Option 3									
To Hobart Yard	Basic	1	--	10.2	A	10.7	A	5.8	A
Sheila/GP	Off	2	2	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	2	--	19.6	C	26.6	D	24.2	C
Patata	Off	2	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	2	--	21.5	C	31.3	D	28.6	D

Table 7-28
I-710 Freight Corridor 2035 Peak Hour Alternative 6B (Build) Level of Service

Location Description	Freeway Type	Lane		AM		PM		MD	
		ML	Ramp	Density / VIC ¹	LOS	Density / VIC ¹	LOS	Density / VIC ¹	LOS
SR-91 EB	Off	2	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	2	--	27.4	D	41.2	E	37.1	E
I-710 NB GP	On	2	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	2	--	21.7	C	34.7	D	32.2	D
Anaheim	On	2	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	2	--	16.3	B	25.3	C	21.8	C
From Pico	On	2	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	2	--	11.7	B	17.0	B	16	B
From HSD	On ⁴	1	--	N/A	N/A	N/A	N/A	N/A	N/A
From Ocean	On ⁴	1	--	N/A	N/A	N/A	N/A	N/A	N/A
Southbound Design Options 1 & 2									
From I-710 SB GP	Basic	2	--	15.2	B	13.9	B	16.0	B
Washington	On ⁴	2	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	3	--	12.9	B	12.0	B	14.0	B
Lane Drop	Basic	2	--	19.3	C	18.1	C	21.0	C
Patata	On	2	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	2	--	22.0	C	19.7	C	23.8	C
SR-91 WB	On	2	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	2	--	25.2	C	22.6	C	27.0	D
FC to GP (Del Amo)	Off	2	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	2	--	20.5	C	15.6	B	20.6	C
FC to GP (PCH)	Off	2	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	2	--	11.9	B	10.0	A	11.7	B
Anaheim	Off ⁴	1	--	N/A	N/A	N/A	N/A	N/A	N/A
Pico	Off ⁴	1	--	N/A	N/A	N/A	N/A	N/A	N/A
Southbound Design Option 3									
From Hobart Yard	Basic	1	--	3.7	A	1.2	A	6.1	A
I-710 SB GP	On	2	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	2	--	17.7	B	16.1	B	19.2	C
Patata	On	2	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	2	--	20.8	C	19.5	C	21.7	C
SR-91 WB	On	2	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	2	--	25.8	C	22.4	C	26.4	D
FC to GP (Del Amo)	Off	2	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	2	--	21.3	C	15.5	B	21.8	C
FC to GP (PCH)	Off	2	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	2	--	13.0	B	10.4	A	14.0	B
Anaheim	Off ⁴	1	--	N/A	N/A	N/A	N/A	N/A	N/A
Pico	Off ⁴	1	--	N/A	N/A	N/A	N/A	N/A	N/A

Notes:

¹ Density = passenger car/mile/lane; v/c = volume-to-capacity ratio. Shaded and bold cells indicate LOS E or F.³ Major diverge area; HCM methodology applied for analysis.⁴ Single-lane addition/drop; HCM methodology applied for analysis.

N/A = not applicable. LOS and/or density information are not shown for major merge areas, single-lane addition/drop, and merge/diverge operations within a weaving segment.

GP = General Purpose; I-710 mainline freeway. FC = Freight Corridor

It should be noted that only basic freeway segment analysis was conducted along the FC for Alternative 6B due to the limitations of the *HCM* methodology for merge and diverge analysis. The enhanced capacity of the automated guideway technologies associated with this Build alternative exceeds the limitations of the *HCM* analysis procedures.

Table 7-29 presents the summary of Alternative 6B Freight Corridor operations and the following statements describe key findings of the analysis:

For Northbound FC:

- Only one of the seven basic FC freeway segments are expected to operate at poor LOS E or F during the evening and midday peak hours under Design Options 1, 2 and 3;

For Southbound FC:

- All FC freeway segments are expected to operate at an acceptable LOS D or better during all three peak hours under Design Options 1, 2 and 3.

Table 7-29
I-710 Freight Corridor 2035 Peak Hour Alternative 6B (Build) Summary

Segment Type	Total Number of Segments	Number of Segments with LOS E or F			Percent of Segments with LOS E or F		
		AM Peak Hour	PM Peak Hour	MD Peak Hour	AM Peak Hour	PM Peak Hour	MD Peak Hour
Northbound Design Options 1 & 2							
Basic Freeway	7	0	1	1	0%	14%	14%
Northbound Design Option 3							
Basic Freeway	7	0	1	1	0%	14%	14%
Southbound Design Options 1 & 2							
Basic Freeway	7	0	0	0	0%	0%	0%
Southbound Design Option 3							
Basic Freeway	6	0	0	0	0%	0%	0%

In general, demand on the FC is expected to be under capacity except for the segment just south of the SR-91 interchange in the northbound direction during midday and evening peak hours. Similar to Alternative 6A, an influx of non-port trucks gain access to northbound FC through the GP on-ramp near the Del Amo Boulevard interchange and the FC operates at near capacity until SR-91 eastbound off-ramp. Since Alternative 6B has an enhanced capacity (an improvement of 650 pces/ln/hr over Alternative 6A), an overall LOS improvement is observed under this Build alternative.

7.7.1.3 I-710 Freight Corridor Segments – Alternative 6C

Table 7-30 shows the LOS for the various segments of I-710 FC under Alternative 6C conditions. Similar to Alternative 6B, only basic freeway segment analysis was conducted along the FC for Alternative 6C due to the limitations of the *HCM* methodology.

Table 7-30
I-710 Freight Corridor Northbound 2035 Peak Hour Alternative 6C (Build) Level of Service

Location Description	Freeway Type	Lane		AM		PM		MD	
		ML	Ramp	Density / VIC ¹	LOS	Density / VIC ¹	LOS	Density / VIC ¹	LOS
Northbound Design Options 1 & 2									
To I-710 NB GP	Basic	2	--	9.8	A	13.6	B	13.4	B
Washington	Major Off ³	3	2	N/A	N/A	N/A	N/A	N/A	N/A
Lane Add	Basic	3	--	10.7	A	13.9	B	12.9	B
--	Basic	2	--	16.0	B	20.8	C	19.4	C
Patata	Off	2	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	2	--	18.2	C	24.6	C	23.5	C
SR-91 EB	Off	2	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	2	--	23.5	C	29.8	D	27.7	D
I-710 NB GP	On	2	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	2	--	15.0	B	25.2	C	23.6	C
Anaheim	On	2	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	2	--	10.5	A	19.6	C	16.4	B
From Pico	On ⁴	1	--	N/A	N/A	N/A	N/A	N/A	N/A
From Ocean & HSD	On ⁴	1	--	N/A	N/A	N/A	N/A	N/A	N/A
From Ocean	On ⁴	1	--	N/A	N/A	N/A	N/A	N/A	N/A
Southbound Design Options 1 & 2									
From I-710 SB GP	Basic	2	--	11.2	B	11.1	B	10.7	A
Washington	On ⁴	2	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	3	--	9.8	A	9.9	A	10.1	A
Lane Drop	Basic	2	--	14.7	B	14.9	B	15.1	B
Patata	On	2	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	2	--	16.7	B	16.2	B	17.3	B
SR-91 WB	On	2	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	2	--	18.9	C	18.8	C	19.3	C
FC to GP (Del Amo)	Off	2	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	2	--	15.9	B	12.7	B	15.7	B
FC to GP (PCH)	Off	2	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	2	--	9.6	A	8.0	A	9.7	A
Anaheim	Off ⁴	1	--	N/A	N/A	N/A	N/A	N/A	N/A
Pico	Off ⁴	1	--	N/A	N/A	N/A	N/A	N/A	N/A

Notes:

¹ Density = passenger car/mile/lane; v/c = volume-to-capacity ratio. Shaded and bold cells indicate LOS E or F.

³ Major diverge area; HCM methodology applied for analysis.

⁴ Single-lane addition/drop; HCM methodology applied for analysis.

N/A = not applicable. LOS and/or density information are not shown for major merge areas, single-lane addition/drop, and merge/diverge operations within a weaving segment.

GP = General Purpose; I-710 mainline freeway. FC = Freight Corridor

Table 7-31 presents the summary of Alternative 6C FC operations and the following statements describe key findings of the analysis:

For Northbound FC:

- All FC freeway segments are expected to operate at an acceptable LOS D or better during all three peak hours.

For Southbound FC:

- All FC freeway segments are expected to operate at an acceptable LOS D or better during all three peak hours.

In summary, the FC is expected to operate below capacity under Alternative 6C conditions. The imposed toll on FC access divert a portion of the truck traffic to mainline I-710 or nearby local arterials, leaving the majority of the FC segments underutilized during analyzed peak hours.

Table 7-31
I-710 Freight Corridor 2035 Peak Hour Alternative 6C (Build) Summary

Segment Type	Total Number of Segments	Number of Segments with LOS E or F			Percent of Segments with LOS E or F		
		AM Peak Hour	PM Peak Hour	MD Peak Hour	AM Peak Hour	PM Peak Hour	MD Peak Hour
Northbound Design Options 1 & 2							
Basic Freeway	7	0	0	0	0%	0%	0%
Southbound Design Options 1 & 2							
Basic Freeway	7	0	0	0	0%	0%	0%

7.7.2 I-710 Freight Corridor Intersection Analysis

Table 7-32 shows the LOS for the FC termini intersections of the I-710 FC under the Alternatives 6A, 6B and 6C conditions. As shown in **Table 7-32**, the FC ramp termini study intersections at Patata Street and I-710 NB and SB ramps will operate at an acceptable LOS D or better during all three peak periods for all three FC Alternatives.

7.7.3 I-710 Freight Corridor Ramp Queuing Analysis

Table 7-33 shows the results of the ramp queuing analysis at FC ramp locations along the I-710 corridor under the Alternative 6A, 6B and 6C conditions.

Based on the results of the FC ramp queuing analysis described above, under Design Option 1, the northbound FC on-ramp would have sufficient storage for Alternatives 6A, 6B and 6C. Under Design Option 2, both the northbound and southbound FC on-ramps would have sufficient storage for Alternatives 6A, 6B and 6C. Under Design Option 3, which applies only to Alternative 6B, the northbound FC on-ramp would have sufficient storage while the southbound FC on-ramp will have insufficient storage to accommodate ramp demand.

Table 7-32
I-710 Freight Corridor 2035 Intersection Analysis

Peak Hour Level of Service (LOS) Analysis (i)						
Patata/I-710 Interchange	AM		PM		MD	
	Delay (ii)	LOS	Delay	LOS	Delay	LOS
<i>Alternative 6A</i>						
Patata / I-710 NB Ramps	16.2	B	9.1	A	14.4	B
Patata / I-710 SB Ramps	6.4	A	2.8	A	5.9	A
<i>Alternative 6B</i>						
Patata / I-710 NB Ramps	16.4	B	9.1	A	14.0	B
Patata / I-710 SB Ramps	7.0	A	3.0	A	6.7	A
<i>Alternative 6C</i>						
Patata / I-710 NB Ramps	16.9	B	9.6	A	14.4	B
Patata / I-710 SB Ramps	4.9	A	3.5	A	5.5	A

Notes:

(i) Based on Highway Capacity Manual (HCM) 2000.

(ii) Average Intersection Delay (seconds/vehicle).

Table 7-33
I-710 Freight Corridor 2035 Ramp Queuing Analysis

Direction	Location	Min Req'd SL ALT 5A	Min Req'd SL ALT 6A	Min Req'd SL ALT 6B	Min Req'd SL ALT 6C	Provided SL ALT 5A, 6A, 6B &
Alternatives 6A, 6B and 6C – Design Option 1						
NB I-710	NB FC on-ramp	N/A	2400' @ 980 vph/lane*	2400' @ 1210 vph/lane**	2400' @ 1040 vph/lane*	2 lanes @ 2500'
SB I-710	N/A	N/A	N/A	N/A	N/A	N/A
Alternatives 6A, 6B and 6C – Design Option 2						
NB I-710	NB FC on-ramp	N/A	2250' @ 985 vph/lane*	2250' @ 1215 vph/lane**	2250' @ 1045 vph/lane*	2 lanes @ 2300'
SB I-710	SB FC on-ramp	N/A	4050' @ 245 vph/lane	4050' @ 255 vph/lane	3300' @ 240 vph/lane	2 lanes @ 4100'
Alternative 6B – Design Option 3						
NB I-710	NB FC on-ramp	N/A	N/A	2100' @ 1150 vph/lane*	N/A	2 lanes @ 2200'
SB I-710	SB FC on-ramp	N/A	N/A	>3000' @ 1380 vph/lane**	N/A	1 lane @ 3000'

Notes:

* Meter rate at 2 cars per green

* Meter rate at 3 cars per green

N/A – Not Applicable

SL – Storage Length

FC – Freight Corridor

Shaded cells indicate insufficient storage

This page intentionally left blank.

8.0 ADJACENT FREEWAYS

In addition to I-710, adjacent freeway segments at the I-405, SR-91, I-105 and I-5 interchanges were also evaluated within one mile of I-710. This section provides the 2035 Alternative 1 (No Build), and Future Year 2035 Alternatives 5A, 6A, 6B and 6C (Build) conditions freeway analysis. The following facilities were evaluated for the morning, midday and evening peak hours: freeway mainline (basic segments), critical weaving areas, major merge and diverge areas, and on- and off-ramp locations.

This section also includes the ramp metering analysis for freeway-to-freeway ramps between I-710 and the above mentioned adjacent freeways. The basis of the ramp metering analysis is discussed in **Section 4.0**.

The freeway operation and ramp metering analysis worksheets for adjacent freeways under future year (2035) conditions are contained in **Appendix F** and results of the analysis are depicted on the Freeway Operations Schematic Diagrams included in **Appendix H**.

The Freeway Operations Schematic Diagrams include the freeway mainline and freight corridor geometrics, peak hour volumes, truck percentages, and peak hour LOS. Note that major merge locations illustrate volume to capacity (V/C) ratios in place of peak hour LOS per *HCM* special cases as described in **Section 4.0**. Where denoted as N/A, these locations are not applicable to the associated scenarios.

8.1 FUTURE YEAR 2035 ALTERNATIVE 1 (NO BUILD)

The following sections provide freeway analysis under the 2035 Alternative 1 (No Build) conditions for I-405, SR-91, I-105 and I-5.

8.1.1 I-405 Freeway Segments

Table 8-1 shows the LOS for I-405 freeway segments adjacent to the I-710 freeway under Alternative 1 (No Build) conditions. **Table 8-2** presents the summary of Alternative 1 I-405 freeway operations and the following statements describe key findings of the analysis:

For Northbound I-405:

- The number of basic freeway segments with poor operating conditions are expected to be highest during the morning and evening peak hours, when all segments (4 out of 4) are expected to operate at poor LOS E or F;
- One merge and diverge area analyzed is expected to operate at an acceptable LOS D or better, during the three peak hours;
- The weaving areas are expected to experience poor operating conditions during all 3 peak hours.

Table 8-1
I-405 2035 Alternative 1 (No Build) Level of Service

Location Description	Freeway Type	Lane		AM		PM		MD	
		ML	Ramp	Density / VIC ¹	LOS	Density / VIC ¹	LOS	Density / VIC ¹	LOS
Northbound									
North of Alameda Off	Basic	5	--	--*	F	--*	F	39.8	E
Alameda	Off	5	1	N/A	N/A	N/A	N/A	N/A	N/A
I-710 & Santa Fe On / Alameda Off	Weave B	5	--	54.4	F	47.2	F	49.9	F
I-710 & Santa Fe	On	4	2	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	4	--	--*	F	--*	F	32.0	D
Santa Fe	On ⁵	2	1	30.3	D	23.0	C	32.8	D
I-710 SB On / Santa Fe Off	Weave A ⁵	3	--	42.0	F	28.3	C	43.2	F
I-710 NB On / I-710 SB Off	Weave A ⁵	2	--	125.9	F	98.6	F	135.2	F
I-710 SB & Santa Fe	Off	5	1	N/A	N/A	N/A	N/A	N/A	N/A
Pacific On / I-710 SB & Santa Fe Off	Weave A	5	--	49.1	F	49.1	F	42.0	E
Pacific	On	4	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	4	--	--*	F	--*	F	43.3	E
I-710 NB	Off	6	2	N/A	N/A	N/A	N/A	N/A	N/A
Wardlow On / I-710 NB Off	Weave C	6	--	34.2	D	34.3	D	30.9	D
Wardlow	On	5	1	N/A	N/A	N/A	N/A	N/A	N/A
South of Wardlow On	Basic	5	--	36.5	E	37.6	E	30.8	D
Southbound									
North of Alameda On	Basic	5	--	34.9	D	44.1	E	34.0	D
Alameda	On	5	1	N/A	N/A	N/A	N/A	N/A	N/A
Alameda On/Wardlow & I-710 NB Off	Weave B	5	--	44.2	F	57.0	F	50.2	F
I-710 NB & Wardlow	Off	5	2	N/A	N/A	N/A	N/A	N/A	N/A
Wardlow On/Off	Weave A ⁵	3	--	50.6	F	49.4	F	61.8	F
--	Basic	4	--	38.5	E	--*	F	36.4	E
I-710 SB	Off ⁴	4	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	3	--	42.2	E	--*	F	43.8	E
Wardlow	On	3	1	N/A	N/A	N/A	N/A	N/A	N/A
Wardlow On / Pacific Off	Weave B	4	--	40.2	E	48.2	F	39.8	E
Pacific	Off	4	1	N/A	N/A	N/A	N/A	N/A	N/A
I-710 NB On / Pacific Off	Weave A ⁵	3	--	26.9	C	22.0	B	24.7	C
--	Basic	4	--	30.2	D	44.7	E	30.7	D
I-710	On	4	1	N/A	N/A	N/A	N/A	N/A	N/A
I-710 On / Long Beach Off	Weave B	5	--	39.2	E	42.8	E	40.1	E
Long Beach	Off	5	1	N/A	N/A	N/A	N/A	N/A	N/A

Notes:

¹ Density = passenger car/mile/lane; v/c = volume-to-capacity ratio. Shaded and bold cells indicate LOS E or F.⁵ Operation occurs on freeway collector/distributor.

N/A = not applicable. LOS and/or density information are not shown for major merge areas, single-lane addition/drop, and merge/diverge operations within a weaving segment.

* = Demand exceeds capacity, no density is predicted.

For Southbound I-405:

- All basic freeway segments (4 out of 4) are expected to operate at a poor LOS E or F during the evening peak hour;
- Eighty percent (4 out of 5) of the weaving areas are expected to operate at poor LOS E or F during the three peak hours analyzed.

**Table 8-2
I-405 2035 Peak Hour Alternative 1 (No Build) Summary**

Segment Type	Total Number of Segments	Number of Segments with LOS E or F			Percent of Segments with LOS E or F		
		AM Peak Hour	PM Peak Hour	MD Peak Hour	AM Peak Hour	PM Peak Hour	MD Peak Hour
Northbound							
Basic Freeway	4	4	4	2	100%	100%	50%
Merge/Diverge	1	0	0	0	0%	0%	0%
Weaving	5	4	3	4	80%	60%	80%
Southbound							
Basic Freeway	4	2	4	2	50%	100%	50%
Merge/Diverge	0	0	0	0	0%	0%	0%
Weaving	5	4	4	4	80%	80%	80%

In summary, the northbound lanes show heavy congestion during the morning peak hours and southbound lanes show heavy congestion during the evening peak hours. This indicates that these study areas along I-405 and within 1-mile from the I-710 are near or exceed capacity and operating under congested conditions through this section. These operating conditions are expected to deteriorate further without any improvements.

8.1.2 SR-91 Freeway Segments

Table 8-3 shows the LOS for SR-91 freeway segments adjacent to the I-710 freeway under Alternative 1 (No Build) conditions. **Table 8-4** presents the summary of Alternative 1 SR-91 freeway operations and the following statements describe key findings of the analysis:

For Eastbound SR-91:

- The number of basic freeway segments with poor operating conditions are expected to be highest during the evening peak hour at 43 percent (3 out of 7);
- The LOS for the merge and diverge areas are also expected to be heaviest during the evening peak hour at 25 percent (1 out of 4);
- The weaving areas are expected to experience maximum densities during the evening peak hour when all weaving areas (2 out of 2) are expected to operate at poor LOS E or F.

Table 8-3
SR-91 2035 Alternative 1 (No Build) Level of Service

Ramp/Weaving Sections	Freeway Type	Lane		AM		PM		MD	
		ML	Ramp	Density / VIC ¹	LOS	Density / VIC ¹	LOS	Density / VIC ¹	LOS
Eastbound									
West of Santa Fe On	Basic	5	--	24.3	C	33.4	D	25.4	C
Santa Fe	On	5	1	N/A	N/A	N/A	N/A	N/A	N/A
Santa Fe On/Long Beach Off	Weave A	6	--	23.3	C	36.4	E	27.4	C
Long Beach	Off	5	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	5	--	29.7	D	39.8	E	31.6	D
Long Beach	On	5	1	N/A	N/A	N/A	N/A	N/A	N/A
Long Beach On/710 SB Off	Weave A	6	--	28.6	C	42.0	F	32.5	D
I-710 SB	Off	5	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	5	--	23.1	C	32.8	D	25.5	C
710 NB & Atlantic	Major Off ³	5	2	27.0	C	35.6	E	29.6	D
--	Basic	3	--	30.3	D	39.9	E	30.5	D
I-710 NB	On ⁴	3	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	4	--	27.2	D	34.7	D	26.7	D
I-710 SB	On ⁴	4	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	5	--	27.8	D	33.1	D	26.2	D
Atlantic	On	5	1	23.4	C	26.3	C	22.3	C
East of Atlantic On	Basic	5	--	30.9	D	36.5	E	29.1	D
Westbound									
West of Santa Fe Off	Basic	4	--	--*	F	41.4	E	--*	F
Santa Fe	Off	4	2	N/A	N/A	N/A	N/A	N/A	N/A
Long Beach On/Santa Fe Off	Weave C	6	--	28.9	D	29.7	D	31.3	D
Long Beach	On	5	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	5	--	31.5	D	31.4	D	35.9	E
Long Beach	Off	6	1	N/A	N/A	N/A	N/A	N/A	N/A
710 SB On/Long Beach Off	Weave C	6	--	58.2	F	43.0	F	48.6	F
I-710 SB	On	4	2	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	4	--	31.3	D	34.7	D	40.1	E
I-710 NB & Atlantic	Major On ²	3	2	0.78	N/A	0.85	N/A	0.90	N/A
--	Basic	3	--	32.6	D	39.3	E	34.4	D
I-710	Major Off ³	5	3	33.9	D	36.1	E	31.9	D
--	Basic	5	--	33.1	D	35.1	E	30.7	D
Atlantic	Off	5	2	18.1	B	15.5	B	15.9	B
--	Basic	5	--	41.1	E	40.5	E	37.5	E
Cherry	On	5	1	23.9	C	23.8	C	21.1	C

Notes:

¹ Density = passenger car/mile/lane; v/c = volume-to-capacity ratio. Shaded and bold cells indicate LOS E or F.³ Major diverge area; HCM methodology applied for analysis.⁴ Single-lane addition/drop; HCM methodology applied for analysis.

N/A = not applicable. LOS and/or density information are not shown for major merge areas, single-lane addition/drop, and merge/diverge operations within a weaving segment.

* = Demand exceeds capacity, no density is predicted.

For Westbound SR-91:

- Approximately 57 percent (4 out of 7) of the basic freeway segments are expected to operate at poor LOS E or F during both midday and evening peak hours;
- The LOS for the merge and diverge areas are expected to be heaviest during the evening peak hour when 25 (1 out of 4) percent of the merge and diverge areas are expected to operate at poor LOS E or F;
- Half of the (1 out of 2) weaving areas are expected to operate at poor LOS E or F during the three peak hours analyzed.

Table 8-4
SR-91 2035 Peak Hour Alternative 1 (No Build) Summary

Segment Type	Total Number of Segments	Number of Segments with LOS E or F			Percent of Segments with LOS E or F		
		AM Peak Hour	PM Peak Hour	MD Peak Hour	AM Peak Hour	PM Peak Hour	MD Peak Hour
Eastbound							
Basic Freeway	7	0	3	0	0%	43%	0%
Merge/Diverge	2	0	1	0	0%	50%	0%
Weaving	2	0	2	0	0%	100%	0%
Westbound							
Basic Freeway	6	2	4	4	33%	67%	67%
Merge/Diverge	4	0	1	0	0%	25%	0%
Weaving	2	1	1	1	50%	50%	50%

In summary, the results show that the study locations (within 1-mile from I-710) on westbound SR-91 would experience congestion during midday and PM peak hours, and on eastbound SR-91 during the PM peak hour only. These conditions are expected to deteriorate further without any improvements.

8.1.3 I-105 Freeway Segments

Table 8-5 shows the LOS for I-105 freeway segments adjacent to the I-710 freeway under Alternative 1 (No Build) conditions. **Table 8-6** presents the summary of Alternative 1 I-105 freeway operations and the following statements describe key findings of the analysis:

For Eastbound I-105:

- 33 percent (2 out of 6) of the basic freeway segments are expected to operate at poor LOS E or F during the three peak hours analyzed;
- The LOS for the merge and diverge areas are acceptable in all peak hours, except one during the PM peak hour.

For Westbound I-105:

- The number of basic freeway segments with poor operating conditions are expected to be highest during the evening peak hour, when 67 percent (4 out of 6) of the segments are expected to operate at poor LOS E or F;
- 67 percent (2 out of 3) merge and diverge areas are expected to operate at an acceptable LOS D or better, during the three peak hours analyzed.

Table 8-5
I-105 2035 Alternative 1 (No Build) Level of Service

Ramp	Freeway Type	Lane		AM		PM		MD	
		ML	Ramp	Density / VIC ¹	LOS	Density / VIC ¹	LOS	Density / VIC ¹	LOS
Eastbound									
West of I-710 Off (3 Lanes)	Basic	3	--	--*	F	--*	F	42.6	E
West of I-710 Off (4 Lanes)	Basic	4	--	29.0	D	33.1	D	26.8	D
I-710	Major Off ³	4	2	33.0	D	36.4	E	31.1	D
--	Basic	3	--	27.7	D	32.0	D	25.3	C
Garfield	Off	3	2	16.4	B	19.1	B	14.8	B
--	Basic	3	--	22.6	C	25.3	C	20.2	C
I-710 NB	Major On ²	3	2	0.58	N/A	0.59	N/A	0.62	N/A
--	Basic	5	--	20.5	C	21.5	C	21.6	C
I-710 SB	On	5	1	17.5	B	18.3	B	19.6	B
East of I-710 On	Basic	3	--	--*	F	--*	F	--*	F
Westbound									
West of I-710 NB On (3 Lanes)	Basic	3	--	--*	F	--*	F	39.4	E
West of I-710 NB On (4 Lanes)	Basic	4	--	31.5	D	35.5	E	26.4	D
I-710 NB	On ⁴	3	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	3	--	--*	F	--*	F	38.0	E
I-710 SB	On	3	1	--*	F	--*	F	35.3	E
--	Basic	3	--	33.3	D	38.7	E	27.4	D
Garfield	On	3	1	27.8	C	31.0	D	24.1	C
--	Basic	3	--	26.4	D	28.5	D	21.8	C
I-710	Major Off ³	5	2	28.1	D	28.4	D	25.9	C
East of I-710 Off	Basic	5	--	24.6	C	24.6	C	22.8	C

Notes:

¹ Density = passenger car/mile/lane; v/c = volume-to-capacity ratio. Shaded and bold cells indicate LOS E or F.

² Major merge area; HCM methodology applied for analysis.

³ Major diverge area; HCM methodology applied for analysis.

N/A = not applicable. LOS and/or density information are not shown for major merge areas, single-lane addition/drop, and merge/diverge operations within a weaving segment.

* = Demand exceeds capacity, no density is predicted.

Table 8-6
I-105 2035 Peak Hour Alternative 1 (No Build) Summary

Segment Type	Total Number of Segments	Number of Segments with LOS E or F			Percent of Segments with LOS E or F		
		AM Peak Hour	PM Peak Hour	MD Peak Hour	AM Peak Hour	PM Peak Hour	MD Peak Hour
Eastbound							
Basic Freeway	6	2	2	2	33%	33%	33%
Merge/Diverge	4	0	1	0	0%	25%	0%
Weaving	0	0	0	0	N/A	N/A	N/A
Westbound							
Basic Freeway	6	2	4	2	33%	67%	33%
Merge/Diverge	3	1	1	1	33%	33%	33%
Weaving	0	0	0	0	N/A	N/A	N/A

In summary, the results show that the study locations (within 1-mile from I-710) on both eastbound and westbound I-105 would experience the same number of congested (2 out of 6) freeway segments during all peak hours with the exception to the westbound direction which is more congested (4 of 6) during the PM peak hour. These conditions are expected to deteriorate further without any improvements.

8.1.4 I-5 Freeway Segments

Table 8-7 shows the LOS for I-5 freeway segments adjacent to the I-710 freeway under Alternative 1 (No Build) conditions.

Table 8-7
I-5 2035 Alternative 1 (No Build) Level of Service

Ramp/Weaving Sections	Freeway Type	Lane		AM		PM		MD	
		ML	Ramp	Density / VIC ¹	LOS	Density / VIC ¹	LOS	Density / VIC ¹	LOS
Northbound									
North of Dennison	Basic	5	--	38.1	E	27.1	D	--*	F
Dennison On-Ramp	On	5	1	23.8	C	17.4	B	27.1	C
--	Basic	5	--	37.5	E	26.2	D	--*	F
Ditman & Dennison	Off	5	1	33.4	D	24.9	C	--*	F
--	Basic	5	--	38.8	E	27.2	D	--*	F
Telegraph & Downey	On	5	1	21.7	C	16.6	B	23.0	C
--	Basic	5	--	36.9	E	26.1	D	40.8	E
I-710 NB	On ⁴	4	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	4	--	31.4	D	23.1	C	33.6	D
I-710 NB	Off ⁴	5	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	5	--	31.4	D	27.3	D	32.7	D
McBride & Telegraph	Off	5	1	29.3	D	25.9	C	30.2	D
--	Basic	5	--	32.0	D	27.6	D	33.2	D
--	Basic	4	--	42.9	E	34.6	D	--*	F
Woods & Telegraph	On	4	1	22.6	C	20.2	C	23.5	C

Table 8-7
I-5 2035 Alternative 1 (No Build) Level of Service

Ramp/Weaving Sections	Freeway Type	Lane		AM		PM		MD	
		ML	Ramp	Density / VIC ¹	LOS	Density / VIC ¹	LOS	Density / VIC ¹	LOS
--	Basic	4	--	41.0	E	33.6	D	44.8	E
Woods & Telegraph	Off	4	1	36.5	E	32.6	D	36.9	E
--	Basic	4	--	43.2	E	35.0	E	44.8	E
Camfield & Telegraph	On	4	1	21.1	C	18.8	B	22.4	C
--	Basic	4	--	40.3	E	31.8	D	44.8	E
Camfield & Telegraph	Off	4	1	37.3	E	31.6	D	39.0	E
South of Camfield&Telegraph Off	Basic	4	--	--*	F	34.2	D	--*	F
Southbound									
North of Ditman Off	Basic	5	--	30.5	D	26.3	D	35.4	E
Ditman	Off	5	1	27.6	C	24.1	C	31.2	D
--	Basic	5	--	30.0	D	25.8	C	35.3	E
Ditman	On	5	1	18.4	B	16.7	B	21.6	C
--	Basic	5	--	30.5	D	26.6	D	35.3	E
Boswell	Off	5	1	28.5	D	25.3	C	32.4	D
--	Basic	5	--	29.9	D	25.9	C	34.5	D
I-710 SB	Major Off ³	5	3	28.8	D	24.9	C	33.1	D
--	Basic	3	--	33.2	D	26.8	D	41.9	E
I-710 SB	On ⁴	3	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	4	--	36	E	33.2	D	39.8	E
Triggs	Off	4	1	32.2	D	30.4	D	34.6	D
--	Basic	4	--	34.9	D	32.8	D	39.8	E
Triggs	On	4	1	19.9	B	19.2	B	21.5	C
--	Basic	4	--	37.0	E	35.0	E	40.6	E
Stevens & Eastern	Off	4	1	33.1	D	31.5	D	34.8	D
South of Stevens & Eastern Off	Basic	4	--	33.3	D	33.4	D	37.7	E

Notes:

¹ Density = passenger car/mile/lane; v/c = volume-to-capacity ratio. Shaded and bold cells indicate LOS E or F.

³ Major diverge area; HCM methodology applied for analysis.

⁴ Single-lane addition/drop; HCM methodology applied for analysis.

N/A = not applicable. LOS and/or density information are not shown for major merge areas, single-lane addition/drop, and merge/diverge operations within a weaving segment.

* = Demand exceeds capacity, no density is predicted.

Table 8-8 presents the summary of Alternative 1 I-5 freeway operations and the following statements describe key findings of the analysis:

For Northbound I-5:

- The number of basic freeway segments with poor operating conditions are expected to be highest during both the morning and midday peak hours when 75 percent (9 out of 12) of the segments are expected to operate at poor LOS E or F;
- The LOS for the merge and diverge areas are generally expected to operate at an acceptable LOS D or better during all 3 peak hours except at 2 and 3 segments during the AM and midday peak hours, respectively.

For Southbound I-5:

- Approximately 89 percent (8 out of 9) of the basic freeway segments are expected to operate at poor LOS E or F during the midday peak hour;
- All merge and diverge areas (7 out of 7) are expected to operate at an acceptable LOS D or better during the three peak hours analyzed.

**Table 8-8
I-5 2035 Peak Hour Alternative 1 (No Build) Summary**

Segment Type	Total Number of Segments	Number of Segments with LOS E or F			Percent of Segments with LOS E or F		
		AM Peak Hour	PM Peak Hour	MD Peak Hour	AM Peak Hour	PM Peak Hour	MD Peak Hour
Northbound							
Basic Freeway	12	9	1	9	75%	8%	75%
Merge/Diverge	8	2	0	3	25%	0%	38%
Weaving	0	0	0	0	N/A	N/A	N/A
Southbound							
Basic Freeway	9	2	1	8	22%	11%	89%
Merge/Diverge	7	0	0	0	0%	0%	0%
Weaving	0	0	0	0	N/A	N/A	N/A

In summary, the northbound lanes show heavy congestion during the morning and midday peak hours and the southbound lanes show heavy congestion in the midday peak hour. The results show that the study locations (within 1-mile from I-710) in both directions of I-5 would experience heavy congestion and are expected to deteriorate further without any improvements.

8.2 FUTURE YEAR 2035 ALTERNATIVE 5A

This section provides the 2035 Alternative 5A traffic analysis for the adjacent freeways. The I-405, SR-91, I-105, and I-5 freeway segment operational analysis is based on the Alternative 5A network as described in **Section 6**. The Alternative 5A network depicts geometric enhancements applied to the SR-91 freeway for improved traffic operations and connectivity between I-710 and SR-91.

The 2035 Alternative 5A adjacent freeway analysis evaluated the following facilities during the morning, midday and evening peak hours:

- Freeway mainline (basic segments);
- Critical weaving areas;
- Major merge and diverge areas;
- On- and off-ramp locations.

8.2.1 I-405 Freeway Segments

Table 8-9 shows the LOS for the I-405 freeway segments adjacent to the I-710 freeway under Alternative 5A conditions. **Table 8-10** presents the summary of Alternative 5A I-405 freeway operations and the following statements describe key findings of the analysis:

For Northbound I-405:

- The number of basic freeway segments with poor operating conditions are expected to be highest during both the morning and evening peak hours, when all segments (5 out of 5) are expected to operate at poor LOS E or F;
- The only merge and diverge area analyzed is expected to operate at an acceptable LOS D or better during all three peak hours;
- The weaving areas are expected to experience significant densities and poor LOS E or F during all three peak hours.

For Southbound I-405:

- All basic freeway segments (5 out of 5) are expected to operate at poor LOS E or F during the evening peak hour;
- All merge and diverge areas (2 out of 2) are expected to operate at poor LOS E or F during the evening peak hour;
- The LOS for the two weaving areas are expected to experience poor LOS E or F conditions during the evening peak hour;

In summary, the northbound and southbound segments show heavy congestion during the morning and evening peak hours. This indicates that these areas are near or exceed capacity and operating under congested conditions through this section. However, the elimination of the collector distributor (CD) road along I-710 for both the I-405 northbound and southbound connectors eliminated the poor weaving conditions and may reduce the high accident rates in the area.

The additional capacity provided on the proposed flyover connector ramps would provide safer operation among the options considered. Even though this results in a loss of circulation, there are alternative means of gaining access to I-710 and the demand for these movements are relatively low.

As discussed in the previous sections, under existing and Alternative 1 conditions, the traffic operations in these areas would deteriorate further without improvements. Therefore, Alternative 5A would not only improve the overall operation, but also help address some of the safety issues in this area.

Table 8-9
I-405 2035 Alternative 5A (Build) Level of Service

Location Description	Freeway Type	Lane		AM		PM		MD	
		ML	Ramp	Density / VIC ¹	LOS	Density / VIC ¹	LOS	Density / VIC ¹	LOS
Northbound									
North of Alameda Off	Basic	5	--	--*	F	--*	F	38.7	E
Alameda	Off	6	1	N/A	N/A	N/A	N/A	N/A	N/A
I-710 NB & Santa Fe On / Alameda Off	Weave A	6	--	64.3	F	23.5	C	58.6	F
Santa Fe & I-710 NB	On	5	2	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	5	--	42.6	E	41.1	E	28.8	D
I-710 SB	Major On ²	4	2	--*	F	--*	F	0.78	N/A
--	Basic	4	--	--*	F	--*	F	32.5	D
Santa Fe	Off	5	1	N/A	N/A	N/A	N/A	N/A	N/A
Pacific On / Santa Fe Off	Weave A	5	--	39.3	E	41.9	E	30.3	D
Pacific	On	4	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	4	--	--*	F	--*	F	30.4	D
I-710	Off	6	2	N/A	N/A	N/A	N/A	N/A	N/A
Wardlow On / I-710 Off	Weave C	6	--	50.3	F	49.5	F	46.3	F
Wardlow	On	5	1	N/A	N/A	N/A	N/A	N/A	N/A
South of Wardlow On	Basic	5	--	39.2	E	40.2	E	32.9	D
Southbound									
North of Alameda On	Basic	5	--	34.8	D	44.5	E	33.5	D
Alameda	On	5	1	N/A	N/A	N/A	N/A	N/A	N/A
Alameda On / I-710 NB & Wardlow Off	Weave B	5	--	54.1	F	64.5	F	56.5	F
I-710 NB & Wardlow	Off	5	2	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	4	--	--*	F	--*	F	44.1	E
I-710 SB	Major Off ³	4	2	--*	F	--*	F	--*	F
--	Basic	3	--	--*	F	--*	F	--*	F
Wardlow	On	3	1	N/A	N/A	N/A	N/A	N/A	N/A
Wardlow On / Pacific Off	Weave B	4	--	32.2	D	41.5	E	32.2	D
Pacific	Off	4	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	4	--	27.9	D	41.3	E	29.8	D
I-710	Major On ²	4	2	0.95	N/A	--*	F	0.90	N/A
--	Basic	5	--	39.8	E	--*	F	35.9	E

Notes:

¹ Density = passenger car/mile/lane; v/c = volume-to-capacity ratio. Shaded and bold cells indicate LOS E or F.² Major merge area; HCM methodology applied for analysis.³ Major diverge area; HCM methodology applied for analysis.

N/A = not applicable. LOS and/or density information are not shown for major merge areas, single-lane addition/drop, and merge/diverge operations within a weaving segment.

* = Demand exceeds capacity, no density is predicted.

Table 8-10
I-405 2035 Peak Hour Alternative 5A (Build) Summary

Segment Type	Total Number of Segments	Number of Segments with LOS E or F			Percent of Segments with LOS E or F		
		AM Peak Hour	PM Peak Hour	MD Peak Hour	AM Peak Hour	PM Peak Hour	MD Peak Hour
Northbound							
Basic Freeway	5	5	5	1	100%	100%	20%
Merge/Diverge	1	1	1	0	100%	100%	0%
Weaving	3	3	2	2	100%	67%	67%
Southbound							
Basic Freeway	5	3	5	3	60%	100%	60%
Merge/Diverge	2	1	2	1	50%	100%	50%
Weaving	2	1	2	1	50%	100%	50%

8.2.1.1 I-405 Freeway Queuing Analysis

This section evaluates projected queuing for 2035 Build Alternative 5A at I-405 and I-710 freeway-to-freeway ramp connections, and at the I-405 and three local arterial ramps. **Table 8-11** indicates that the storage length provided on freeway-to-freeway ramp connectors with proposed ramp metering for the 2035 Build Alternative 5A are not adequate using suggested meter rates (discussed in **Section 4.0**) for the following:

- I-710 northbound connector ramp to I-405 northbound
- I-710 southbound connector ramp to I-405 southbound

Table 8-11
I-405 2035 Alternative 5A Freeway Ramp Queuing Analysis

Direction	Location	Min Req'd SL ALT 5A	Provided SL ALT 5A
NB I-405	Off-ramp to I-710 NB Connector	2250' @ 1070 vph / lane*	2 lanes @ 2400'
NB I-405	Off-ramp to I-710 SB Connector	3000' @ 785 vph / lane	2 lanes @ 3100'
NB I-405	On-ramp from I-710 SB Connector	1800' @ 750 vph / lane	2 lane @ 1900'
NB I-405	On-ramp from I-710 NB Connector	>4200' @ 1380 vph / lane**	2 lane @ 4200'
SB I-405	Off-ramp to I-710 NB Connector	4500' @ 1205 vph / lane**	2 lane @ 4600'
SB I-405	Off-ramp to I-710 SB Connector	1800' @ 1030 vph / lane*	2 lane @ 1900'
SB I-405	On-ramp from I-710 NB Connector	1650' @ 245 vph / lane	1 lane @ 1700'
SB I-405	On-ramp from I-710 SB Connector	> 4700' @ 1380 vph / lane**	2 lanes @ 4700'

Notes:

Shaded cells indicate insufficient storage

* Meter rate at 2 cars per green;

** Meter rate at 3 cars per green

SL – Storage Length

Table 8-12 indicates that the storage provided on all on-ramps with proposed ramp metering for the 2035 Build Alternative 5A are adequate using suggested meter rates between 240 vph/lane and 900 vph/lane.

At locations where the required storage is not provided and the maximum meter rate is utilized, it is concluded that there are no feasible improvement recommendations. This is generally a result of physical and design constraints such as the proximity of community parks or commercial buildings. Note that a higher meter rate allows more throughput, but would generally cause turbulence at the merge area and increase congestion on the freeway.

Table 8-12
I-405 2035 Alternative 5A Arterial Ramps Queuing Analysis

Direction	Location	Min Req'd SL ALT 5A	Provided SL ALT 5A
NB I-405	Pacific Place On-Ramp	450' @ 485 vph / lane	1 lane @ 500'
SB I-405	Wardlow Road On-ramp	<365' @ 240 vph / lane	2 lane @ 365'
NB I-405	Hughes Way On-ramp	<200' @ 240 vph / lane	2 lane @ 200'

Notes:
SL – Storage Length

8.2.2 SR-91 Freeway Segments

The 2035 Alternative 5A traffic analysis on the SR-91 freeway segments consists of operational analysis on the Alternative 5A network as described in **Section 6**. The Alternative 5A network includes geometric enhancements applied to the SR-91 freeway (such as building new freeway connectors between SR-91 and I-710, addition of auxiliary lanes, etc.) for improved traffic operations. **Table 8-13** shows the LOS for SR-91 freeway segments adjacent to the I-710 freeway under Alternative 5A conditions.

Table 8-13
SR-91 2035 Alternative 5A (Build) Level of Service

Ramp/Weaving Sections	Freeway Type	Lane		AM		PM		MD	
		ML	Ramp	Density / VIC ¹	LOS	Density / VIC ¹	LOS	Density / VIC ¹	LOS
Eastbound									
West of Santa Fe On	Basic	5	--	24.8	C	33.7	D	26.5	D
Santa Fe	On	5	1	N/A	N/A	N/A	N/A	N/A	N/A
Santa Fe On / Long Beach Off	Weave A	6	--	25.5	C	35.9	E	27.7	C
Long Beach	Off	6	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	5	--	24.9	C	35.1	E	27.1	D
Long Beach	On	5	1	N/A	N/A	N/A	N/A	N/A	N/A
Long Beach On / I-710 SB Off	Weave A	6	--	24.7	C	38.0	E	28.7	D
I-710 SB	Off	6	1	N/A	N/A	N/A	N/A	N/A	N/A

Table 8-13
SR-91 2035 Alternative 5A (Build) Level of Service

Ramp/Weaving Sections	Freeway Type	Lane		AM		PM		MD	
		ML	Ramp	Density / VIC ¹	LOS	Density / VIC ¹	LOS	Density / VIC ¹	LOS
--	Basic	5	--	23.6	C	31.8	D	26.3	D
I-710 NB & Atlantic	Major Off ³	5	2	26.4	C	33.8	D	29.2	D
--	Basic	3	--	27.3	D	36.0	E	24.2	C
I-710 NB	On ⁴	3	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	4	--	28.0	D	35.0	D	24.7	C
I-710 SB	On ⁴	4	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	5	--	27.8	D	33.3	D	28.3	D
Atlantic	On	5	1	20.8	C	23.5	C	21.0	C
--	Basic	5	--	30.9	D	36.2	E	31.2	D
Westbound									
West of Santa Fe Off	Basic	4	--	44.9	E	42.1	E	--*	F
Santa Fe	Off	6	2	N/A	N/A	N/A	N/A	N/A	N/A
Long Beach On / Santa Fe Off	Weave C	6	--	29.2	D	30.7	D	35.2	E
Long Beach	On	6	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	6	--	24.5	C	25.0	C	30.0	D
I-710 NB	On ⁴	5	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	5	--	25.3	C	25.3	C	32.4	D
Long Beach	Off	6	2	N/A	N/A	N/A	N/A	N/A	N/A
I-710 SB On / Long Beach Off	Weave B	6	--	40.8	E	28.4	D	37.7	E
I-710 SB	On	4	2	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	4	--	25.1	C	28.1	D	32.9	D
Atlantic	On ⁴	3	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	3	--	30.8	D	36.4	E	32.2	D
I-710	Major Off ³	5	3	34.9	D	35.6	E	33.8	D
--	Basic	5	--	31.7	D	32.9	D	30.4	D
Atlantic	Major Off ³	6	2	31.5	D	31.2	D	30.1	D
--	Basic	5	--	37.2	E	36.5	E	34.3	D
Cherry	On	5	1	26.1	C	26.1	C	24.8	C

Notes:

¹ Density = passenger car/mile/lane; v/c = volume-to-capacity ratio. Shaded and bold cells indicate LOS E or F.

³ Major diverge area; HCM methodology applied for analysis.

⁴ Single-lane addition/drop; HCM methodology applied for analysis.

N/A = not applicable. LOS and/or density information are not shown for major merge areas, single-lane addition/drop, and merge/diverge operations within a weaving segment.

* = Demand exceeds capacity, no density is predicted.

Table 8-14 presents the summary of Alternative 5A SR-91 freeway operations and the following statements describe key findings of the analysis:

For Eastbound SR-91:

- The number of basic freeway segments with poor operating conditions are expected to be highest during the evening peak hour, when 33 percent (3 out of 7) of the segments are expected to operate at poor LOS E or F;

- All merge and diverge areas (2 out of 2) are expected to operate at an acceptable LOS D or better during all three peak hours;
- All weaving areas are expected to operate at poor LOS E or F during the evening peak hour.

For Westbound SR-91:

- Approximately 43 percent (3 out of 7) of the basic freeway segments are expected to operate at poor LOS E or F during the evening peak hour;
- All merge and diverge areas are expected to operate at an acceptable LOS D or better during all three peak hours with exception to one diverge area during the PM peak hour;
- All weaving areas analyzed (2 out of 2) are expected to operate at poor LOS E or F during the midday peak hour.

Table 8-14
SR-91 2035 Peak Hour Alternative 5A (Build) Summary

Segment Type	Total Number of Segments	Number of Segments with LOS E or F			Percent of Segments with LOS E or F		
		AM Peak Hour	PM Peak Hour	MD Peak Hour	AM Peak Hour	PM Peak Hour	MD Peak Hour
Eastbound							
Basic Freeway	7	0	3	0	0%	43%	0%
Merge/Diverge	2	0	0	0	0%	0%	0%
Weaving	2	0	2	0	0%	100%	0%
Westbound							
Basic Freeway	7	2	3	1	29%	43%	14%
Merge/Diverge	3	0	1	0	0%	33%	0%
Weaving	2	1	0	2	50%	0%	100%

In summary, the eastbound lanes experience heavy congestion during the evening peak hours, while the westbound lanes experience heavy congestion during both AM and PM peak hours. This indicates that these areas are near or exceed capacity and operating under congested conditions through this section.

Under the Alternative 5A condition, in order to increase I-710 mainline capacity and not affect the SR-91/I-710 interchange, it was proposed to remove the existing I-710 northbound loop connector to SR-91 westbound. This would help alleviate congestion and improve operations on the mainline as well as at the ramp influence areas.

As discussed in the previous sections, under existing and Alternative 1 conditions, the operating conditions in these areas would deteriorate further without improvements. Therefore, Alternative 5A would not only improve the overall operation, but may also provide the additional capacity to accommodate projected future traffic demand in this area.

8.2.2.1 SR-91 Freeway Queuing Analysis

This section evaluates projected queuing for 2035 Build Alternative 5A at SR-91 and I-710 freeway-to-freeway ramp connections, and at SR-91 and two local arterial ramps. **Table 8-15** indicates that the storage provided on freeway-to-freeway ramp connectors with proposed ramp metering for the 2035 Build Alternative 5A are not adequate using suggested meter rates (discussed in **Section 4.0**) for the following:

- SR-91 westbound connector ramp to I-710 southbound
- I-710 southbound connector ramp to SR-91 westbound

Table 8-15
SR-91 2035 Alternative 5A Freeway Ramp Queuing Analysis

Direction	Location	Min Req'd SL ALT 5A	Provided SL ALT 5A
EB SR-91	Off-ramp to I-710 NB Connector	4650' @ 930 vph / lane*	2 lanes @ 4800'
EB SR-91	Off-ramp to I-710 SB Connector	2100' @ 1120 vph / lane*	1 lane @ 2200'
EB SR-91	On-ramp from I-710 NB Connector	1650' @ 845 vph / lane	2 lanes @ 1700'
EB SR-91	On-ramp from I-710 SB Connector	5700' @ 935 vph / lane*	2 lanes @ 5800'
WB SR-91	Off-ramp to I-710 NB Connector	1950' @ 715 vph / lane	2 lanes @ 2050'
WB SR-91	Off-ramp to I-710 SB Connector	> 2160' @ 1380 vph / lane**	2 lanes @ 2160'
WB SR-91	On-ramp from I-710 NB Connector	2850' @ 620 vph / lane	2 lanes @ 2900'
WB SR-91	On-ramp from I-710 SB Connector	> 1500' @ 1380 vph / lane**	2 lanes @ 1500'

Notes:
 Shaded cells indicate insufficient storage
 * Meter rate at 2 cars per green;
 ** Meter rate at 3 cars per green
 SL – Storage Length

Table 8-16 indicates that the storage provided on all on-ramps with proposed ramp metering for the 2035 Build Alternative 5A are adequate using suggested meter rates between 240 vph/lane and 900 vph/lane for one car per green and 480 vph/lane and 1200 vph/lane for two cars per green.

At locations where the required storage is not provided and the maximum meter rate is utilized, it is concluded that due to physical and design constraints there may be no feasible improvement recommendations. Note that a higher meter rate allows more throughput, but would generally cause turbulence at the merge area and increase congestion to the freeway.

Table 8-16
SR-91 2035 Alternative 5A Arterial Ramp Queuing Analysis

Direction	Location	Min Req'd SL ALT 5A	Provided SL ALT 5A
EB SR-91	Long Beach On-Ramp	900' @ 580 vph / lane	1 lane @ 925'
EB SR-91	Atlantic On-ramp	150' @ 350 vph / lane	2 lanes @ 280'
WB SR-91	Atlantic On-ramp	1200' @ 900 vph / lane*	2 lanes @ 1275'
WB SR-91	Long Beach On-Ramp	< 670' @ 240 vph / lane	2 lanes @ 670'

Notes:
 Shaded cells indicate insufficient storage
 * Meter rate at 2 cars per green;
 ** Meter rate at 3 cars per green
 SL – Storage Length

8.2.3 I-105 Freeway Segments

Table 8-17 shows the LOS for the I-105 freeway segments adjacent to the I-710 freeway under Alternative 5A conditions.

Table 8-17
I-105 2035 Alternative 5A (Build) Level of Service

Ramp	Freeway Type	Lane		AM		PM		MD	
		ML	Ramp	Density / VIC ¹	LOS	Density / VIC ¹	LOS	Density / VIC ¹	LOS
Eastbound									
West of I-710 Off	Basic	3	--	--*	F	--*	F	41.3	E
Lane Addition	Basic	4	--	28.5	D	32.2	D	26.4	D
I-710	Major Off ³	4	2	32.6	D	35.7	E	30.5	D
--	Basic	3	--	24.7	C	30.9	D	22.9	C
Garfield	Off	3	2	12.0	B	15.6	B	11.8	B
--	Basic	3	--	22.7	C	28.2	D	19.5	C
I-710 NB	Major On ²	3	2	0.55	N/A	0.64	N/A	0.62	N/A
--	Basic	5	--	19.8	C	23.4	C	21.6	C
I-710 SB	On	5	1	19.4	B	21.1	C	21.2	C
--	Basic	5	--	24.4	C	30.3	D	28.7	D
East of I-710 On (Lane Drop)	Basic	3	--	--*	F	--*	F	--*	F
Westbound									
West of Long Beach Off	Basic	3	--	41.6	E	--*	F	32.8	D
Long Beach	Off	3	1	--*	F	--*	F	37.1	E
Lane Drop	Basic	3	--	--*	F	--*	F	37.9	E
--	Basic	4	--	30.3	D	32.3	D	25.8	C
I-710 NB	On ⁴	3	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	3	--	--*	F	--*	F	36.7	E
I-710 SB	On	3	1	--*	F	--*	F	35.6	E
--	Basic	3	--	29.8	D	33.9	D	25.5	C

Table 8-17
I-105 2035 Alternative 5A (Build) Level of Service

Ramp	Freeway Type	Lane		AM		PM		MD	
		ML	Ramp	Density / VIC ¹	LOS	Density / VIC ¹	LOS	Density / VIC ¹	LOS
Garfield	On	3	1	24.9	C	27.1	C	21.7	C
--	Basic	3	--	25.6	C	29.5	D	22.1	C
I-710	Major Off ³	5	2	27.6	C	28.1	D	25.9	C
East of I-710 Off	Basic	5	--	24.2	C	24.4	C	22.8	C

Notes:

¹ Density = passenger car/mile/lane; v/c = volume-to-capacity ratio. Shaded and bold cells indicate LOS E or F.

² Major merge area; HCM methodology applied for analysis.

³ Major diverge area; HCM methodology applied for analysis.

⁴ Single-lane addition/drop; HCM methodology applied for analysis.

N/A = not applicable. LOS and/or density information are not shown for major merge areas, single-lane addition/drop, and merge/diverge operations within a weaving segment.

* = Demand exceeds capacity, no density is predicted.

Table 8-18 presents the summary of Alternative 5A I-105 freeway operations and the following statements describe key findings of the analysis:

For Eastbound I-105:

- 29 percent (2 out of 7) of the basic freeway segments are expected to operate at poor LOS E or F during the three peak hours analyzed;
- 25 percent (1 out of 4) merge and diverge areas is expected to operate at poor LOS E or F during the evening peak hour.

For Westbound I-105:

- Approximately 43 percent (3 out of 7) basic freeway segments are expected to operate at poor LOS E or F during morning and evening peak hours;
- 25 percent (1 out of 4) merge and diverge areas are expected to operate at poor LOS E or F during the three peak hours analyzed.

Table 8-18
I-105 2035 Peak Hour Alternative 5A (Build) Summary

Segment Type	Total Number of Segments	Number of Segments with LOS E or F			Percent of Segments with LOS E or F		
		AM Peak Hour	PM Peak Hour	MD Peak Hour	AM Peak Hour	PM Peak Hour	MD Peak Hour
Eastbound							
Basic Freeway	7	2	2	2	29%	29%	29%
Merge/Diverge	4	0	1	0	0%	25%	0%
Weaving	0	0	0	0	N/A	N/A	N/A
Westbound							
Basic Freeway	7	3	3	2	43%	43%	29%
Merge/Diverge	4	1	1	1	25%	25%	25%
Weaving	0	0	0	0	N/A	N/A	N/A

In summary, the I-105 eastbound and westbound lanes show congestion during the three peak hours. This indicates that these areas are near or exceed capacity and operating under congested conditions through this section.

As discussed in the previous sections, under existing and Alternative 1 conditions, the traffic operations in these areas would deteriorate further without improvements. Compared to Alternative 1, under Alternative 5A, some of the segments improved as a result of geometric enhancements and capacity improvements on the I-710 mainline. Therefore, Alternative 5A would not only improve the overall operation, but may also provide the additional capacity to accommodate projected future traffic demand in this area.

8.2.3.1 I-105 Freeway Queuing Analysis

This section evaluates projected queuing for 2035 Build Alternative 5A condition at I-105 and I-710 freeway-to-freeway ramp connectors. **Table 8-19** indicates that the storage provided on freeway-to-freeway ramp connectors with proposed ramp metering for the 2035 Build Alternative 5A are not adequate using suggested meter rates (discussed in **Section 4.0**) for the following:

- I-105 connector ramp to I-710 northbound
- I-710 northbound connector ramp to I-105 eastbound and westbound

At locations where the required storage is not provided and the maximum meter rate is utilized, it is concluded that due to physical and design constraints, there may be no feasible improvement recommendations. Note that a higher meter rate allows more throughput, but would generally cause turbulence at the merge area and increase congestion to the freeway.

Table 8-19
I-105 2035 Alternative 5A Freeway Ramp Queuing Analysis

Direction	Location	Min Req'd SL ALT 5A	Provided SL ALT 5A
WB & EB I-105	Off-ramp to I-710 NB Connector	900' @ 1370 vph / lane**	2 lanes @ 1000'
WB I-105	On-ramp from I-710 SB Connector	2100' @ 1350 vph / lane**	1 lane @ 2240'
WB I-105	On-ramp from I-710 NB Connector	2550' @ 240 vph / lane	2 lanes @ 4065'
WB & EB I-105	Off-ramp to I-710 SB Connector	> 1580' @ 1380 vph / lane**	2 lanes @ 1580'
EB I-105	On-ramp from I-710 SB Connector	3900' @ 845 vph / lane	2 lanes @ 4015'
EB I-105	On-ramp from I-710 NB Connector	> 1115' @ 1380 vph / lane**	2 lanes @ 1115'

Notes:
Shaded cells indicate insufficient storage
* Meter rate at 2 cars per green;
** Meter rate at 3 cars per green
SL – Storage Length

8.2.4 I-5 Freeway Segments

Table 8-20 shows the LOS for I-5 freeway segments adjacent to the I-710 freeway under Alternative 5A conditions.

Table 8-20
I-5 2035 Alternative 5A (Build) Level of Service

Ramp/Weaving Sections	Freeway Type	Lane		AM		PM		MD	
		ML	Ramp	Density / VIC ¹	LOS	Density / VIC ¹	LOS	Density / VIC ¹	LOS
Northbound									
North of Dennison On	Basic	5	--	34.6	D	22.9	C	44.2	E
Dennison	On	5	1	23.8	C	17.4	B	27.1	C
--	Basic	5	--	33.2	D	21.7	C	41.4	E
Ditman & Dennison	Off	5	1	33.7	D	24.9	C	36.3	E
--	Basic	5	--	34.8	D	22.8	C	41.7	E
Telegraph & Downey	On	5	1	21.5	C	16.6	B	23.0	C
--	Basic	5	--	32.1	D	21.7	C	36.6	E
I-710 NB	On ⁴	4	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	4	--	24.5	C	17.3	B	26.8	D
I-710 NB	Off ⁴	5	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	5	--	26.7	D	22.4	C	28.5	D
McBride & Telegraph	Off	5	1	29.1	D	25.1	C	30.6	D
--	Basic	5	--	27.2	D	22.8	C	29.0	D
--	Basic	4	--	38.0	E	29.1	D	42.8	E
Woods & Telegraph	On	4	1	22.4	C	19.7	B	23.6	C
--	Basic	4	--	35.9	E	27.8	D	41.0	E
Woods & Telegraph	Off	4	1	36.1	E	31.5	D	37.2	E
--	Basic	4	--	37.2	E	29.4	D	41.0	E
Camfield & Telegraph	On	4	1	20.8	C	18.5	B	22.5	C
--	Basic	4	--	34.7	D	26.2	D	41.0	E
Camfield & Telegraph	Off	4	1	36.7	E	31.1	D	39.0	E
South of Camfield & Telegraph Off	Basic	4	--	39.7	E	29.2	D	--*	F
Southbound									
North of Ditman Off	Basic	5	--	30.1	D	22.9	C	32.6	D
Ditman	Off	5	1	28.5	D	24.8	C	32.3	D
--	Basic	5	--	26.6	D	22.5	C	32.5	D
Ditman	On	5	1	18.9	B	17.0	B	22.5	C
--	Basic	5	--	27.1	D	23.0	C	32.5	D
Boswell	Off	5	1	29.4	D	26.0	C	33.4	D
--	Basic	5	--	26.6	D	22.2	C	31.6	D
I-710 SB	Major Off ³	5	3	30.0	D	34.3	D	25.3	C
--	Basic	3	--	26.5	D	21.3	C	32.6	D
I-710 SB	On ⁴	3	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	4	--	28.4	D	26.8	D	30.8	D
Triggs	Off	4	1	30.2	D	28.9	D	31.8	D
--	Basic	4	--	27.8	D	26.4	D	30.8	D
Triggs	On	4	1	19.0	B	18.5	B	20.0	C
--	Basic	4	--	29.3	D	27.8	D	31.2	D

Table 8-20
I-5 2035 Alternative 5A (Build) Level of Service

Ramp/Weaving Sections	Freeway Type	Lane		AM		PM		MD	
		ML	Ramp	Density / VIC ¹	LOS	Density / VIC ¹	LOS	Density / VIC ¹	LOS
Stevens & Eastern	Off	4	1	30.8	D	29.3	D	32.1	D
South of Stevens & Eastern Off	Basic	4	--	26.3	D	27.0	D	29.7	D

Notes:

¹ Density = passenger car/mile/lane; v/c = volume-to-capacity ratio. Shaded and bold cells indicate LOS E or F.

³ Major diverge area; HCM methodology applied for analysis.

⁴ Single-lane addition/drop; HCM methodology applied for analysis.

N/A = not applicable. LOS and/or density information are not shown for major merge areas, single-lane addition/drop, and merge/diverge operations within a weaving segment.

* = Demand exceeds capacity, no density is predicted.

Table 8-21 presents the summary of Alternative 5A I-5 freeway operations and the following statements describe key findings of the analysis:

For Northbound I-5:

- The number of basic freeway segments with poor operating conditions are expected to be highest during the midday peak hour when 75 percent (9 out of 12) of the segments are expected to operate at poor LOS E or F;
- The majority of merge and diverge areas are expected to operate at acceptable LOS D or better with exception to three areas during the midday peak hour.

For Southbound I-5:

- All basic freeway segments are expected to operate at an acceptable LOS D or better during all three peak hours analyzed;
- All merge and diverge areas are expected to operate at an acceptable LOS D or better during the three peak hours analyzed.

In summary, the northbound lanes show heavy congestion in the morning and midday peak hours and southbound lanes show feasible operating conditions during all three peak hours. This indicates that these areas are near or exceed capacity and operating under congested conditions through this section.

As discussed in the previously, under existing and Alternative 1 conditions, the traffic operations in these areas would deteriorate further without improvements. Compared to Alternative 1, under Alternative 5A, some of the segments improved as a result of geometric enhancements and capacity improvements on the I-710 mainline. Therefore, Alternative 5A would not only improve the overall operation, but may also provide the additional capacity to accommodate projected future traffic demand in this area.

Table 8-21
I-5 2035 Peak Hour Alternative 5A (Build) Summary

Segment Type	Total Number of Segments	Number of Segments with LOS E or F			Percent of Segments with LOS E or F		
		AM Peak Hour	PM Peak Hour	MD Peak Hour	AM Peak Hour	PM Peak Hour	MD Peak Hour
Northbound							
Basic Freeway	12	4	0	9	33%	0%	75%
Merge/Diverge	8	2	0	3	25%	0%	38%
Weaving	0	0	0	0	N/A	N/A	N/A
Southbound							
Basic Freeway	9	0	0	0	0%	0%	0%
Merge/Diverge	7	0	0	0	0%	0%	0%
Weaving	0	0	0	0	N/A	N/A	N/A

8.2.4.1 I-5 Freeway Queuing Analysis

This section evaluates projected queuing for 2035 Build Alternative 5A at I-5 and I-710 freeway-to-freeway ramp connectors. **Table 8-22** indicates that the storage provided on freeway-to-freeway ramp connectors with proposed ramp metering for the 2035 Build Alternative 5A are not adequate using suggested meter rates (discussed in **Section 4.0**) for the following:

- I-710 northbound connector ramp to I-5 northbound
- I-5 southbound connector ramp to I-710 southbound

Table 8-22
I-5 2035 Alternative 5A Freeway Ramp Queuing Analysis

Direction	Location	Min Req'd SL ALT 5A	Provided SL ALT 5A, 6A, 6B & 6C
NB I-5	Off-ramp to I-710 NB Connector	1200'@1005 vph/lane*	2 Lanes @ 1300'
SB I-5	On-ramp from I-710 SB Connector	1650'@1310 vph/lane**	2 Lanes @ 1800'
NB I-5	On-ramp from I-710 NB Connector	>4500'@1380 vph/lane**	2 Lanes @ 4500'
SB I-5	Off-ramp to I-710 SB Connector	>2200'@1380 vph/lane**	2 Lanes @ 2200'

Notes:
 Shaded cells indicate insufficient storage
 * Meter rate at 2 cars per green;
 ** Meter rate at 3 cars per green
 SL – Storage Length

At locations where the required storage is not provided and the maximum meter rate is utilized, it is concluded that due to physical and design constraints, there may be no feasible improvement recommendations. Note that a higher meter rate allows more throughput, but would generally cause turbulence at the merge area and increase congestion to the freeway.

8.3 FUTURE YEAR 2035 ALTERNATIVE 6A

This section provides the 2035 Alternative 6A traffic analysis for the adjacent freeways. The I-405, SR-91, I-105 and I-5 freeway segment operational analysis are based on Alternative 6A network as described in **Section 6**; no further geometric improvements were implemented on I-405, I-105 and I-5 freeways.

The SR 91 freeway segment operational analysis has been performed for Alternative 6A network depicting geometric enhancements applied to the SR-91 freeway for improved traffic operations and connectivity between I-710 and SR-91.

The 2035 Alternative 6A freeway analysis evaluated the following facilities during the morning, midday and evening peak hours: freeway mainline (basic segments), critical weaving areas, major merge and diverge areas, and on- and off-ramp locations.

8.3.1 I-405 Freeway Segments

Table 8-23 shows the LOS for I-405 freeway segments adjacent to the I-710 freeway under Alternative 6A conditions. **Table 8-24** presents the summary of Alternative 6A I-405 freeway operations and the following statements describe key findings of the analysis:

For Northbound I-405:

- All basic freeway segments (5 out of 5) are expected to operate at LOS E or F, with the majority of deficiencies occurring during the morning and evening peak hours;
- The weaving areas are expected to experience maximum delay during all analyzed peak hours when all weaving areas are expected to operate at LOS E or F.

For Southbound I-405:

- All basic freeway segments (5 out of 5) are expected to operate at LOS E or F during the evening peak hour;
- All merge and diverge areas (2 out of 2) are expected to operate at LOS E or F during the evening peak hour;
- The weaving areas are expected to experience maximum densities during all analyzed peak hours when all weaving areas are expected to operate at LOS E or F.

Table 8-23
I-405 2035 Alternative 6A (Build) Level of Service

Location Description	Freeway Type	Lane		AM		PM		MD	
		ML	Ramp	Density / V/C ¹	LOS	Density / V/C ¹	LOS	Density / V/C ¹	LOS
Northbound									
North of Alameda Off	Basic	5	--	--*	F	44.8	E	33.8	D
Alameda	Off	6	1	N/A	N/A	N/A	N/A	N/A	N/A
I-710 NB & Santa Fe On / Alameda Off	Weave A	6	--	51.7	F	43.7	F	43.0	F
Santa Fe & I-710 NB	On	5	2	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	5	--	36.8	E	37.2	E	26.3	D
I-710 SB	Major On ²	4	2	0.92	N/A	0.92	N/A	0.72	N/A
--	Basic	4	--	40.8	E	44.9	E	30.1	D
Santa Fe	Off	5	1	N/A	N/A	N/A	N/A	N/A	N/A
Pacific On / Santa Fe Off	Weave A	5	--	49.0	F	52.1	F	35.6	E
Pacific	On	4	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	4	--	--*	F	--*	F	33.1	D
I-710	Off	6	2	N/A	N/A	N/A	N/A	N/A	N/A
Wardlow On / I-710 Off	Weave C	6	--	47.7	F	46.9	F	44.6	F
Wardlow	On	5	1	N/A	N/A	N/A	N/A	N/A	N/A
South of Wardlow On	Basic	5	--	42.2	E	43.8	E	35.4	E
Southbound									
North of Alameda On	Basic	5	--	33.4	D	42.1	E	31.6	D
Alameda	On	5	1	N/A	N/A	N/A	N/A	N/A	N/A
Alameda On / I-710 NB & Wardlow Off	Weave B	5	--	45.7	F	58.0	F	48.9	F
I-710 NB & Wardlow	Off	5	2	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	4	--	35.9	E	--*	F	34.1	D
I-710 SB	Major Off ³	4	2	37.1	E	--*	F	36.0	E
--	Basic	3	--	36.4	E	--*	F	40.0	E
Wardlow	On	3	1	N/A	N/A	N/A	N/A	N/A	N/A
Wardlow On / Pacific Off	Weave B	4	--	40.8	E	45.8	F	39.7	E
Pacific	Off	4	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	4	--	28.9	D	36.0	E	28.8	D
I-710	Major On ²	4	2	0.97	N/A	--*	F	0.92	N/A
--	Basic	5	--	40.8	E	--*	F	37.2	E

Notes:

¹ Density = passenger car/mile/lane; v/c = volume-to-capacity ratio. Shaded and bold cells indicate LOS E or F.

² Major merge area; HCM methodology applied for analysis.

³ Major diverge area; HCM methodology applied for analysis.

N/A = not applicable. LOS and/or density information are not shown for major merge areas, single-lane addition/drop, and merge/diverge operations within a weaving segment.

* = Demand exceeds capacity, no density is predicted.

Table 8-24
I-405 2035 Peak Hour Alternative 6A (Build) Summary

Segment Type	Total Number of Segments	Number of Segments with LOS E or F			Percent of Segments with LOS E or F		
		AM Peak Hour	PM Peak Hour	MD Peak Hour	AM Peak Hour	PM Peak Hour	MD Peak Hour
Northbound							
Basic Freeway	5	5	5	1	100%	100%	20%
Merge/Diverge	1	0	0	0	0%	0%	0%
Weaving	3	3	3	3	100%	100%	100%
Southbound							
Basic Freeway	5	3	5	2	60%	100%	40%
Merge/Diverge	2	1	2	1	50%	100%	50%
Weaving	2	2	2	2	100%	100%	100%

In summary, the northbound lanes show heavy congestion during the morning and evening peak hours while the southbound lanes show heavy congestion mostly throughout all analyzed peak hours. This indicates that these areas are near or exceed capacity and operating under congested conditions through this section.

Similar to Alternative 5A, the elimination of the collector distributor (CD) road along I-710 for both the I-405 northbound and southbound connectors would eliminate the poor weaving conditions and may reduce the high accident rates in the area. In addition, the additional capacity provided on the proposed flyover connector ramps in combination with other geometric enhancements would provide safer operation among the options considered.

As discussed in the previous sections, under existing and Alternative 1 conditions, the traffic operations in these areas would deteriorate further without improvements. Compared to Alternative 1, under Alternative 6A, some of the segments improved as a result of the reduction in traffic on both the I-710 mainline and connector ramps due to the incorporation of the FC. This is a result of the diversion of truck traffic into the freight corridor. Therefore, Alternative 6A would not only improve the overall conditions, but may help address some of the safety concerns in this area.

8.3.1.1 I-405 Freeway Queuing Analysis

This section evaluates projected queuing for 2035 Build Alternative 6A at I-405 and I-710 freeway-to-freeway ramp connections, and at I-405 and three local arterial ramps. **Table 8-25** indicates that the storage provided on freeway-to-freeway ramp connectors with proposed ramp metering for the 2035 Build Alternative 6A are not adequate using suggested meter rates (discussed in **Section 4.0**) for the following:

- I-710 southbound connector ramp to I-405 southbound

Table 8-25
I-405 2035 Alternative 6A Freeway Ramp Queuing Analysis

Direction	Location	Min Req'd SL ALT 6A	Provided SL ALT 6A
NB I-405	Off-ramp to I-710 NB Connector	2250' @ 975 vph / lane*	2 lanes @ 2400'
NB I-405	Off-ramp to I-710 SB Connector	3000' @ 700 vph / lane	2 lanes @ 3100'
NB I-405	On-ramp from I-710 SB Connector	1800' @ 760 vph / lane	2 lane @ 1900'
NB I-405	On-ramp from I-710 NB Connector	4050' @ 960 vph / lane*	2 lane @ 4200'
SB I-405	Off-ramp to I-710 NB Connector	4350' @ 1240 vph / lane**	2 lane @ 4600'
SB I-405	Off-ramp to I-710 SB Connector	1800' @ 935 vph / lane*	2 lane @ 1900'
SB I-405	On-ramp from I-710 NB Connector	<1700' @ 240 vph / lane	1 lane @ 1700'
SB I-405	On-ramp from I-710 SB Connector	> 4700' @ 1380 vph / lane**	2 lanes @ 4700'

Notes:
 Shaded cells indicate insufficient storage
 * Meter rate at 2 cars per green;
 ** Meter rate at 3 cars per green
 SL – Storage Length

Table 8-26
I-405 2035 Alternative 6A Arterial Ramp Queuing Analysis

Direction	Location	Min Req'd SL ALT 6A	Provided SL ALT 6A
NB I-405	Pacific Place On-Ramp	450' @ 715 vph / lane	1 lane @ 500'
SB I-405	Wardlow Road On-ramp	300' @ 755 vph / lane	2 lane @ 365'
NB I-405	Hughes Way On-ramp	<200' @ 240 vph / lane	2 lane @ 200'

Notes:
 SL – Storage Length

Table 8-26 indicates that the storage provided on all on-ramps with proposed ramp metering for the 2035 Build Alternative 6A are adequate using suggested meter rates between 240 vph/lane and 900 vph/lane.

At locations where the required storage is not provided and the maximum meter rate is utilized, it is concluded that due to physical and design constraints, there may be no feasible improvement recommendations. Note that a higher meter rate allows more throughput, but would generally cause turbulence at the merge area and increase congestion to the freeway.

8.3.2 SR-91 Freeway Segments

The 2035 Alternative 6A traffic analysis on the SR-91 freeway segments consists of operational analysis on the Alternative 6A network as described in **Section 6**. Examples of the geometric enhancements include ramp braiding and auxiliary lane improvements. The Alternative 6A network also includes the direct connectors from northbound I-710 Freight Corridor to eastbound SR-91 and from westbound SR-91 to southbound I-710 Freight Corridor. **Table 8-27** shows the LOS for SR-91 freeway segments adjacent to the I-710 freeway under Alternative 6A conditions.

Table 8-27
SR-91 2035 Alternative 6A (Build) Level of Service

Ramp/Weaving Sections	Freeway Type	Lane		AM		PM		MD	
		ML	Ramp	Density / VIC ¹	LOS	Density / VIC ¹	LOS	Density / VIC ¹	LOS
Eastbound									
West of Santa Fe On	Basic	5	--	24.1	C	32.6	D	26.3	D
Santa Fe	On	5	1	N/A	N/A	N/A	N/A	N/A	N/A
Santa Fe On / Long Beach Off	Weave A	6	--	31.5	D	35.6	E	27.8	C
Long Beach	Off	6	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	5	--	19.4	C	33.4	D	26.6	D
Long Beach	On	5	1	N/A	N/A	N/A	N/A	N/A	N/A
Long Beach On / I-710 SB Off	Weave A	6	--	18.9	B	36.5	E	28.5	D
I-710 SB	Off	6	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	5	--	18.4	C	31.2	D	26.7	D
I-710 NB & Atlantic	Major Off ³	5	2	20.4	C	33.4	D	29.5	D
--	Basic	3	--	18.6	C	36.0	E	27.9	D
I-710 NB	On ⁴	3	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	4	--	17.9	B	30.2	D	24.8	C
I-710 SB	On ⁴	4	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	5	--	21.3	C	30.9	D	27.7	D
Atlantic	On	5	1	18.0	B	22.3	C	20.7	C
--	Basic	5	--	23.6	C	33.3	D	30.2	D
I-710 FC NB	On	5	1	N/A	N/A	N/A	N/A	N/A	N/A
I-710 FC NB On / Cherry Off	Weave B	5	--	29.8	D	37.8	E	36.0	E
Cherry	Off	5	1	N/A	N/A	N/A	N/A	N/A	N/A
Westbound									
West of Santa Fe Off	Basic	4	--	--*	F	41.3	E	43.8	E
Santa Fe	Off	6	2	N/A	N/A	N/A	N/A	N/A	N/A
Long Beach On / Santa Fe Off	Weave C	6	--	29.6	D	30.6	D	31.5	D
Long Beach	On	5	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	6	--	24.9	C	24.9	C	25.9	C
I-710 NB	On ⁴	5	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	5	--	24.9	C	25.9	C	26.5	D
Long Beach	Off	6	2	N/A	N/A	N/A	N/A	N/A	N/A
I-710 SB On / Long Beach Off	Weave B	6	--	39.7	E	29.5	D	32.8	D
I-710 SB	On	4	2	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	4	--	23.2	C	26.9	D	24.1	C

Table 8-27
SR-91 2035 Alternative 6A (Build) Level of Service

Ramp/Weaving Sections	Freeway Type	Lane		AM		PM		MD	
		ML	Ramp	Density / V/C ¹	LOS	Density / V/C ¹	LOS	Density / V/C ¹	LOS
Atlantic	On ⁴	3	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	3	--	29.1	D	33.4	D	31.2	D
I-710	Major Off ³	5	3	33.5	D	33.9	D	31.8	D
--	Basic	5	--	29.7	D	29.9	D	27.9	D
Atlantic	Major Off ³	6	2	30.1	D	29.3	D	28.3	D
--	Basic	5	--	34.3	D	32.7	D	31.2	D
I-710 FC SB	Off	6	1	N/A	N/A	N/A	N/A	N/A	N/A
Cherry On / I-710 FC SB Off	Weave A	6	--	34.5	D	33.2	D	31.5	D
Cherry	On	5	1	N/A	N/A	N/A	N/A	N/A	N/A
East of Cherry On	Basic	5	--	32.9	D	32.1	D	29.9	D

Notes:

¹ Density = passenger car/mile/lane; v/c = volume-to-capacity ratio. Shaded and bold cells indicate LOS E or F.

³ Major diverge area; HCM methodology applied for analysis.

⁴ Single-lane addition/drop; HCM methodology applied for analysis.

N/A = not applicable. LOS and/or density information are not shown for major merge areas, single-lane addition/drop, and merge/diverge operations within a weaving segment.

* = Demand exceeds capacity, no density is predicted.

Table 8-28 presents the summary of Alternative 6A SR-91 freeway operations and the following statements describe key findings of the analysis:

For Eastbound SR-91:

- During the evening peak hour, all basic freeway segments are expected to operate at LOS D or better with the exception of one freeway segment. It is anticipated that both the morning and midday peak hours will experience no operational deficiencies;
- All merge and diverge areas (2 out of 2) are expected to operate at an acceptable LOS D or better during all three peak hours analyzed;
- All weaving areas (3 out of 3) are expected to operate at poor LOS E or F during the evening peak hour only while both the morning and midday peak hours will experience minimal weaving operational deficiencies.

For Westbound SR-91:

- All basic freeway segments are anticipated to operate at an acceptable LOS D or better with the exception of 13 percent (1 out of 8) freeway segments during all three analyzed peak hours;
- All merge and diverge areas (2 out of 2) are expected to operate at an acceptable LOS D or better during each of the three peak hours analyzed;
- All weaving areas are expected to operate at LOS D or better with the exception of one area during the AM peak hour.

Table 8-28
SR-91 2035 Peak Hour Alternative 6A (Build) Summary

Segment Type	Total Number of Segments	Number of Segments with LOS E or F			Percent of Segments with LOS E or F		
		AM Peak Hour	PM Peak Hour	MD Peak Hour	AM Peak Hour	PM Peak Hour	MD Peak Hour
Eastbound							
Basic Freeway	7	0	1	0	0%	14%	0%
Merge/Diverge	2	0	0	0	0%	0%	0%
Weaving	3	0	3	1	0%	100%	33%
Westbound							
Basic Freeway	8	1	1	1	13%	13%	13%
Merge/Diverge	2	0	0	0	0%	0%	0%
Weaving	3	1	0	0	33%	0%	0%

In summary, the eastbound and westbound lanes show comparatively reduced congestion along SR-91. For the few deficient freeway segments, there are indications that they are near or exceed capacity and operating under congested conditions.

As discussed in the previous section, under Alternative 5A condition, in order to increase I-710 mainline capacity and not affect the SR-91 separation, it was proposed to remove the existing I-710 northbound loop connector to SR-91 westbound. This would alleviate congestion and improve operations on both the mainline and at the ramp influence areas.

In addition to the proposed geometric enhancements proposed under Alternative 5A, Alternative 6A would provide connector ramps between the FC and SR-91. These connector ramps are provided to accommodate projected future 2035 truck traffic demand.

As discussed in the previous sections, under existing and Alternative 1 conditions, the traffic operations in these areas would deteriorate further without improvements. Compared to Alternative 1, under Alternative 6A, some of the segments improved as a result of the reduction in traffic on both the I-710 mainline and connector ramps due to the incorporation of the FC. Therefore, Alternative 6A would not only improve the overall conditions, but may also help address some of the safety concerns in this area.

8.3.2.1 SR-91 Freeway Queuing Analysis

This section evaluates projected queuing for 2035 Build Alternative 6A at SR-91 and I-710 freeway-to-freeway ramp connections, and at SR-91 and two local arterial ramps. **Table 8-29** indicates that the storage provided on freeway-to-freeway ramp connectors with proposed ramp metering for the 2035 Build Alternative 6A are not adequate using suggested meter rates (discussed in **Section 4.0**) for the following:

- SR-91 westbound connector ramp from I-710 southbound

Table 8-29
SR-91 2035 Alternative 6A Freeway Ramp Queuing Analysis

Direction	Location	Min Req'd SL ALT 6A	Provided SL ALT 6A
EB SR-91	Off-ramp to I-710 NB Connector	4650' @ 940 vph / lane*	2 lanes @ 4800'
EB SR-91	Off-ramp to I-710 SB Connector	2100' @ 940 vph / lane*	1 lane @ 2200'
EB SR-91	On-ramp from I-710 NB Connector	1650' @ 535 vph / lane	2 lanes @ 1700'
EB SR-91	On-ramp from I-710 SB Connector	5700' @ 915 vph / lane*	2 lanes @ 5800'
WB SR-91	Off-ramp to I-710 NB Connector	1950' @ 825 vph / lane	2 lanes @ 2050'
WB SR-91	Off-ramp to I-710 SB Connector	2100' @ 1355 vph / lane**	2 lanes @ 2160'
WB SR-91	On-ramp from I-710 NB Connector	2850' @ 650 vph / lane	2 lanes @ 2900'
WB SR-91	On-ramp from I-710 SB Connector	> 1500' @ 1380 vph / lane**	2 lanes @ 1500'

Notes:

Shaded cells indicate insufficient storage

* Meter rate at 2 cars per green;

** Meter rate at 3 cars per green

SL – Storage Length

Table 8-30 indicates that the storage provided on all on-ramps with proposed ramp metering for the 2035 Build Alternative 6A are adequate using suggested meter rates between 240 vph/lane and 900 vph/lane.

At locations where the required storage is not provided and the maximum meter rate is utilized, it is concluded that due to physical and design constraints, there may be no feasible improvement recommendations. Note that a higher meter rate allows more throughput, but would generally cause turbulence at the merge area and increase congestion to the freeway.

Table 8-30
SR-91 2035 Alternative 6A Arterial Ramps Queuing Analysis

Direction	Location	Min Req'd SL ALT 6A	Provided SL ALT 6A
EB SR-91	Long Beach On-Ramp	900' @ 550 vph / lane	1 lane @ 925'
EB SR-91	Atlantic On-ramp	150' @ 355 vph / lane	2 lanes @ 280'
WB SR-91	Atlantic On-ramp	1200' @ 340 vph / lane	2 lanes @ 1275'
WB SR-91	Long Beach On-ramp	< 670' @ 240 vph/lane	2 lanes @ 670'

Notes: SL – Storage Length

8.3.3 I-105 Freeway Segments

Table 8-31 shows the LOS for I-105 freeway segments adjacent to the I-710 freeway under Alternative 6A conditions.

Table 8-31
I-105 2035 Alternative 6A (Build) Level of Service

Ramp	Freeway Type	Lane		AM		PM		MD	
		ML	Ramp	Density / VIC ¹	LOS	Density / VIC ¹	LOS	Density / VIC ¹	LOS
Eastbound									
West of I-710 Off	Basic	3	--	--*	F	--*	F	42.8	E
Lane Addition	Basic	4	--	29.1	D	33.1	D	26.8	D
I-710	Major Off ³	4	2	33.1	D	36.3	E	31.0	D
--	Basic	3	--	26.9	D	32.3	D	25.9	C
Garfield	Off	3	2	14.0	B	16.8	B	14.8	B
--	Basic	3	--	23.9	C	29.0	D	21.2	C
I-710 NB	Major On ²	3	2	0.5	N/A	0.6	N/A	0.6	N/A
--	Basic	5	--	19.6	C	23.3	C	20.4	C
I-710 SB	On	5	1	18.3	B	20.1	C	19.4	B
--	Basic	5	--	22.8	C	28.0	D	25.1	C
East of I-710 On (Lane Drop)	Basic	3	--	--*	F	--*	F	--*	F
Westbound									
West of Long Beach Off	Basic	3	--	30.0	D	30.3	D	--*	F
Long Beach	Off	3	1	35.6	E	36.1	E	--*	F
Lane Drop	Basic	3	--	33.8	D	34.9	D	--*	F
--	Basic	4	--	24.3	C	24.7	C	38.1	E
I-710 NB	On ⁴	3	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	3	--	33.2	D	33.8	D	--*	F
I-710 SB	On	3	1	33.3	D	33.6	D	--*	F
--	Basic	3	--	24.8	C	25.1	C	35.4	E
Garfield	On	3	1	21.0	C	21.4	C	28.1	D
--	Basic	3	--	21.3	C	21.7	C	30.7	D
I-710	Major Off ³	5	2	24.1	C	24.1	C	29.9	D
East of I-710 Off	Basic	5	--	21.3	C	21.3	C	26.1	D

Notes:

¹ Density = passenger car/mile/lane; v/c = volume-to-capacity ratio. Shaded and bold cells indicate LOS E or F.

² Major merge area; HCM methodology applied for analysis.

³ Major diverge area; HCM methodology applied for analysis.

N/A = not applicable. LOS and/or density information are not shown for major merge areas, single-lane addition/drop, and merge/diverge operations within a weaving segment.

* = Demand exceeds capacity, no density is predicted.

Table 8-32 presents the summary of Alternative 6A I-105 freeway operations and the following statements describe key findings of the analysis:

For Eastbound I-105:

- 29 percent (2 out of 7) of the basic freeway segments are expected to operate at poor LOS E or F during the three peak hours analyzed;

- All merge and diverge areas are expected to operate at acceptable LOS D or better with the exception of 25 percent (1 out of 4) merge and diverge areas that will operate at poor LOS E or F during the evening peak hour.

For Westbound I-105:

- 71 percent (5 out of 7) basic freeway segments are expected to operate at poor LOS E or F during the midday peak hour;
- 50 percent (2 out of 4) of the merge and diverge areas are expected to operate at poor LOS E or F during the midday peak hour.

In summary, the eastbound and westbound lanes show similar congestion during the three peak hours with various segments experiencing deficiencies during different peak hours. However, it is safe to assume that the majority of the congestion occurs in the vicinity of I-710 where segments are near or exceed capacity and operating under congested conditions.

As discussed in the previous sections, under existing and Alternative 1 conditions, the traffic operations in this area would deteriorate further without improvements. Compared to Alternative 1, under Alternative 6A, overall traffic operations remain unchanged. Therefore, the addition of the I-710 FC would not further deteriorate the operations on these segments. Overall, Alternative 6A is projected to improve the regional circulation and provide an alternate path for future truck traffic demand in the area. In addition, Alternative 6A would not only improve the overall operation, but may also address the safety concerns in this area.

Table 8-32
I-105 2035 Peak Hour Alternative 6A (Build) Summary

Segment Type	Total Number of Segments	Number of Segments with LOS E or F			Percent of Segments with LOS E or F		
		AM Peak Hour	PM Peak Hour	MD Peak Hour	AM Peak Hour	PM Peak Hour	MD Peak Hour
Eastbound							
Basic Freeway	7	2	2	2	29%	29%	29%
Merge/Diverge	4	0	1	0	0%	25%	0%
Weaving	0	0	0	0	N/A	N/A	N/A
Westbound							
Basic Freeway	7	0	0	5	0%	0%	71%
Merge/Diverge	4	1	1	2	25%	25%	50%
Weaving	0	0	0	0	N/A	N/A	N/A

8.3.3.1 I-105 Freeway Queuing Analysis

This section evaluates projected queuing for 2035 Build Alternative 6A at I-105 and I-710 freeway-to-freeway ramp connectors. **Table 8-33** indicates that the storage provided on freeway-to-freeway ramp connectors with proposed ramp metering for the 2035 Build Alternative 6A are not adequate using suggested meter rates (discussed in **Section 4.0**) for the following:

- I-105 connector ramp to I-710 northbound

At locations where the required storage is not provided and the maximum meter rate is utilized, it is concluded that due to physical and design constraints, there may be no feasible improvement recommendations. Note that a higher meter rate allows more throughput, but would generally cause turbulence at the merge area and increase congestion to the freeway.

Table 8-33
I-105 2035 Alternative 6A Freeway Ramp Queuing Analysis

Direction	Location	Min Req'd SL ALT 6A	Provided SL ALT 6A
WB & EB I-105	Off-ramp to I-710 NB Connector	> 1000' @ 1380 vph / lane**	2 lanes @ 1000'
WB I-105	On-ramp from I-710 SB Connector	2100' @ 570 vph / lane	1 lane @ 2240'
WB I-105	On-ramp from I-710 NB Connector	4050' @ 335 vph / lane	2 lanes @ 4065'
WB & EB I-105	Off-ramp to I-710 SB Connector	1500' @ 1290 vph / lane**	2 lanes @ 1580'
EB I-105	On-ramp from I-710 SB Connector	3900' @ 570 vph / lane*	2 lanes @ 4015'
EB I-105	On-ramp from I-710 NB Connector	1050' @ 1175 vph / lane**	2 lanes @ 1115'

Notes:
Shaded cells indicate insufficient storage
* Meter rate at 2 cars per green;
** Meter rate at 3 cars per green
SL – Storage Length

8.3.4 I-5 Freeway Segments

Table 8-34 shows the LOS for the I-5 freeway segments adjacent to the I-710 freeway under Alternative 6A conditions.

Table 8-34
I-5 2035 Alternative 6A (Build) Level of Service

Ramp/Weaving Sections	Type	Lane		AM		PM		MD	
		ML	Ramp	Density / VIC ¹	LOS	Density / VIC ¹	LOS	Density / VIC ¹	LOS
Northbound									
North of Dennison On	Basic	5	--	35.2	E	24.9	C	--*	F
Dennison	On	5	1	24.6	C	18.3	B	28.1	D
--	Basic	5	--	34.6	D	24.1	C	44.0	E
Ditman & Dennison	Off	5	1	35.0	D	27.4	C	36.9	E
--	Basic	5	--	36.0	E	24.9	C	44.0	E
Telegraph & Downey	On	5	1	22.3	C	17.4	B	23.8	C
--	Basic	5	--	34.0	D	23.9	C	39.1	E
I-710 NB	On ⁴	4	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	4	--	25.9	C	18.9	C	28.8	D

Table 8-34
I-5 2035 Alternative 6A (Build) Level of Service

Ramp/Weaving Sections	Type	Lane		AM		PM		MD	
		ML	Ramp	Density / VIC ¹	LOS	Density / VIC ¹	LOS	Density / VIC ¹	LOS
I-710 NB	Off ⁴	5	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	5	--	26.5	D	23.0	C	28.5	D
McBride & Telegraph	Off	5	1	29.5	D	26.2	C	31.2	D
--	Basic	5	--	27.1	D	23.4	C	29.1	D
--	Basic	4	--	37.7	E	30.3	D	43.1	E
Woods & Telegraph	On	4	1	22.4	C	20.1	C	23.6	C
--	Basic	4	--	36.0	E	28.9	D	41.2	E
Woods & Telegraph	Off	4	1	37.0	E	33.9	D	37.3	E
--	Basic	4	--	37.9	E	30.9	D	41.2	E
Camfield & Telegraph	On	4	1	21.0	C	18.8	B	22.5	C
--	Basic	4	--	35.3	E	27.1	D	41.0	E
Camfield & Telegraph	Off	4	1	39.1	E	33.7	D	--*	F
South of Camfield & Telegraph Off	Basic	4	--	40.3	E	29.9	D	--*	F
Southbound									
North of Ditman Off	Basic	5	--	26.0	D	21.8	C	35.7	E
Ditman	Off	5	1	28.1	D	24.1	C	34.0	D
--	Basic	5	--	25.8	C	21.4	C	35.6	E
Ditman	On	5	1	18.6	B	16.5	B	24.0	C
--	Basic	5	--	26.0	C	22.1	C	36.2	E
Boswell	Off	5	1	29.0	D	25.4	C	35.2	E
--	Basic	5	--	25.4	C	21.5	C	35.9	E
I-710 SB	Major Off ³	5	3	28.8	D	24.5	C	37.1	E
--	Basic	3	--	20.6	C	17.1	B	32.9	D
I-710 SB	On ⁴	3	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	4	--	23.8	C	22.4	C	29.7	D
Triggs	Off	4	1	26.8	C	25.2	C	31.1	D
--	Basic	4	--	23.4	C	22.1	C	29.7	D
Triggs	On	4	1	17.3	B	16.8	B	19.7	B
--	Basic	4	--	24.8	C	23.7	C	30.5	D
Stevens & Eastern	Off	4	1	29.8	D	27.1	C	31.5	D
South of Stevens & Eastern Off	Basic	4	--	22.1	C	22.5	C	30.0	D

Notes:

¹ Density = passenger car/mile/lane; v/c = volume-to-capacity ratio. Shaded and bold cells indicate LOS E or F.³ Major diverge area; HCM methodology applied for analysis.⁴ Single-lane addition/drop; HCM methodology applied for analysis.

N/A = not applicable. LOS and/or density information are not shown for major merge areas, single-lane addition/drop, and merge/diverge operations within a weaving segment.

* = Demand exceeds capacity, no density is predicted.

Table 8-35 presents the summary of Alternative 6A I-5 freeway operations and the following statements describe key findings of the analysis:

For Northbound I-5:

- 75 percent (9 out of 12) of the basic freeway segments are expected to operate at poor LOS E or F during midday peak hours;

- Approximately 38 percent (3 out of 8) of all merge and diverge areas are expected to operate at poor LOS E or F during the midday peak hour.

For Southbound I-5:

- Nearly half (4 out of 9) of the basic freeway segments during the midday peak hour are expected to operate at poor LOS E or F;
- All merge and diverge areas are expected to operate at acceptable LOS D or better except for two merge and diverge areas which will operate at poor LOS E or F during midday peak hour.

Similar to Alternative 1 and 5A, the northbound lanes show heavy congestion in the morning and midday peak hours. In the southbound direction, segments just north of the I-710 interchange operate at near capacity conditions during midday peak hour. Overall LOS improvement is observed, however, when comparing Alternative 6A conditions to No Build (Alternative 1) conditions.

Table 8-35
I-5 2035 Peak Hour Alternative 6A (Build)

Segment Type	Total Number of Segments	Number of Segments with LOS E or F			Percent of Segments with LOS E or F		
		AM Peak Hour	PM Peak Hour	MD Peak Hour	AM Peak Hour	PM Peak Hour	MD Peak Hour
Northbound							
Basic Freeway	12	7	0	9	58%	0%	75%
Merge/Diverge	8	2	0	3	25%	0%	38%
Weaving	0	0	0	0	N/A	N/A	N/A
Southbound							
Basic Freeway	9	0	0	4	0%	0%	44%
Merge/Diverge	7	0	0	2	0%	0%	29%
Weaving	0	0	0	0	N/A	N/A	N/A

8.3.4.1 I-5 Freeway Queuing Analysis

This section evaluates projected queuing for 2035 Build Alternative 6A condition at I-5 and I-710 freeway-to-freeway ramp connectors. **Table 8-36** indicates that the storage provided on freeway-to-freeway ramp connectors with proposed ramp metering for the 2035 Build Alternative 6A are not adequate using suggested meter rates (discussed in **Section 4.0**) for the following:

- I-710 northbound connector ramp to I-5 northbound
- I-5 southbound connector ramp to I-710 southbound

At locations where the required storage is not provided and the maximum meter rate is utilized, it is concluded that due to physical and design constraints, there may be no feasible

improvement recommendations. Note that a higher meter rate allows more throughput, but would generally cause turbulence at the merge area and increase congestion to the freeway.

Table 8-36
I-5 2035 Alternative 6A Freeway Ramp Queuing Analysis

Direction	Location	Min Req'd SL ALT 6A	Provided SL ALT 5A, 6A, 6B & 6C
NB I-5	Off-ramp to I-710 NB Connector	1200'@1170 vph/lane*	2 Lanes @ 1300'
SB I-5	On-ramp from I-710 SB Connector	1650'@1160 vph/lane*	2 Lanes @ 1800'
NB I-5	On-ramp from I-710 NB Connector	>4500'@1380 vph/lane**	2 Lanes @ 4500'
SB I-5	Off-ramp to I-710 SB Connector	>2200'@1380 vph/lane**	2 Lanes @ 2200'

Notes:

Shaded cells indicate insufficient storage

* Meter rate at 2 cars per green;

** Meter rate at 3 cars per green

SL – Storage Length

8.4 FUTURE YEAR 2035 ALTERNATIVE 6B

This section provides the 2035 Alternative 6B traffic analysis for the adjacent freeways. The I-405, SR-91, I-105 and I-5 freeway segment operational analysis are based on the Alternative 6B network as described in **Section 6**; no further geometric improvements were implemented on I-405, I-105 and I-5 freeways.

The SR 91 freeway segment operational analysis has been performed for Alternative 6B network depicting geometric enhancements applied to the SR-91 freeway for improved traffic operations and connectivity between I-710 and SR-91.

The 2035 Alternative 6B conditions freeway analysis evaluated the following facilities during the morning, midday and evening peak hours: freeway mainline (basic segments), critical weaving areas, major merge and diverge areas, and on- and off-ramp locations.

8.4.1 I-405 Freeway Segments

Table 8-37 shows the LOS for I-405 freeway segments adjacent to the I-710 freeway under Alternative 6B conditions. **Table 8-38** presents the summary of Alternative 6B I-405 freeway operations and the following statements describe key findings of the analysis:

For Northbound I-405:

- All basic freeway segments (5 out of 5) are anticipated to experience poor LOS E or F during the morning and evening peak hours;

- The weaving areas are expected to experience maximum densities during all peak hours when 100 percent (3 out of 3) of the weaving areas are expected to operate at poor LOS E or F.

Table 8-37
I-405 2035 Alternative 6B (Build) Level of Service

Location Description	Freeway Type	Lane		AM		PM		MD	
		ML	Ramp	Density / V/C ¹	LOS	Density / V/C ¹	LOS	Density / V/C ¹	LOS
Northbound									
North of Alameda Off	Basic	5	--	--*	F	44.8	E	33.2	D
Alameda	Off	6	1	N/A	N/A	N/A	N/A	N/A	N/A
I-710 NB & Santa Fe On / Alameda Off	Weave A	6	--	51.9	F	43.8	F	42.9	E
Santa Fe & I-710 NB	On	5	2	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	5	--	36.7	E	37.0	E	26.0	D
I-710 SB	Major On ²	4	2	0.92	N/A	0.92	N/A	0.72	N/A
--	Basic	4	--	40.6	E	44.4	E	29.9	D
Santa Fe	Off	5	1	N/A	N/A	N/A	N/A	N/A	N/A
Pacific On / Santa Fe Off	Weave A	5	--	48.8	F	51.9	F	35.5	E
Pacific	On	4	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	4	--	--*	F	--*	F	32.3	D
I-710	Off	6	2	N/A	N/A	N/A	N/A	N/A	N/A
Wardlow On / I-710 Off	Weave C	6	--	48.2	F	47.0	F	44.9	F
Wardlow	On	5	1	N/A	N/A	N/A	N/A	N/A	N/A
South of Wardlow On	Basic	5	--	42.0	E	43.0	E	35.2	E
Southbound									
North of Alameda On	Basic	5	--	33.3	D	42.3	E	31.6	D
Alameda	On	5	1	N/A	N/A	N/A	N/A	N/A	N/A
Alameda On / I-710 NB & Wardlow Off	Weave B	5	--	45.5	F	57.2	F	45.5	F
I-710 NB & Wardlow	Off	5	2	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	4	--	36.0	E	--*	F	33.9	D
I-710 SB	Major Off ³	4	2	37.1	E	--*	F	35.9	E
--	Basic	3	--	36.7	E	--*	F	39.9	E
Wardlow	On	3	1	N/A	N/A	N/A	N/A	N/A	N/A
Wardlow On / Pacific Off	Weave B	4	--	40.8	E	46.1	F	39.8	E
Pacific	Off	4	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	4	--	28.9	D	36.4	E	28.8	D
I-710	Major On ²	4	2	0.97	N/A	--*	F	0.92	N/A
--	Basic	5	--	40.9	E	--*	F	37.0	E

Notes:

¹ Density = passenger car/mile/lane; v/c = volume-to-capacity ratio. Shaded and bold cells indicate LOS E or F.

² Major merge area; HCM methodology applied for analysis.

³ Major diverge area; HCM methodology applied for analysis.

N/A = not applicable. LOS and/or density information are not shown for major merge areas, single-lane addition/drop, and merge/diverge operations within a weaving segment.

* = Demand exceeds capacity, no density is predicted.

Table 8-38
I-405 2035 Peak Hour Alternative 6B (Build) Summary

Segment Type	Total Number of Segments	Number of Segments with LOS E or F			Percent of Segments with LOS E or F		
		AM Peak Hour	PM Peak Hour	MD Peak Hour	AM Peak Hour	PM Peak Hour	MD Peak Hour
Northbound							
Basic Freeway	5	5	5	1	100%	100%	20%
Merge/Diverge	1	0	0	0	0%	0%	0%
Weaving	3	3	3	3	100%	100%	100%
Southbound							
Basic Freeway	5	3	5	2	60%	100%	40%
Merge/Diverge	2	1	2	1	50%	100%	50%
Weaving	2	2	2	2	100%	100%	100%

For Southbound I-405:

- All basic freeway segments (5 out of 5) are anticipated to experience poor LOS E or F during the evening peak hour;
- All merge and diverge areas (2 out of 2) are expected to operate at poor LOS E or F during the evening peak hour;
- All weaving areas are expected to operate at poor LOS E or F during all analyzed peak hours.

In summary, the northbound lanes show heavy congestion during the morning and evening peak hours, while the midday shows slightly reduced congestion areas. The southbound lanes show a similar outcome where the majority of the heavy congestion occurs during the morning and evening peak hours, and while the midday shows slightly reduced congestion levels. This indicates that these areas are near or exceed capacity and operating under congested conditions through this section.

Similar to Alternative 5A, the elimination of the collector distributor (CD) road along I-710 for both the I-405 northbound and southbound connectors would eliminate the poor weaving conditions and may reduce the high accident rates in the area. In addition, the additional capacity provided on the proposed flyover connector ramps in combination with other geometric enhancements would provide safer operation among the options considered.

As discussed in the previous sections, under existing and Alternative 1 conditions, the traffic operations in these areas would deteriorate further without improvements. Compared to Alternative 1, under Alternative 6B, some of the segments improved as a result of the reduction in traffic on both the I-710 mainline and connector ramps. This is a result of the diversion of truck traffic onto the FC. Therefore, Alternative 6B would not only improve the overall conditions, but may also help address some of the safety concerns in this area.

8.4.1.1 I-405 Freeway Queuing Analysis

This section evaluates projected queuing for 2035 Build Alternative 6B at I-405 and I-710 freeway-to-freeway ramp connections, and at I-405 and three local arterial ramps. **Table 8-39** indicates that the storage provided on freeway-to-freeway ramp connectors with proposed ramp metering for the 2035 Build Alternative 6B are not adequate using suggested meter rates (discussed in **Section 4.0**) for the following:

- I-710 southbound connector ramp to I-405 southbound

Table 8-39
I-405 2035 Alternative 6B Freeway Ramp Queuing Analysis

Direction	Location	Min Req'd SL ALT 6B	Provided SL ALT 6B
NB I-405	Off-ramp to I-710 NB Connector	2250' @ 975 vph / lane*	2 lanes @ 2400'
NB I-405	Off-ramp to I-710 SB Connector	3000' @ 700 vph / lane	2 lanes @ 3100'
NB I-405	On-ramp from I-710 SB Connector	1800' @ 770 vph / lane	2 lane @ 1900'
NB I-405	On-ramp from I-710 NB Connector	4050' @ 965 vph / lane*	2 lane @ 4200'
SB I-405	Off-ramp to I-710 NB Connector	4500' @ 1210 vph / lane**	2 lane @ 4600'
SB I-405	Off-ramp to I-710 SB Connector	1800' @ 925 vph / lane*	2 lane @ 1900'
SB I-405	On-ramp from I-710 NB Connector	<1700' @ 240 vph / lane	1 lane @ 1700'
SB I-405	On-ramp from I-710 SB Connector	> 4700' @ 1380 vph / lane**	2 lanes @ 4700'

Notes:

Shaded cells indicate insufficient storage

* Meter rate at 2 cars per green;

** Meter rate at 3 cars per green

SL – Storage Length

Table 8-40 indicates that the storage provided on all on-ramps with proposed ramp metering for the 2035 Build Alternative 6B are adequate using suggested meter rates between 240 vph/lane and 900 vph/lane.

At locations where the required storage is not provided and the maximum meter rate is utilized, it is concluded that due to physical and design constraints, there may be no feasible improvement recommendations. Note that a higher meter rate allows more throughput, but would generally cause turbulence at the merge area and increase congestion to the freeway.

Table 8-40
I-405 2035 Alternative 6B Arterial Ramp Queuing Analysis

Direction	Location	Min Req'd SL ALT 6B	Provided SL ALT 6B
NB I-405	Pacific Place On-Ramp	450' @ 705 vph / lane	1 lane @ 500'
SB I-405	Wardlow Road On-ramp	300' @ 745 vph / lane	2 lane @ 365'
NB I-405	Hughes Way On-ramp	<200' @ 240 vph / lane	2 lane @ 200'

Notes: SL – Storage Length

8.4.2 SR-91 Freeway Segments

The 2035 Alternative 6B traffic analysis on the SR-91 freeway segments consists of operational analysis on the Alternative 6B network as described in **Section 6**. Examples of the geometric enhancements include ramp braiding and auxiliary lane improvements. The network also includes the direct connectors from northbound I-710 Freight Corridor to eastbound SR-91 and from westbound SR-91 to southbound I-710 Freight Corridor. **Table 8-41** shows the LOS for the various segments of SR-91 freeway segments adjacent to the I-710 freeway under Alternative 6B conditions.

Table 8-41
SR-91 2035 Alternative 6B (Build) Level of Service

Ramp/Weaving Sections	Freeway Type	Lane		AM		PM		MD	
		ML	Ramp	Density / VIC ¹	LOS	Density / VIC ¹	LOS	Density / VIC ¹	LOS
Eastbound									
West of Santa Fe On	Basic	5	--	24.0	C	32.2	D	26.3	D
Santa Fe	On	5	1	N/A	N/A	N/A	N/A	N/A	N/A
Santa Fe On / Long Beach Off	Weave A	6	--	31.5	D	31.3	D	27.8	C
Long Beach	Off	6	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	5	--	19.3	C	33.6	D	26.6	D
Long Beach	On	5	1	N/A	N/A	N/A	N/A	N/A	N/A
Long Beach On / I-710 SB Off	Weave A	6	--	18.8	B	36.7	E	28.4	D
I-710 SB	Off	6	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	5	--	18.3	C	31.5	D	26.7	D
I-710 NB & Atlantic	Major Off ³	5	2	20.4	C	33.6	D	29.6	D
--	Basic	3	--	18.6	C	36.2	E	27.9	D
I-710 NB	On ⁴	3	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	4	--	17.9	B	30.3	D	24.8	C
I-710 SB	On ⁴	4	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	5	--	21.2	C	30.8	D	27.5	D
Atlantic	On	5	1	18.0	B	22.3	C	20.6	C
--	Basic	5	--	23.5	C	33.1	D	30.0	D
I-710 FC NB	On	5	1	N/A	N/A	N/A	N/A	N/A	N/A
I-710 FC NB On / Cherry Off	Weave B	5	--	29.9	D	37.9	E	36.1	E
Cherry	Off	5	1	N/A	N/A	N/A	N/A	N/A	N/A
Westbound									
West of Santa Fe Off	Basic	4	--	44.7	E	41.5	E	43.9	E

Table 8-41
SR-91 2035 Alternative 6B (Build) Level of Service

Ramp/Weaving Sections	Freeway Type	Lane		AM		PM		MD	
		ML	Ramp	Density / V/C ¹	LOS	Density / V/C ¹	LOS	Density / V/C ¹	LOS
Santa Fe	Off	6	2	N/A	N/A	N/A	N/A	N/A	N/A
Long Beach On / Santa Fe Off	Weave C	6	--	29.6	D	30.7	D	31.6	D
Long Beach	On	5	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	6	--	24.6	C	25.0	C	25.8	C
I-710 NB	On ⁴	5	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	5	--	24.8	C	26.0	D	26.2	D
Long Beach	Off	6	2	N/A	N/A	N/A	N/A	N/A	N/A
I-710 SB On / Long Beach Off	Weave B	6	--	39.7	E	29.8	D	32.8	D
I-710 SB	On	4	2	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	4	--	23.1	C	27.1	D	24.1	C
Atlantic	On ⁴	3	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	3	--	29.1	D	33.8	D	30.9	D
I-710	Major Off ³	5	3	33.3	D	34.3	D	31.6	D
--	Basic	5	--	29.5	D	30.4	D	27.6	D
Atlantic	Major Off ³	6	2	30.0	D	29.6	D	28.3	D
--	Basic	5	--	34.0	D	33.3	D	31.1	D
I-710 FC SB	Off	6	1	N/A	N/A	N/A	N/A	N/A	N/A
Cherry On / I-710 FC SB Off	Weave A	6	--	34.5	D	33.7	D	31.6	D
Cherry	On	5	1	N/A	N/A	N/A	N/A	N/A	N/A
East of Cherry On	Basic	5	--	32.9	D	32.6	D	29.9	D

Notes:

¹ Density = passenger car/mile/lane; v/c = volume-to-capacity ratio. Shaded and bold cells indicate LOS E or F.

³ Major diverge area; HCM methodology applied for analysis.

⁴ Single-lane addition/drop; HCM methodology applied for analysis.

N/A = not applicable. LOS and/or density information are not shown for major merge areas, single-lane addition/drop, and merge/diverge operations within a weaving segment.

* = Demand exceeds capacity, no density is predicted

Table 8-42 presents the summary of Alternative 6B SR-91 freeway operations and the following statements describe key findings of the analysis:

For Eastbound SR-91:

- All basic freeway segments are expected to operate at an acceptable LOS D or better with the exception of one segment during the evening peak hour;
- All merge and diverge areas (2 out of 2) are expected to operate at an acceptable LOS D or better during all three peak hours analyzed;
- Two-thirds of the weaving areas are expected to operate at poor LOS E or F during the evening peak hour.

For Westbound SR-91:

- All basic freeway segments are expected to operate at an acceptable LOS D or better except for one segment during all three peak hours;

- All merge and diverge areas (2 out of 2) are expected to operate at an acceptable LOS D or better during all three peak hours analyzed;
- All weaving areas are expected to operate at LOS D or better except for one area during the morning peak hour.

Table 8-42
SR-91 2035 Peak Hour Alternative 6B (Build) Summary

Segment Type	Total Number of Segments	Number of Segments with LOS E or F			Percent of Segments with LOS E or F		
		AM Peak Hour	PM Peak Hour	MD Peak Hour	AM Peak Hour	PM Peak Hour	MD Peak Hour
Eastbound							
Basic Freeway	7	0	1	0	0%	14%	0%
Merge/Diverge	2	0	0	0	0%	0%	0%
Weaving	3	0	2	1	0%	67%	33%
Westbound							
Basic Freeway	8	1	1	1	13%	13%	13%
Merge/Diverge	2	0	0	0	0%	0%	0%
Weaving	3	1	0	0	33%	0%	0%

In summary, the eastbound and westbound lanes show increased congestion based on weaving operational analysis, while basic freeway segments and the merge and diverge areas show minor congestion throughout the segment. This indicates that these areas are near or exceed capacity and are operating under congested conditions through this section.

As discussed in the previous section, under Alternative 5A conditions, in order to increase I-710 mainline capacity and not affect the SR-91 separation, it was proposed to remove the existing I-710 northbound loop connector to westbound SR-91. This would alleviate congestion and improve operations on both the mainline and at the ramp influence areas.

In addition to the proposed geometric enhancements proposed under Alternative 5A, Alternative 6B would provide connector ramps between the FC and SR-91. These connector ramps are provided to accommodate projected future 2035 truck traffic demand.

As discussed in the previous sections, under existing and Alternative 1 conditions, the traffic operations in these areas would deteriorate further without improvements. Compared to Alternative 1, under Alternative 6B, some of the segments improved as a result of the reduction in traffic on the I-710 mainline and connector ramps. This is also a result of the diversion of truck traffic onto the FC. Therefore, Alternative 6B would not only improve the overall conditions, but may also provide the additional capacity required to accommodate projected future 2035 traffic demand in this area.

8.4.2.1 SR-91 Freeway Queuing Analysis

This section evaluates projected queuing for 2035 Build Alternative 6B at SR-91 and I-710 freeway-to-freeway ramp connections, and at SR-91 and two local arterial ramps. **Table 8-43**

Final

indicates that the storage provided on freeway-to-freeway ramp connectors with proposed ramp metering for the 2035 Build Alternative 6B are not adequate using suggested meter rates (discussed in **Section 4.0**) for the following:

- SR-91 westbound connector ramp from I-710 southbound

Table 8-44 indicates that the storage provided on all on-ramps with proposed ramp metering for the 2035 Build Alternative 6B are adequate using suggested meter rates between 240 vph/lane and 900 vph/lane.

At locations where the required storage is not provided and the maximum meter rate is utilized, it is concluded that due to physical and design constraints, there may be no feasible improvement recommendations. Note that a higher meter rate allows more throughput, but would generally cause turbulence at the merge area and increase congestion to the freeway.

Table 8-43
SR-91 2035 Alternative 6B Freeway Ramps Queuing Analysis

Direction	Location	Min Req'd SL ALT 6B	Provided SL ALT 6B
EB SR-91	Off-ramp to I-710 NB Connector	4650' @ 940 vph / lane*	2 lanes @ 4800'
EB SR-91	Off-ramp to I-710 SB Connector	2100' @ 920 vph / lane*	1 lane @ 2200'
EB SR-91	On-ramp from I-710 NB Connector	1650' @ 515 vph / lane	2 lanes @ 1700'
EB SR-91	On-ramp from I-710 SB Connector	5700' @ 910 vph / lane*	2 lanes @ 5800'
WB SR-91	Off-ramp to I-710 NB Connector	1950' @ 830 vph / lane	2 lanes @ 2050'
WB SR-91	Off-ramp to I-710 SB Connector	2100' @ 1330 vph / lane**	2 lanes @ 2160'
WB SR-91	On-ramp from I-710 NB Connector	2850' @ 650 vph / lane	2 lanes @ 2900'
WB SR-91	On-ramp from I-710 SB Connector	> 1500' @ 1380 vph / lane**	2 lanes @ 1500'

Notes:

Shaded cells indicate insufficient storage

* Meter rate at 2 cars per green;

** Meter rate at 3 cars per green

SL – Storage Length

Table 8-44
SR-91 2035 Alternative 6B Arterial Ramp Queuing Analysis

Direction	Location	Min Req'd SL ALT 6B	Provided SL ALT 6B
EB SR-91	Long Beach On-Ramp	900' @ 570 vph / lane	1 lane @ 925'
EB SR-91	Atlantic On-ramp	150' @ 355 vph / lane	2 lanes @ 280'
WB SR-91	Atlantic On-ramp	1200' @ 340 vph / lane	2 lanes @ 1275'
WB SR-91	Long Beach On-Ramp	< 670' @ 240 vph / lane	2 lanes @ 670'

Notes: SL – Storage Length

8.4.3 I-105 Freeway Segments

Table 8-45 shows the LOS for I-105 freeway segments adjacent to the I-710 freeway under Alternative 6B conditions. **Table 8-46** presents the summary of Alternative 6B I-105 freeway operations and the following statements describe key findings of the analysis:

For Eastbound I-105:

- The majority of the basic freeway segments are expected to operate at acceptable LOS D or better with the exception two segments during the three peak hours analyzed;
- All merge and diverge areas are expected to operate at an LOS D or better with the exception of one during the evening peak hour.

For Westbound I-105:

- All basic freeway segments are expected to operate at acceptable LOS D or better during the morning and evening peak hours, while 71% (5 out of 7) of the segments are expected to operate at poor LOS E or F during midday peak hour;
- Most merge and diverge areas are expected to acceptable LOS D or better except for two areas during the midday peak hour.

In summary, the eastbound and westbound lanes show congestion, during one of the three peak hours. This indicates that these areas are near or exceed capacity and operating under congested conditions through this section.

As discussed in the previous sections, under existing and Alternative 1 conditions, the traffic operations in this area would deteriorate further without improvements. Compared to Alternative 1, under Alternative 6B, the overall traffic conditions remain unchanged. Therefore, the addition of the I-710 FC would not further deteriorate the operations on these segments. Overall, Alternative 6B is projected to improve the regional circulation and provide an alternate path for future truck traffic demand in the area.

Table 8-45
I-105 2035 Alternative 6B (Build) Level of Service

Ramp	Freeway Type	Lane		AM		PM		MD	
		ML	Ramp	Density / VIC ¹	LOS	Density / VIC ¹	LOS	Density / VIC ¹	LOS
Eastbound									
West of I-710 Off	Basic	3	--	--*	F	--*	F	42.8	E
Lane Addition	Basic	4	--	29.2	D	33.0	D	26.8	D
I-710	Major Off ³	4	2	33.1	D	36.3	E	31.0	D
--	Basic	3	--	26.9	D	32.6	D	26.0	D
Garfield	Off	3	2	14.1	B	16.9	B	15.0	B
--	Basic	3	--	23.9	C	29.2	D	21.3	C
I-710 NB	Major On ²	3	2	0.5	N/A	0.6	N/A	0.6	N/A
--	Basic	5	--	19.6	C	23.4	C	20.2	C
I-710 SB	On	5	1	18.4	B	20.1	C	19.3	B
--	Basic	5	--	22.9	C	27.9	D	24.8	C
East of I-710 On (Lane Drop)	Basic	3	--	--*	F	--*	F	--*	F
Westbound									
West of Long Beach Off	Basic	3	--	30.0	D	30.3	D	--*	F
Long Beach	Off	3	1	35.6	E	36.1	E	--*	F
Lane Drop	Basic	3	--	33.8	D	34.9	D	--*	F
--	Basic	4	--	24.2	C	24.7	C	38.0	E
I-710 NB	On ⁴	3	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	3	--	33.2	D	33.8	D	--*	F
I-710 SB	On	3	1	33.2	D	33.5	D	--*	F
--	Basic	3	--	24.9	C	25.1	C	35.3	E
Garfield	On	3	1	21.0	C	21.5	C	28.0	C
--	Basic	3	--	21.4	C	21.7	C	30.6	D
I-710	Major Off ³	5	2	24.3	C	24.5	C	29.4	D
East of I-710 Off	Basic	5	--	21.4	C	21.6	C	25.5	C

Notes:

¹ Density = passenger car/mile/lane; v/c = volume-to-capacity ratio. Shaded and bold cells indicate LOS E or F.² Major merge area; HCM methodology applied for analysis.³ Major diverge area; HCM methodology applied for analysis.⁴ Single-lane addition/drop; HCM methodology applied for analysis.

N/A = not applicable. LOS and/or density information are not shown for major merge areas, single-lane addition/drop, and merge/diverge operations within a weaving segment.

* = Demand exceeds capacity, no density is predicted.

Table 8-46
I-105 2035 Peak Hour Alternative 6B (Build) Summary

Segment Type	Total Number of Segments	Number of Segments with LOS E or F			Percent of Segments with LOS E or F		
		AM Peak Hour	PM Peak Hour	MD Peak Hour	AM Peak Hour	PM Peak Hour	MD Peak Hour
Eastbound							
Basic Freeway	7	2	2	2	29%	29%	29%
Merge/Diverge	4	0	1	0	0%	25%	0%
Westbound							
Basic Freeway	7	0	0	5	0%	0%	71%
Merge/Diverge	4	1	1	2	25%	25%	50%

8.4.3.1 I-105 Freeway Queuing Analysis**Final**

Identification: 160.10.35

8-45
1/11/2012

This section evaluates projected queuing for 2035 Build Alternative 6B at I-105 and I-710 freeway-to-freeway ramp connectors. **Table 8-47** indicates that the storage provided on freeway-to-freeway ramp connectors with proposed ramp metering for the 2035 Build Alternative 6B are not adequate using suggested meter rates (discussed in **Section 4.0**) for the following:

- I-105 connector ramp to I-710 northbound

At locations where the required storage is not provided and the maximum meter rate is utilized, it is concluded that due to physical and design constraints, there may be no feasible improvement recommendations. Note that a higher meter rate allows more throughput, but would generally cause turbulence at the merge area and increase congestion to the freeway.

Table 8-47
I-105 2035 Alternative 6B Freeway Ramp Queuing Analysis

Direction	Location	Min Req'd SL ALT 6B	Provided SL ALT 6B
WB & EB I-105	Off-ramp to I-710 NB Connector	> 1000' @ 1380 vph / lane**	2 lanes @ 1000'
WB I-105	On-ramp from I-710 SB Connector	2100' @ 570 vph / lane	1 lane @ 2240'
WB I-105	On-ramp from I-710 NB Connector	4050' @ 335 vph / lane	2 lanes @ 4065'
WB & EB I-105	Off-ramp to I-710 SB Connector	1500' @ 1280 vph / lane**	2 lanes @ 1580'
EB I-105	On-ramp from I-710 SB Connector	3900' @ 565 vph / lane*	2 lanes @ 4015'
EB I-105	On-ramp from I-710 NB Connector	1050' @ 1135 vph / lane**	2 lanes @ 1115'

Notes:

Shaded cells indicate insufficient storage

* Meter rate at 2 cars per green;

** Meter rate at 3 cars per green

SL – Storage Length

8.4.4 I-5 Freeway Segments

Table 8-48 shows the LOS for the I-5 freeway segments adjacent to the I-710 freeway under Alternative 6B conditions. **Table 8-49** presents the summary of Alternative 6B I-5 freeway operations and the following statements describe key findings of the analysis:

For Northbound I-5

- Nearly 75 percent (9 out of 12) of the basic freeway segments are expected to operate at poor LOS E or worse during the midday peak hour;
- Approximately 38 percent (3 out of 8) of the merge and diverge areas are expected to operate at poor LOS E or F during all morning and midday peak hours;

For Southbound I-5

- All basic freeway segments are to operate at acceptable LOS D or F except during midday peak hour when nearly half (4 out of 9) of the segments are expected to operate at LOS E or worse;
- Approximately 30 percent (2 out of 7) of the merge and diverge areas are expected to operate at poor LOS E or F during midday peak hour.

Similar to Alternative 1, the northbound lanes show heavy congestion in the morning and midday peak hours. In the southbound direction, segments just north of the I-710 interchange operate at near capacity conditions during midday peak hour. Overall LOS improvement is expected when comparing Alternative 6B conditions to No Build (Alternative 1) conditions on I-5 within Project vicinity.

Table 8-48
I-5 2035 Alternative 6B (Build) Level of Service

Ramp/Weaving Sections	Type	Lane		AM		PM		MD	
		ML	Ramp	Density / VIC ¹	LOS	Density / VIC ¹	LOS	Density / VIC ¹	LOS
Northbound									
North of Dennison On	Basic	5	--	35.4	E	24.5	C	--*	F
Dennison	On	5	1	24.7	C	18.1	B	28.2	D
--	Basic	5	--	34.7	D	23.8	C	44.2	E
Ditman & Dennison	Off	5	1	35.0	D	27.1	C	37.0	E
--	Basic	5	--	36.1	E	24.6	C	44.2	E
Telegraph & Downey	On	5	1	22.3	C	17.2	B	23.8	C
--	Basic	5	--	34.1	D	23.5	C	39.2	E
I-710 NB	On ⁴	4	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	4	--	25.9	C	18.6	C	28.3	D
I-710 NB	Off ⁴	5	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	5	--	26.5	D	23.0	C	28.4	D
McBride & Telegraph	Off	5	1	29.5	D	26.0	C	31.2	D
--	Basic	5	--	27.1	D	23.2	C	29.1	D
--	Basic	4	--	37.7	E	29.9	D	42.9	E
Woods & Telegraph	On	4	1	22.4	C	20.0	B	23.6	C
--	Basic	4	--	36.0	E	28.5	D	41.0	E

Table 8-48
I-5 2035 Alternative 6B (Build) Level of Service

Ramp/Weaving Sections	Type	Lane		AM		PM		MD	
		ML	Ramp	Density / VIC ¹	LOS	Density / VIC ¹	LOS	Density / VIC ¹	LOS
Woods & Telegraph	Off	4	1	37.0	E	33.6	D	37.2	E
--	Basic	4	--	37.9	E	30.5	D	41.0	E
Camfield & Telegraph	On	4	1	21.0	C	18.7	B	22.5	C
--	Basic	4	--	35.3	E	26.8	D	40.8	E
Camfield & Telegraph	Off	4	1	39.1	E	33.4	D	--*	F
South of Camfield & Telegraph Off	Basic	4	--	40.3	E	29.5	D	--*	F
Southbound									
North of Ditman Off	Basic	5	--	26.3	D	21.6	C	36.2	E
Ditman	Off	5	1	28.3	D	24.1	C	34.2	D
--	Basic	5	--	25.8	C	21.2	C	36.1	E
Ditman	On	5	1	18.6	B	16.3	B	24.2	C
--	Basic	5	--	26.0	C	21.9	C	36.8	E
Boswell	Off	5	1	29.0	D	25.4	C	35.5	E
--	Basic	5	--	25.7	C	21.3	C	36.5	E
I-710 SB	Major Off ³	5	3	29.1	D	24.3	C	37.4	E
--	Basic	3	--	20.9	C	17.1	B	32.2	D
I-710 SB	On ⁴	3	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	4	--	24.0	C	22.3	C	30.1	D
Triggs	Off	4	1	26.9	C	25.2	C	31.4	D
--	Basic	4	--	23.6	C	22.0	C	30.1	D
Triggs	On	4	1	17.3	B	16.8	B	19.8	B
--	Basic	4	--	25.0	C	23.4	C	30.9	D
Stevens & Eastern	Off	4	1	30.1	D	26.8	C	31.8	D
South of Stevens & Eastern Off	Basic	4	--	22.3	C	22.2	C	30.3	D

Notes:

¹ Density = passenger car/mile/lane; v/c = volume-to-capacity ratio. Shaded and bold cells indicate LOS E or F.³ Major diverge area; HCM methodology applied for analysis.⁴ Single-lane addition/drop; HCM methodology applied for analysis.

N/A = not applicable. LOS and/or density information are not shown for major merge areas, single-lane addition/drop, and merge/diverge operations within a weaving segment.

* = Demand exceeds capacity, no density is predicted.

Table 8-49
I-5 2035 Peak Hour Alternative 6B (Build)

Segment Type	Total Number of Segments	Number of Segments with LOS E or F			Percent of Segments with LOS E or F		
		AM Peak Hour	PM Peak Hour	MD Peak Hour	AM Peak Hour	PM Peak Hour	MD Peak Hour
Northbound							
Basic Freeway	12	7	0	9	58%	0%	75%
Merge/Diverge	8	2	0	3	25%	0%	38%
Southbound							
Basic Freeway	9	0	0	4	0%	0%	44%
Merge/Diverge	7	0	0	2	0%	0%	29%

8.4.4.1 I-5 Freeway Queuing Analysis

Final

Identification: 160.10.35

8-48
1/11/2012

This section evaluates projected queuing for 2035 Build Alternative 6B condition at I-5 and I-710 freeway-to-freeway ramp connectors. **Table 8-50** indicates that the storage provided on freeway-to-freeway ramp connectors with proposed ramp metering for the 2035 Build Alternative 6B are not adequate using suggested meter rates (discussed in **Section 4.0**) for the following:

- I-5 northbound connector ramp from I-710 northbound;
- I-5 southbound connector ramp to I-710 southbound.

Table 8-50
I-5 2035 Alternative 6B Freeway Ramp Queuing Analysis

Direction	Location	Min Req'd SL ALT 6B	Provided SL ALT 5A, 6A, 6B & 6C
NB I-5	Off-ramp to I-710 NB Connector	1200' @ 1195 vph/lane*	2 Lanes @ 1300'
SB I-5	On-ramp from I-710 SB Connector	1650' @ 1155 vph/lane*	2 Lanes @ 1800'
NB I-5	On-ramp from I-710 NB Connector	>4500' @ 1380 vph/lane**	2 Lanes @ 4500'
SB I-5	Off-ramp to I-710 SB Connector	>2200' @ 1380 vph/lane**	2 Lanes @ 2200'

Notes:

Shaded cells indicate insufficient storage

* Meter rate at 2 cars per green** Meter rate is 3 cars per green

SL – Storage Length

At locations where the required storage is not provided and the maximum meter rate is utilized, it is concluded that due to physical and design constraints, there may be no feasible improvement recommendations. Note that a higher meter rate allows more throughput, but would generally cause turbulence at the merge area and increase congestion to the freeway.

8.5 FUTURE YEAR 2035 ALTERNATIVE 6C

This section provides the 2035 Alternative 6C traffic analysis for the adjacent freeways. The I-405, SR-91, I-105 and I-5 freeway segment operational analysis are based on the Alternative 6C network as described in Section 6; no further geometric improvements were implemented on I-405, I-105 and I-5 freeways. The SR 91 freeway segment Alternative 6C network depicts geometric enhancements applied to the SR-91 freeway for improved traffic operations and connectivity between I-710 and SR-91.

The 2035 Alternative 6C conditions freeway analysis evaluated the following facilities during the morning, midday and evening peak hours: freeway mainline (basic segments), critical weaving areas, major merge and diverge areas, and on- and off-ramp locations.

8.5.1 I-405 Freeway Segments

Table 8-51 shows the LOS for I-405 freeway segments adjacent to the I-710 freeway under Alternative 6C conditions.

Table 8-51
I-405 2035 Alternative 6C (Build) Level of Service

Location Description	Freeway Type	Lane		AM		PM		MD	
		ML	Ramp	Density / V/C ¹	LOS	Density / V/C ¹	LOS	Density / V/C ¹	LOS
Northbound									
North of Alameda Off	Basic	5	--	--*	F	44.6	E	33.4	D
Alameda	Off	6	1	N/A	N/A	N/A	N/A	N/A	N/A
I-710 NB & Santa Fe On / Alameda Off	Weave A	6	--	51.7	F	43.6	F	42.3	E
Santa Fe & I-710 NB	On	5	2	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	5	--	36.8	E	36.9	E	26.3	D
I-710 SB	Major On ²	4	2	0.91	N/A	--*	F	0.72	N/A
--	Basic	4	--	41.5	E	--*	F	30.2	D
Santa Fe	Off	5	1	N/A	N/A	N/A	N/A	N/A	N/A
Pacific On / Santa Fe Off	Weave A	5	--	49.1	F	52.5	F	36.2	E
Pacific	On	4	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	4	--	--*	F	--*	F	33.1	D
I-710	Off	6	2	N/A	N/A	N/A	N/A	N/A	N/A
Wardlow On / I-710 Off	Weave C	6	--	47.0	F	46.9	F	44.4	F
Wardlow	On	5	1	N/A	N/A	N/A	N/A	N/A	N/A
South of Wardlow On	Basic	5	--	42.5	E	43.7	E	35.4	E
Southbound									
North of Alameda On	Basic	5	--	33.5	D	42.2	E	31.8	D
Alameda	On	5	1	N/A	N/A	N/A	N/A	N/A	N/A
Alameda On / I-710 NB & Wardlow Off	Weave B	5	--	46.4	F	58.1	F	48.0	F
I-710 NB & Wardlow	Off	5	2	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	4	--	36.0	E	--*	F	35.1	E
I-710 SB	Major Off ³	4	2	37.2	E	--*	F	36.6	E
--	Basic	3	--	36.6	E	--*	F	41.2	E
Wardlow	On	3	1	N/A	N/A	N/A	N/A	N/A	N/A
Wardlow On / Pacific Off	Weave B	4	--	41.0	E	46.3	F	39.8	E
Pacific	Off	4	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	4	--	29.1	D	36.4	E	29.4	D
I-710	Major On ²	4	2	0.97	N/A	--*	F	0.92	N/A
--	Basic	5	--	40.9	E	44.9	E	36.5	E

Notes:

¹ Density = passenger car/mile/lane; v/c = volume-to-capacity ratio. Shaded and bold cells indicate LOS E or F.

² Major merge area; HCM methodology applied for analysis.

³ Major diverge area; HCM methodology applied for analysis.

N/A = not applicable. LOS and/or density information are not shown for major merge areas, single-lane addition/drop, and merge/diverge operations within a weaving segment.

* = Demand exceeds capacity, no density is predicted.

Table 8-52 presents the summary of Alternative 6C I-405 freeway operations and the following statements describe key findings of the analysis:

For Northbound I-405:

- The number of basic freeway segments with poor operating conditions are expected to be highest during both the morning and evening peak hours, when all of the segments (5 out of 5) are expected to operate at poor LOS E or F;
- The only merge and diverge area analyzed is expected to operate at poor LOS E or F during the evening peak hour;
- All weaving areas are expected to operate at poor LOS E or F during all three peak hours.

For Southbound I-405:

- All basic freeway segments (5 out of 5) are expected to operate at poor LOS E or F during the evening peak hour;
- All merge and diverge areas (2 out of 2) are expected to operate at poor LOS E or F during the evening peak hour;
- The LOS for the weaving areas is expected to be heaviest during all analyzed peak hours when 100 percent (2 out of 2) of the weaving areas are expected to operate at poor LOS E or F.

Table 8-52
I-405 2035 Peak Hour Alternative 6C (Build)

Segment Type	Total Number of Segments	Number of Segments with LOS E or F			Percent of Segments with LOS E or F		
		AM Peak Hour	PM Peak Hour	MD Peak Hour	AM Peak Hour	PM Peak Hour	MD Peak Hour
Northbound							
Basic Freeway	5	5	5	1	100%	100%	20%
Merge/Diverge	1	0	1	0	0%	100%	0%
Weaving	3	3	3	3	100%	100%	100%
Southbound							
Basic Freeway	5	3	5	3	60%	100%	60%
Merge/Diverge	2	1	2	1	50%	100%	50%
Weaving	2	2	2	2	100%	100%	100%

In summary, the northbound lanes show that the majority of the heavy congestion occurs during the morning and evening peak hours. The southbound lanes show heavy congestion throughout all analysis peak hours. This indicates that these areas are near or exceed capacity and operating under congested conditions through this section.

Similar to Alternative 5A, the elimination of the collector distributor (CD) road along I-710 for both the I-405 northbound and southbound connectors would eliminate the poor weaving

conditions and may reduce the high accident rates in the area. In addition, the additional capacity provided on the proposed flyover connector ramps in combination with other geometric enhancements would provide safer operation among the options considered.

Tolling on I-710 FC under Alternative 6C conditions impose a marginal increase in traffic volume and delay on the I-405 compared to the non-tolling Alternative 6B. In general, LOS remain consistent between the tolling and non-tolling alternatives except during PM peak hour when LOS were worse under Alternative 6C conditions in the northbound direction through the I-710 interchange area.

As discussed in the previous sections, under existing and Alternative 1 conditions, the traffic operations in these areas would deteriorate further without improvements. Compared to Alternative 1, under Alternative 6C, some of the segments improved as a result of the reduction in traffic on both the I-710 mainline and connector ramps. This is a result of the diversion of truck traffic onto the FC. Therefore, Alternative 6C would not only improve the overall conditions, but may also help address some of the safety concerns in this area.

8.5.1.1 I-405 Freeway Queuing Analysis

This section evaluates projected queuing for 2035 Build Alternative 6C at I-405 and I-710 freeway-to-freeway ramp connections, and at I-405 and three local arterial ramps.

Table 8-53 indicates that the storage provided on freeway-to-freeway ramp connectors with proposed ramp metering for the 2035 Build Alternative 6C are not adequate using suggested meter rates (discussed in **Section 4.0**) for the following:

- I-710 southbound connector ramp to I-405 southbound

Table 8-53
I-405 2035 Alternative 6C Freeway Ramp Queuing Analysis

Direction	Location	Min Req'd SL ALT 6C	Provided SL ALT 6C
NB I-405	Off-ramp to I-710 NB Connector	2250' @ 975 vph / lane*	2 lanes @ 2400'
NB I-405	Off-ramp to I-710 SB Connector	3000' @ 740 vph / lane	2 lanes @ 3100'
NB I-405	On-ramp from I-710 SB Connector	1800' @ 720 vph / lane	2 lane @ 1900'
NB I-405	On-ramp from I-710 NB Connector	4050' @ 935 vph / lane*	2 lane @ 4200'
SB I-405	Off-ramp to I-710 NB Connector	4500' @ 1230 vph / lane**	2 lane @ 4600'
SB I-405	Off-ramp to I-710 SB Connector	1800' @ 945 vph / lane*	2 lane @ 1900'
SB I-405	On-ramp from I-710 NB Connector	<1700' @ 240 vph / lane	1 lane @ 1700'
SB I-405	On-ramp from I-710 SB Connector	> 4700' @ 1380 vph / lane**	2 lanes @ 4700'

Notes:

Shaded cells indicate insufficient storage

* Meter rate at 2 cars per green;

** Meter rate at 3 cars per green

SL – Storage Length

Table 8-54 indicates that the storage provided on all on-ramps with proposed ramp metering for the 2035 Build Alternative 6C are adequate using suggested meter rates between 240 vph/lane and 900 vph/lane.

At locations where the required storage is not provided and the maximum meter rate is utilized, it is concluded that due to physical and design constraints, there may be no feasible improvement recommendations. Note that a higher meter rate allows more throughput, but would generally cause turbulence at the merge area and increase congestion to the freeway.

Table 8-54
I-405 2035 Alternative 6C Arterial Ramp Queuing Analysis

Direction	Location	Min Req'd SL ALT 6C	Provided SL ALT 6C
NB I-405	Pacific Place On-Ramp	450' @ 755 vph / lane	1 lane @ 500'
SB I-405	Wardlow Road On-ramp	300' @ 760 vph / lane	2 lane @ 365'
NB I-405	Hughes Way On-ramp	<200' @ 240 vph / lane	2 lane @ 200'

Notes:
SL – Storage Length

8.5.2 SR-91 Freeway Segments

The 2035 Alternative 6C traffic analysis on the SR-91 freeway segments consists of operational analysis on the Alternative 6C network as described in **Section 6**. Examples of the geometric enhancements include ramp braiding and auxiliary lane improvements. The network also includes the direct connectors from northbound I-710 FC to eastbound SR-91 and from westbound SR-91 to southbound I-710 FC. **Table 8-55** shows the LOS for the various segments of SR-91 freeway segments adjacent to the I-710 freeway under Alternative 6C conditions.

Table 8-55
SR-91 2035 Alternative 6C (Build) Level of Service

Ramp/Weaving Sections	Freeway Type	Lane		AM		PM		MD	
		ML	Ramp	Density / VIC ¹	LOS	Density / VIC ¹	LOS	Density / VIC ¹	LOS
Eastbound									
West of Santa Fe On	Basic	5	--	24.1	C	32.7	D	26.3	D
Santa Fe	On	5	1	N/A	N/A	N/A	N/A	N/A	N/A
Santa Fe On / Long Beach Off	Weave A	6	--	31.4	D	35.7	E	27.8	C
Long Beach	Off	6	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	5	--	19.5	C	33.6	D	26.6	D
Long Beach	On	5	1	N/A	N/A	N/A	N/A	N/A	N/A
Long Beach On / I-710 SB Off	Weave A	6	--	18.9	B	36.6	E	28.4	D
I-710 SB	Off	6	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	5	--	18.4	C	31.2	D	26.5	D
I-710 NB & Atlantic	Major Off ³	5	2	20.4	C	33.4	D	29.4	D
--	Basic	3	--	19.0	C	36.0	E	27.1	D

Table 8-55
SR-91 2035 Alternative 6C (Build) Level of Service

Ramp/Weaving Sections	Freeway Type	Lane		AM		PM		MD	
		ML	Ramp	Density / V/C ¹	LOS	Density / V/C ¹	LOS	Density / V/C ¹	LOS
I-710 NB	On ⁴	3	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	4	--	18.3	C	30.3	D	24.5	C
I-710 SB	On ⁴	4	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	5	--	21.5	C	30.6	D	27.2	D
Atlantic	On	5	1	18.1	B	22.2	C	20.3	C
--	Basic	5	--	23.9	C	33.1	D	29.5	D
I-710 FC NB	On	5	1	N/A	N/A	N/A	N/A	N/A	N/A
I-710 FC NB On / Cherry Off	Weave B	5	--	29.9	D	36.9	E	34.1	D
Cherry	Off	5	1	N/A	N/A	N/A	N/A	N/A	N/A
Westbound									
West of Santa Fe Off	Basic	4	--	--*	F	40.7	E	43.4	E
Santa Fe	Off	6	2	N/A	N/A	N/A	N/A	N/A	N/A
Long Beach On / Santa Fe Off	Weave C	6	--	29.7	D	30.4	D	31.0	D
Long Beach	On	5	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	6	--	24.7	C	24.7	C	25.4	C
I-710 NB	On ⁴	5	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	5	--	25.4	C	26.0	D	26.7	D
Long Beach	Off	6	2	N/A	N/A	N/A	N/A	N/A	N/A
I-710 SB On / Long Beach Off	Weave B	6	--	40.4	E	29.6	D	33.0	D
I-710 SB	On	4	2	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	4	--	23.7	C	27.1	D	24.6	C
Atlantic	On ⁴	3	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	3	--	30.1	D	33.9	D	31.8	D
I-710	Major Off ³	5	3	33.9	D	34.1	D	32.2	D
--	Basic	5	--	30.3	D	30.1	D	28.4	D
Atlantic	Major Off ³	6	2	30.4	D	29.4	D	28.6	D
--	Basic	5	--	34.9	D	32.9	D	31.6	D
I-710 FC SB	Off	6	1	N/A	N/A	N/A	N/A	N/A	N/A
Cherry On / I-710 FC SB Off	Weave A	6	--	34.3	D	33.2	D	31.5	D
Cherry	On	5	1	N/A	N/A	N/A	N/A	N/A	N/A
East of Cherry On	Basic	5	--	33.4	D	32.2	D	30.2	D

Notes:

¹ Density = passenger car/mile/lane; v/c = volume-to-capacity ratio. Shaded and bold cells indicate LOS E or F.

³ Major diverge area; HCM methodology applied for analysis.

⁴ Single-lane addition/drop; HCM methodology applied for analysis.

N/A = not applicable. LOS and/or density information are not shown for major merge areas, single-lane addition/drop, and merge/diverge operations within a weaving segment.

* = Demand exceeds capacity, no density is predicted.

Table 8-56 presents the summary of Alternative 6C SR-91 freeway operations and the following statements describe key findings of the analysis:

For Eastbound SR-91:

- All basic freeway segments are expected to operate at an acceptable LOS D or better with the exception of one segment during the evening peak hour;

- All merge and diverge areas (2 out of 2) are expected to operate at an acceptable LOS D or better during all three peak hours analyzed;
- All weaving areas are expected to operate an acceptable LOS D or better except during the evening peak hour when all weaving segments are expected to operate at poor LOS E or F.

For Westbound SR-91:

- All basic freeway segments are expected to operate at an acceptable LOS D or better with the exception of one segment during all three peak hours;
- All merge and diverge areas (2 out of 2) are expected to operate at an acceptable LOS D or better during all three peak hours analyzed;
- All weaving areas are expected to operate at an acceptable LOS D or better with the exception of one weaving segment during the morning peak hour.

Table 8-56
SR-91 2035 Peak Hour Alternative 6C (Build) Summary

Segment Type	Total Number of Segments	Number of Segments with LOS E or F			Percent of Segments with LOS E or F		
		AM Peak Hour	MD Peak Hour	PM Peak Hour	AM Peak Hour	MD Peak Hour	PM Peak Hour
Eastbound							
Basic Freeway	7	0	1	0	0%	14%	0%
Merge/Diverge	2	0	0	0	0%	0%	0%
Weaving	3	0	3	0	0%	100%	0%
Westbound							
Basic Freeway	8	1	1	1	13%	13%	13%
Merge/Diverge	2	0	0	0	0%	0%	0%
Weaving	3	1	0	0	33%	0%	0%

In summary, the eastbound and westbound lanes generally show reduced congestion throughout the analysis peak hours with the exception of eastbound weaving segments during the evening peak hour.

As discussed in the previous section, under Alternative 5A, in order to increase I-710 mainline capacity and not affect the SR-91 separation, it was proposed to remove the existing I-710 northbound loop connector to SR-91 westbound. This would alleviate congestion and improve operations on both the mainline and at the ramp influence areas.

In addition to the proposed geometric enhancements proposed under Alternative 5A, Alternative 6C would provide connector ramps between the FC and SR-91. These connector ramps are provided to accommodate projected future 2035 truck traffic demand.

Tolling on I-710 FC under Alternative 6C conditions results in decrease in overall traffic volumes on SR-91 compared to Alternative 6B conditions. However, delay and LOS remain relatively

consistent between the tolling and non-tolling alternatives due to the higher truck percentages on both mainline SR-91 and connector ramps to/from I-710 under Alternative 6C conditions.

As discussed in the previous sections, under existing and Alternative 1 conditions, the traffic operations in these areas would deteriorate further without improvements. Compared to Alternative 1, under Alternative 6C, some of the segments improved as a result of the reduction in traffic on the I-710 mainline and connector ramps. This is a result of the diversion of truck traffic onto the FC. Therefore, Alternative 6C would not only improve the overall conditions, but may also provide the additional capacity required to accommodate projected future 2035 traffic demand in this area.

8.5.2.1 SR-91 Freeway Queuing Analysis

This section evaluates projected queuing for 2035 Build Alternative 6C at SR-91 and I-710 freeway-to-freeway ramp connections, and at SR-91 and two local arterial ramps. **Table 8-57** indicates that the storage provided on freeway-to-freeway ramp connectors with proposed ramp metering for the 2035 Build Alternative 6C are not adequate using suggested meter rates (discussed in **Section 4.0**) for the following:

- SR-91 westbound connector ramp from I-710 southbound

Table 8-57
SR-91 2035 Alternative 6C Freeway Ramp Queuing Analysis

Direction	Location	Min Req'd SL ALT 6C	Provided SL ALT 6C
EB SR-91	Off-ramp to I-710 NB Connector	4650' @ 945 vph / lane*	2 lanes @ 4800'
EB SR-91	Off-ramp to I-710 SB Connector	2100' @ 960 vph / lane*	1 lane @ 2200'
EB SR-91	On-ramp from I-710 NB Connector	1650' @ 515 vph / lane	2 lanes @ 1700'
EB SR-91	On-ramp from I-710 SB Connector	5700' @ 885 vph / lane	2 lanes @ 5800'
WB SR-91	Off-ramp to I-710 NB Connector	1950' @ 820 vph / lane	2 lanes @ 2050'
WB SR-91	Off-ramp to I-710 SB Connector	1950' @ 1340 vph / lane**	2 lanes @ 2160'
WB SR-91	On-ramp from I-710 NB Connector	2850' @ 575 vph / lane	2 lanes @ 2900'
WB SR-91	On-ramp from I-710 SB Connector	> 1500' @ 1380 vph / lane**	2 lanes @ 1500'

Notes:

Shaded cells indicate insufficient storage

* Meter rate at 2 cars per green;

** Meter rate at 3 cars per green

SL – Storage Length

Table 8-58 indicates that the storage provided on all on-ramps with proposed ramp metering for the 2035 Build Alternative 6C are adequate using suggested meter rates between 240 vph/lane and 900 vph/lane.

At locations where the required storage is not provided and the maximum meter rate is utilized, it is concluded that due to physical and design constraints, there may be no feasible improvement recommendations. Note that a higher meter rate allows more throughput, but would generally cause turbulence at the merge area and increase congestion to the freeway.

Final

Table 8-58
SR-91 2035 Alternative 6C Arterial Ramp Queuing Analysis

Direction	Location	Min Req'd SL ALT 6B	Provided SL ALT 6B
EB SR-91	Long Beach On-Ramp	900' @ 540 vph / lane	1 lane @ 925'
EB SR-91	Atlantic On-ramp	150' @ 355 vph / lane	2 lanes @ 280'
WB SR-91	Atlantic On-ramp	1200' @ 340 vph / lane	2 lanes @ 1275'
WB SR-91	Long Beach On-Ramp	< 670' @ 240 vph / lane	2 lanes @ 670'

Notes:
SL – Storage Length

8.5.3 I-105 Freeway Segments

Table 8-59 shows the LOS for I-105 freeway segments adjacent to the I-710 freeway under Alternative 6C conditions. **Table 8-60** presents the summary of Alternative 6C I-105 freeway operations and the following statements describe key findings of the analysis:

For Eastbound I-105:

- All basic freeway segments are expected to operate at an acceptable LOS D or better with the exception of two segments during all analysis peak hours;
- All merge and diverge areas are expected to operate at an acceptable LOS D or better with the exception of one during the evening peak hour.

For Westbound I-105:

- 71 percent (5 out of 7) of the basic freeway segments are expected to operate at poor LOS E or F during the midday peak hour;
- Half (2 out of 4) of the merge and diverge areas are expected to operate at poor LOS E or F during the midday peak hour.

In summary, the eastbound and westbound lanes show congestion during staggered peak hours throughout the entire segment where some peak hours experience excessive congestion and other minimal congestion. This indicates that these areas are near or exceed capacity and operating under congested conditions through this section.

Tolling on I-710 FC under Alternative 6C conditions results in decrease in overall traffic volumes on I-105 (particularly in the westbound direction) compared to Alternative 6B conditions. In addition, minor reductions in delay are observed within the study corridor. The overall LOS, however, remain relatively consistent between the tolling and non-tolling alternatives due to the higher truck percentages on both mainline I-105 and connector ramps to/from I-710 under Alternative 6C conditions.

As discussed in the previous sections, under Alternative 1 conditions, the operation conditions in these areas would deteriorate further without improvements. Compared to Alternative 1, under Alternative 6C, some of the segments improved as a result of the reduction in traffic on

the I-710 mainline and connector ramps as a result of the diversion of truck traffic onto the FC. Therefore, Alternative 6C would not only improve the overall operation, but may also provide the additional capacity required to accommodate projected future 2035 traffic demand in this area.

Table 8-59
I-105 2035 Alternative 6C (Build) Level of Service

Ramp	Freeway Type	Lane		AM		PM		MD	
		ML	Ramp	Density / VIC ¹	LOS	Density / VIC ¹	LOS	Density / VIC ¹	LOS
Eastbound									
West of I-710 Off	Basic	3	--	--*	F	--*	F	43.0	E
Lane Addition	Basic	4	--	29.2	D	32.9	D	26.9	D
I-710	Major Off ³	4	2	33.1	D	36.2	E	31.1	D
--	Basic	3	--	26.6	D	32.0	D	25.7	C
Garfield	Off	3	2	14.0	B	16.7	B	14.9	B
--	Basic	3	--	23.7	C	28.7	D	21.1	C
I-710 NB	Major On ²	3	2	0.55	N/A	0.65	N/A	0.58	N/A
--	Basic	5	--	19.9	C	23.3	C	20.8	C
I-710 SB	On	5	1	18.5	B	20.2	C	19.7	B
--	Basic	5	--	23.3	C	28.4	D	25.7	C
East of I-710 On (Lane Drop)	Basic	3	--	--*	F	--*	F	--*	F
Westbound									
West of Long Beach Off	Basic	3	--	29.2	D	29.5	D	--*	F
Long Beach	Off	3	1	35.2	E	35.7	E	--*	F
Lane Drop	Basic	3	--	32.9	D	33.8	D	--*	F
--	Basic	4	--	23.8	C	24.3	C	37.8	E
I-710 NB	On ⁴	3	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	3	--	32.5	D	32.9	D	--*	F
I-710 SB	On	3	1	32.8	D	33.0	D	--*	F
--	Basic	3	--	24.4	C	24.6	C	35.6	E
Garfield	On	3	1	20.6	C	21.0	C	28.2	D
--	Basic	3	--	21.0	C	21.3	C	30.8	D
I-710	Major Off ³	5	2	24.1	C	24.1	C	30.1	D
East of I-710 Off	Basic	5	--	21.2	C	21.2	C	26.3	D

Notes:

¹ Density = passenger car/mile/lane; v/c = volume-to-capacity ratio. Shaded and bold cells indicate LOS E or F.

² Major merge area; HCM methodology applied for analysis.

³ Major diverge area; HCM methodology applied for analysis.

⁴ Single-lane addition/drop; HCM methodology applied for analysis.

N/A = not applicable. LOS and/or density information are not shown for major merge areas, single-lane addition/drop, and merge/diverge operations within a weaving segment.

* = Demand exceeds capacity, no density is predicted.

Table 8-60
I-105 2035 Peak Hour Alternative 6C (Build) Summary

Segment Type	Total Number of Segments	Number of Segments with LOS E or F			Percent of Segments with LOS E or F		
		AM Peak Hour	PM Peak Hour	MD Peak Hour	AM Peak Hour	PM Peak Hour	MD Peak Hour
Eastbound							
Basic Freeway	7	2	2	2	29%	29%	29%
Merge/Diverge	4	0	1	0	0%	25%	0%
Weaving	0	0	0	0	N/A	N/A	N/A
Westbound							
Basic Freeway	7	0	0	5	0%	0%	71%
Merge/Diverge	4	1	1	2	25%	25%	50%
Weaving	0	0	0	0	N/A	N/A	N/A

8.5.3.1 I-105 Freeway Queuing Analysis

This section evaluates projected queuing for 2035 Build Alternative 6C at I-105 and I-710 freeway-to-freeway ramp connectors. **Table 8-61** indicates that the storage provided on freeway-to-freeway ramp connectors with proposed ramp metering for the 2035 Build Alternative 6C are not adequate using suggested meter rates (discussed in **Section 4.0**) for the following:

- I-105 connector ramp to I-710 northbound

Table 8-61
I-105 2035 Alternative 6C Freeway Ramps Queuing Analysis

Direction	Location	Min Req'd SL ALT 6B	Provided SL ALT 6B
WB & EB I-105	Off-ramp to I-710 NB Connector	> 1000' @ 1380 vph / lane**	2 lanes @ 1000'
WB I-105	On-ramp from I-710 SB Connector	2100' @ 570 vph / lane	1 lane @ 2240'
WB I-105	On-ramp from I-710 NB Connector	4050' @ 325 vph / lane	2 lanes @ 4065'
WB & EB I-105	Off-ramp to I-710 SB Connector	1500' @ 1290 vph / lane**	2 lanes @ 1580'
EB I-105	On-ramp from I-710 SB Connector	3900' @ 590 vph / lane*	2 lanes @ 4015'
EB I-105	On-ramp from I-710 NB Connector	1050' @ 1270 vph / lane**	2 lanes @ 1115'

Notes:

Shaded cells indicate insufficient storage

* Meter rate at 2 cars per green;

** Meter rate at 3 cars per green

SL – Storage Length

At locations where the required storage is not provided and the maximum meter rate is utilized, it is concluded that due to physical and design constraints, there may be no feasible improvement recommendations. Note that a higher meter rate allows more throughput, but would generally cause turbulence at the merge area and increase congestion to the freeway.

8.5.4 I-5 Freeway Segments

Table 8-62 shows the LOS for the I-5 freeway segments adjacent to the I-710 freeway under Alternative 6C conditions.

Table 8-62
I-5 2035 Alternative 6C (Build) Level of Service

Ramp/Weaving Sections	Type	Lane		AM		PM		MD	
		ML	Ramp	Density / VIC ¹	LOS	Density / VIC ¹	LOS	Density / VIC ¹	LOS
Northbound									
North of Dennison On	Basic	5	--	35.2	E	24.7	C	--*	F
Dennison	On	5	1	24.6	C	18.2	B	28.1	D
--	Basic	5	--	34.6	D	23.9	C	44.0	E
Ditman & Dennison	Off	5	1	34.9	D	27.3	C	36.9	E
--	Basic	5	--	36.0	E	24.8	C	44.0	E
Telegraph & Downey	On	5	1	22.3	C	17.3	B	23.8	C
--	Basic	5	--	34.0	D	23.7	C	39.1	E
I-710 NB	On ⁴	4	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	4	--	25.9	C	18.8	C	28.5	D
I-710 NB	Off ⁴	5	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	5	--	26.5	D	23.0	C	28.5	D
McBride & Telegraph	Off	5	1	29.5	D	26.2	C	31.1	D
--	Basic	5	--	27.1	D	23.4	C	29.1	D
--	Basic	4	--	37.7	E	30.3	D	42.9	E
Woods & Telegraph	On	4	1	22.4	C	20.1	C	23.6	C
--	Basic	4	--	36.0	E	28.9	D	41.1	E
Woods & Telegraph	Off	4	1	37.0	E	33.9	D	37.2	E
--	Basic	4	--	37.9	E	30.9	D	41.1	E
Camfield & Telegraph	On	4	1	21.0	C	18.8	B	22.5	C
--	Basic	4	--	35.3	E	27.1	D	41.0	E
Camfield & Telegraph	Off	4	1	39.1	E	33.6	D	--*	F
South of Camfield & Telegraph Off	Basic	4	--	40.3	E	29.9	D	--*	F
Southbound									
North of Ditman Off	Basic	5	--	26.0	D	21.8	C	35.7	E
Ditman	Off	5	1	28.1	D	24.1	C	34.0	D
--	Basic	5	--	25.5	C	21.4	C	35.6	E
Ditman	On	5	1	18.4	B	16.5	B	24.0	C
--	Basic	5	--	26.0	C	22.1	C	36.2	E
Boswell	Off	5	1	29.0	D	25.4	C	35.2	E
--	Basic	5	--	25.4	C	21.6	C	36.0	E
I-710 SB	Major Off ³	5	3	28.8	D	24.5	C	37.1	E
--	Basic	3	--	16.7	B	14.5	B	27.7	D
I-710 SB	On ⁴	3	1	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	4	--	18.6	C	19.9	C	25.1	C
Triggs	Off	4	1	21.7	C	22.7	C	27.4	C
--	Basic	4	--	18.1	C	19.5	C	25.1	C
Triggs	On	4	1	14.9	B	15.7	B	17.8	B
--	Basic	4	--	19.6	C	21.2	C	25.7	C

Table 8-62
I-5 2035 Alternative 6C (Build) Level of Service

Ramp/Weaving Sections	Type	Lane		AM		PM		MD	
		ML	Ramp	Density / VIC ¹	LOS	Density / VIC ¹	LOS	Density / VIC ¹	LOS
Stevens & Eastern	Off	4	1	24.8	C	24.6	C	27.8	C
South of Stevens & Eastern Off	Basic	4	--	16.9	B	20.0	C	25.3	C

Notes:

¹ Density = passenger car/mile/lane; v/c = volume-to-capacity ratio. Shaded and bold cells indicate LOS E or F.

³ Major diverge area; HCM methodology applied for analysis.

⁴ Single-lane addition/drop; HCM methodology applied for analysis.

N/A = not applicable. LOS and/or density information are not shown for major merge areas, single-lane addition/drop, and merge/diverge operations within a weaving segment.

* = Demand exceeds capacity, no density is predicted

Table 8-63
I-5 2035 Peak Hour Alternative 6C (Build) Summary

Segment Type	Total Number of Segments	Number of Segments with LOS E or F			Percent of Segments with LOS E or F		
		AM Peak Hour	PM Peak Hour	MD Peak Hour	AM Peak Hour	PM Peak Hour	MD Peak Hour
Eastbound							
Basic Freeway	12	7	0	9	58%	0%	75%
Merge/Diverge	8	2	0	3	25%	0%	38%
Weaving	0	0	0	0	N/A	N/A	N/A
Westbound							
Basic Freeway	9	0	0	4	0%	0%	44%
Merge/Diverge	7	0	0	2	0%	0%	29%
Weaving	0	0	0	0	N/A	N/A	N/A

Table 8-63 presents the summary of Alternative 6C I-5 freeway operations and the following statements describe key findings of the analysis:

For Northbound I-5:

- 75 percent (9 out of 12) of basic freeway segments analyzed are expected to operate at poor LOS E or F during the midday peak hour;
- Nearly 40 percent (3 out of 8) of all merge and diverge areas are expected to operate at LOS E or worse during midday peak hour;

For Southbound I-5:

- Nearly half (4 out of 9) of the basic freeway segments analyzed are expected to operate at LOS E or worse during the midday peak hour;
- All merge and diverge area operations are expected to perform at LOS D or better except for two areas that are expected to operate at poor LOS E or F during the midday peak hour.

Compared to Alternative 6B, tolling on I-710 FC under Alternative 6C conditions impose a marginal increase in overall traffic volume on the sections of I-5 downstream of I-710 interchange area in both northbound and southbound directions during morning and evening peak hours. In addition, minor increase in truck percentage on southbound I-5 mainline traffic is observed under the tolling alternative. In general, delay and LOS remain consistent between the tolling and non-tolling alternatives.

Similar to Alternative 1, the northbound lanes show heavy congestion in the morning and midday peak hours. In the southbound direction, segments just north of the I-710 interchange operate at near capacity conditions during midday peak hour. Overall LOS improvement is expected when comparing Alternative 6C conditions to No Build (Alternative 1) conditions on I-5 within Project vicinity.

8.5.4.1 I-5 Freeway Queuing Analysis

This section evaluates projected queuing for 2035 Build Alternative 6C at I-5 and I-710 freeway-to-freeway ramp connectors. **Table 8-64** indicates that the storage provided on freeway-to-freeway ramp connectors with proposed ramp metering for the 2035 Build Alternative 6C are not adequate using suggested meter rates (discussed in **Section 4.0**) for the following:

- I-5 northbound connector ramp from I-710 northbound
- I-5 southbound connector ramp to I-710 southbound

Table 8-64
I-5 2035 Alternative 6C Freeway Ramp Queuing Analysis

Direction	Location	Min Req'd SL ALT 6C	Provided SL ALT 5A, 6A, 6B & 6C
NB I-5	Off-ramp to I-710 NB Connector	1200'@1175 vph/lane*	2 Lanes @ 1300'
SB I-5	On-ramp from I-710 SB Connector	1650'@1225 vph/lane*	2 Lanes @ 1800'
NB I-5	On-ramp from I-710 NB Connector	>4500'@1380 vph/lane**	2 Lanes @ 4500'
SB I-5	Off-ramp to I-710 SB Connector	>2200'@1380 vph/lane**	2 Lanes @ 2200'

Notes:

Shaded cells indicate insufficient storage

* Meter rate at 2 cars per green;

** Meter rate at 3 cars per green

SL – Storage Length

At locations where the required storage is not provided and the maximum meter rate is utilized, it is concluded that due to physical and design constraints, there may be no feasible improvement recommendations. Note that a higher meter rate allows more throughput, but would generally cause turbulence at the merge area and increase congestion to the freeway.

9.0 FUTURE YEAR 2035 INTERCHANGE ANALYSIS

This section builds upon the recommendations of a previous task to screen various interchange layouts and configurations to address the interchange geometric needs of the I-710 freeway. The preferred interchange configurations presented in this section were selected based on measures of effectiveness criteria (MOEs), geometric plans where several concepts were analyzed and refined to their full extent based on their feasibility and constructability. The data was presented in the Final TOAR document dated April 2010. This report presents the updated analysis on the preferred interchange configuration that corresponds to the geometric plans presented in the Project Report.

The succeeding discussion provides the 2035 Alternative 1 (No Build), and Alternatives 5A, 6A, 6B and 6C (Build) conditions analysis for fifteen (15) interchanges along the I-710 Freeway from the south end at Pico Avenue to Washington Boulevard at the north end, including three (3) additional interchanges north of Washington Boulevard analyzed in the I-5 Corridor Study.

In Alternatives 6A, 6B and 6C, the Freight Corridor (FC) lanes extend between Ocean Boulevard and the intermodal rail yards in the cities of Commerce and Vernon. In addition to the southern and northern termini, several intermediate connections to/from the FC are featured in the Build Alternatives 6A, 6B and 6C.

Three (3) intermediate connections are analyzed along the FC in this section, that is located in the proximity of the Anaheim Street, Del Amo Boulevard, and Washington Boulevard interchanges. In addition, the interchange at Pico Avenue in the southern termini is also included as part of the analysis. Other connections located at the northern and southern termini as well as other intermediate access points were discussed and analyzed as part of the freeway segments in **Sections 7.0** and **8.0** of this report.

The following were evaluated during the morning, midday and evening peak hours: intersection LOS, intersection queuing (95th Percentile), ramp metering analysis.

As discussed in **Section 4.0**, *Synchro 6* (which uses *HCM 2000* methodology) was used to calculate the intersection LOS. The delay shown in the intersection LOS tables are in seconds per vehicle. Note that the intersection LOS analysis output is for each individual intersection within the interchange.

The ramp metering analysis spreadsheets were setup to consider all three (morning, evening, and midday) peak hour volumes. However, the highest volume for each ramp from these three peak hours was used in the analysis, which was equally distributed across the one hour time period.

The intersection analysis worksheets, queuing worksheets, and ramp metering analysis worksheets are contained in **Appendix I**. Figures depicting peak hour turning movement volumes and lane geometrics for the recommended interchange configuration are found at the end of this section. The lane geometrics are consistent with the geometric layout plans found in the Project Report.

9.1 PICO AVENUE/9TH STREET INTERCHANGE

Pico Avenue is a north-south corridor with two lanes in each direction and provides direct access to Broadway, Pier C/ 7th Street, and Pier D Street. At the interchange, access to and from Pico Avenue is via two separate loop ramps. The Pico Avenue ramps are two lanes and feature overcrossings that span I-710, rail lines, Pico Avenue, and Pier C Street. As part of the interchange analysis, the following intersection was analyzed:

- Pico Avenue/9th Street at I-710 ramps

The recommended geometric configurations for each Alternative are described as follows:

Local Arterials and Streets

- No modifications to Pico Avenue, Pier B Street, and the I-710 ramp intersection are shown at this time. Modifications to these streets and intersections are anticipated as part of the Port of Long Beach's (POLB) Pier B Rail Yard Expansion Project. The POLB modifications will not diminish the viability of the I-710 Alternatives at this location.

I-710 Ramps

- The on- and off- ramp terminus will remain at its existing location at the intersection of Pico Avenue and Pier B Street.
- The existing northbound on-ramp structure will be replaced by a metered single lane on-ramp that enters the freeway on the left hand side. Given the proximity of the Anaheim Street off-ramp, a right hand side on-ramp is not viable. The ramp will be barrier separated from the mainline lanes for several hundred feet to prohibit movement to the Anaheim Street off-ramp.
- The southbound off-ramp departure location will be moved from its existing location south of the Anaheim Street on-ramp to improve freeway operations. The new location will be approximately one-half mile north of Anaheim Street. A two-lane off-ramp will serve both Pico Avenue and Anaheim Street. Approximately 1,000' south of the mainline departure, the ramp will split. The Pico Avenue off-ramp will ascend and span Anaheim Street, then descend and join the existing Pico Avenue off-ramp structure. The existing two-lane structure will not be replaced.

Freight Corridor (Alternative 6A, 6B and 6C)

The northbound and southbound FC lanes originate and terminate in the southern terminus of the project and are fed by the multiple arterial ramp connections from Harbor Scenic Drive, Ocean Boulevard and then at Pico Avenue. Although the northbound and southbound corridor lanes originate and terminate at the same respective location, it should be noted that the approaches and travel ways vary for the corridor. The FC carries two lanes into and out of this location.

- A third arterial connection is provided at Pico Avenue. A two-lane on-ramp following the Pico Avenue freeway entrance alignment diverges from the freeway ramp and merges with the FC lanes from the left hand side.

- Northbound on the FC, a two-lane ramp travels to Anaheim Street and Pico Avenue. The northbound FC segment diverges to the left hand side, remains elevated, and crosses over Anaheim Street. The two-lane section splits to form two single lane ramps serving both Anaheim Street and Pico Avenue.
- Southbound on the FC, the Pico Avenue ramp diverges to the left and joins the Pico Avenue off-ramp lanes from the freeway. The Pico Avenue off-ramp lanes are barrier separated through the split. The barrier prohibits unsafe movements between the ramps. The FC ramp and the freeway off-ramp combine as a two-lane ramp and terminate at the Pico Avenue/Pier B intersection.

9.1.1 Intersection Level of Service

Table 9-1 shows the intersection LOS for Pico Avenue at I-710 ramps for each Alternative. As shown in **Table 9-1**, the intersection is projected to operate at LOS D or better for all Build alternatives with the exception of Alternatives 6A, 6B, and 6C during the AM and PM peak hours.

Table 9-1
Pico Avenue 2035 Intersection Level of Service

Peak Hour Level of Service (LOS) Analysis (i)						
Pico/I-710 Interchange	AM		PM		MD	
	Delay (ii)	LOS	Delay	LOS	Delay	LOS
<i>Alternative 1</i>						
Pico / I-710 Ramps (Node #10)	37.8	D	26.3	C	24.1	C
<i>Alternative 5A</i>						
Pico / I-710 Ramps (Node #10)	54.4	D	25.8	C	35.7	D
<i>Alternative 6A</i>						
Pico / I-710 Ramps (Node #10)	123.0	F	68.7	E	41.1	D
<i>Alternative 6B</i>						
Pico / I-710 Ramps (Node #10)	139.0	F	61.1	E	47.9	D
<i>Alternative 6C</i>						
Pico / I-710 Ramps (Node #10)	64.1	E	59.3	E	42.0	D

Note:

- (i) Based on Highway Capacity Manual (HCM) 2000.
(ii) Average Intersection Delay (seconds/vehicle).

Based on the results of the intersection operations analysis summarized above, the ramp LOS for Alternative 6A, 6B, and 6C change from C to E during the evening peak hours compared to Alternative 1. This is a result of more truck traffic utilizing the new connection to the FC ramps at Pico Avenue. However, it is expected that existing geometric configurations of this intersection will significantly change in the near future due to the Port of Long Beach On-Dock Rail Support Facility (Pier B) Project.

Figures 9-1, 9-7, 9-14, 9-23 and 9-33 at the end of this section, show the intersection peak hour turning movement volumes and lane geometrics at Pico Avenue at I-710 ramps for each

Alternative. **Figures 9-42, 9-48, 9-55, 9-63, and 9-72** graphically displays the LOS designations for the morning and evening peak hours, and depicts those intersections projected to operate at LOS E or F with a larger red dot for each Alternative.

9.1.2 Queuing Analysis

This section evaluates projected queuing for the 2035 Build Alternatives (5A, 6A, 6B and 6C) conditions at Pico Avenue and I-710. **Table 9-2** indicates that the storage provided on Pico Avenue to northbound I-710 on-ramp with proposed ramp metering for the 2035 Build Alternative 5A is not adequate using suggested meter rates between 480 vph/lane and 1200 vph/lane for 2 cars per green. This indicates that the Pico Avenue on-ramp does not provide sufficient storage needed to accommodate the required demand. It should be noted that using a higher discharge rate at 1220 and allowing 3 cars per green for Pico Avenue On-ramp would meet the required storage length.

Table 9-2
Pico Avenue 2035 Ramp Queuing Analysis

Direction	Location	Min Req'd SL ALT 5A	Min Req'd SL ALT 6A	Min Req'd SL ALT 6B	Min Req'd SL ALT 6C	Provided SL ALT 5A, 6A, 6B & 6C
NB I-710	Pico Ave on-ramp	>3000' @ 1200 vph/lane*	2850' @ 465 vph/lane	2850' @ 455 vph/lane	2850' @ 495 vph/lane	1 lane @ 3000'
SB I-710	Pico Ave off-ramp	138'	311'	330'	296'	1 lane @ 6000'

Notes:

*Meter rate at 2 cars per green

SL – Storage Length

Shaded cells indicate insufficient storage.

9.2 ANAHEIM STREET INTERCHANGE

Anaheim Street features an eight-lane overcrossing and a six-lane bridge spanning the Los Angeles (LA) River. The existing interchange configuration is a four-quadrant cloverleaf with free right turn movements to and from the local street. Ramp connections provide access to and from Anaheim Street to the freeway; however, access is prohibited to downtown Long Beach via Shoemaker.

The southbound exit to westbound Anaheim Street ramp terminates at the Harbor Avenue intersection. Traffic on this ramp cannot turn left onto Harbor Avenue. The eastbound Anaheim Street to southbound entrance ramp originates at the Harbor Avenue intersection. As part of the interchange analysis, the following intersections were analyzed:

- Anaheim Street at I-710 ramps
- Anaheim Street/Freight Corridor Access

The recommended geometric configurations for each Alternative are described as follows:

Local Arterials and Streets

- Anaheim Street will be reconstructed to three through lanes in each direction between Harbor Avenue and San Francisco Avenue, east of the Los Angeles (LA) River.
- The Anaheim Street overcrossing will carry three through lanes and two left turn lanes in each direction. The number of lanes and left turn storage are the minimum required to ensure adequate interchange operation.
- The Anaheim Street bridge over the Los Angeles River will be widened to accommodate the additional lanes and turning movements to and from the I-710 ramps.
- To ensure adequate traffic operation at the interchange, access control is needed along Anaheim Street. Therefore, a cul-de-sac is featured on Fashion Avenue. Businesses along Fashion Avenue will gain access to Anaheim Street via Harbor Avenue.
- Under Alternative 5A conditions, to accommodate the southbound Anaheim off-ramp, cul-de-sacs are proposed at Cowles Street, 15th Street, and Gaylord Street. The cul-de-sacs will employ a modified standard to avoid additional right-of-way impacts. However, under Alternative 6A, 6B and 6C conditions, a cul-de-sac is only proposed for Gaylord Street while Cowles Street and 15th Street will terminate east of Fashion Avenue pending a proposed right-of-way acquisition.
- Truck traffic is permitted on Anaheim Street in the existing condition and will be permitted in the proposed condition.
- On-street parking is permitted on Anaheim Street in the westbound direction between Harbor Avenue and Santa Fe Avenue in the existing and proposed conditions.

I-710 Ramps

- The existing four-quadrant cloverleaf configuration will be replaced by a single point interchange (SPI) configuration.
- The existing on-ramps will be replaced by metered multi-lane on-ramps. The northbound on-ramp is braided below the Pacific Coast Highway (PCH) off-ramp to eliminate the short weaving area between existing ramps.
- The existing off-ramps will be replaced by two lane off-ramps.
- The southbound off-ramp is braided above the PCH on-ramp to eliminate the short weaving area between the existing ramps. This ramp also serves Pico Avenue, as mentioned previously in the Pico Avenue interchange description.

Freight Corridor (Alternative 6A, 6B and 6C)

The northbound FC lanes originate in the southern terminus of the project and are fed by the multiple arterial ramp connections. Similarly, the southbound lanes terminate in the same location and provide return movements. The FC carries two lanes into and out of this location.

- The northbound FC has access from Harbor Scenic Drive, Ocean Boulevard, Pico Avenue and Anaheim Street.

- The southbound FC crosses over the I-710 freeway north of PCH and then splits to provide ramp connections to the southbound freeway mainline lanes, Anaheim Street and Pico Avenue.
- A two-lane ramp to Anaheim Street and Pico Avenue diverges to the left hand side, remains elevated, and crosses over Anaheim Street. The two-lane section splits to form two single lane ramps serving Anaheim and Pico.
- The Anaheim Street ramp diverges to the right and descends to the Anaheim Street/Harbor Avenue intersection.

9.2.1 Intersection Level of Service

Based upon freeway operations analysis and geometric constraints, two interchange configurations (partial cloverleaf and single point) were initially considered and analyzed. The SPI configuration was determined to be the better configuration for Anaheim Street at I-710.

Table 9-3 shows the intersection LOS for Anaheim Street at I-710 ramps with the SPI for Alternatives 5A, 6A, 6B and 6C. As illustrated in the table, the intersection will operate at LOS D or better for all Build alternatives, except the following:

- Anaheim Street and I-710 Ramps during the MD peak hour (Alt 5A, LOS F; Alt 6A, LOS E; Alt 6B, LOS E; Alt 6C, LOS E)
- Anaheim Street and Freight Corridor Ramps during the MD peak hour (Alt 6B, LOS E)

Figures 9-7, 9-14, 9-23 and 9-33 show the intersection peak hour turning movement volumes and lane geometrics for Alternatives 5A, 6A, 6B and 6C, respectively. **Figures 9-49, 9-56, 9-64, and 9-73** graphically displays the LOS designations for the morning and evening peak hours, and depicts those intersections projected to operate at LOS E or F with a larger red dot for Alternatives 5A, 6A, 6B, and 6C, respectively.

9.2.2 Queuing Analysis

This section evaluates projected queuing for 2035 Build Alternatives 5A, 6A, 6B and 6C conditions at Anaheim Street and I-710 for the SPI configuration. **Table 9-4** and **Table 9-5** show the 2035 predicted maximum queue lengths in feet by approach movement compared to the storage provided in the 2035 Build configurations.

As shown in **Table 9-4** and **Table 9-5**, adequate storage is provided at all locations for all 2035 Build conditions with the recommended interchange and geometric configuration, except at the following:

- Eastbound Anaheim Street to NB I-710 on-ramp (Alt 5A, Alt 6A, and Alt 6C);
- Eastbound Anaheim Street to Freight Corridor Access (Alt 6B).

Table 9-3
Anaheim Street 2035 Intersection Level of Service

Peak Hour Level of Service (LOS) Analysis (i)						
Anaheim Street/I-710 Interchange	AM		PM		MD	
	Delay (ii)	LOS	Delay	LOS	Delay	LOS
<i>Alternative 1</i>						
Anaheim Street/I-710 Ramps (Node #202)	N/A	N/A	N/A	N/A	N/A	N/A
Anaheim Street/Freight Corridor Ramps (Node #200)	N/A	N/A	N/A	N/A	N/A	N/A
<i>Alternative 5A</i>						
Anaheim Street/I-710 Ramps (Node #202)	23.5	C	27.6	C	91.7	F
Anaheim Street/Freight Corridor Ramps (Node #200)	N/A	N/A	N/A	N/A	N/A	N/A
<i>Alternative 6A</i>						
Anaheim Street/I-710 Ramps (Node #202)	26.3	C	25.6	C	78.3	E
Anaheim Street/Freight Corridor Ramps (Node #200)	46.0	D	39.6	D	48.0	D
<i>Alternative 6B</i>						
Anaheim Street/I-710 Ramps (Node #202)	25.5	C	24.8	C	61.8	E
Anaheim Street/Freight Corridor Ramps (Node #200)	47.1	D	41.2	D	78.5	E
<i>Alternative 6C</i>						
Anaheim Street/I-710 Ramps (Node #202)	26.2	C	25.0	C	78.9	E
Anaheim Street/Freight Corridor Ramps (Node #200)	40.8	D	32.7	C	41.2	D

Note:

Highway Capacity Manual (HCM) 2000.

Average Intersection Delay (seconds/vehicle).

Shaded and bold cells indicate LOS E or F.

Table 9-4
Anaheim Street 2035 Intersection Queuing Analysis

Direction	Location	Min Req'd SL ALT 5A	Min Req'd SL ALT 6A	Min Req'd SL ALT 6B	Min Req'd SL ALT 6C	Provided SL ALT 5A, 6A, 6B& 6C
WB Anaheim St	NB I-710 on-ramp	575' *	571' *	544' *	569' *	1 lane @ 950'
WB Anaheim St	SB I-710 on-ramp	92'	98'	98'	95'	2 lanes @ 340'
EB Anaheim St	NB I-710 on-ramp	623'	640'	339'	632'	2 lanes @ 460'
EB Anaheim St	SB I-710 on-ramp	125' **	28' **	16' **	27' **	1 lane @ 550'
EB Anaheim St	FC Access/Harbor	N/A	475' **	747' **	472' **	1 lane @ 525'
WB Anaheim St	FC Access/Harbor	N/A	48'	59'	66'	1 lane @ 90'
NB I-710	WB Anaheim St Off-ramp	436'	388'	371'	377'	1 lane @ 1400' & 1 lane @ 425'
NB I-710	EB Anaheim St Off-ramp	N/A	N/A	N/A	N/A	N/A
SB I-710	WB Anaheim St Off-ramp	N/A	N/A	N/A	N/A	N/A
SB I-710	EB Anaheim St Off Ramp	276'	224'	230'	213'	2 lanes @ 1000'

Notes:

Shaded cells indicate insufficient storage.

* Based on WB Anaheim St through queue length

** Based on EB Anaheim St through queue length

SL – Storage Length

FC – Freight Corridor

Table 9-5 indicates that the storage provided on all on-ramps with proposed ramp metering for the 2035 Build Alternatives 5A, 6A, 6B and 6C are adequate using suggested meter rates between 240 vph/lane and 900 vph/lane for 1 car per green and 480 vph/lane and 1200 vph/lane for 2 cars per green.

**Table 9-5
Anaheim Street 2035 Ramp Queuing Analysis**

Direction	Location	Min Req'd SL ALT 5A	Min Req'd SL ALT 6A	Min Req'd SL ALT 6B	Min Req'd SL ALT 6C	Provided SL ALT 5A, 6A, 6B
NB I-710	Anaheim St off-ramp	1950' @ 895 vph/lane	1950' @ 685 vph/lane	1950' @ 650 vph/lane	1950' @ 680 vph/lane	2 lanes @ 2000'
SB I-710	Anaheim St on-ramp	750' @ 345 vph/lane	750' @ 325 vph/lane	750' @ 325 vph/lane	750' @ 330 vph/lane	2 lanes @ 870'

Notes:

N/A = Not Applicable

SL – Storage Length

9.3 PACIFIC COAST HIGHWAY INTERCHANGE

Pacific Coast Highway (PCH), which is also Route 1, is a four-lane, east-west street traversing the cities of Wilmington and Long Beach. The existing interchange configuration is a four-quadrant cloverleaf with free right turn movements to and from the local street. As part of the interchange analysis, the following intersection was analyzed:

- Pacific Coast Highway at I-710 ramps

The recommended geometric configurations for each Alternative are described below:

Local Arterials and Streets

- PCH will be reconstructed to three through lanes in each direction from east of Harbor Avenue to San Francisco Avenue, east of the LA River. A through lane will be dropped in each direction beyond these limits to tie into the existing four-lane section.
- The PCH overcrossing will carry three through lanes and two left turn lanes in each direction. The number of lanes and left turn storage are the minimum required to ensure adequate interchange operation.
- The PCH bridge over the Los Angeles River will be widened to accommodate the additional lanes and turning movements to and from the I-710 ramps.
- Truck traffic is permitted on PCH in the existing condition and will be restricted in the proposed condition.
- On-street parking is permitted on PCH in the westbound direction between Caspian Avenue and Santa Fe Avenue in the existing and proposed condition.

I-710 Ramps

- The existing four-quadrant configuration will be replaced by an SPI configuration.

- The existing on-ramps will be replaced by metered multi-lane on-ramps. The southbound on-ramp is braided below the Anaheim Street off-ramp to eliminate the short waving area between ramps.

Other recommendations to Pacific Coast Highway include the following:

9.3.1 Intersection Level of Service

Based upon freeway operations analysis and geometric constraints, two interchange configurations were analyzed. The SPI is the selected configuration for the interchange of Pacific Coast Highway at I-710.

Table 9-6 shows the intersection LOS for Pacific Coast Highway/I-710 ramps with the SPI for Alternatives 5A and 6A, 6B and 6C. As shown in **Table 9-6**, the intersection will operate at LOS D or better for all Build alternatives with the exception to Alternative 6B during the midday peak hour.

Figures 9-7, 9-14, 9-23 and 9-33 show the intersection peak hour turning movement volumes and lane geometrics for Alternatives 5A, 6A, 6B and 6C, respectively. **Figures 9-49, 9-56, 9-64, and 9-73** graphically displays the LOS designations for the morning and evening peak hours, and depicts those intersections projected to operate at LOS E or F with a larger red dot for Alternatives 5A, 6A, 6B, and 6C, respectively.

Table 9-6
Pacific Coast Highway 2035 Intersection Level of Service

Peak Hour Level of Service (LOS) Analysis (i)						
PCH/I-710 Interchange	AM		PM		MD	
	Delay (ii)	LOS	Delay	LOS	Delay	LOS
<i>Alternative 1</i>						
PCH / I-710 Ramps (Node #205)	N/A	N/A	N/A	N/A	N/A	N/A
<i>Alternative 5A</i>						
PCH / I-710 Ramps (Node #205)	34.2	C	23.3	C	45.8	D
<i>Alternative 6A</i>						
PCH / I-710 Ramps (Node #205)	36.8	D	22.1	C	48.1	D
<i>Alternative 6B</i>						
PCH / I-710 Ramps (Node #205)	40.9	D	21.9	C	57.0	E
<i>Alternative 6C</i>						
PCH / I-710 Ramps (Node #205)	40.1	D	21.0	C	52.5	D

Notes:

(i) Based on Highway Capacity Manual (HCM) 2000.

(ii) Average Intersection Delay (seconds/vehicle).

Shaded and bold cells indicate LOS E or F.

9.3.2 Queuing Analysis

This section evaluates projected queuing for 2035 Build Alternatives 5A, 6A, 6B and 6C conditions at Pacific Coast Highway/I-710 for the SPI configuration. **Table 9-7** shows the 2035 predicted maximum queue lengths in feet by approach movement compared to the storage provided in the 2035 Build configurations.

As shown in **Table 9-7** and **Table 9-8**, adequate storage is provided at all locations for the 2035 Build conditions with the recommended interchange and geometric configuration, except at the following:

- Eastbound Pacific Coast Highway to I-710 northbound (Alt 5A, Alt 6A, Alt 6B, and Alt 6C).

Table 9-7
Pacific Coast Highway 2035 Intersection Queuing Analysis

Direction	Location	Min Req'd SL ALT 5A	Min Req'd SL ALT 6A	Min Req'd SL ALT 6B	Min Req'd SL ALT 6C	Provided SL ALT 5A, 6A, 6B & 6C
WB PCH	NB I-710 on-ramp	404' *	404' *	422' *	412'	1 lane @ 550'
WB PCH	SB I-710 on-ramp	20'	19'	19'	26'	1 lane @ 1050' & 1 lane @ 350'
EB PCH	NB I-710 on-ramp	457'	476'	517'	519'	2 lanes @ 425'
EB PCH	SB I-710 on-ramp	116' **	169' **	156' **	144' **	1 lane @ 450'
NB I-710	WB PCH off-ramp	91'	97'	98'	97'	1 lane @ 1280' & 1 lane @ 620'
NB I-710	EB PCH off-ramp	N/A	N/A	N/A	N/A	N/A
SB I-710	WB PCH off-ramp	N/A	N/A	N/A	N/A	N/A
SB I-710	EB PCH off-ramp	258'	292'	308'	258'	1 lane @ 1850' & 1 lane @ 750'

Notes:

Shaded cells indicate insufficient storage.

* Based on WB PCH through queue length

** Based on EB PCH through queue length

SL – Storage Length

The 95th percentile queue calculations are projected to exceed the storage provided at that location. These over-capacity conditions will likely result in vehicles “spilling out” into the through lanes and possibly into the adjacent intersections causing increased congestion and poor operating conditions at the ramps and on Pacific Coast Highway. **Table 9-8** indicates that the storage provided on all on-ramps with proposed ramp metering for 2035 Build Alternatives 5A, and 6A, 6B and 6C are adequate using suggested meter rates between 240 vph/lane and 900 vph/lane at 1 car per green and 480 vph/lane and 1200 vph/lane at 2 cars per green.

**Table 9-8
Pacific Coast Highway 2035 Ramp Queuing Analysis**

Direction	Location	Min Req'd SL ALT 5A	Min Req'd SL ALT 6A	Min Req'd SL ALT 6B	Min Req'd SL ALT 6C	Provided SL ALT 5A, 6A, 6B & 6C
NB I-710	PCH on-ramp	1050' @ 1010 vph/lane*	1050' @ 1000 vph/lane*	1050' @ 1040 vph/lane*	1050' @ 1055 vph/lane*	2 lanes @ 1090'
NB I-710	PCH on-ramp	1050' @ 1010 vph/lane*	1050' @ 1000 vph/lane*	1050' @ 1040 vph/lane*	1050' @ 1055 vph/lane*	2 lanes @ 1090'

Notes:

* Meter rate at 2 cars per green

SL – Storage Length

9.4 WILLOW STREET INTERCHANGE

Willow Street is a four-lane, east-west street traversing the cities of Wilmington and Long Beach. The existing interchange configuration is a four-quadrant cloverleaf with free right turn movements to and from the local street. As part of the interchange analysis, the following intersection was analyzed:

- Willow Street at I-710 ramps

The recommended geometric configurations for each Alternative are described as follows:

Local Arterials and Streets

- Willow Street will be reconstructed to two through lanes in the eastbound direction and three through lanes in the westbound direction between Fashion Avenue and the Los Angeles River.
- The Willow Street Overcrossing will carry two through lanes and two left turn lanes in the eastbound direction and carry three through lanes and two left turn lanes in the westbound direction. The section also includes right turn lanes entering and exiting the freeway ramps.
- The Willow Street bridge over the Los Angeles River will be widened to accommodate the turning movements to and from the I-710 ramps.
- To ensure adequate traffic operation at the interchange, access control is needed along Willow Street. Therefore, cul-de-sacs are featured on Fashion Avenue. Residents along Fashion Avenue will gain access to Willow Street via Easy Avenue.
- Truck traffic is restricted by the City of Long Beach on Willow Street in the existing condition and will be restricted in the proposed condition.
- On-street parking is allowed on Willow St in the westbound and the eastbound direction between Fashion Avenue and Santa Fe Avenue in the existing condition. On-street parking will be prohibited on Willow Street in the westbound and the eastbound direction between Fashion Avenue and Easy Avenue in the proposed condition.

I-710 Ramps

- The existing four-quadrant cloverleaf configuration will be replaced by an SPI configuration.
- The existing on-ramps will be replaced by metered multi-lane on-ramps.
- The existing southbound off-ramp will be replaced by a two-lane off-ramp.

9.4.1 Intersection Level of Service

Based upon freeway operations analysis and geometric constraints, a modified SPI configuration was evaluated for Willow Street at I-710. The modified SPI configuration consists of two through lanes in the eastbound direction and three in the westbound direction of Willow Street.

Table 9-9 shows the intersection LOS for the Willow Street I-710 Ramps with the modified SPI configuration for Alternatives 5A, 6A, 6B and 6C respectively. As illustrated in the table, the intersection operates at LOS D or better for all Build alternatives, except at the following:

- Willow Street / I-710 Ramps during PM peak hour.

Table 9-9
Willow Street 2035 Intersection Level of Service

Peak Hour Level of Service (LOS) Analysis (i)						
Willow/I-710 Interchange	AM		PM		MD	
	Delay (ii)	LOS	Delay	LOS	Delay	LOS
<i>Alternative 1</i>						
Willow / I-710 Ramps (Node #208)	N/A	N/A	N/A	N/A	N/A	N/A
<i>Alternative 5A</i>						
Willow / I-710 Ramps (Node #208)	34.0	C	64.2	E	36.5	D
<i>Alternative 6A</i>						
Willow / I-710 Ramps (Node #208)	35.3	D	68.5	E	36.2	D
<i>Alternative 6B</i>						
Willow / I-710 Ramps (Node #208)	34.7	C	67.7	E	35.7	D
<i>Alternative 6C</i>						
Willow / I-710 Ramps (Node #208)	36.4	D	73.2	E	37.4	D

Notes:

(i) Based on Highway Capacity Manual (HCM) 2000.

(ii) Average Intersection Delay (seconds/vehicle).

Shaded and bold cells indicate LOS E or F.

Figures 9-8, 9-15, 9-24 and 9-34 show the intersection peak hour turning movement volumes and lane geometrics for Alternatives 5A, 6A, 6B and 6C, respectively. **Figures 9-50, 9-57, 9-65, and 9-74** graphically displays the LOS designations for the morning and evening peak hours, and depicts those intersections projected to operate at LOS E or F with a larger red dot for Alternatives 5A, 6A, 6B, and 6C, respectively.

9.4.2 Queuing Analysis

This section evaluates projected queuing for 2035 Build Alternatives 5A, 6A, 6B and 6C at Willow Street I-710 for the modified SPI configuration. **Table 9-10** shows the 2035 predicted maximum queue lengths in feet by approach movement compared to the storage provided in the 2035 Build configurations. As shown in **Table 9-10**, the storage is adequate for the projected 95th percentile queue calculations.

Table 9-10
Willow Street 2035 Intersection Queuing Analysis

Direction	Location	Min Req'd SL ALT 5A	Min Req'd SL ALT 6A	Min Req'd SL ALT 6B	Min Req'd SL ALT 6C	Provided SL ALT 5A, 6A, 6B & 6C
WB Willow St	NB 710 on-ramp	555*	447*	442*	418*	1 lane @ 700'
WB Willow St	SB 710 on-ramp	240'	259'	254'	242'	2 lanes @ 300'
EB Willow St	NB 710 on-ramp	445'	329'	320'	375'	1 lane @ 475' & 1 lane @ 150'
EB Willow St	SB 710 on-ramp	315**	308**	323**	308**	1 lane @ 330'
NB 710	WB Willow St off-ramp	65'	113'	115'	192'	1 lane @ 1100' & 1 lane @ 500'
NB 710	EB Willow St off-ramp	65'	N/A	N/A	N/A	1 lane @ 500'
SB 710	WB Willow St off-ramp	435'	N/A	N/A	N/A	1 lane @ 1000'
SB 710	EB Willow St off-ramp	435'	651'	661'	690'	1 lane @ 1000' & 1 lane @ 375'

Notes:

* Based on WB Willow St through queue length

** Based on EB Willow St through queue length

SL – Storage Length

Table 9-11 indicates that the storage provided on all on-ramps with proposed ramp metering for the 2035 Build Alternatives 5A, 6A, 6B and 6C are adequate using suggested meter rates between 240 vph/lane and 900 vph/lane.

Table 9-11
Willow Street 2035 Ramp Queuing Analysis

Direction	Location	Min Req'd SL ALT 5A	Min Req'd SL ALT 6A	Min Req'd SL ALT 6B	Min Req'd SL ALT 6C	Provided SL ALT 5A, 6A, 6B &
NB 710	Willow St on-ramp	900' @ 735 vph/lane	900' @ 685 vph/lane	900' @ 690 vph/lane	900' @ 695 vph/lane	2 lanes @ 950'
SB 710	Willow St on-ramp	600' @ 560 Vph/lane	600' @ 560 Vph/lane	600' @ 560 Vph/lane	600' @ 565 Vph/lane	2 lanes @ 700'

Notes: SL – Storage Length

9.5 DEL AMO BOULEVARD INTERCHANGE

Del Amo Boulevard is a six-lane, east-west street traversing the cities of Carson and Lakewood. The existing interchange configuration is a modified 3-quadrant cloverleaf with free right turn movements to and from the local street. The SB I-710 ramp currently exits directly to the

Susana Road intersection. The westbound Del Amo Boulevard to southbound entrance ramp originates at the Susana Road intersection. As part of the interchange analysis, the following intersections were analyzed:

- Del Amo Boulevard at I-710 ramps
- Del Amo Boulevard at Susana Road

The recommended geometric configurations for each Alternative are described as follows:

Local Arterials and Streets

- Del Amo Boulevard will be reconstructed to three through lanes in each direction between Compton Creek and the LA River.
- The section through the Del Amo Boulevard undercrossing will carry three through lanes and two left turn lanes in each direction. The section also includes right turn lanes entering and exiting the freeway ramps. The number of lanes and left turn storage ensure adequate intersection operation.
- The Del Amo Boulevard bridge over the LA River will be widened to accommodate the additional lanes and turning movements to and from the I-710 ramps.
- To ensure adequate traffic operation at the interchange, the intersection with Susana Road is relocated to the west.
- Modifications west of Susana Road, across the Compton Creek bridge, are limited to restriping and resurfacing. To create left turn storage, the existing median will be removed.

Susana Road

- Approximately 1,500' of Susana Road will be realigned and reconstructed to two lanes in each direction from Del Amo Boulevard to the north.
- The new intersection with Del Amo Boulevard will be 420' west of the existing intersection. The intersection location is needed to ensure adequate traffic operation at the intersection and the adjacent freeway ramp intersection.
- The Susana Road cul-de-sac on the south side of Del Amo Boulevard will be closed.

I-710 Ramps

- The existing modified 3-quadrant cloverleaf configuration will be replaced by an SPI configuration.
- The existing on-ramps will be replaced by metered multi-lane on-ramps.
- The existing off-ramps will be replaced by two-lane off-ramps.

9.5.1 Intersection Level of Service

Table 9-12 shows the intersection LOS for Del Amo Boulevard the I-710 Ramps and the Susana Road intersections with the SPI configuration for Alternatives 5A, 6A, 6B and 6C, respectively. As illustrated in the table, Del Amo Boulevard/I-710 Ramps and Del Amo

Boulevard/ Susana Road intersections are expected to operate at LOS D or better during all three peak hours under all Build alternatives.

Table 9-12
Del Amo Boulevard 2035 Intersection Level of Service

Peak Hour Level of Service (LOS) Analysis (i)						
Del Amo/I-710 Interchange	AM		PM		MD	
	Delay (ii)	LOS	Delay	LOS	Delay	LOS
<i>Alternative 1</i>						
I-710 SB off-ramp/Susana (Node #111)	15.8	B	10.9	B	13.7	B
Del Amo / Susana (Node #161)	76.2	E	65.3	E	53.9	D
<i>Alternative 5A</i>						
Del Amo / I-710 Ramps (Node #211)	21.3	C	21.6	C	25.7	C
Del Amo / Susana (Node #161)	45.9	D	16.2	B	19.5	B
<i>Alternative 6A</i>						
Del Amo / I-710 Ramps (Node #211)	23.4	C	20.5	C	29.6	C
Del Amo / Susana (Node #161)	41.3	D	17.5	B	19.6	B
<i>Alternative 6B</i>						
Del Amo / I-710 Ramps (Node #211)	23.2	C	20.4	C	29.7	C
Del Amo / Susana (Node #161)	41.3	D	17.5	B	19.1	B
<i>Alternative 6C</i>						
Del Amo / I-710 Ramps (Node #211)	22.6	C	19.7	B	28.6	C
Del Amo / Susana (Node #161)	39.2	D	17.6	B	19.4	B

Notes:

(i) Based on Highway Capacity Manual (HCM) 2000.

(ii) Average Intersection Delay (seconds/vehicle).

Shaded and bold cells indicate LOS E or F.

Figures 9-2, 9-9, 9-16, 9-25, 9-35 show the intersection peak hour turning movement volumes and lane geometrics for each Alternative. **Figures 9-43, 9-50, 9-57, 9-65, and 9-74** graphically displays the LOS designations for the morning and evening peak hours, and depicts those intersections projected to operate at LOS E or F with a larger red dot for each Alternative.

9.5.2 Queuing Analysis

This section evaluates projected queuing for the Alternatives 5A, 6A, 6B and 6C condition at Del Amo Boulevard and I-710. **Table 9-13** and **Table 9-14** show the 2035 predicted maximum queue lengths in feet by approach movement compared to the storage provided in the 2035 Build configurations at Del Amo Boulevard and at Susana Road, respectively.

As shown in the tables, adequate storage is provided at all locations for all 2035 Build conditions with the recommended interchange and geometric configurations, except at the following:

- Westbound Del Amo Boulevard through at Susana Road (Alt 5A, 6A, 6B and 6C)

- Eastbound Del Amo Boulevard to northbound Susana Road (Alt 5A, and Alt 6B)

The 95th percentile queue calculations are projected to exceed the storage provided at these locations. The westbound through length is constrained by the distance between the intersections along Del Amo Boulevard at Susana Road and the I-710 ramps. The eastbound Del Amo Boulevard onto Susana Road storage length is limited by another turn pocket required for the westbound Del Amo Boulevard left turn at the adjacent signal to the west. These over-capacity conditions will likely result in vehicles “spilling out” into the through lanes and possibly into the adjacent intersections causing increased congestion and poor operating conditions on Del Amo Boulevard.

Table 9-13
Del Amo Boulevard 2035 Intersection Queuing Analysis

Direction	Location	Min Req'd SL ALT 5A	Min Req'd SL ALT 6A	Min Req'd SL ALT 6B	Min Req'd SL ALT 6C	Provided SL ALT 5A, 6A, 6B & 6C
WB Del Amo Blvd	NB I-710 on-ramp	167'*	163'*	165'*	156'*	1 lane @ 540'
WB Del Amo Blvd	SB I-710 on-ramp	163'	176'	172'	177'	2 lanes @ 465'
EB Del Amo Blvd	NB I-710 on-ramp	205'	227'	227'	221'	2 lanes @ 315'
EB Del Amo Blvd	SB I-710 on-ramp	177'**	170'**	168'**	165'**	1 lane @ 180'
NB I-710	WB Del Amo Blvd off-ramp	202'	219'	213'	211'	1 lane @ 860' & 1 lane @ 1380'
NB I-710	EB Del Amo Blvd off-ramp	N/A	N/A	N/A	N/A	N/A
SB I-710	WB Del Amo Blvd off-ramp	N/A	N/A	N/A	N/A	N/A
SB I-710	EB Del Amo Blvd off-ramp	137'	218'	222'	215'	1 lane @ 880' & 1 lane @ 1395'

Notes:

* Based on WB Del Amo Blvd through queue length

** Based on EB Del Amo Blvd through queue length

SL – Storage Length

Table 9-14
Susana Road 2035 Intersection Queuing Analysis

Direction	Location	Min Req'd SL ALT 5A	Min Req'd SL ALT 6A	Min Req'd SL ALT 6B	Min Req'd SL ALT 6C	Provided SL ALT 5A, 6A, 6B & 6C
WB Del Amo Blvd	NB Susana Rd	74'	49'	137'	128'	1 lane @ 400'
WB Del Amo Blvd	Susana Rd	937'	976'	1163'	1131'	3 lanes @ 575'
EB Del Amo Blvd	NB Susana Rd	346'	296'	403'	296'	1 lane @ 300'
SB Susana Rd	WB Del Amo Blvd	114'	91'	86'	86'	1 lane @ 1145'
SB Susana Rd	EB Del Amo Blvd	329'	309'	226'	231'	2 lane @ 1145'

Notes:

Shaded cells indicate insufficient storage.

SL – Storage Length

Table 9-15 indicates that the storage provided on all on-ramps with proposed ramp metering for the 2035 Build Alternatives 5A and 6A, 6B and 6C are adequate using suggested meter rates between 240 vph/lane and 900 vph/lane.

**Table 9-15
Del Amo Boulevard 2035 Ramp Queuing Analysis**

Direction	Location	Min Req'd SL ALT 5A	Min Req'd SL ALT 6A	Min Req'd SL ALT 6B	Min Req'd SL ALT 6C	Provided SL ALT 5A, 6A, 6B &
NB I-710	Del Amo Blvd on-ramp	1050' @ 585 vph/lane	1050' @ 530 vph/lane	1050' @ 535 vph/lane	1050' @ 535 vph/lane	2 lanes @ 1065'
SB I-710	Del Amo Blvd on-ramp	600' @ 600 vph/lane	600' @ 590 vph/lane	600' @ 590 vph/lane	600' @ 615 vph/lane	2 lanes @ 630'

Notes:

SL – Storage Length

9.6 LONG BEACH BOULEVARD INTERCHANGE

Long Beach Boulevard is a four-lane, north-south street traversing the cities of Compton and Lakewood. The existing interchange configuration is a one-quadrant cloverleaf. As part of the interchange analysis, the following intersections were analyzed:

- Long Beach Boulevard at I-710 NB ramps
- Long Beach Boulevard at I-710 SB ramps

The recommended geometric configurations for each Alternative are described as follows:

Local Arterials and Streets

- Long Beach Boulevard will be reconstructed to two through lanes in each direction, throughout the improved section.
- The southbound loop off-ramp terminus will provide a free right lane onto Long Beach Boulevard eastbound, introducing a third lane that continues across the I-710 structure and the LA River bridge before merging into the second through lane.
- A left turn lane is introduced in the northbound direction on Long Beach Boulevard just south of the LA River bridge approaching the northbound I-710 on-ramp.
- The overcrossing and street modifications accommodate dual left-turn lanes between the Long Beach Boulevard northbound ramp intersection and Victoria Street.

I-710 Ramps

- The existing one-quadrant cloverleaf configuration will be modified. The southbound to westbound off-ramp will be removed. The southbound loop will be widened to carry both the westbound and eastbound traffic.
- The existing on-ramps will be replaced by metered multi-lane on-ramps.
- The existing southbound off-ramp will be replaced by a two-lane off-ramp.

- The existing northbound single lane off-ramp will be realigned and replaced.

9.6.1 Intersection Level of Service

Figures 9-2, 9-9, 9-16, 9-25, and 9-35 at the end of this section, show the intersection peak hour turning movement volumes and lane geometrics for Alternative 1, 5A, 6A, 6B and 6C, respectively. **Figures 9-43, 9-50, 9-57, 9-65, and 9-74** graphically displays the LOS designations for the morning and evening peak hours, and depicts those intersections projected to operate at LOS E or F with a larger red dot for each Alternative. **Table 9-16** shows the intersection LOS for Long Beach Boulevard at the I-710 NB and SB ramps for each Build alternative. As illustrated in the table, the intersections will operate at LOS D or better for all Build alternatives with the exception of the Long Beach Boulevard I-710 NB ramp, which is forecast to operate at LOS F under Alternative 6C during the morning peak hour.

Table 9-16
Long Beach Boulevard 2035 Intersection Level of Service

Peak Hour Level of Service (LOS) Analysis (i)						
Long Beach/I-710 Interchange	AM		PM		MD	
	Delay (ii)	LOS	Delay	LOS	Delay	LOS
<i>Alternative 1</i>						
Long Beach / I-710 NB Ramps (Node #112)	36.8	D	31.1	C	18.2	B
Long Beach / I-710 SB Ramps (Node #113)	26.9	C	11.0	B	10.6	B
<i>Alternative 5A</i>						
Long Beach / I-710 NB Ramps (Node #112)	40.4	D	27.6	C	22.2	C
Long Beach / I-710 SB Ramps (Node #113)	19.1	B	10.7	B	11.5	B
<i>Alternative 6A</i>						
Long Beach / I-710 NB Ramps (Node #112)	53.5	D	31.0	C	19.4	B
Long Beach / I-710 SB Ramps (Node #113)	21.9	C	12.5	B	17.0	B
<i>Alternative 6B</i>						
Long Beach / I-710 NB Ramps (Node #112)	49.5	D	28.8	C	19.6	B
Long Beach / I-710 SB Ramps (Node #113)	20.5	C	12.1	B	16.1	B
<i>Alternative 6C</i>						
Long Beach / I-710 NB Ramps (Node #112)	94.1	F	38.5	D	34.1	C
Long Beach / I-710 SB Ramps (Node #113)	21.9	C	12.9	B	19.8	B

Notes:

(i) Based on Highway Capacity Manual (HCM) 2000.

(ii) Average Intersection Delay (seconds/vehicle).

Shaded and bold cells indicate LOS E or F.

9.6.2 Queuing Analysis

This section evaluates projected queuing for 2035 Build Alternatives 5A, 6A, 6B and 6C condition at Long Beach Boulevard and I-710.

Table 9-17 shows the 2035 predicted maximum queue lengths in feet by approach movement compared to the storage provided in the 2035 Build configurations, except at the following:

- Eastbound Long Beach Boulevard at I-710 NB Ramp (Alt 6A and Alt 6C)

Table 9-18 indicates that the storage provided on all on-ramps with the proposed ramp metering for the 2035 Build Alternatives 5A, 6A, 6B and 6C are adequate using suggested meter rates between 240 vph/lane and 900 vph/lane.

Table 9-17
Long Beach Boulevard 2035 Intersection Queuing Analysis

Direction	Location	Min Req'd SL ALT 5A	Min Req'd SL ALT 6A	Min Req'd SL ALT 6B	Min Req'd SL ALT 6C	Provided SL ALT 5A, 6A, 6B &
WB Long Beach Blvd	SB I-710 on-ramp	258'	241'	241'	220'	2 lanes @ 1800'
WB Long Beach Blvd	NB I-710 on-ramp	61'	495'	270'	551'	2 lanes @ 1800'
EB Long Beach Blvd	NB I-710 on-ramp	185'	476'	212'	372'	2 lanes @ 300'
EB Long Beach Blvd	SB I-710 on-ramp	64'	367'	367'	370'	2 lanes @ 400'
NB I-710	WB Long Beach Blvd off-ramp	197'	284'	184'	433'	1 lane @ 1400'
NB I-710	EB Long Beach Blvd off-ramp	76'	37'	46'	71'	1 lane @ 1400'
SB I-710	WB Long Beach Blvd off-ramp	231'	240'	240'	240'	1 lane @ 250' & 1 lane @ 1350'
SB I-710	EB Long Beach Blvd off-ramp	N/A	N/A	N/A	N/A	N/A

Notes:
SL – Storage Length

Table 9-18
Long Beach Boulevard 2035 Ramp Queuing Analysis

Direction	Location	Min Req'd SL ALT 5A	Min Req'd SL ALT 6A	Min Req'd SL ALT 6B	Min Req'd SL ALT 6C	Provided SL ALT 5A, 6A, 6B &
NB I-710	Long Beach Blvd on-ramp	1500' @ 300 vph/lane	1500' @ 320 vph/lane	1500' @ 320 vph/lane	1500' @ 325 vph/lane	2 lanes @ 1520'
SB I-710	Long Beach Blvd on-ramp	600' @ 365 vph/lane	600' @ 330 vph/lane	600' @ 325 vph/lane	600' @ 340 vph/lane	2 lanes @ 700'

Notes:
SL – Storage Length

9.7 ARTESIA BOULEVARD INTERCHANGE

Artesia Boulevard is a four-lane, east-west street traversing the cities of Compton and Paramount. The existing interchange configuration is a half diamond. As part of the interchange analysis, the following intersections were analyzed:

- Artesia Boulevard at I-710 NB ramps;

- Artesia Boulevard at I-710 SB ramps.

The recommended geometric configurations for each Alternative are described as follows:

Alternative 5A, 6A, 6B and 6C Configuration

- The existing ramps will remain and will be modified to accommodate freeway widening. The northbound off-ramp serves both the Artesia Boulevard and the NB I-710 to EB SR-91 connector as it does in the existing configuration. Additionally, the southbound on-ramp merges in a non-standard gore with the EB SR-91 to SB I-710 connector alongside Coolidge Park. Because of the park, sufficient right-of-way is not available to provide a standard gore.

9.7.1 Intersection Level of Service

Table 9-19 shows the intersection LOS for Artesia Boulevard at the I-710 NB and SB ramps for each Alternative. As the table illustrates, the intersections operate at LOS C or better for all Build alternatives. In addition, it shows the LOS improved for the Build alternatives, which previously showed LOS E or F during the AM and PM peak hours for both I-710 northbound and southbound ramps. Under all Build alternatives, the intersections resulted in LOS C or better and the overall intersection LOS and delay improved as compared to Alternative 1 No Build.

Table 9-19
Artesia Boulevard 2035 Intersection Level of Service

Peak Hour Level of Service (LOS) Analysis (i)						
Artesia/I-710 Interchange	AM		PM		MD	
	Delay (ii)	LOS	Delay	LOS	Delay	LOS
<i>Alternative 1</i>						
Artesia / NB I-710 Ramps (Node #114)	29.8	C	120.6	F	19.2	B
Artesia / SB I-710 Ramps (Unsignalized – Node #115)	48.5	E	63.5	E	10.6	B
<i>Alternative 5A</i>						
Artesia / NB I-710 Ramps (Node #114)	7.9	A	13.5	B	5.3	A
Artesia / SB I-710 Ramps (Unsignalized – Node #115)	33.5	C	27.3	C	11.8	B
<i>Alternative 6A</i>						
Artesia / NB I-710 Ramps (Node #114)	7.7	A	12.0	B	4.7	A
Artesia / SB I-710 Ramps (Unsignalized – Node #115)	15.7	C	19	C	10.3	B
<i>Alternative 6B</i>						
Artesia / NB I-710 Ramps (Node #114)	7.1	A	12.3	B	4.7	A
Artesia / SB I-710 Ramps (Unsignalized – Node #115)	15	B	19.3	C	10.3	B
<i>Alternative 6C</i>						
Artesia / NB I-710 Ramps (Node #114)	7.8	A	14.9	B	5.3	A
Artesia / SB I-710 Ramps (Unsignalized)	14.6	B	18.1	C	10.4	B

Notes:

(i) Based on Highway Capacity Manual (HCM) 2000.

(ii) Average Intersection Delay (seconds/vehicle).

Shaded and bold cells indicate LOS E or F.

Figures 9-2, 9-9, 9-16, 9-25, and 9-35 show the intersection peak hour turning movement volumes and lane geometrics for Alternatives 1, 5A, 6A, 6B and 6C, respectively. **Figures 9-43, 9-50, 9-57, 9-65, and 9-74** graphically displays the LOS designations for the morning and evening peak hours, and depicts those intersections projected to operate at LOS E or F with a larger red dot for Alternatives 1, 5A, 6A, 6B and 6C, respectively.

9.7.2 Queuing Analysis

This section evaluates projected queuing for 2035 Build Alternatives 5A, 6A, 6B and 6C conditions at Artesia Boulevard and I-710. **Table 9-20** shows the 2035 predicted maximum queue lengths in feet by approach movement compared to the storage provided in the 2035 Build configurations.

As shown in the table, adequate storage is provided at all locations for all 2035 Build conditions with the recommended interchange and geometric configurations.

Table 9-21 also indicates that the storage provided on NB I-710 Artesia on-ramp with proposed ramp metering for the 2035 Build Alternatives 5A, 6A, 6B and 6C are adequate using suggested meter rates between 240 vph/lane and 900 vph/lane.

Table 9-20
Artesia Boulevard 2035 Intersection Queuing Analysis

Direction	Location	Min Req'd SL ALT 5A	Min Req'd SL ALT 6A	Min Req'd SL ALT 6B	Min Req'd SL ALT 6C	Provided SL ALT 5A, 6A, 6B &
NB I-710	WB Artesia Blvd off-ramp	65'	72'	65'	44'	1 lane @ 325'
NB I-710	EB Artesia Blvd off- ramp	196'	160'	170'	212'	1 lane @ 325'

Notes: SL – Storage Length

Table 9-21
Artesia Boulevard 2035 Ramp Queuing Analysis

Direction	Location	Min Req'd SL ALT 5A	Min Req'd SL ALT 6A	Min Req'd SL ALT 6B	Min Req'd SL ALT 6C	Provided SL ALT 5A, 6A, 6B &
SB I-710	Artesia Blvd on-ramp	150' @ 725 vph/lane	150' @ 350 vph/lane	150' @ 350 vph/lane	150' @ 365 vph/lane	2 lanes @ 170'

Notes: SL – Storage Length

9.8 ALONDRA BOULEVARD INTERCHANGE

Alondra Boulevard is a four-lane, east-west street traversing the cities of Compton and Paramount. The existing interchange configuration is a partial cloverleaf/tight diamond. As part of the interchange analysis, the following existing intersections were analyzed under the 2035 No Build conditions:

- Alondra Boulevard at I-710 NB ramps
- Alondra Boulevard at I-710 SB ramps

Based on the required interchange (SPI) design, the following intersection was analyzed under the 2035 Build conditions.

- Alondra Boulevard at I-710 ramps

The recommended geometric configurations for each Alternative are described as follows:

Local Arterials and Streets

- Alondra Boulevard will be reconstructed to three through lanes in each direction between Atlantic Avenue and the second Dominguez High School entrance, east of the LA River.
- Alondra Boulevard requires realignment across the I-710 and LA River to accommodate a low skew angle for a SPI. This realignment necessitates a new structure across the LA River as well as off-street improvements east of the river to maintain access to surrounding parcels.
- Frailey Avenue and Lime Avenue require cul-de-sacs, eliminating access to Alondra Boulevard in close proximity to either the SPI.

I-710 Ramps

- The existing partial cloverleaf/tight diamond configuration at Alondra Boulevard is proposed to be replaced with a SPI. This configuration improves traffic operations and safety over the existing interchange's tight curves, narrow lanes, and non-standard deceleration lengths.
- Providing sufficient deceleration lengths and distances for a vertical profile, in combination with the widened mainline, pushes the southbound off-ramp into the adjacent residential street, Gibson Avenue. Gibson Avenue is pulled back to a cul-de-sac, which may, through the use of long driveways, continue to offer access to most of the properties along this block. However, the southernmost residences along Gibson Avenue are either directly affected by the ramp or will become inaccessible after construction.
- The Alondra Boulevard southbound on-ramp is braided over the SB I-710 to EB SR-91 connector directly south of Alondra Boulevard. The ramp then continues over Atlantic Avenue before joining the mainline.
- The northbound off-ramp to Alondra Boulevard will now exit within the SR-91 interchange, braiding with both connectors from the SR-91. The ramp passes beneath each connector, as well as beneath Atlantic Avenue where it climbs to cross the LA River, before rising to meet the Alondra Boulevard interchange.
- Alondra Boulevard requires realignment across the I-710 and LA River to ensure a low degree of skew required for a SPI. This realignment necessitates a new structure across the LA River as well as off-street improvements east of the river to maintain access to surrounding parcels.

9.8.1 Intersection Level of Service

Table 9-22 shows the intersection LOS for Alondra Boulevard at I-710 ramps for each Alternative based upon the recommended geometric configuration as described in the previous section. As illustrated in the table, the intersections operate at a LOS C or better for all Build alternatives. In addition, it shows the LOS is improved for all 2035 Build alternatives during all peak hours compared to the “No Build” Alternative 1.

Table 9-22
Alondra Boulevard 2035 Intersection Level of Service

Peak Hour Level of Service (LOS) Analysis (i)						
Alondra/I-710 Interchange	AM		PM		MD	
	Delay (ii)	LOS	Delay	LOS	Delay	LOS
<i>Alternative 1</i>						
Alondra / NB I-710 Ramps (Signalized – Node #116)	18.7	B	38.7	D	22.8	C
Alondra / SB I-710 Ramps (Unsignalized – Node #117)	22.9	C	19.5	C	17.8	C
<i>Alternative 5A</i>						
Alondra / NB I-710 Ramps (Signalized – Node #213)	15.4	B	20.9	C	19.2	B
<i>Alternative 6A</i>						
Alondra / NB I-710 Ramps (Signalized – Node #213)	16.8	B	20.5	C	19.4	B
<i>Alternative 6B</i>						
Alondra / NB I-710 Ramps (Signalized – Node #213)	16.9	B	20.6	C	19.9	B
<i>Alternative 6C</i>						
Alondra / NB I-710 Ramps (Signalized – Node #213)	17.0	B	20.4	C	20.0	B

Notes:

(i) Based on Highway Capacity Manual (HCM) 2000.

(ii) Average Intersection Delay (seconds/vehicle).

Figures 9-3, 9-10, 9-17, 9-26, and 9-36 show the intersection peak hour turning movement volumes and lane geometrics for Alternatives 1, 5A, 6A, 6B and 6C, respectively. It should be noted that the individual node numbers coincide with each respective Figure/Alternative. **Figures 9-44, 9-51, 9-58, 9-66, and 9-75** graphically displays the LOS designations for the morning and evening peak hours, and depicts those intersections projected to operate at LOS E or F with a larger red dot for Alternatives 1, 5A, 6A, 6B and 6C, respectively.

9.8.2 Queuing Analysis

This section evaluates projected queuing for 2035 Build Alternatives 5A, 6A, 6B, and 6C condition at Alondra Boulevard and I-710. **Table 9-23** shows the 2035 predicted maximum queue lengths in feet by approach movement compared to the storage provided in the 2035 Build configurations.

Adequate storage is provided at all locations for all 2035 Build conditions with the recommended interchange and geometric configurations.

Table 9-24 also indicates that the storage provided on all on-ramps with the proposed ramp metering for the 2035 Build Alternatives (5A, 6A, 6B and 6C) are adequate using suggested meter rates between 240 vph/lane and 900 vph/lane.

It must be noted that the NB I-710 off-ramp to eastbound Alondra Boulevard and SB I-710 off-ramp to westbound Alondra Boulevard are right turn movements analyzed as yield controlled. Therefore, these movements do not have reported queues and are denoted as not applicable (N/A).

Table 9-23
Alondra Boulevard 2035 Intersection Queuing Analysis

Direction	Location	Min Req'd SL ALT 5A	Min Req'd SL ALT 6A	Min Req'd SL ALT 6B	Min Req'd SL ALT 6C	Provided SL ALT 5A, 6A, 6B &
WB Alondra Blvd	NB I-710 on-ramp	145'*	142' *	141' *	138' *	1 lane @ 175'
WB Alondra Blvd	SB I-710 on-ramp	119'	127'	121'	138'	2 lanes @ 250'
EB Alondra Blvd	NB I-710 on-ramp	70'	87'	86'	87'	2 lanes @ 250'
EB Alondra Blvd	SB I-710 on-ramp	231'**	243' **	242' **	223' **	1 lane @ 243'
NB I-710	WB Alondra Blvd off-ramp	64'	61'	61'	58'	2 lanes @ 2450'
NB I-710	EB Alondra Blvd off-ramp	N/A	N/A	N/A	N/A	N/A
SB I-710	WB Alondra Blvd off-ramp	N/A	N/A	N/A	N/A	N/A
SB I-710	EB Alondra Blvd off-ramp	162'	215'	225'	223'	2 lanes @ 740'

Notes:

* Based on WB Alondra Blvd through queue length

** Based on EB Alondra Blvd through queue length

N/A – Not Applicable

SL – Storage Length

Table 9-24
Alondra Boulevard 2035 Ramp Queuing Analysis

Direction	Location	Min Req'd SL ALT 5A	Min Req'd SL ALT 6A	Min Req'd SL ALT 6B	Min Req'd SL ALT 6C	Provided SL ALT 5A, 6A, 6B &
NB I-710	Alondra Blvd on-ramp	600' @ 360 vph/lane	600' @ 380 vph/lane	600' @ 380 vph/lane	600' @ 370 vph/lane	2 lanes @ 680'
SB I-710	Alondra Blvd on-ramp	1200' @ 400 vph/lane	1200' @ 345 vph/lane	1200' @ 345 vph/lane	1200' @ 335 vph/lane	2 lanes @ 1350'

Notes:

SL – Storage Length

9.9 ROSECRANS AVENUE INTERCHANGE

Rosecrans Avenue features a six lane overcrossing and a six lane bridge spanning the LA River. The existing interchange configuration is a partial cloverleaf with free right turn

movements from the local street. As part of the interchange analysis, the following intersections were analyzed:

- Rosecrans Avenue at I-710 NB ramps
- Rosecrans Avenue at I-710 SB ramps

The recommended geometric configurations for each Alternative are described as follows:

Local Arterials and Streets

- Rosecrans Avenue will be reconstructed to two through lanes in each direction between the I-710 and Gibson Avenue.
- East of Gibson Avenue, a dedicated ramp lane is added for the southbound I-710 on-ramp for improved operations.
- A third through lane on eastbound Rosecrans Avenue will be added immediately east of the intersection of Rosecrans Avenue and the southbound I-710 off-ramp.
- The Rosecrans Avenue overcrossing will carry two through lanes and one on-ramp lane in each direction.
- The existing Rosecrans Avenue bridge over the LA River will require no structure modifications. Pavement delineation will be modified to match improvements to the west.

I-710 Ramps

- The existing partial cloverleaf configuration is retained. Due to the mainline shift and widening, the interchange is reconstructed with a new overcrossing and new ramps.
- The reconstructed on-ramps are metered multi-lane on-ramps similar to the existing on-ramps. The northbound direct on-ramp is a single lane on-ramp.
- The two northbound on-ramps merge and form a single two-lane ramp braid with I-105. This will eliminate weaving with the connector from the northbound I-710 to the I-105 freeway. The on-ramp passes beneath a new structure for the I-105 connector and parallels the I-710 on a separate alignment. The new ramp alignment passes beneath three existing connector structures, the I-105 separation structure, and one reconstructed connector structure. The ramp merges as a single lane at the same location as the existing merge.
- The northbound off-ramp maintains the lane configuration of the existing off-ramp, diverging from the I-710 as a one-lane ramp and widening to three lanes before intersecting with Rosecrans Avenue.
- The new southbound off-ramp diverges at the same location as the existing ramp. The existing two-lane collector-distributor (CD) road alignment shared by the MLK Boulevard on-ramp is maintained. The Rosecrans Avenue off-ramp splits off the CD road and passes below the entrance connector from the I-105. The off-ramp widens to three

lanes approaching the ramp termini. A slip ramp from the I-105 connector also merges with the off-ramp 700 feet ahead of the intersection.

9.9.1 Intersection Level of Service

Table 9-25 shows the intersection LOS for Rosecrans Avenue at I-710 ramps for each Alternative. As illustrated in the table, the intersections operate at LOS D or better for all Build alternatives.

Table 9-25
Rosecrans Avenue 2035 Intersection Level of Service

Peak Hour Level of Service (LOS) Analysis (i)						
Rosecrans/I-710 Interchange	AM		PM		MD	
	Delay (ii)	LOS	Delay	LOS	Delay	LOS
<i>Alternative 1</i>						
Rosecrans / I-710 NB Ramps (Node #118)	13.6	B	14.4	B	10.8	B
Rosecrans / I-710 SB Ramps (Node #119)	13.0	B	17.1	B	8.6	A
<i>Alternative 5A</i>						
Rosecrans / I-710 NB Ramps (Node #118)	10.3	B	12.9	B	8.2	A
Rosecrans / I-710 SB Ramps (Node #119)	9.6	A	21.2	C	5.8	A
<i>Alternative 6A</i>						
Rosecrans / I-710 NB Ramps (Node #118)	9.0	A	11.9	B	8.1	A
Rosecrans / I-710 NB Ramps (Node #119)	11.0	B	22.6	C	9.8	A
<i>Alternative 6B</i>						
Rosecrans / I-710 NB Ramps (Node #118)	9.0	A	11.9	B	7.8	A
Rosecrans / I-710 SB Ramps (Node #119)	11.0	B	23.2	C	8.2	A
<i>Alternative 6C</i>						
Rosecrans / I-710 NB Ramps (Node #118)	9.1	A	11.0	B	7.5	A
Rosecrans / I-710 SB Ramps (Node #119)	11.0	B	46.0	D	8.2	A

Notes:

(i) Based on Highway Capacity Manual (HCM) 2000.

(ii) Average Intersection Delay (seconds/vehicle).

Figures 9-3, 9-10, 9-17, 9-26, and 9-36 show the intersection peak hour turning movement volumes and lane geometrics for Alternatives 5A, 6A, 6B and 6C respectively. **Figures 9-44, 9-51, 9-58, 9-66, and 9-75** graphically displays the LOS designations for the morning and evening peak hours, and depicts those intersections projected to operate at LOS E or F with a larger red dot for Alternatives 1, 5A, 6A, 6B and 6C, respectively.

9.9.2 Queuing Analysis

This section evaluates projected queuing for 2035 Build Alternatives 5A, 6A, 6B and 6C conditions at Rosecrans Avenue and I-710. **Table 9-26** show the 2035 predicted maximum queue lengths in feet by approach movement compared to the storage provided in the 2035 Build configurations.

Adequate storage is provided at all locations for the 2035 Build conditions with the recommended interchange and geometric configurations, except at the following:

- Westbound Rosecrans Avenue to SB I-710 on-ramp (Alt 5A, Alt 6A, Alt 6B, and Alt 6C)

Table 9-26
Rosecrans Avenue 2035 Intersection Queuing Analysis

Direction	Location	Min Req'd SL ALT 5A	Min Req'd SL ALT 6A	Min Req'd SL ALT 6B	Min Req'd SL ALT 6C	Provided SL ALT 5A, 6A, 6B & 6C
WB Rosecrans Ave	NB I-710 on-ramp	183'*	120' *	119' *	120' *	N/A
WB Rosecrans Ave	SB I-710 on-ramp	720'	572'	579'	694'	1 lane @ 550'
EB Rosecrans Ave	NB I-710 on-ramp	46'	125' **	125' **	121' **	1 lane @ 550'
EB Rosecrans Ave	SB I-710 on-ramp	475'**	239'	242'	195'	2 lanes @ 700'
NB I-710	WB Rosecrans Ave off-ramp	182'	167'	170'	137'	2 lanes @ 700'
NB I-710	EB Rosecrans Ave off-ramp	< 700'	< 700'	< 700'	< 700'	1 lane @ 700'
SB I-710	WB Rosecrans Ave off-ramp	696'	357'	361'	393'	1 lane @ > 700'
SB I-710	EB Rosecrans Ave off-ramp	51'	106'	106'	119'	1 lane @ 700' 1 lane @ 1300'

Notes:

* Based on WB Rosecrans Ave through queue length

** Based on EB Rosecrans Ave through queue length

SL – Storage Length

Table 9-27 also indicates that the storage provided on all on-ramps with proposed ramp metering for the 2035 Build Alternatives 5A, 6A, 6B and 6C are adequate using suggested meter rates between 240 vph/lane and 900 vph/lane.

Table 9-27
Rosecrans Avenue 2035 Ramp Queuing Analysis

Direction	Location	Min Req'd SL ALT 5A	Min Req'd SL ALT 6A	Min Req'd SL ALT 6B	Min Req'd SL ALT 6C	Provided SL ALT 5A, 6A, 6B & 6C
NB I-710	Rosecrans Ave on-ramp	600' @ 240 vph/lane	750' @ 240 vph/lane	750' @ 240 vph/lane	450' @ 240 vph/lane	2 lanes @ 2710'
SB I-710	WB Rosecrans Ave on-ramp	< 1180' @ 240 vph/lane	< 1180' @ 240 vph/lane	1050' @ 330 vph/lane	1050' @ 335 vph/lane	2 lanes @ 1180'
SB I-710	EB Rosecrans Ave on-ramp	1050' @ 395 vph/lane	1050' @ 335 vph/lane	< 1180' @ 240 vph/lane	< 1180' @ 240 vph/lane	2 lanes @ 1200'

Notes:

SL – Storage Length

9.10 IMPERIAL HIGHWAY INTERCHANGE

Imperial Highway features a six lane overcrossing and bridge spanning the LA River. The existing interchange configuration is a modified four-quadrant cloverleaf with free right turn movements to and from the local street. The southbound ramp exit to westbound Abbott Road and terminates at the Wright Road intersection. As part of the interchange analysis, the following intersections were analyzed:

- Imperial Highway at I-710 ramps
- Imperial Highway at Wright Road
- Wright Road at Abbott Road

The recommended geometric configurations for each Alternative are described as follows:

Local Arterials and Streets

- Imperial Highway will be reconstructed to provide three through lanes in each direction between Wright Road and the LA River. A dedicated right turn lane is added on westbound Imperial Highway at Wright Road.
- Between Atlantic Avenue and Wright Road, restriping eliminates existing parking to provide a third through lane, but existing sidewalks will remain.
- The overcrossing will carry three through lanes in each direction, along with two left turn lanes.
- The Imperial Highway bridge over the LA River will be widened to accommodate ramp turn lanes.
- The northbound approach of the Imperial Highway and Wright Road intersection will be converted to allow only right-turn traffic.

I-710 Ramps

- The existing modified four-quadrant cloverleaf configuration will be replaced by a SPI. This conversion, along with the mainline shift and widening, requires that the interchange be entirely reconstructed with a new overcrossing and new ramps. The location of the existing southbound direct off-ramp at Wright Road will be eliminated.
- The existing on-ramps will be replaced by metered multi-lane on-ramps.
- The existing pair of northbound off-ramps will be replaced by a single multi-lane off-ramp. The new ramp will diverge from the I-710 as a two-lane ramp, widening to three lanes before intersecting with Imperial Highway.
- The existing pair of southbound Imperial Highway off-ramps will be replaced by a multi-lane off-ramp. The new off-ramp will serve both Imperial Highway and Martin Luther King Jr. Boulevard. It will diverge from the freeway as a two-lane ramp with the outside right lane as a choice lane for the Martin Luther King Jr. Boulevard and Imperial Highway. After the split, the Imperial Highway/Wright Road ramp would provide two left

turn lanes to access EB Imperial Highway and one free right turn to access WB Imperial Highway.

- The existing Wright Road & I-710 southbound off-ramp (Abbott Road) intersection will operate as a three legged (T) intersection because of the relocated off-ramp location.

9.10.1 Intersection Level of Service

Table 9-28 shows the intersection LOS for Imperial Highway at I-710 ramps for each Build alternative. As illustrated in the table, the intersection of Imperial Highway at Wright Road is forecast to operate at LOS E or F during all three peak analysis hours under No Build conditions. Under Alternative 5A, the aforementioned intersection is forecast to operate at LOS C or better, while under Alternatives 6A, 6B, and 6C the intersection is forecast to operate at LOS E or F during the evening peak hour. In addition, the intersection of Wright Road at Abbott Road is forecast to operate at LOS A during all peak analysis hours for all Build alternatives.

Table 9-28
Imperial Highway 2035 Intersection Level of Service

Peak Hour Level of Service (LOS) Analysis (i)						
Imperial/I-710 Interchange	AM		PM		MD	
	Delay (ii)	LOS	Delay	LOS	Delay	LOS
<i>Alternative 1</i>						
Imperial /I-710 Ramps (SPI) (Node #216)	--	--	--	--	--	--
Wright Road /Abbott Road/SB I-710 Off-Ramp (Node #120)	19.1	B	30.6	C	17.9	B
Imperial / Wright Road (Node #214)	198.5	F	190.2	F	58.8	E
<i>Alternative 5A</i>						
Imperial /I-710 Ramps (SPI) (Node #216)	26.9	C	37.1	D	34.7	C
Wright Road / Abbott Road (Node #120)	6.9	A	5.7	A	4.8	A
Imperial / Wright Road (Node #214)	30.5	C	25.5	C	19.5	B
<i>Alternative 6A</i>						
Imperial /I-710 Ramps (SPI) (Node #216)	28.3	C	28.5	C	33.4	C
Wright Road / Abbott Road(Node #120)	7.9	A	5.9	A	5.0	A
Imperial / Wright Road (Node #214)	52.7	D	78.3	E	51.2	D
<i>Alternative 6B</i>						
Imperial /I-710 Ramps (SPI) (Node #216)	28.3	C	32.2	C	34.8	C
Wright Road / Abbott Road(Node #120)	7.9	A	7.1	A	5.4	A
Imperial / Wright Road (Node #214)	52.3	D	78.5	E	34.9	C
<i>Alternative 6C</i>						
Imperial /I-710 Ramps (SPI) (Node #216)	28.9	C	28.1	C	33.4	C
Wright Road / Abbott Road(Node #120)	7.9	A	6.0	A	5.0	A
Imperial / Wright Road (Node #214)	52.3	D	91.7	F	49.2	D

Notes:

(i) Based on Highway Capacity Manual (HCM) 2000.

(ii) Average Intersection Delay (seconds/vehicle).

Shaded and bold cells indicate LOS E or F.

Figures 9-4, 9-11, 9-18, 9-19, 9-27, 9-28, 9-37 and 9-38 show the intersection peak hour turning movement volumes and lane geometrics for Alternatives 1, 5A, 6A, 6B and 6C respectively. **Figures 9-45, 9-52, 9-59, 9-67, and 9-76** graphically displays the LOS designations for the morning and evening peak hours, and depicts those intersections projected to operate at LOS E or F with a larger red dot for Alternatives 1, 5A, 6A, 6B and 6C, respectively.

9.10.2 Queuing Analysis

This section evaluates the projected queuing for 2035 Build Alternatives 5A, 6A, 6B and 6C conditions at Imperial Highway and I-710. **Table 9-29** and **Table 9-30** show the 2035 predicted maximum queue lengths in feet by approach movement as compared to the storage provided in the 2035 Build configurations, along Imperial Highway and Wright Road respectively.

Adequate storage is provided at all locations for all 2035 Build conditions with the recommended interchange and geometric configurations, except at the following:

- Eastbound Imperial Highway to I-710 northbound (Alt 5A)

Table 9-31 also indicates that the storage provided on all on-ramps with proposed ramp metering for the 2035 Build alternatives are adequate using suggested meter rates between 480 vph/lane and 1200 vph/lane at 2 cars per green.

Table 9-29
Imperial Highway 2035 Intersection Queuing Analysis

Direction	Location	Min Req'd SL ALT 5A	Min Req'd SL ALT 6A	Min Req'd SL ALT 6B	Min Req'd SL ALT 6C	Provided SL ALT 5A, 6A, 6B & 6C
WB Imperial Hwy	NB I-710 on-ramp	211'*	172' *	174' *	178' *	1 lane @ 800'
EB Imperial Hwy	SB I-710 on-ramp	358'**	235' **	238' **	232' **	1 lane @ 450'
WB Imperial Hwy	SB I-710 on-ramp	278'	268'	268'	279'	2 lanes @ 315'
EB Imperial Hwy	NB I-710 on-ramp	343'	170'	160'	170'	2 lanes @ 325'
NB I-710	WB Imperial Hwy off-ramp	381'	363'	359'	330'	1 lane @ 1500' & 1 lane @ 1000'
NB I-710	EB Imperial Hwy off-ramp	NA	N/A	N/A	N/A	N/A
SB I-710	WB Imperial Hwy off-ramp	NA	N/A	N/A	N/A	N/A
SB I-710	EB Imperial Hwy off-ramp	124'	105'	106'	110'	1 lane @ 1500' & 1 lane @ 900'

Notes:

* Based on WB Imperial Highway through queue length

** Based on EB Imperial Highway through queue length

Shaded cells indicate insufficient storage; SL – Storage Length

N/A – Not Applicable

Table 9-30
Wright Road 2035 Intersection Queuing Analysis

Direction	Location	Min Req'd SL ALT 5A	Min Req'd SL ALT 6A	Min Req'd SL ALT 6B	Min Req'd SL ALT 6C	Provided SL ALT 5A, 6A, 6B & 6C
WB Imperial Hwy (R)	NB Wright Rd	55'	23'	72'	23'	1 lane @ 220'
EB Imperial Hwy (L)	NB Wright Rd	284'	334'	334'	314'	1 lane @ 350'
EB Imperial Hwy (R)	SB Duncan Ave Rd	442'	509' **	507' **	502' **	1 lane @ 725'
NB Duncan Ave (R)	EB Imperial Hwy	180'	252'	248'	248'	2 lanes @ 275'
SB Wright Rd (R)	WB Imperial Hwy	14'	14'	16'	14'	1 lane @ 200'
SB Wright Rd (L)	EB Imperial Hwy	231'	248'	246'	243'	2 lanes @ 350'
NB Wright Rd (L)	WB Abbott Rd	71'	24'	90'	24'	1 lane @ 110'

Notes:

** Based on EB Imperial Highway through queue length

Shaded cells indicate insufficient storage

SL – Storage Length

L – Left Turn

R – Right Turn

Table 9-31
Imperial Highway 2035 Ramp Queuing Analysis

Direction	Location	Min Req'd SL ALT 5A	Min Req'd SL ALT 6A	Min Req'd SL ALT 6B	Min Req'd SL ALT 6C	Provided SL ALT 5A, 6A, 6B & 6C
NB I-710	Imperial Hwy on-ramp	750' @ 630 vph/lane	750' @ 310 vph/lane	750' @ 300 vph/lane	750' @ 310 vph/lane	2 lanes @ 850'
SB I-710	Imperial Hwy on-ramp	1050' @ 790 vph/lane	1050' @ 1155 vph/lane*	1050' @ 1155 vph/lane*	1050' @ 1150 vph/lane*	2 lanes @ 1110'

Notes:

SL – Storage Length

9.11 FIRESTONE BOULEVARD INTERCHANGE

Firestone Boulevard features a six lane overcrossing and a six lane bridge spanning the LA River. The existing interchange configuration is a partial cloverleaf with free right turn movements from the local street. As part of the interchange analysis, the following intersections were analyzed:

- Firestone Boulevard at I-710 NB ramps
- Firestone Boulevard at I-710 SB ramps

The recommended geometric configurations for each Alternative are described as follows:

Local Arterials and Streets

- Firestone Boulevard will be reconstructed to three through lanes in each direction between National Avenue and the LA River.
- The Firestone Boulevard overcrossing will carry three through lanes and one dedicated right turn lane in each direction. The dedicated right turn lane and the rightmost through lane in each direction will provide access to the loop on-ramp.
- The Firestone Boulevard bridge over the LA River requires widening that will add a fourth eastbound lane to the direct southbound I-710 on-ramp.
- The dedicated right turn lane from westbound Firestone Boulevard to the direct northbound freeway on-ramp is added from National Avenue to provide additional access to the ramp. The northwest quadrant of National Avenue at Firestone Boulevard will be reconstructed to accommodate this additional lane.
- The South Gate underpass, a UPRR railroad crossing to the north of the Firestone Boulevard overcrossing, will be reconstructed to span the widened I-710. A shoofly will be built first to maintain railroad operations during the reconstruction.

I-710 Ramps

- The existing partial cloverleaf configuration will be retained. Due to the mainline shift and widening, the interchange will be entirely reconstructed with a new overcrossing and new ramps.
- The new on-ramps will be metered multi-lane on-ramps, similar to the existing on-ramps.
- The new southbound off-ramp will diverge from the I-710 as a two-lane ramp, widening to four lanes before intersecting with Firestone Boulevard.
- The new northbound off-ramp will diverge from the I-710 as a two-lane ramp and widens to four lanes before intersecting with Firestone Boulevard.

9.11.1 Intersection Level of Service

Table 9-32 shows the intersection LOS for Firestone Boulevard at I-710 ramps for Alternatives 1, 5A and 6A, 6B and 6C. As illustrated in the table, the intersections will operate at LOS D or better for all Build alternatives and also shows that the Firestone Boulevard and NB I-710 on-

ramp LOS improved to LOS D or better during the PM and MD peak hours for all Build alternatives.

Table 9-32
Firestone Boulevard 2035 Intersection Level of Service

Peak Hour Level of Service (LOS) Analysis (i)						
Firestone/I-710 Interchange	AM		PM		MD	
	Delay (ii)	LOS	Delay	LOS	Delay	LOS
<i>Alternative 1</i>						
Firestone / I-710 NB Ramps (Node #121)	13.5	B	90.5	F	70.0	E
Firestone / I-710 SB Ramps (Node #122)	13.0	B	43.4	D	14.3	B
<i>Alternative 5A</i>						
Firestone / I-710 NB Ramps (Node #121)	10.1	B	52.1	D	37.2	D
Firestone / I-710 SB Ramps (Node #122)	15.4	B	19.3	B	30.8	C
<i>Alternative 6A</i>						
Firestone / I-710 NB Ramps (Node #121)	26.9	C	24.7	C	31.7	C
Firestone / I-710 SB Ramps (Node #122)	11.7	B	19.8	B	19.7	B
<i>Alternative 6B</i>						
Firestone / I-710 NB Ramps (Node #121)	30.1	C	25.0	C	35.5	D
Firestone / I-710 SB Ramps (Node #122)	11.5	B	19.8	B	19.6	B
<i>Alternative 6C</i>						
Firestone / I-710 NB Ramps (Node #121)	26.3	C	24.8	C	32.0	C
Firestone / I-710 SB Ramps (Node #122)	11.7	B	19.9	B	19.7	B

Notes:

(i) Based on Highway Capacity Manual (HCM) 2000.

(ii) Average Intersection Delay (seconds/vehicle).

*Shaded and bold cells indicate LOS E or F.

Figures 9-4, 9-11, 9-18, 9-19, 9-27, 9-28, 9-37 and 9-38 show the intersection peak hour turning movement volumes and lane geometrics for Alternatives 1, 5A, 6A, 6B and 6C, respectively. **Figures 9-45, 9-52, 9-59, 9-67, and 9-76** graphically displays the LOS designations for the morning and evening peak hours, and depicts those intersections projected to operate at LOS E or F with a larger red dot for Alternatives 1, 5A, 6A, 6B and 6C, respectively.

9.11.2 Queuing Analysis

This section evaluates projected queuing for 2035 Build Alternatives 5A, 6A, 6B and 6C conditions at Firestone Boulevard and I-710. **Table 9-33** shows the 2035 predicted maximum queue lengths in feet by approach movement compared to the storage provided in the 2035 Build configurations.

Adequate storage is provided at all locations for all 2035 Build conditions with the recommended interchange and geometric configurations, except at the following:

- Westbound Firestone Boulevard to I-710 NB Ramp (Alt 6A, Alt 6B, and Alt 6C)

Table 9-33
Firestone Boulevard 2035 Intersection Queuing Analysis

Direction	Location	Min Req'd SL ALT 5A	Min Req'd SL ALT 6A	Min Req'd SL ALT 6B	Min Req'd SL ALT 6C	Provided SL ALT 5A, 6A, 6B &
WB Firestone Blvd	NB I-710 on-ramp	126'	572'	554'	561'	1 lane @ 250'
WB Firestone Blvd	SB I-710 on-ramp	113'	225'	218'	220'	1 lane @ 600'
EB Firestone Blvd	NB I-710 on-ramp	176'	518'	529'	550'	1 lane @ 550'
EB Firestone Blvd	SB I-710 on-ramp	340'	357'	356'	363'	1 lane @ 500'
NB I-710	WB Firestone Blvd off-ramp	209'	319'	313'	308'	2 lanes @ 700'
NB I-710	EB Firestone Blvd off-ramp	421'	503'	513'	504'	2 lanes @ 650'
SB I-710	WB Firestone Blvd off-ramp	239'	306'	303'	301'	2 lanes @ 570'
SB I-710	EB Firestone Blvd off-ramp	172'	351'	351'	351'	2 lanes @ 500'

Notes:

SL – Storage Length

Table 9-34 shows that the storage provided on all on-ramps with proposed ramp metering for the 2035 Build Alternatives 5A, 6A, 6B and 6C are adequate using suggested meter rates between 240 vph/lane and 900 vph/lane.

Table 9-34
Firestone Boulevard 2035 Ramp Queuing Analysis

Direction	Location	Min Req'd SL ALT 5A	Min Req'd SL ALT 6A	Min Req'd SL ALT 6B	Min Req'd SL ALT 6C	Provided SL ALT 5A, 6A, 6B &
NB I-710	WB Firestone Blvd on-ramp	600' @ 300 vph/lane	600' @ 530 vph/lane	600' @ 525 vph/lane	600' @ 535 vph/lane	2 lane @ 650'
NB I-710	EB Firestone Blvd on-ramp	600' @ 340 vph/lane	600' @ 425 vph/lane	600' @ 420 vph/lane	600' @ 430 vph/lane	2 lanes @ 700'
SB I-710	WB Firestone Blvd on-ramp	600' @ 420 vph/lane	600' @ 370 vph/lane	600' @ 375 vph/lane	600' @ 335 vph/lane	2 lanes @ 700'
SB I-710	EB Firestone Blvd on-ramp	1050' @ 385 vph/lane	1050' @ 550 vph/lane	1050' @ 545 vph/lane	1050' @ 560 vph/lane	2 lanes @ 1080'

Notes:

SL – Storage Length

9.12 FLORENCE AVENUE INTERCHANGE

Florence Avenue features a six lane overcrossing and bridge spanning the LA River. The existing interchange configuration is a four-quadrant cloverleaf with free right turn movements to and from the local street. As part of the interchange analysis, the following intersections were analyzed:

- Florence Avenue at I-710 ramps
- Florence Avenue at Eastern Avenue

The recommended geometric configurations for each Alternative are described as follows:

Local Arterials and Streets

- Florence Avenue will be reconstructed to two through lanes in each direction from east of Walker Avenue to west side of Eastern Avenue.
- The Florence Avenue overcrossing will be replaced and carry two through lanes and two left turn lanes in each direction. The number of lanes and left turn storage are the minimum required to ensure adequate interchange operation.
- The Florence Avenue bridge over the LA River will be replaced to smooth the vertical profile and accommodate the additional lanes and turning movements to and from the I-710 ramps.

I-710 Ramps

- The existing four-quadrant configuration will be replaced by a SPI configuration.
- The existing northbound and southbound on-ramps will be replaced by metered multi-lane on-ramps.
- The existing northbound and southbound off-ramps will be replaced by two-lane off-ramps.

9.12.1 Intersection Level of Service

Table 9-35 shows the intersection LOS for Florence Avenue at I-710 ramps for each Alternative. As illustrated in the table, the intersections will operate at LOS D or better for all Build alternatives except Florence Avenue at I-710 ramp intersection during the MD peak hour under Alternative 6B.

Figures 9-4, 9-11, 9-18, 9-19, 9-27, 9-28, 9-37 and 9-38 show the intersection peak hour turning movement volumes and lane geometrics for Alternatives 1, 5A, 6A, 6B and 6C, respectively. **Figures 9-45, 9-52, 9-59, 9-67, and 9-76** graphically displays the LOS designations for the morning and evening peak hours, and depicts those intersections projected to operate at LOS E or F with a larger red dot for Alternatives 1, 5A, 6A, 6B and 6C, respectively.

Table 9-35
Florence Avenue 2035 Intersection Level of Service

Peak Hour Level of Service (LOS) Analysis (i)						
Florence/I-710 Interchange	AM		PM		MD	
	Delay (ii)	LOS	Delay	LOS	Delay	LOS
<i>Alternative 1</i>						
Florence / I-710 Ramps (Node #219)	N/A	N/A	N/A	N/A	N/A	N/A
Florence / Eastern (Node #65)	37.2	D	41.3	D	34.7	C
<i>Alternative 5A</i>						
Florence / I-710 Ramps (Node #219)	18.1	B	23.5	C	41.2	D
Florence / Eastern (Node #65)	41.0	D	41.5	D	34.4	C
<i>Alternative 6A</i>						
Florence / I-710 Ramps (Node #219)	19.6	B	26.3	C	49.8	D
Florence / Eastern (Node #65)	27.3	C	31.6	C	28.1	C
<i>Alternative 6B</i>						
Florence / I-710 Ramps (Node #219)	19.9	B	26.2	C	55.6	E
Florence / Eastern (Node #65)	27.0	C	31.6	C	27.6	C
<i>Alternative 6C</i>						
Florence / I-710 Ramps (Node #219)	19.2	B	26.5	C	53.1	D
Florence / Eastern (Node #65)	29.0	C	31.9	C	28.3	C

Notes:

(i) Based on Highway Capacity Manual (HCM) 2000.

(ii) Average Intersection Delay (seconds/vehicle).

Shaded and bold cells indicate LOS E or F.

9.12.2 Queuing Analysis

This section evaluates projected queuing for 2035 Build Alternatives 5A, 6A, 6B and 6C conditions at Florence Avenue and I-710. **Table 9-36** shows the 2035 predicted maximum queue lengths in feet by approach movement as compared to the storage provided in the 2035 Build configurations.

Adequate storage is provided at all locations for all 2035 Build conditions with the recommended interchange and geometric configurations, except at the following:

- Eastbound Florence Avenue to I-710 southbound (Alt 5A)

Table 9-37 indicates that the storage provided on all on-ramps with proposed ramp metering for the 2035 Build Alternatives 5A and 6A, 6B and 6C are adequate using suggested meter rates between 240 vph/lane and 900 vph/lane.

Table 9-36
Florence Avenue 2035 Intersection Queuing Analysis

Direction	Location	Min Req'd SL ALT 5A	Min Req'd SL ALT 6A	Min Req'd SL ALT 6B	Min Req'd SL ALT 6C	Provided SL ALT 5A, 6A, 6B & 6C
WB Florence Ave	NB I-710 on-ramp	73'	111' *	112' *	75' *	1 lane @ 300'
WB Florence Ave	SB I-710 on-ramp	224'	255'	380'	351'	2 lanes @ 300'
EB Florence Ave	NB I-710 on-ramp	177'	115'	119'	119	2 lanes @ 300'
EB Florence Ave	SB I-710 on-ramp	676' **	488' **	508' **	512' **	1 lane @ 600'
NB I-710	WB Florence Ave off-ramp	245'	308'	309'	303'	1 lane @ 1100' 1 lane @600'
NB I-710	EB Florence Ave off-ramp	N/A	N/A	N/A	N/A	N/A
SB I-710	WB Florence Ave off-ramp	N/A	N/A	N/A	N/A	N/A
SB I-710	EB Florence Ave off-ramp	153'	134'	134'	136'	1 lane @ 1200' & 1 lane @ 600'

Notes:

* Based on WB Florence Avenue through queue length

** Based on EB Florence Avenue through queue length

Shaded cells indicate insufficient storage.

SL – Storage Length

Table 9-37
Florence Avenue 2035 Ramp Queuing Analysis

Direction	Location	Min Req'd SL ALT 5A	Min Req'd SL ALT 6A	Min Req'd SL ALT 6B	Min Req'd SL ALT 6C	Provided SL ALT 5A, 6A, 6B &
NB I-710	Florence Ave on- ramp	750' @ 435 vph/lane	750' @ 335 vph/lane	750' @ 335 vph/lane	750' @ 335 vph/lane	2 lanes @ 900'
SB I-710	Florence Ave on- ramp	1050' @ 485	1050' @ 550	1050' @ 550	1050' @ 545	2 lanes @ 1150'

Notes:

NA – Not Applicable

SL – Storage Length

9.13 SLAUSON AVENUE INTERCHANGE

Slauson Avenue currently features a four lane overcrossing without ramp connections to I-710 and a four lane bridge spanning the LA River. However, the recommended interchange configuration is a SPI. As part of the interchange analysis, the following intersections were analyzed:

- Slauson Avenue at I-710 ramps

The recommended geometric configurations for each Alternative are described as follows:

Local Arterials and Streets

- Slauson Avenue will be reconstructed to three through lanes in each direction from District Boulevard to 1,000' east of the eastern edge of the existing Caltrans right of way. The reconstructed section will join the existing section approaching Eastern Avenue.
- The Slauson Avenue overcrossing will be replaced and carry three through lanes and two left turn lanes in each direction. The number of lanes and left turn storage are the minimum required to ensure adequate interchange operation.
- The Slauson Avenue bridge over the LA River will be replaced. The horizontal and vertical geometric requirements and additional turning lanes associated with the SPI configuration necessitate replacement of the bridge.

I-710 Ramps

- Slauson will serve as a new connection to I-710 and will feature a SPI configuration. The existing Slauson Avenue overcrossing will be replaced.
- The northbound and southbound on-ramps will be metered multi-lane on-ramps.
- The northbound off-ramp will be a single lane off-ramp.
- The southbound off-ramp will be a two-lane off-ramp.

9.13.1 Intersection Level of Service

Table 9-38 shows the intersection LOS for Slauson Avenue at I-710 ramps for each Alternatives. As illustrated in the table, the intersection will operate at LOS D or better for the Build alternatives.

Figures 9-12, 9-20, 9-21, 9-29, 9-30, 9-31, 9-39 and **9-40** show the intersection peak hour turning movement volumes and lane geometrics including the design options for Alternatives 5A, 6A, 6B and 6C, respectively. **Figures 9-53, 9-60, 9-61, 9-68, 9-69, 9-70, 9-77, and 9-78** graphically displays the LOS designations including design options for the morning and evening peak hours, and depicts those intersections projected to operate at LOS E or F with a larger red dot for Alternatives 5A, 6A, 6B and 6C, respectively.

Table 9-38
Slauson Avenue 2035 Intersection Level of Service

Peak hour Level of Service (LOS) Analysis (i)						
Slauson/I-710 Interchange	AM		PM		MD	
	Delay (ii)	LOS	Delay	LOS	Delay	LOS
<i>Alternative 1</i>						
Slauson / I-710 Ramps (Node #222)	N/A	N/A	N/A	N/A	N/A	N/A
<i>Alternative 5A</i>						
Slauson / I-710 Ramps (Node #222)	35.1	D	40.8	D	34.1	C
<i>Alternative 6A (SPI) – Design Option 1&2</i>						
Slauson / I-710 Ramps (Node #222)	33.0	C	38.8	D	31.7	C
<i>Alternative 6B (SPI) – Design Option 1&2</i>						
Slauson / I-710 Ramps (Node #222)	33.4	C	40.4	D	31.7	C
<i>Alternative 6B (SPI) – Design Option 3</i>						
Slauson / I-710 Ramps (Node #222)	34.0	C	42.3	D	32.0	C
<i>Alternative 6C (SPI) – Design Option 1&2</i>						
Slauson / I-710 Ramps (Node #222)	32.9	C	37.9	D	31.6	C

Notes:

(i) Based on Highway Capacity Manual (HCM) 2000.

(ii) Average Intersection Delay (seconds/vehicle).

Shaded and bold cells indicate LOS E or F.

9.13.2 Queuing Analysis

This section evaluates projected queuing for 2035 Build Alternatives 5A, 6A, 6B and 6C conditions at Slauson Avenue and I-710. **Table 9-30** shows the 2035 predicted maximum queue lengths in feet by approach movement compared to the storage provided in the 2035 Build configurations.

Adequate storage is provided at all locations for all 2035 Build conditions with the recommended interchange and geometric configurations, except at the following:

- Eastbound Slauson Avenue to I-710 southbound (Alt 5A; Alt 6A, Alt 6B, and Alt 6C Design Options 1 & 2; Alt 6B Design Option 3)
- Westbound Slauson Avenue to I-710 southbound (Alt 6C Design Options 1 & 2)

Table 9-40 indicates that the storage provided on all on-ramps with proposed ramp metering for the 2035 Build Alternatives 5A and 6A, 6B and 6C are adequate using suggested meter rates between 480 vph/lane and 1200 vph/lane for 2 cars per green.

Table 9-39
Slauson Avenue 2035 Intersection Queuing Analysis

Direction	Location	Min Req'd SL ALT 5A	Min Req'd SL ALT 6A	Min Req'd SL ALT 6B	Min Req'd SL ALT 6C	Provided SL ALT 5A, 6A, 6B & 6C
Alternative 5A						
WB Slauson Ave	NB I-710 on-ramp	167'*	(See Design Options below)			1 lane @ 250'
WB Slauson Ave	SB I-710 on-ramp	242'				2 lanes @ 280'
EB Slauson Ave	NB I-710 on-ramp	383'				1 lane @ 820'& 1 lane @ 200'
EB Slauson Ave	SB I-710 on-ramp	403'**				1 lane @ 240'
NB I-710	WB Slauson Ave off-ramp	158'				2 lanes @ 950'
NB I-710	EB Slauson Ave off-ramp	N/A				N/A
SB I-710	WB Slauson Ave off-ramp	N/A				N/A
SB I-710	EB Slauson Ave off-ramp	404'				1 lane @ 820'& 1 lane @ 1500'
Alternative 6A, 6B and 6C - Design Option 1						
WB Slauson Ave	NB I-710 on-ramp	N/A	210'	212'	206'	1 lane @ 250'
WB Slauson Ave	SB I-710 on-ramp	N/A	272'	217'	281'	2 lanes @ 280'
EB Slauson Ave	NB I-710 on-ramp	N/A	300'	300'	308'	1 lane @ 820'& 1 lane @ 200'
EB Slauson Ave	SB I-710 on-ramp	N/A	490'	447'	434'	1 lane @ 240'
NB I-710	WB Slauson Ave off-ramp	N/A	388'	401'	379'	2 lanes @ 950'
NB I-710	EB Slauson Ave off-ramp	N/A	N/A	N/A	N/A	N/A
SB I-710	WB Slauson Ave off-ramp	N/A	N/A	N/A	N/A	N/A
SB I-710	EB Slauson Ave off-ramp	N/A	154'	154'	158'	1 lane @ 820'& 1 lane @ 1500'
Alternative 6A, 6B and 6C - Design Option 2						
WB Slauson Ave	NB I-710 on-ramp	N/A	210'	212'	206'	1 lane @ 250'
WB Slauson Ave	SB I-710 on-ramp	N/A	272'	217'	281'	2 lanes @ 280'
EB Slauson Ave	NB I-710 on-ramp	N/A	300'	300'	308'	1 lane @ 820'& 1 lane @ 200'
EB Slauson Ave	SB I-710 on-ramp	N/A	490'	447'	434'	1 lane @ 240'
NB I-710	WB Slauson Ave off-ramp	N/A	388'	401'	379'	2 lanes @ 950'
NB I-710	EB Slauson Ave off-ramp	N/A	N/A	N/A	N/A	N/A
SB I-710	WB Slauson Ave off-ramp	N/A	N/A	N/A	N/A	N/A
SB I-710	EB Slauson Ave off-ramp	N/A	154'	154'	158'	1 lane @ 820'& 1 lane @ 1500'
Alternative 6B - Design Option 3						
WB Slauson Ave	NB I-710 on-ramp	N/A	N/A	225'*	N/A	1 lane @ 250'
WB Slauson Ave	SB I-710 on-ramp	N/A	N/A	170'	N/A	2 lanes @ 280'
EB Slauson Ave	NB I-710 on-ramp	N/A	N/A	331'	N/A	1 lane @ 820'& 1 lane @ 200'
EB Slauson Ave	SB I-710 on-ramp	N/A	N/A	391'**	N/A	1 lane @ 240'
NB I-710	WB Slauson Ave off-ramp	N/A	N/A	530*	N/A	2 lanes @ 950'

Table 9-39
Slauson Avenue 2035 Intersection Queuing Analysis

Direction	Location	Min Req'd SL ALT 5A	Min Req'd SL ALT 6A	Min Req'd SL ALT 6B	Min Req'd SL ALT 6C	Provided SL ALT 5A, 6A, 6B & 6C
NB I-710	EB Slauson Ave off-ramp	N/A	N/A	N/A	N/A	1 lane @ 400'
SB I-710	WB Slauson Ave off-ramp	N/A	N/A	N/A	N/A	1 lane @ 1600'
SB I-710	EB Slauson Ave off-ramp	N/A	N/A	206'	N/A	1 lane @ 820' & 1 lane @ 1500'

Notes:

* Based on WB Florence Avenue through queue length

** Based on EB Florence Avenue through queue length

Shaded cells indicate insufficient storage.

SL – Storage Length

Table 9-40
Slauson Avenue 2035 Ramp Queuing Analysis

Direction	Location	Min Req'd SL ALT 5A	Min Req'd SL ALT 6A	Min Req'd SL ALT 6B	Min Req'd SL ALT 6C	Provided SL ALT 5A, 6A, 6B & 6C
<i>Alternative 5A</i>						
NB I-710	Slauson Ave on-ramp	1200' @ 660 vph/lane	N/A	N/A	N/A	2 lanes @ 1300'
SB I-710	Slauson Ave on-ramp	1050' @ 355 vph/lane	N/A	N/A	N/A	2 lanes @ 1120'
<i>Alternative 6A, 6B and 6C – Design Option 1</i>						
NB I-710	Slauson Ave on-ramp	N/A	1200' @ 415 vph/lane	1200' @ 410 vph/lane	1200' @ 415 vph/lane	2 lanes @ 1300'
SB I-710	Slauson Ave on-ramp	N/A	1050' @ 490 vph/lane	1050' @ 490 vph/lane	1050' @ 480 vph/lane	2 lanes @ 1120'
<i>Alternative 6A, 6B and 6C - Design Option 2</i>						
NB I-710	Slauson Ave on-ramp	N/A	1200' @ 415 vph/lane	1200' @ 410 vph/lane	1200' @ 415 vph/lane	2 lanes @ 1300'
SB I-710	Slauson Ave on-ramp	N/A	1050' @ 490 vph/lane	1050' @ 490 vph/lane	1050' @ 480 vph/lane	2 lanes @ 1120'
<i>Alternative 6B - Design Option 3</i>						
NB I-710	Slauson Ave on-ramp	N/A	N/A	1200' @ 440 vph/lane	N/A	2 lanes @ 1300'
SB I-710	Slauson Ave on-ramp	N/A	N/A	1050' @ 505 vph/lane	N/A	2 lanes @ 1120'

Notes:

N/A – Not Applicable; SL – Storage Length

9.14 BANDINI BOULEVARD INTERCHANGE

Bandini Boulevard currently is a six-lane underpass crossing the I-710 freeway and intersecting with Atlantic Boulevard on the east side of the I-710 freeway. The existing interchange allows

traffic to enter and exit the I-710 freeway from and to both Bandini Boulevard and Atlantic Boulevard. The I-710 northbound on-ramp is located on Atlantic Boulevard just north of Bandini Boulevard, while the southbound on-ramp is located on Atlantic Boulevard just south of Bandini Boulevard. As part of the interchange analysis, the following existing intersections were analyzed under the 2035 No Build conditions:

- Atlantic Boulevard at Bandini Boulevard (I-710 NB Ramps)
- Bandini Boulevard at I-710 SB ramps

Due to the design changes at the northern termini, the following intersections were analyzed for Design Alternatives 6A, 6B and 6C, including the Design Options:

- Atlantic Boulevard at Bandini Boulevard
- Bandini Boulevard at I-710 SB off-ramp
- Bandini Boulevard at I-710 NB ramp/26th Street
- Atlantic Boulevard at I-710 SB on-ramp
- Atlantic Boulevard at I-710 NB Loop off-ramp

Alternative 6B Option 3 only includes the first three intersections listed above for the analysis and Alternative 5A only includes the first four intersections in the analysis.

The geometric configurations are described for each Alternative as follows:

Alternatives 6A, 6B and 6C for Options 1 and 2

Local Arterials and Streets

- Bandini Boulevard will still carry three through lanes in each direction, but will be widened to accommodate exclusive left and/or right turn lanes at the I-710 southbound off-ramp, Atlantic Boulevard, and the I-710 northbound loop on-ramp/26th Street.
- Atlantic Boulevard will be realigned and reconstructed three through lanes in each direction between the LA River and the 26th Street overcrossing.

I-710 Ramps

- The existing interchange configurations will be replaced by a three-quadrant partial cloverleaf configuration to provide better and more effective access between the I-710 freeway and both Bandini Boulevard and Atlantic Boulevard.
- The existing NB off-ramp to NB Atlantic Boulevard and Bandini Boulevard will be replaced by a two-lane off-ramp connecting to the intersection of Bandini Boulevard and 26th Street.
- The existing NB loop off-ramp to SB Atlantic Boulevard and WB Bandini Boulevard will be removed and replaced by a two-lane loop off-ramp terminating only at Atlantic Boulevard.

- The existing NB on-ramp originating from the intersection of Atlantic Boulevard and Bandini Boulevard will be removed and replaced by a metered two-lane loop on-ramp originating from the intersection of Bandini Boulevard and 26th Street. A 500' distance between Atlantic Boulevard/Bandini Boulevard intersection and Bandini Boulevard/26th Street intersection is designed to provide left turn storage and help traffic operations for both intersections.
- The existing SB loop off-ramp to both Bandini Boulevard and SB Atlantic Boulevard will be replaced by a two-lane off-ramp directly connecting to Bandini Boulevard and then continuing to Atlantic Boulevard.
- Both the existing SB loop on-ramp originating from WB Atlantic Boulevard and the existing direct SB on-ramp originating from EB Atlantic Boulevard will be replaced by one metered SB two-lane on-ramp originating from a new intersection between Atlantic Boulevard and the modified SB on-ramp. A three-lane one-way segment will be constructed to connect the intersection of Bandini Boulevard and I-710 SB off-ramp to the intersection of Atlantic Boulevard and I-710 SB on-ramp that will provide access to Atlantic Boulevard for the traffic exiting from the new SB off-ramp at Bandini Boulevard.

Alternative 5A

Alternative 5A has the same geometric configuration as Alternatives 6A, 6B, and 6C described above except for the fifth bullet listed above under I-710 ramp configuration. Specifically, the existing SB loop off-ramp to both Bandini Boulevard and SB Atlantic Boulevard will be removed but the new the direct two-lane off-ramp only connecting to Atlantic Boulevard as above will not be constructed for Alternative 5A.

Alternative 6B Design Option 3

Alternative 6B Option 3 has different geometric configurations for this interchange from those described above and they are described as follows:

Local Arterials and Streets

- Bandini Boulevard will still carry three through lanes in each direction but will be widened to accommodate exclusive left and/or right turn lanes at I-710 southbound loop off-ramp, Atlantic Boulevard, and I-710 northbound loop on-ramp/26th Street.
- Atlantic Boulevard will be realigned and reconstructed between the LA River bridge and the 26th Street overcrossing. The street will carry three through lanes in each direction and include exclusive left turn and right turn lanes at Bandini Boulevard.
- For Alternative 5A only, the intersection at Sheila Avenue will be modified to accommodate the freight corridor ramp exiting to Sheila Avenue.

I-710 Ramps

- The existing atypical configuration will be replaced by a two-quadrant cloverleaf configuration to provide access between I-710 freeway and both Bandini Boulevard and Atlantic Boulevard.
- Both the existing NB off-ramp to NB Atlantic Boulevard/EB Bandini Boulevard and the existing NB loop off-ramp to SB Atlantic Boulevard/WB Bandini Boulevard will be replaced by a two-lane off-ramp terminating at the intersection of Bandini Boulevard and 26th Street.
- The existing NB on-ramp originating from the Atlantic Boulevard/Bandini Boulevard intersection will be replaced by a metered two-lane loop on-ramp originating from the intersection of Bandini Boulevard and 26th Street. A 500' distance between Atlantic Boulevard/Bandini Boulevard intersection and Bandini Boulevard/26th Street intersection is designed to provide left turn storage and help traffic operations for both intersections
- The existing SB one-lane loop off-ramp to Bandini Boulevard will be replaced by a two-lane loop off-ramp with a longer radius, terminating at a 100' distance west of the existing ramp terminus. The existing SB two-lane off-ramp to SB Atlantic Boulevard will be replaced by a one-lane off-ramp.
- The existing SB loop on-ramp originating from WB Atlantic Boulevard will be replaced by a two-lane on-ramp originating directly from Bandini Boulevard. The existing SB two-lane on-ramp originating from EB Atlantic Boulevard will be replaced by a single lane on-ramp. Both these two SB ramps will merge to a metered two-lane on-ramp.

9.14.1 Intersection Level of Service

Table 9-41 shows the intersection LOS for Bandini Boulevard at I-710 ramps for each Alternative based upon the recommended geometric configuration as described in the previous section. As illustrated in the table, the intersections operate at LOS D or better for the Build alternatives, except at the following that operates poorly at LOS E or F:

- Bandini Boulevard at I-710 NB ramps/26th Street during PM peak hour under Alt 6B Design Option 3.

Figures 9-5, 9-12, 9-20, 9-21, 9-29, 9-30, 9-31, 9-39 and 9-40 show the intersection peak hour turning movement volumes and lane geometrics for Alternatives 1, 5A 6A, 6B and 6C, respectively. **Figures 9-46, 9-53, 9-60, 9-61, 9-68, 9-69, 9-70, 9-77, and 9-78** graphically displays the LOS designations including design options for the morning and evening peak hours, and depicts those intersections projected to operate at LOS E or F with a larger red dot for Alternatives 1, 5A, 6A, 6B and 6C, respectively.

Table 9-41
Bandini Boulevard 2035 Intersection Level of Service

Bandini/I-710 Interchange	AM		PM		MD	
	Delay (ii)	LOS (i)	Delay	LOS	Delay	LOS
<i>Alternative 1</i>						
Atlantic/ Bandini (I-710 NB Ramps) (Node #74)	55.4	E	80.3	F	54.5	D
Bandini/I-710 SB Ramps (Node #124)	15.6	B	14.5	B	16.5	B
<i>Alternative 5A</i>						
Atlantic/ Bandini (Node #74)	22.8	C	21.9	C	25.1	C
Bandini/I-710 SB Ramps (Node #124)	20.6	C	33.6	C	39.2	D
Bandini/I-710 NB Ramps (26th St) (Node #224)	51.9	D	33.3	C	39.7	D
Atlantic/ Bandini (I-710 SB Ramps) (Node #274)	42.8	D	38.4	D	35.2	D
<i>Alternative 6A - Design Options 1 & 2</i>						
Atlantic/ Bandini (Node #74)	23.6	C	30.3	C	22.8	C
Bandini/I-710 SB Ramps (Node #124)	17.8	B	53.3	D	15.3	B
Bandini/I-710 NB Ramps (26th St) (Node #224)	22.4	C	25.7	C	23.3	C
Atlantic/ Bandini (I-710 SB Ramps) (Node #274)	26.8	C	16.1	B	26.4	C
Atlantic/ Bandini (I-710 NB Loop Off) (Node #374)	17.6	B	10.5	B	7.7	A
<i>Alternative 6B - Design Options 1 & 2</i>						
Atlantic/ Bandini (Node #74)	22.9	C	27.7	C	23.3	C
Bandini/I-710 SB Ramps (Node #124)	20.0	B	52.2	D	18.2	B
Bandini/I-710 NB Ramps (26th St) (Node #224)	22.2	C	25.6	C	24.0	C
Atlantic/ Bandini (I-710 SB Ramps) (Node #274)	37.4	D	16.8	B	28.7	C
Atlantic/ Bandini (I-710 NB Loop Off) (Node #374)	20.7	C	10.0	A	7.6	A
<i>Alternative 6B - Design Option 3</i>						
Atlantic/ Bandini (Node #74)	32.7	C	26.8	C	30.3	C
Bandini/I-710 SB Ramps (Node #124)	20.9	C	23.0	C	19.4	B
Bandini/I-710 NB Ramps (26th St) (Node #224)	44.5	D	73.2	E	45.3	D
<i>Alternative 6C - Design Options 1 & 2</i>						
Atlantic/ Bandini (Node #74)	28.6	C	29.0	C	23.1	C
Bandini/I-710 SB Ramps (Node #124)	12.3	B	53.7	D	15.3	B
Bandini/I-710 NB Ramps (26th St) (Node #224)	26.0	C	25.3	C	23.6	C
Atlantic/ Bandini (I-710 SB Ramps) (Node #274)	39.7	D	16.6	B	25.4	C
Atlantic/ Bandini (I-710 NB Loop Off) (Node #374)	15.4	B	10.6	B	7.8	A

Notes:

(i) Based on Highway Capacity Manual (HCM) 2000.

(ii) Average Intersection Delay (seconds/vehicle).

Shaded and bold cells indicate LOS E or F.

9.14.2 Queuing Analysis

This section evaluates projected queuing for 2035 Build Alternatives 5A, 6A, 6B and 6C condition at Bandini Boulevard/Atlantic Boulevard and I-710. **Table 9-42** shows the 2035

predicted maximum queue lengths in feet by approach movement compared to the storage provided in the 2035 Build configurations.

Adequate storage is provided at all intersection locations for all 2035 Build conditions with the recommended interchange and geometric configurations, except at the following locations:

- Westbound Bandini Boulevard to I-710 northbound (Alt 5A).
- Southbound Atlantic Boulevard (L) at Atlantic Boulevard/Bandini Boulevard Intersection (Alt 6B Design Option 3).
- Westbound Bandini Boulevard (L) to I-710 Northbound Ramp (Alt 6B for Design Option 3).
- Westbound Bandini Boulevard (R) at Atlantic Boulevard/Bandini Boulevard Intersection (Alt 6B Design Option 3).

Table 9-43 indicates that all 2035 Build configurations and design Options would have adequate ramp storage with the exception of Alternative 6B Design Option 3, the storage provided for SB I-710 Bandini Boulevard on-ramp with proposed ramp metering is not adequate using suggested meter rates between 780 vph/lane and 1380 vph/lane at 3 cars per green.

Table 9-42
Bandini Boulevard 2035 Intersection Queuing Analysis

Direction	Location	Min Req'd SL ALT 5A	Min Req'd SL ALT 6A	Min Req'd SL ALT 6B	Min Req'd SL ALT 6C	Provided SL ALT 5A, 6A, 6B & 6C
Alternative 5A						
NB Atlantic Blvd (L)	Atlantic Blvd/Bandini Blvd Int.	86'	(See Design Options below)			1 lane @ 495'
SB Atlantic Blvd (L)	Atlantic Blvd/Bandini Blvd Int.	148'				1 lane @ 200'
WB Bandini Blvd (L)	NB 710 on-ramp	483'				2 lanes @ 225'
WB Bandini Blvd (L)	Atlantic Blvd/Bandini Blvd Int.	289'				2 lanes @ 450'
WB Bandini Blvd (R)	Atlantic Blvd/Bandini Blvd Int.	62'				1 lane @ 285'
EB Bandini Blvd (L)	Atlantic Blvd/Bandini Blvd Int.	90'				1 lane @ 300'
EB Bandini Blvd (L)	26 th St/Bandini Blvd Int.	4'				1 lane @ 155'
NB I-710	WB Bandini Blvd off-ramp	452'				2 lanes @ 3400'
NB I-710	EB Bandini Blvd off-ramp	398'				1 lane @ 850'
SB I-710	WB Bandini Blvd off-ramp	172'				1 lane @ 400' 1 lane @ 1000'
SB I-710	EB Bandini Blvd off-ramp	411'				1 lane @ 400' 1 lane @ 1000'
Alternative 6A, 6B and 6C - Design Options 1 & 2						
NB Atlantic Blvd (L)	Atlantic Blvd/Bandini Blvd Int.	N/A	129'	129'	142'	1 lane @ 495'
SB Atlantic Blvd (L)	Atlantic Blvd/Bandini Blvd Int.	N/A	126'	131'	126'	2 lanes @ 275'

Table 9-42
Bandini Boulevard 2035 Intersection Queuing Analysis

Direction	Location	Min Req'd SL ALT 5A	Min Req'd SL ALT 6A	Min Req'd SL ALT 6B	Min Req'd SL ALT 6C	Provided SL ALT 5A, 6A, 6B & 6C
WB Bandini Blvd (L)	NB 710 on-ramp	N/A	136'	131'	140'	2 lanes @ 225'
WB Bandini Blvd (L)	Atlantic Blvd/Bandini Blvd Int.	N/A	216'	202'	196'	2 lanes @ 450'
WB Bandini Blvd (R)	Atlantic Blvd/Bandini Blvd Int.	N/A	110'	150'	125'	1 lane @ 285'
EB Bandini Blvd (L)	Atlantic Blvd/Bandini Blvd Int.	N/A	150'	147'	164'	1 lane @ 275'
EB Bandini Blvd (L)	26 th St/Bandini Blvd Int.	N/A	31'	32'	47'	1 lane @ 155'
NB I-710	WB Bandini Blvd off-ramp	N/A	184'	189'	184'	2 lanes @ 3400'
NB I-710	EB Bandini Blvd off-ramp	N/A	333'	274'	328'	1 lane @ 850'
SB I-710	WB Bandini Blvd off-ramp	N/A	189'	233'	99'	1 lane @ 400' 1 lane @ 1000'
SB I-710	EB Bandini Blvd off-ramp	N/A	63'	72'	40'	1 lane @ 400' 1 lane @ 1000'
<i>Alternative 6B - Design Option 3</i>						
NB Atlantic Blvd (L)	Atlantic Blvd/Bandini Blvd Int.	N/A	N/A	433'	N/A	1 lane @ 495'
SB Atlantic Blvd (L)	Atlantic Blvd/Bandini Blvd Int.	N/A	N/A	400'	N/A	2 lanes @ 275'
WB Bandini Blvd (L)	NB 710 on-ramp	N/A	N/A	321'	N/A	2 lanes @ 225'
WB Bandini Blvd (L)	Atlantic Blvd/Bandini Blvd Int.	N/A	N/A	301'	N/A	2 lanes @ 450'
WB Bandini Blvd (R)	Atlantic Blvd/Bandini Blvd Int.	N/A	N/A	307'	N/A	1 lane @ 285'
WB Bandini Blvd (L)	SB 710 on-ramp	N/A	N/A	447'	N/A	1 lane @ 500'
EB Bandini Blvd (L)	Atlantic Blvd/Bandini Blvd Int.	N/A	N/A	108'	N/A	1 lane @ 275'
EB Bandini Blvd (L)	26 th St/Bandini Blvd Int.	N/A	N/A	15'	N/A	1 lane @ 155'
NB I-710	WB Bandini Blvd off-ramp	N/A	N/A	338'	N/A	2 lanes @ 3400'
NB I-710	EB Bandini Blvd off-ramp	N/A	N/A	562'	N/A	1 lane @ 850'
SB I-710	WB Bandini Blvd off-ramp	N/A	N/A	924'	N/A	1 lane @ 400' 1 lane @ 1000'
SB I-710	EB Bandini Blvd off-ramp	N/A	N/A	17'	N/A	1 lane @ 400' 1 lane @ 1000'

Notes:

SL – Storage Length; L – Left Turn; Int. – Intersection

Table 9-43
Atlantic Boulevard and Bandini Boulevard 2035 Ramp Queuing Analysis

Direction	Location	Min Req'd SL ALT 5A	Min Req'd SL ALT 6A	Min Req'd SL ALT 6B	Min Req'd SL ALT 6C	Provided SL ALT 5A, 6A, 6B & 6C
<i>Alternative 5A</i>						
SB I-710	Atlantic Blvd on-ramp	900' @ 900 vph/lane	N/A	N/A	N/A	2 lanes @ 1000'
NB I-710	Bandini Blvd on-ramp	2100' @ 835 vph/lane	N/A	N/A	N/A	2 lanes @ 2210'
<i>Alternative 6A, 6B and 6C - Design Option 1</i>						
SB I-710	Atlantic Blvd on-ramp	N/A	2250' @ 935 vph/lane*	2250' @ 920 vph/lane*	2250' @ 985 vph/lane*	2 lanes @ 2350'
NB I-710	Bandini Blvd on-ramp	N/A	1200' @ 745 vph/lane	1200' @ 745 vph/lane	1200' @ 765 vph/lane	2 lanes @ 1300'
<i>Alternative 6A, 6B and 6C - Design Option 2</i>						
SB I-710	Atlantic Blvd on-ramp	N/A	2550' @ 925 vph/lane*	2550' @ 910 vph/lane*	2550' @ 970 vph/lane*	2 lanes @ 2600'
NB I-710	Bandini Blvd on-ramp	N/A	1200' @ 745 vph/lane	1200' @ 745 vph/lane	1200' @ 765 vph/lane	2 lanes @ 1300'
<i>Alternative 6B - Design Option 3</i>						
SB I-710	Atlantic Blvd on-ramp	N/A	N/A	600' @ 670 vph/lane	N/A	1 lane @ 700'
NB I-710	Bandini Blvd on-ramp	N/A	N/A	2250' @ 710 vph/lane	N/A	2 lanes @ 2300'
SB I-710	Bandini Blvd on-ramp	N/A	N/A	>700' @ 1380 vph/lane**	N/A	1 lane @ 700'

Notes:

Shaded cells indicate insufficient storage; ** Meter rate at 3 cars per green

SL – Storage Length

9.15 WASHINGTON BOULEVARD INTERCHANGE

Washington Boulevard is a four-lane underpass crossing the I-710 freeway. The existing interchange configuration is a two-quadrant cloverleaf. Ramp connections provide full access between Washington Boulevard and the I-710 freeway. As part of the interchange analysis, the following intersections were analyzed for both Alternatives 1 and 5A:

- Washington Boulevard at I-710 NB ramps
- Washington Boulevard at I-710 SB ramps

Due to the design changes at the northern termini, the following intersections were analyzed for Alternatives 6A, 6B and 6C Design Option 1:

- Washington Boulevard at Atlantic Boulevard
- Washington Boulevard at I-710 NB ramps
- Washington Boulevard at I-710 SB ramp
- Washington Boulevard at Freight Corridor (FC) Ramps

The Alternatives 6A, 6B, and 6C Design Option 2 only analyzed the first three intersections listed above. No intersections were analyzed for Alternative 6B Design Option 3 since the ramps at the I-710/Washington Boulevard interchange will be removed to accommodate the proposed FC ramps in and out of the rail yards.

The recommended geometric configurations for each Alternative are described as follows:

Alternative 5A

The existing northbound and southbound interchange ramps at Washington Boulevard will be modified to meet the proposed reconstruction and widening of the I-710 mainline without affecting residential properties that abut the existing Caltrans right of way.

Alternatives 6A, 6B, and 6C for Design Option 1

Local Arterials and Streets

- Washington Boulevard will be widened to three through lanes in each direction and exclusive left and/or right turn lanes at FC ramps, I-710 SB off-ramp, I-710 NB ramps, and Atlantic Boulevard.

I-710 Ramps

- The existing I-710 NB loop off-ramp will be removed and replaced by a long NB off-ramp that originates from I-710 NB mainline segment on the south side of Bandini Boulevard and directly connects to Washington Boulevard.
- The existing I-710 SB loop on-ramp will be removed and replaced by a two-lane loop on-ramp originating from Ayers Avenue at Washington Boulevard. This on-ramp is diverged to connect I-710 southbound and FC southbound respectively on the south side of Bandini Boulevard.

- A new two-lane FC northbound loop off-ramp will be constructed terminating as the southbound approach at the intersection of Ayers Avenue and Washington Boulevard. This off-ramp is designated to serve the truck traffic exiting from the northbound FC.
- The existing one-lane I-710 SB off-ramp will be widened and realigned to a two-lane SB off-ramp terminating at Washington Boulevard.

Alternatives 6A, 6B, and 6C for Design Option 2

Local Arterials and Streets

- The Washington Boulevard configuration is the same as Alternative 6A, 6B, and 6C Design Option 1.

I-710 Ramps

- The existing I-710 NB loop off-ramp will be removed. A combined three-lane NB off-ramp will be constructed to accommodate the general traffic coming from I-710 NB mainline to Atlantic/Bandini and to Washington Boulevard. After the split, the northbound FC exit ramp combines with the Washington Boulevard traffic. The I-710 NB general purpose off-ramp and FC NB off-ramp will be merged on the southeast side of the Bandini Boulevard/26th Street intersection and connect directly to Sheila Street. This four-lane off-ramp will be constructed as such that the left two lanes will be designated to serve the truck traffic exiting from the northbound FC while the right two lanes will only serve the general traffic exiting from the I-710 NB mainline segment.
- A three-lane northbound segment will be constructed to connect the four-lane off-ramp/Sheila Street intersection to Washington Boulevard/I-710 NB on-ramp intersection. All truck traffic exiting from the left two lanes of the four-lane off-ramp can only access westbound Sheila Street, while the general purpose traffic exiting from the right two lanes of the ramp can continue northbound across Sheila Street towards Washington Boulevard.
- The existing one-lane I-710 SB off-ramp will be widened and realigned to a two-lane SB off-ramp.
- The existing I-710 SB on-ramp will be removed and replaced by a two-lane SB on-ramp without impacting residential properties that abut the existing Caltrans right of way. This on-ramp will be diverged to connect I-710 mainline segment and southbound FC on the southwest side of Atlantic Boulevard/Bandini Boulevard intersection.

Alternative 6B Design Option 3

- The I-710 ramps at Washington Boulevard will be removed.
- A two-lane SB off-ramp and a I-710 NB on-ramp will be constructed to and from the rail yards.
- One lane NB FC and one lane SB FC will be constructed to and from the rail yards.
- A one lane NB FC off-ramp will be constructed which will connect with the Sheila Street.

- A two lane NB FC off-ramp to NB I-710 near Atlantic Boulevard/ Bandini Boulevard interchange will be constructed.
- A two lane SB FC on-ramp from SB I-710 near Atlantic Boulevard/ Bandini Boulevard interchange will be constructed.

9.15.1 Intersection Level of Service

Table 9-44 shows the intersection LOS for Washington Boulevard at I-710 ramps for each Alternative based on recommended geometric configuration as described in the previous section. As illustrated in the table, the intersections will operate at LOS D or better for all Build alternatives. The overall intersection LOS improved as compared to “No Build” Alternative 1.

Figures 9-5, 9-12, 9-20, 9-21, 9-29, 9-30, 9-31, 9-39, and 9-40 show the intersection peak hour turning movement volumes and lane geometrics for Alternatives 1, 5A, 6A, 6B and 6C, respectively. **Figures 9-46, 9-53, 9-60, 9-61, 9-68, 9-69, 9-70, 9-77, and 9-78** graphically displays the LOS designations including design options for the morning and evening peak hours, and depicts those intersections projected to operate at LOS E or F with a larger red dot for Alternatives 1, 5A, 6A, 6B and 6C, respectively.

9.15.2 Queuing Analysis

This section evaluates projected queuing for 2035 Build Alternatives 5A, 6A, 6B and 6C conditions at Washington Boulevard and I-710. **Table 9-45** shows the 2035 predicted maximum queue lengths in feet by approach movement compared to the storage provided in the 2035 Build configurations.

Adequate storage is provided at all locations for all 2035 Build conditions with the recommended interchange and geometric configurations, except at the following:

- Westbound Washington Boulevard to I-710 southbound ramp (Alt 5A);
- Eastbound Washington Boulevard to I-710 northbound ramp (Alt 5A);
- Eastbound Washington Boulevard to I-710 southbound ramp (Alt 5A); and
- Westbound Washington Boulevard to I-710 northbound ramp (Alt 6A, Alt 6B, and Alt 6B Design Option1 and 2).

The storage length for the westbound right turn movement at northbound I-710 on-ramp is limited to physical and geometric constraints along Washington Boulevard. The over-capacity condition will result in vehicles “spilling out” into the through lanes and possibly into the adjacent intersections causing increased congestion and poor operating conditions at westbound Washington Boulevard.

Table 9-46 indicates that the storage provided on all on-ramps with proposed ramp metering for the 2035 Build Alternatives 5A, 6A, 6B and 6C are adequate using suggested meter rates between 240 vph/lane and 900 vph/lane for one car per green.

Table 9-44
Washington Boulevard 2035 Intersection Level of Service

Washington/I-710 Interchange	AM		PM		MD	
	Delay (ii)	LOS (i)	Delay	LOS	Delay	LOS
<i>Alternative 1</i>						
Washington / I-710 NB Ramps (Node #125)	16.2	B	21.3	C	14.0	B
Washington / I-710 SB Ramps (Node #126)	20.4	C	38.8	D	72.8	E
<i>Alternative 5A</i>						
Washington / I-710 NB Ramps (Node #125)	21.7	C	27.2	C	25.8	C
Washington / I-710 SB Ramps (Node #126)	24.3	C	52.5	D	29.7	C
<i>Alternative 6A - Design Option 1</i>						
Washington / Atlantic (I-710 Ramps) (Node #78)	51.6	D	44.8	D	37.8	D
Washington / I-710 NB Ramps (Node #125)	7.6	A	12.5	B	8.6	A
Washington / I-710 SB Ramps (Node #126)	10.1	B	7.1	A	10.1	B
Washington / SB FC Ramps (Node #326)	39.3	D	37.4	D	32.4	C
<i>Alternative 6A - Design Option 2</i>						
Washington / Atlantic (I-710 Ramps) (Node #78)	54.2	D	44.6	D	39.5	D
Washington / I-710 NB Ramps (Node #125)	15.5	B	32.5	C	15.8	B
Washington / I-710 SB Ramps (Node #126)	20.0	B	21.5	C	21.9	C
<i>Alternative 6B - Design Option 1</i>						
Washington / Atlantic (I-710 Ramps) (Node #78)	53.4	D	49.3	D	45.9	D
Washington / I-710 NB Ramps (Node #125)	8.7	A	10.1	B	8.3	A
Washington / I-710 SB Ramps (Node #126)	12.7	B	6.2	A	11.2	B
Washington / SB FC Ramps (Node #326)	44.0	D	48.8	D	38.5	D
<i>Alternative 6B - Design Option 2</i>						
Washington / Atlantic (I-710 Ramps) (Node #78)	54.1	D	54.0	D	39.5	D
Washington / I-710 NB Ramps (Node #125)	18.2	B	24.7	C	20.2	C
Washington / I-710 SB Ramps (Node #126)	18.3	B	18.3	B	17.6	B
<i>Alternative 6C - Design Option 1</i>						
Washington / Atlantic (I-710 Ramps) (Node #78)	52.8	D	46.3	D	40.3	D
Washington / I-710 NB Ramps (Node #125)	8.1	A	11.5	B	8.7	A
Washington / I-710 SB Ramps (Node #126)	10.4	B	6.8	A	11.0	B
Washington / SB FC Ramps (Node #326)	33.0	C	42.4	D	31.2	C
<i>Alternative 6C - Design Option 2</i>						
Washington / Atlantic (I-710 Ramps) (Node #78)	53.2	D	44.6	D	41.5	D
Washington / I-710 NB Ramps (Node #125)	15.8	B	33.0	C	13.0	B
Washington / I-710 SB Ramps (Node #126)	20.3	C	21.8	C	18.2	B

Notes:

(i) Based on Highway Capacity Manual (HCM) 2000.

(ii) Average Intersection Delay (seconds/vehicle).

*Shaded and bold cells indicate LOS E or F.

Table 9-45
Washington Boulevard 2035 Intersection Queuing Analysis

Direction	Location	Min Req'd SL ALT 5A	Min Req'd SL ALT 6A	Min Req'd SL ALT 6B	Min Req'd SL ALT 6C	Provided SL ALT 5A, 6A, 6B &
Alternative 5A						
WB Washington Blvd (R)	NB 710 on-ramp	230'	(See Design Options below)			1 lane @ 230'
WB Washington Blvd (R)	SB 710 on-ramp	540'				1 lane @ 200'
EB Washington Blvd (L)	SB 710 on-ramp	530'				1 lane @ 125'
EB Washington Blvd (L)	NB 710 on-ramp	400'				1 lane @ 175'
NB I-710	WB Washington Blvd off-ramp	206'				1 lane @ 1000'
NB I-710	EB Washington Blvd off-ramp	158'				1 lane @ 1000'
SB I-710	WB Washington Blvd off-ramp	77'				1 lane @ 220'
SB I-710	EB Washington Blvd off-ramp	177'				1 lane @ 800'
Alternative 6A, 6B and 6C - Design Option 1						
WB Washington Blvd (R)	NB 710 on-ramp	N/A	293'	23'	0'	1 lane @ >200'
WB Washington Blvd (R)	SB 710 on-ramp	N/A	145'	393'	162'	2 lanes @ 425'
EB Washington Blvd (L)	SB 710 on-ramp	N/A	219'	219'	230'	2 lanes @ 250'
EB Washington Blvd (L)	NB 710 on-ramp	N/A	130'	129'	128'	2 lane @ 525'
NB I-710	WB Washington Blvd off-ramp	N/A	53'	57'	59'	1 lane @ 1000'
NB I-710	EB Washington Blvd off-ramp	N/A	134'	118'	148'	1 lane @ >1000'
SB I-710	WB Washington Blvd off-ramp	N/A	139'	145'	140'	2 lanes @ 600'
SB I-710	EB Washington Blvd off-ramp	N/A	226'	230'	226'	2 lanes @ 600'
Alternative 6A, 6B and 6C - Design Option 2						
WB Washington Blvd (R)	NB 710 on-ramp	N/A	213'	348'	214'	1 lane @ 200'
WB Washington Blvd (L)	SB 710 on-ramp	N/A	233'	133'	162'	2 lanes @ 350'
EB Washington Blvd (R)	SB 710 on-ramp	N/A	36'	35'	36'	2 lanes @ >500'
EB Washington Blvd (L)	NB 710 on-ramp	N/A	120'	122'	132'	2 lanes @ 400'
NB I-710	WB Washington Blvd off-ramp	N/A	148'	131'	135'	2 lanes @ 400'
NB I-710	EB Washington Blvd off-ramp	N/A	207'	219'	220'	1 lane @ 400'
SB I-710	WB Washington Blvd off-ramp	N/A	150'	156'	148'	2 lanes @ 1000'
SB I-710	EB Washington Blvd off-ramp	N/A	251'	253'	247'	2 lanes @ 1000'

Notes:

** Based on EB Washington Boulevard through queue length, Shaded cells indicate insufficient storage

NA – Not Applicable SL – Storage Length

Table 9-46
Washington Boulevard 2035 Ramp Queuing Analysis

Direction	Location	Min Req'd SL ALT 5A	Min Req'd SL ALT 6A	Min Req'd SL ALT 6B	Min Req'd SL ALT 6C	Provided SL ALT 5A, 6A, 6B &
<i>Alternative 5A</i>						
NB I-710	Washington Blvd on-ramp	600' @ 240 vph/lane	N/A	N/A	N/A	2 lanes @ 650'
SB I-710	Washington Blvd on-ramp	150' @ 450 vph/lane	N/A	N/A	N/A	2 lanes @ 160'
<i>Alternative 6A, 6B and 6C - Design Option 1</i>						
NB I-710	Washington Blvd on-ramp	N/A	750' @ 435 vph/lane	750' @ 440 vph/lane	750' @ 435 vph/lane	2 lanes @ 850'
<i>Alternative 6A, 6B and 6C - Design Option 2</i>						
NB I-710	Washington Blvd on-ramp	N/A	750' @ 520 vph/lane	750' @ 550 vph/lane	750' @ 435 vph/lane	2 lanes @ 850'
<i>Alternative 6B - Design Option 3</i>						
NB I-710	Washington Blvd on-ramp	N/A	N/A	<4800' @ 240 vph/lane	N/A	1 lane @ 4800'

Notes:
N/A – Not Applicable
SL – Storage Length

9.16 INTERCHANGES NORTH OF WASHINGTON BOULEVARD

This section presents the results of the intersection operations analysis for three (3) interchanges north of Washington Boulevard to State Route 60 from the I-5 Corridor Study along I-710. These interchanges are analyzed with existing geometric conditions for both No Build and Build alternatives. As part of the interchange analysis, the following intersections were analyzed:

- I-710 SB on-ramp at Ramona Boulevard
- I-710 SB off-ramp/Humphreys at Floral Drive
- Ford Boulevard/I-710 NB off-ramp at Olympic Boulevard

Figures 9-6, 9-13, 9-22, 9-32 and 9-41 at the end of this section, show the intersection peak hour turning movement volumes and lane geometrics for Alternatives 1, 5A, 6A, 6B and 6C respectively.

9.16.1 Intersection Level of Service

Table 9-47 shows the intersection LOS for the interchanges north of Washington Boulevard at I-710 ramps for each Alternative based on existing geometric configurations. As illustrated in the table, these intersections operate at LOS D or better for all Build alternatives. Under all Build

alternatives, the overall intersection LOS and delay was either maintained at an acceptable LOS or improved as compared to “No Build” Alternative 1.

Table 9-47
North of Washington Boulevard 2035 Intersection Level of Service

Peak Hour Level of Service (LOS) Analysis (i)						
North of Washington Boulevard	AM		PM		MD	
	Delay (ii)	LOS	Delay	LOS	Delay	LOS
<i>Alternative 1</i>						
I-710 SB on-ramp / Ramona Blvd (Node #137)	5.3	A	10.5	B	7.2	A
I-710 SB off-ramp-Humphreys Ave / Floral Dr (Node #135)	29.9	C	32.3	C	35.3	D
Ford Blvd – I-710 NB off-ramp / Olympic Blvd (Node #86)	19.6	B	54.9	D	16.5	B
<i>Alternative 5A</i>						
I-710 SB on-ramp / Ramona Blvd (Node #137)	6.0	A	11.3	B	7.6	A
I-710 SB off-ramp-Humphreys Ave / Floral Dr (Node #135)	33.0	C	32.0	C	49.2	D
Ford Blvd – I-710 NB off-ramp / Olympic Blvd (Node #86)	30.5	C	38.0	D	20.5	C
<i>Alternative 6A</i>						
I-710 SB on-ramp / Ramona Blvd (Node #137)	7.1	A	9.9	A	6.2	A
I-710 SB off-ramp-Humphreys Ave / Floral Dr (Node #135)	27.2	C	34.5	C	23.0	C
Ford Blvd – I-710 NB off-ramp / Olympic Blvd (Node #86)	21.7	C	47.0	D	19.0	B
<i>Alternative 6B</i>						
I-710 SB on-ramp / Ramona Blvd (Node #137)	6.9	A	10.4	B	6.6	A
I-710 SB off-ramp-Humphreys Ave / Floral Dr (Node #135)	27.4	C	39.3	D	23.1	C
Ford Blvd – I-710 NB off-ramp / Olympic Blvd (Node #86)	21.6	C	42.4	D	19.3	B
<i>Alternative 6C</i>						
I-710 SB on-ramp / Ramona Blvd (Node #137)	7.3	A	9.8	B	6.7	A
I-710 SB off-ramp-Humphreys Ave / Floral Dr (Node #135)	27.4	C	26.9	C	26.8	C
Ford Blvd – I-710 NB off-ramp / Olympic Blvd (Node #86)	22.6	C	48.6	D	20.1	C

Notes:

(i) Based on Highway Capacity Manual (HCM) 2000.

(ii) Average Intersection Delay (seconds/vehicle).

Shaded and bold cells indicate LOS E or F.

Since the acceptable intersection LOS was maintained or improved for all alternatives, the existing interchange configurations do not require any improvements at these study interchanges.

Figures 9-47, 9-54, 9-62, 9-71, and 9-79 graphically displays the LOS designations including design options for the morning and evening peak hours, and depicts those intersections

projected to operate at LOS E or F with a larger red dot for Alternatives 1, 5A, 6A, 6B and 6C, respectively.

9.16.2 Queuing Analysis

This section evaluates projected queuing for 2035 Build Alternatives 5A, 6A, 6B and 6C condition at the interchanges north of Washington Boulevard at I-710 ramps for each Alternative. **Table 9-48** shows the 2035 predicted maximum queue lengths in feet compared to the storage provided in the 2035 Build Alternative configuration.

Adequate storage exists at all locations for all 2035 Build conditions, except at the following:

- Northbound I-710 off-ramp at Olympic Boulevard (Alt 5A, 6A, 6B, and 6C).

Table 9-48
North of Washington Boulevard 2035 Intersection Queuing Analysis

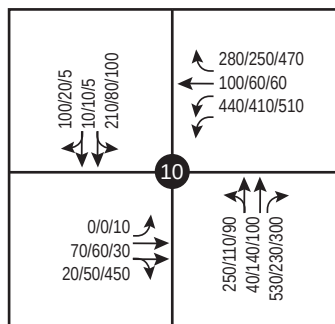
Direction	Location	Min Req'd SL ALT 5A	Min Req'd SL ALT 6A	Min Req'd SL ALT 6B	Min Req'd SL ALT 6C	Provided SL ALT 5A, 6A, 6B & 6C
NB I-710	Olympic Blvd off-ramp	767'	687'	677'	867'	600'
SB I-710	Humphreys Ave/Floral off-ramp	246'	126'	118'	114'	625'

Source: LSA Associates

Table 9-49 indicates that storages provided on the two on-ramps with proposed ramp metering for the 2035 Build Alternatives 5A, 6A, 6B and 6C are adequate using suggested meter rates between 240 vph/lane and 900 vph/lane for one car per green.

Table 9-49
North of Washington Boulevard 2035 Ramp Queuing Analysis

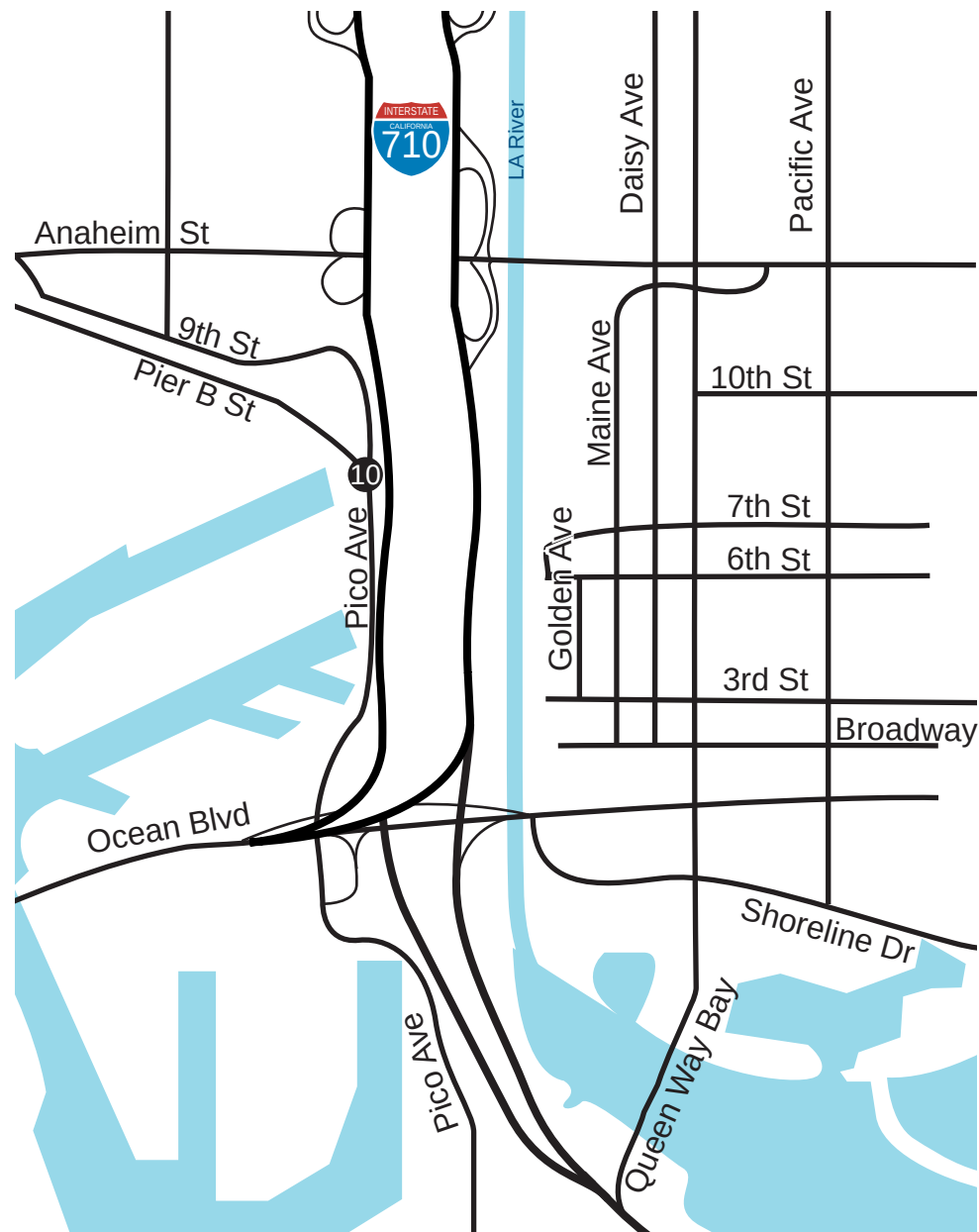
Direction	Location	Min Req'd SL ALT 5A	Min Req'd SL ALT 6A	Min Req'd SL ALT 6B	Min Req'd SL ALT 6C	Provided SL ALT 5A, 6A, 6B &
NB I-710	NB Olympic Blvd on-ramp	300' @ 390 vph/lane	300' @ 300 vph/lane	300' @ 300 vph/lane	300' @ 320 vph/lane	1 lane @ 450'
SB I-710	SB Eastern Ave on-ramp	150' @ 580 vph/lane	150' @ 430 vph/lane	150' @ 440 vph/lane	150' @ 430 vph/lane	2 lanes @ 260'



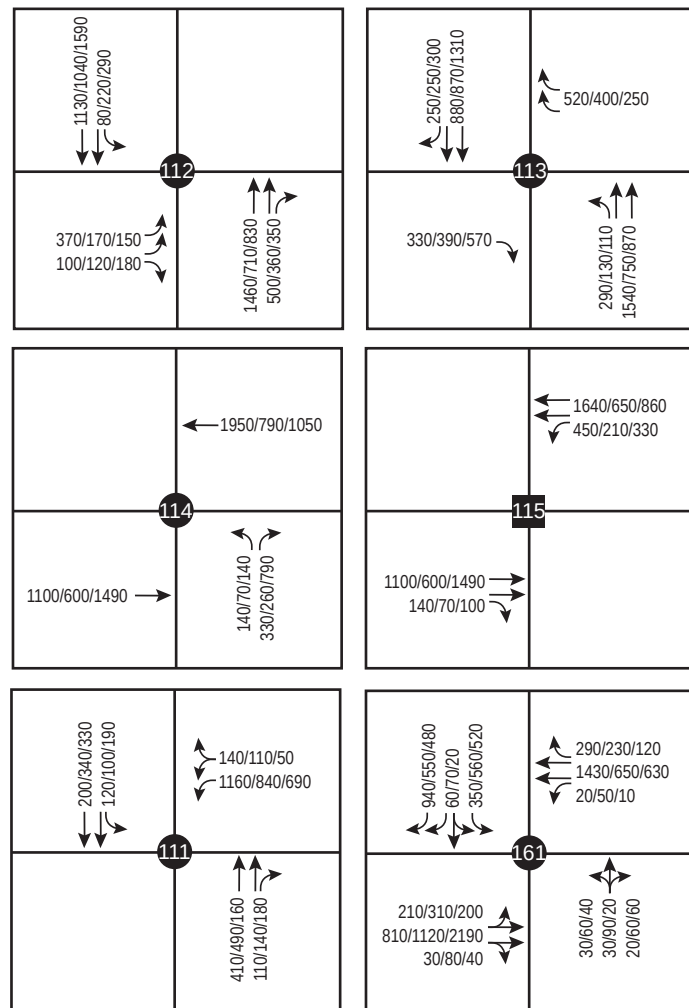
NOT TO SCALE

LEGEND

- # Signalized Intersection
 25/10/30 AM/MD/PM Peak hour volumes

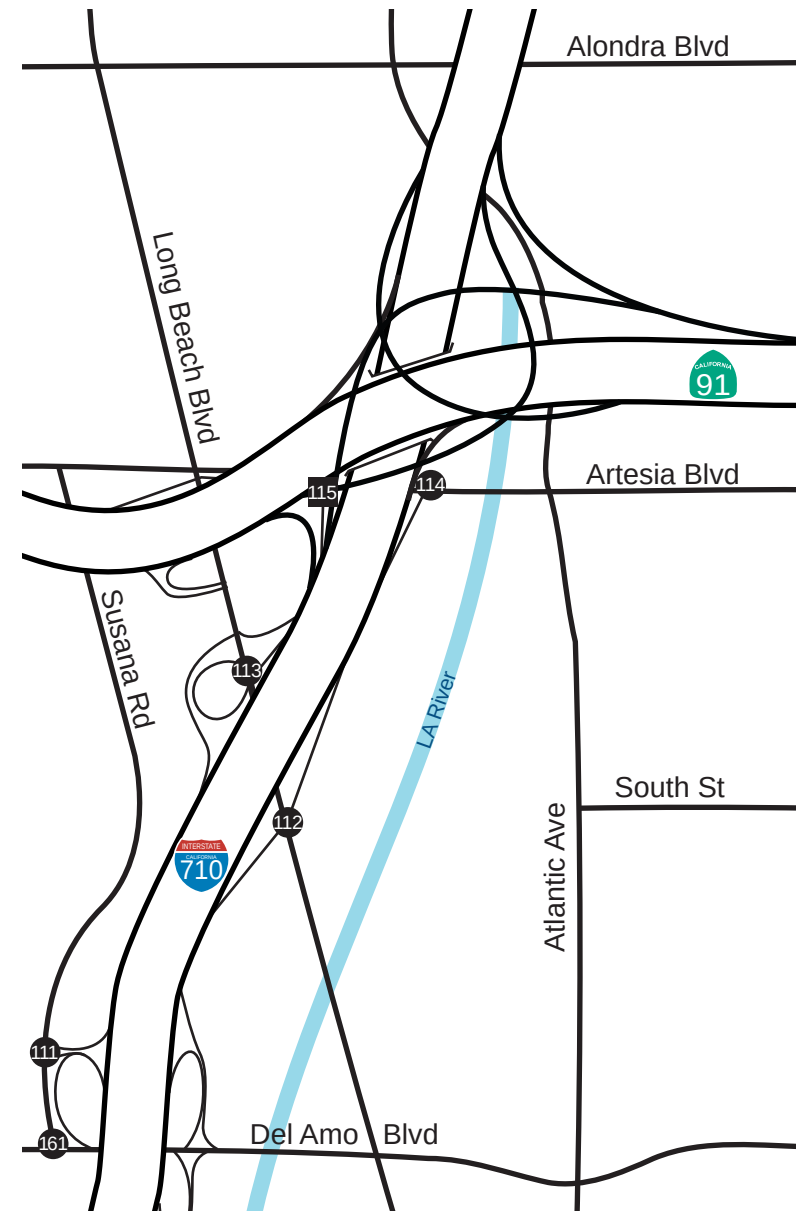


K:\K12011\I-710\TOAR\ALT 1\Fig 9-2 Alt 1-Long Beach.ai



LEGEND

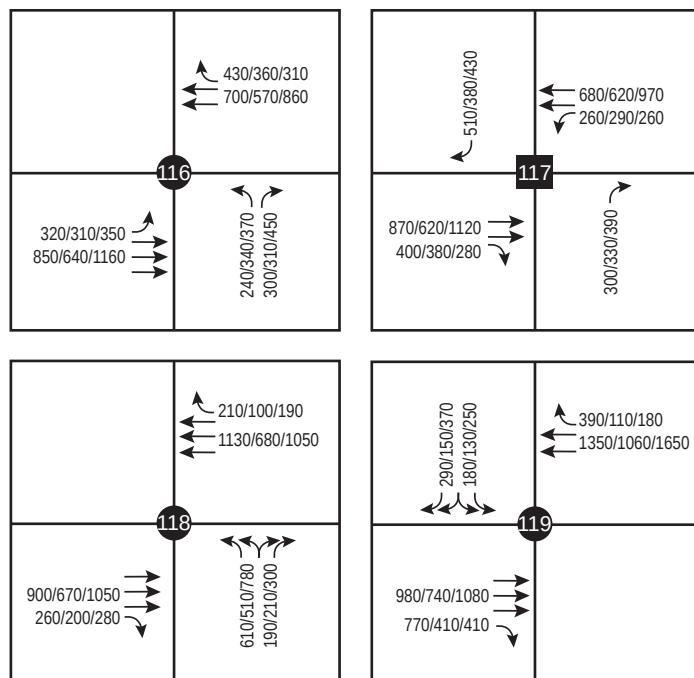
- Signalized Intersection
- Unsignalized Intersection
- 25/10/30 AM/MD/PM Peak hour volumes



Project: I-710 PA-ED

ALT 1 - YEAR 2035 NO BUILD TRAFFIC VOLUMES DEL AMO, LONG BEACH, & ARTESIA INTERCHANGE

Figure 9-2



NOT TO SCALE

LEGEND

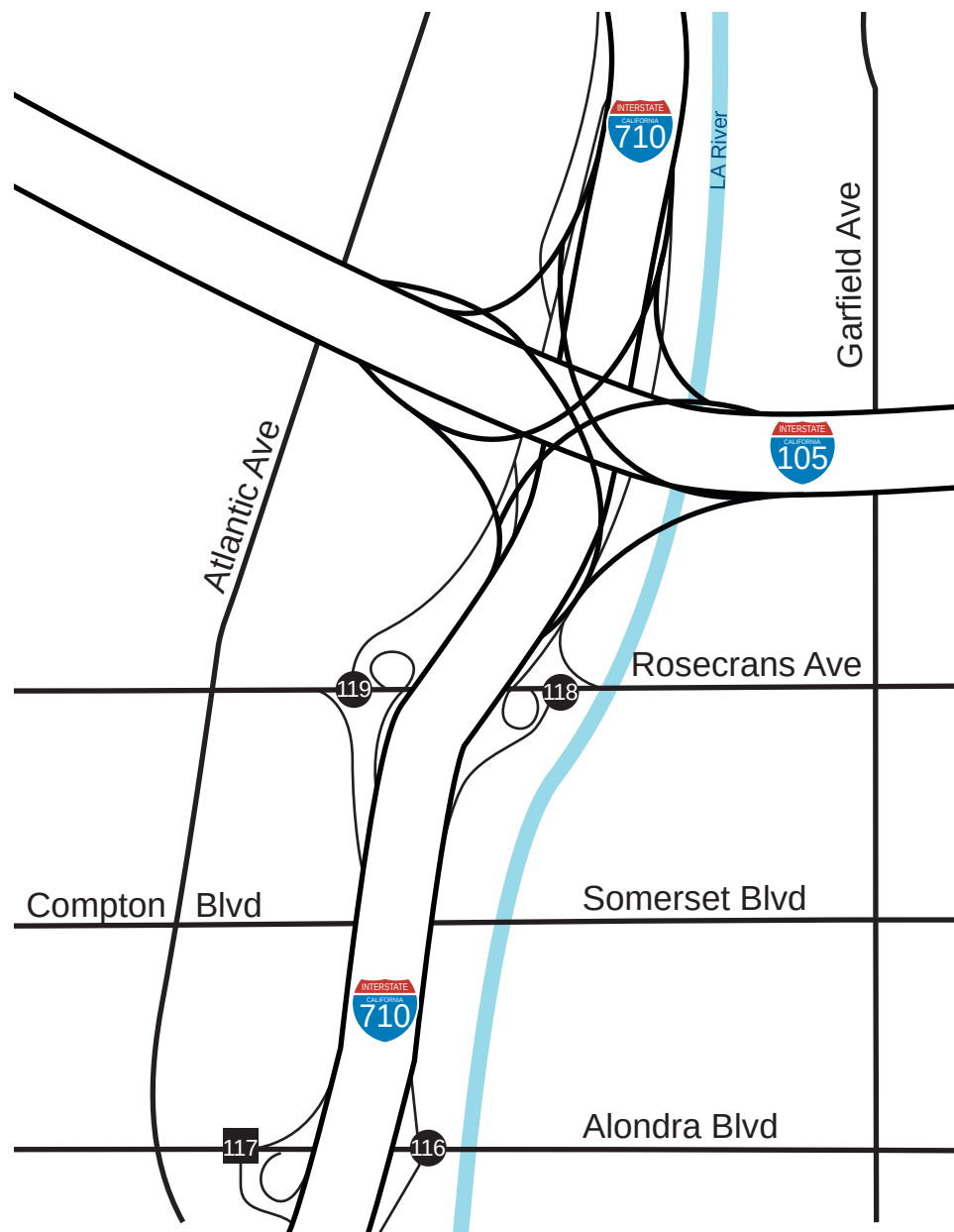


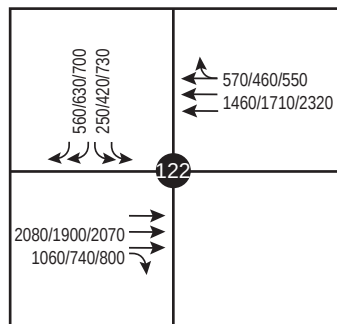
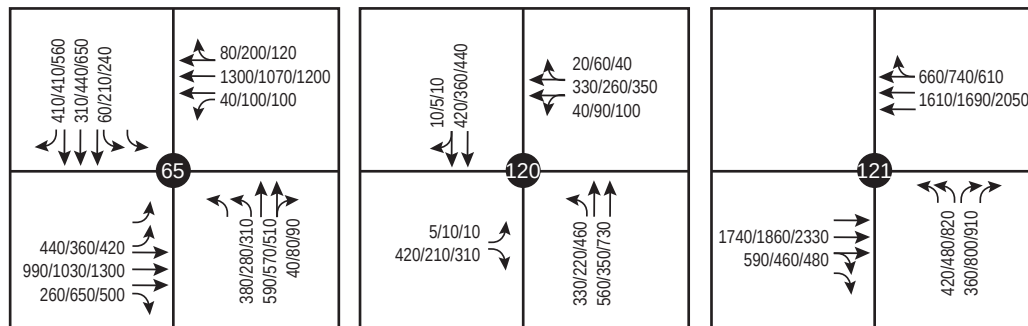
Signalized Intersection



Unsignalized Intersection

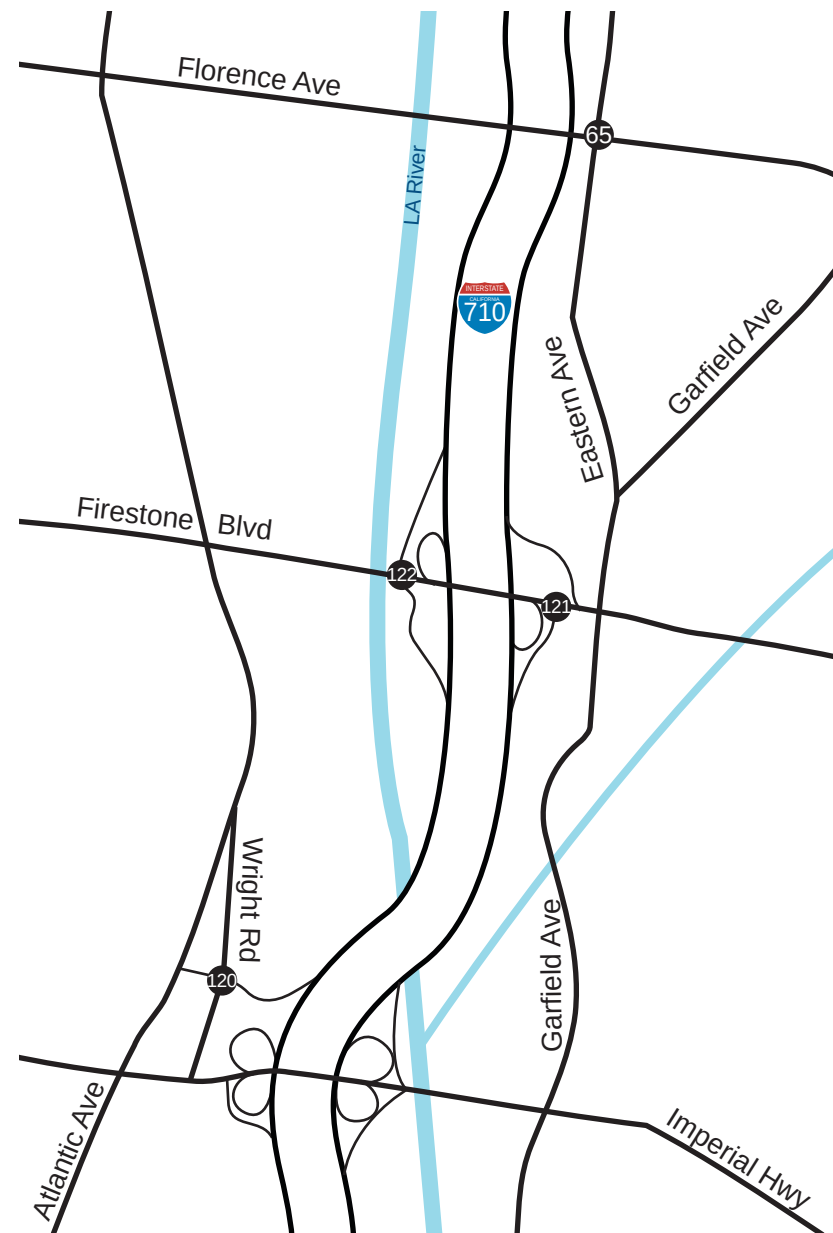
25/10/30 AM/MD/PM Peak hour volumes



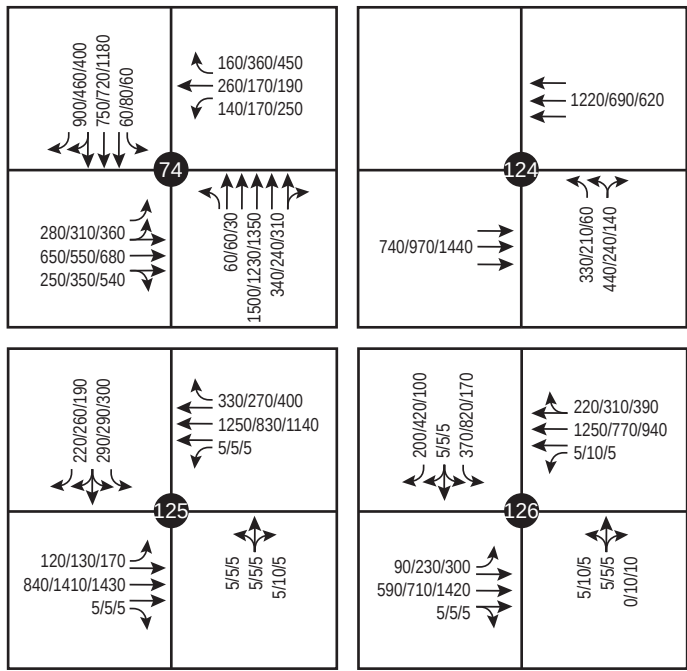


LEGEND

- # Signalized Intersection
- 25/10/30 AM/MD/PM Peak hour volumes



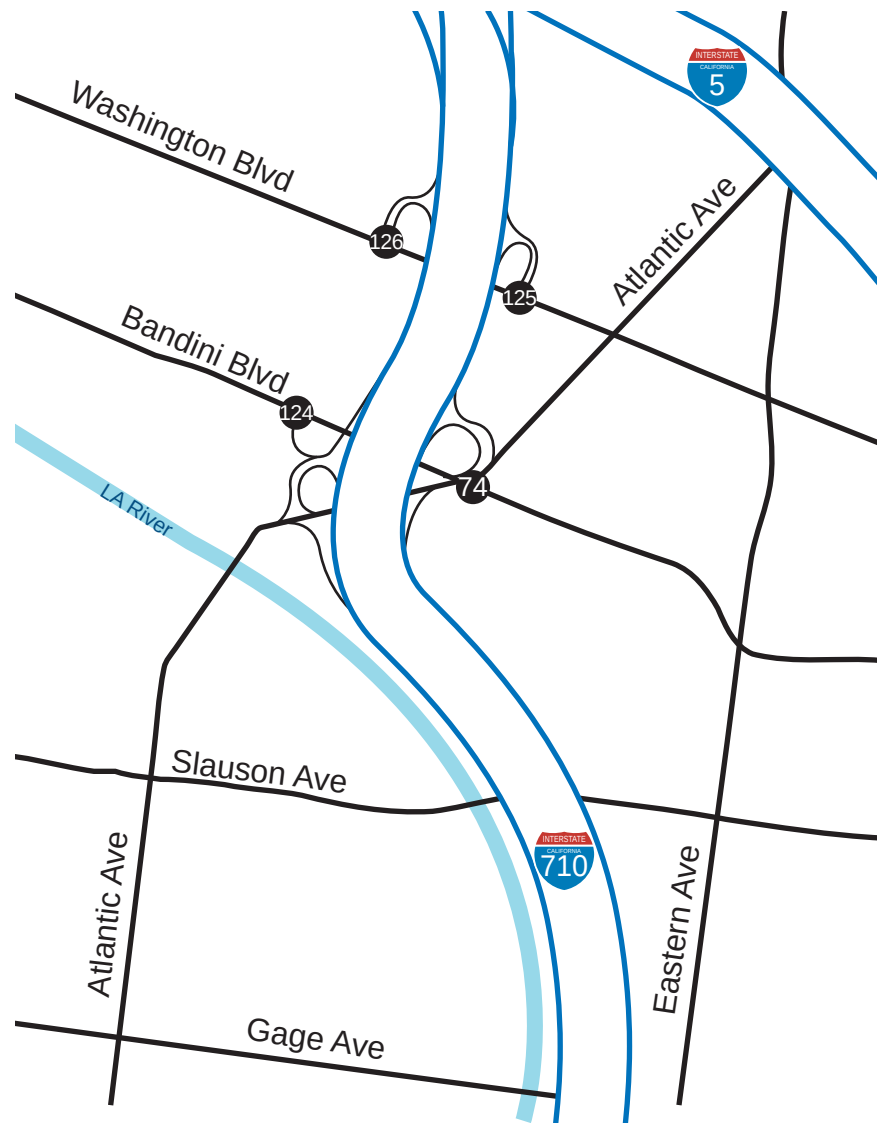
K:\2011\I-710\TOAR\ALT 1\Fig 9-5 Alt 1-Slauson.ai



LEGEND

Signalized Intersection

25/10/30 AM/MD/PM Peak hour volumes

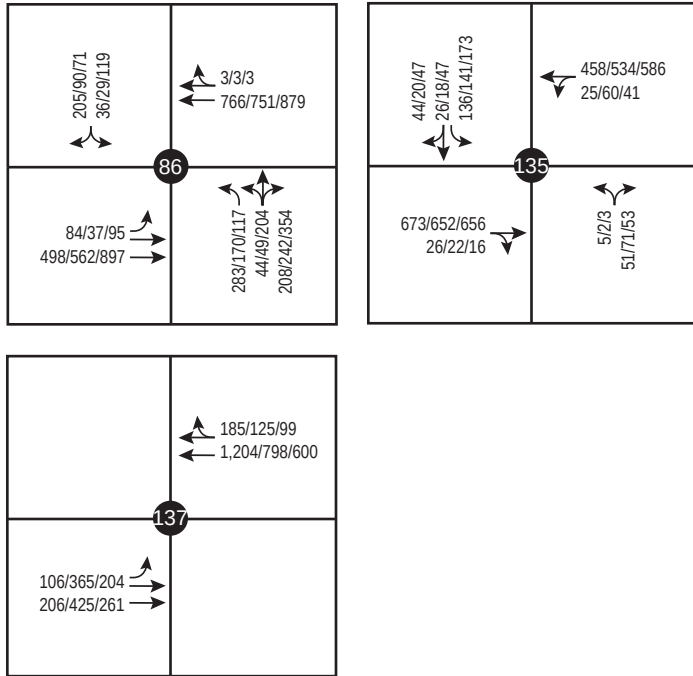


Project: I-710 PA-ED

ALT 1 - YEAR 2035 NO BUILD TRAFFIC VOLUMES BANDINI, & WASHINGTON INTERCHANGE

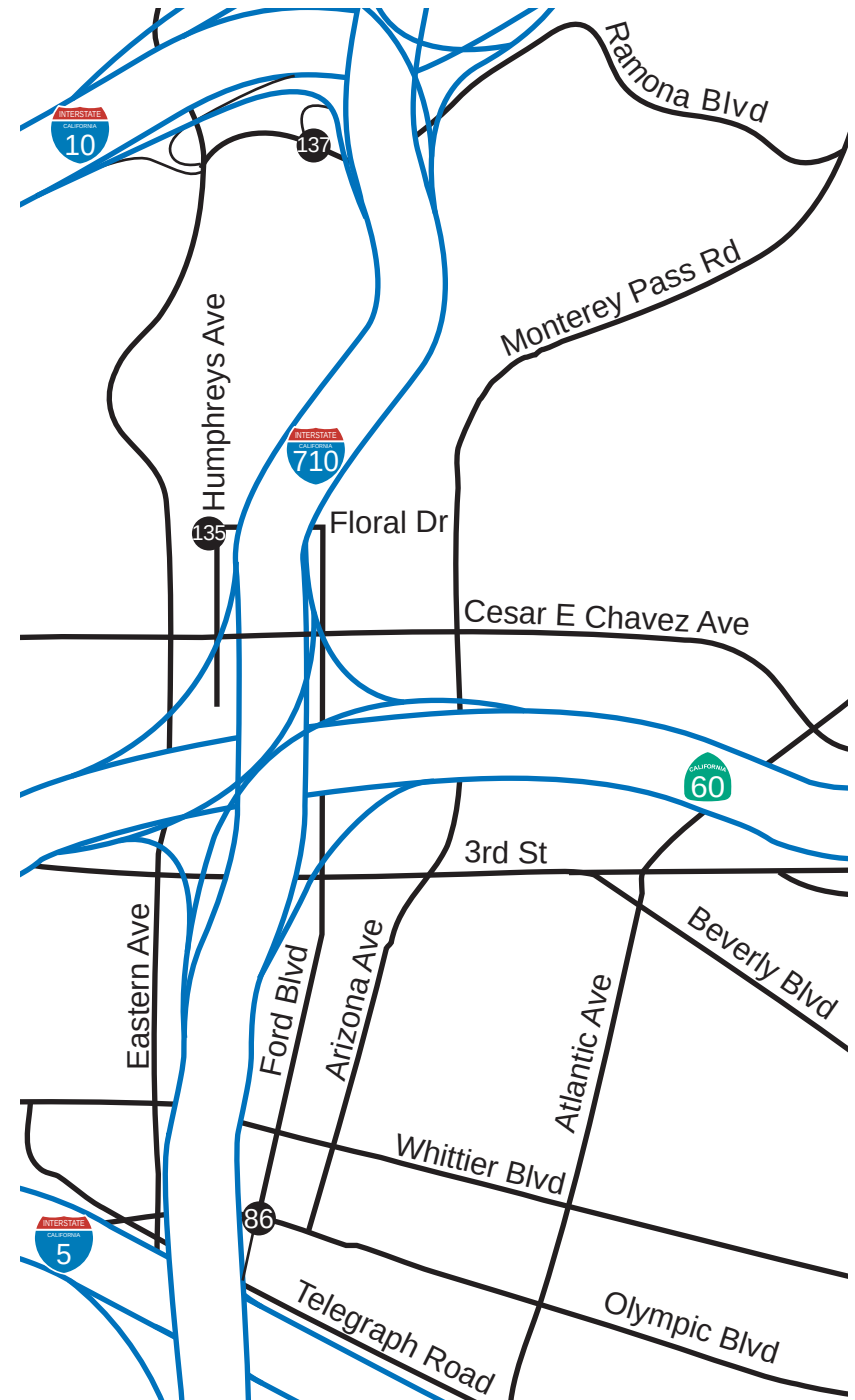
Figure 9-5



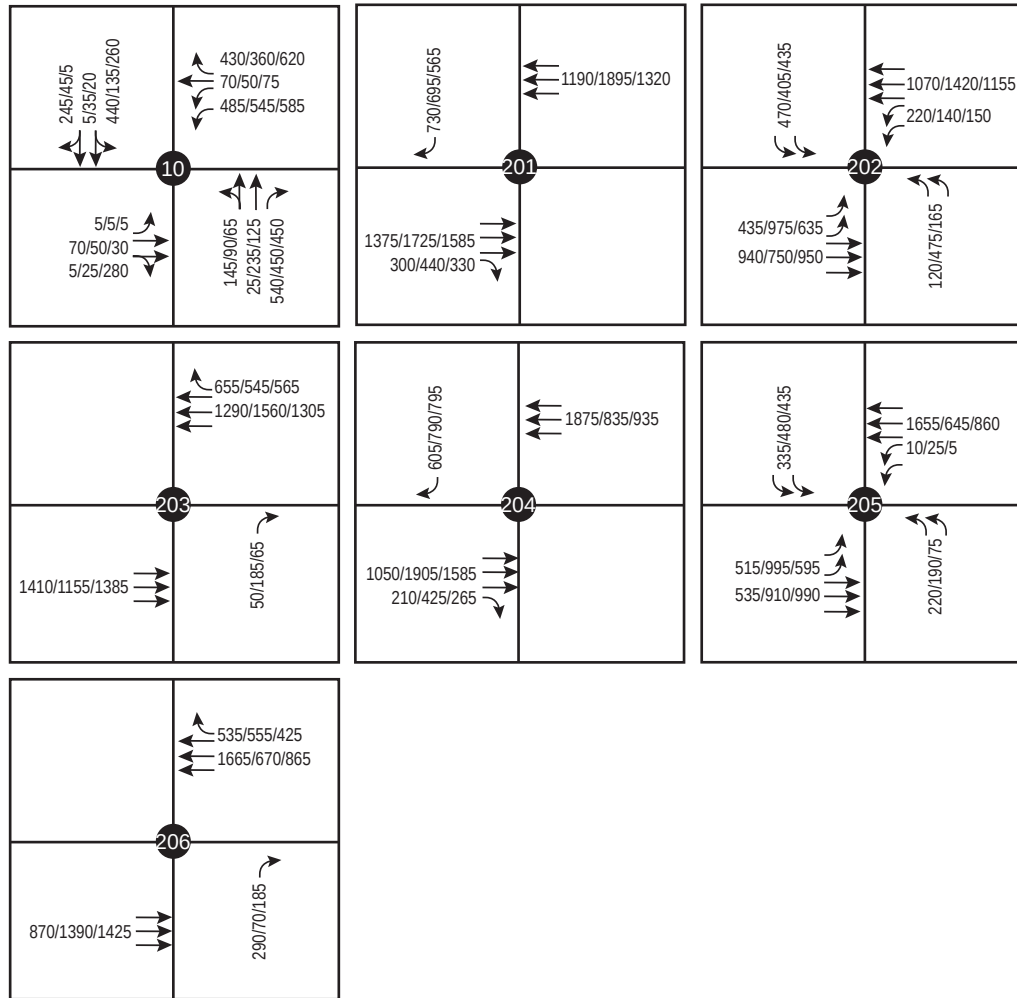


LEGEND

- # Signalized Intersection
- 25/10/30 AM/MD/PM Peak hour volumes

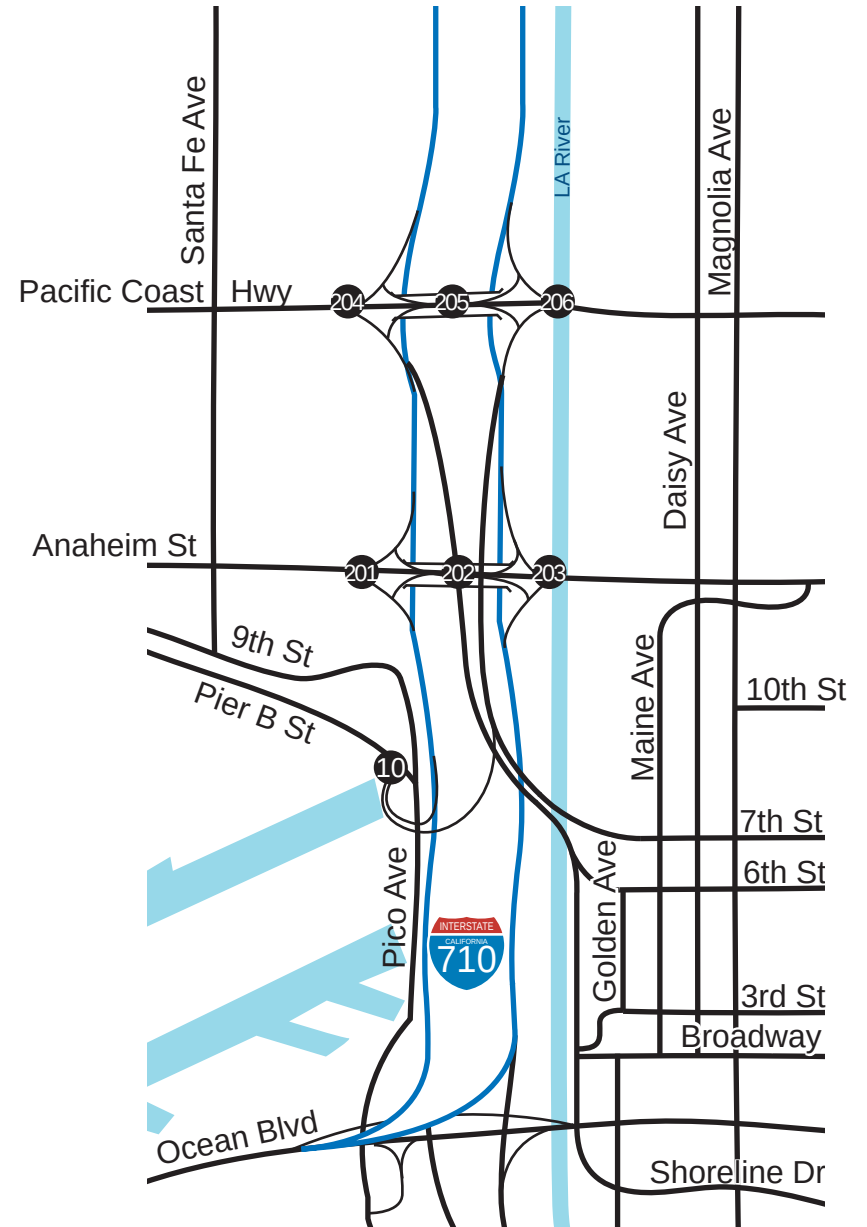


K:\2011\I-710\TOAR\ALT 5\Fig 9-7 Alt 5-Pico.al

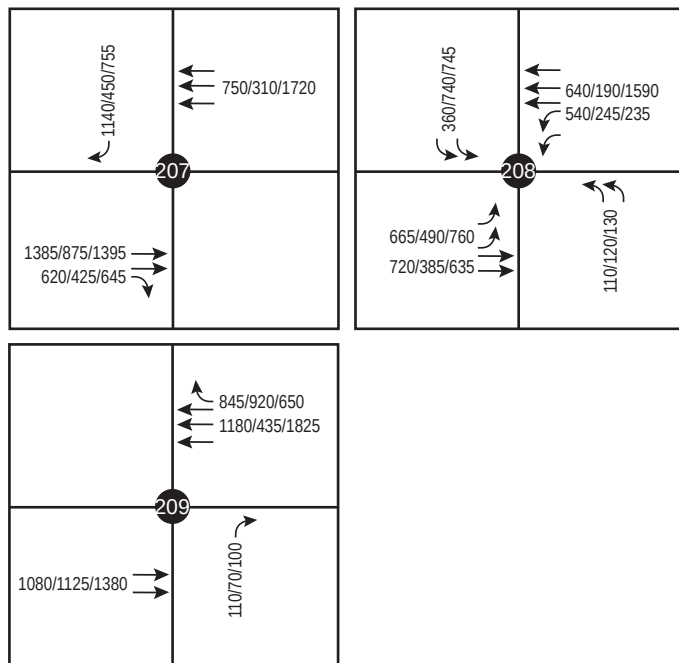


LEGEND

- Signalized Intersection
- 25/10/30 AM/MD/PM Peak hour volumes



K:\2011\I-710\TOAR\ALT 5\Fig 9-8 Alt 5-Willow.ai



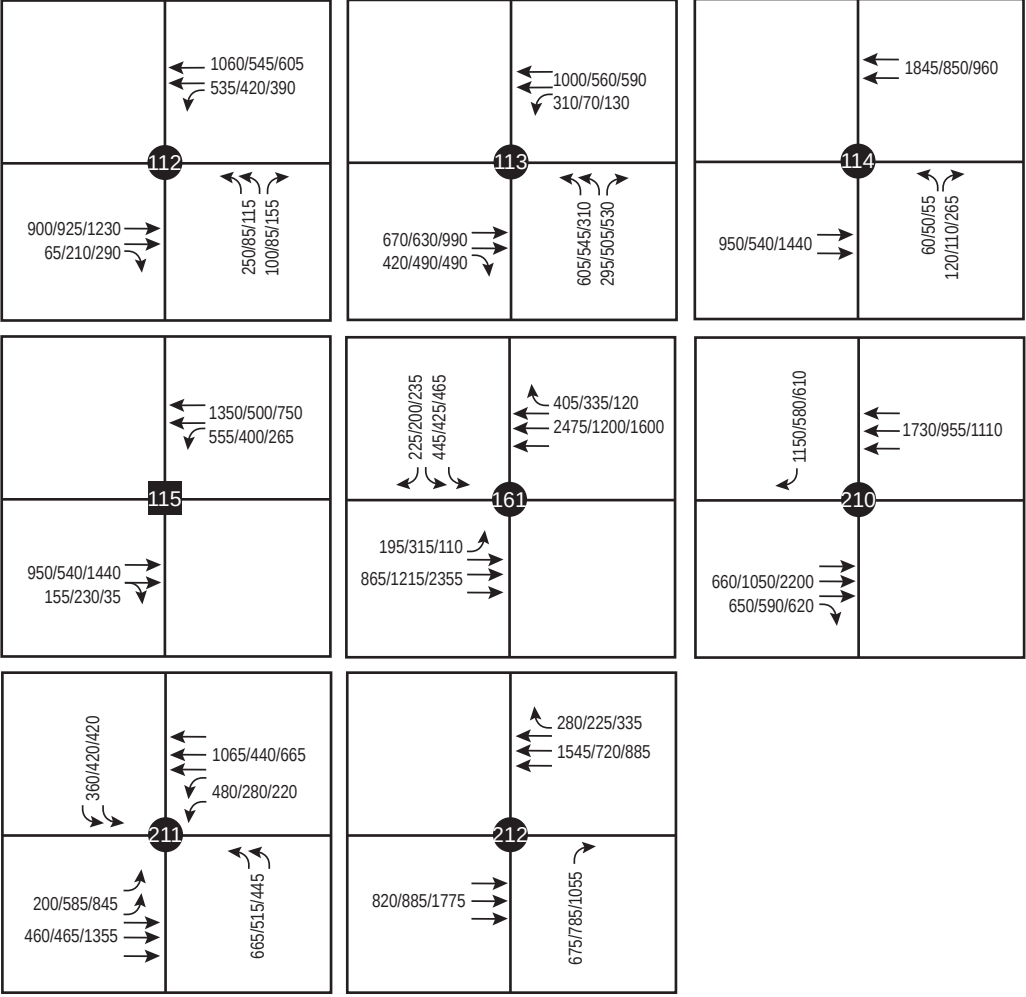
LEGEND

Signalized Intersection

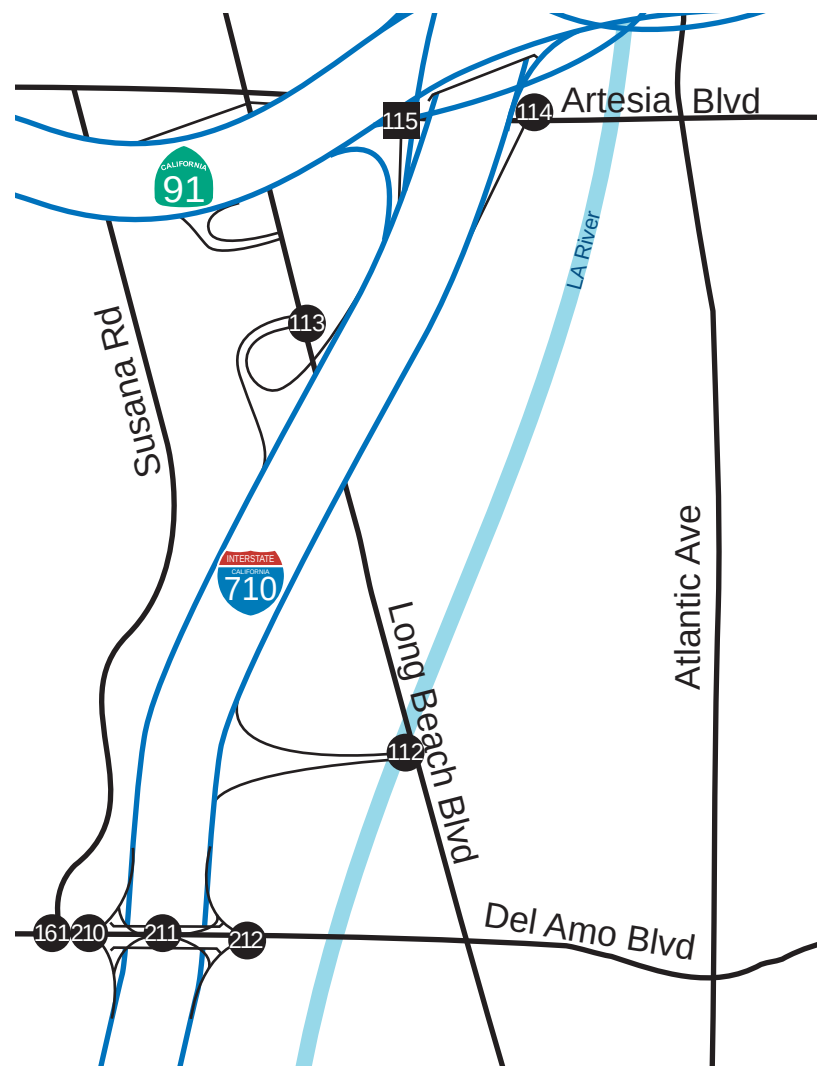
25/10/30 AM/MD/PM Peak hour volumes



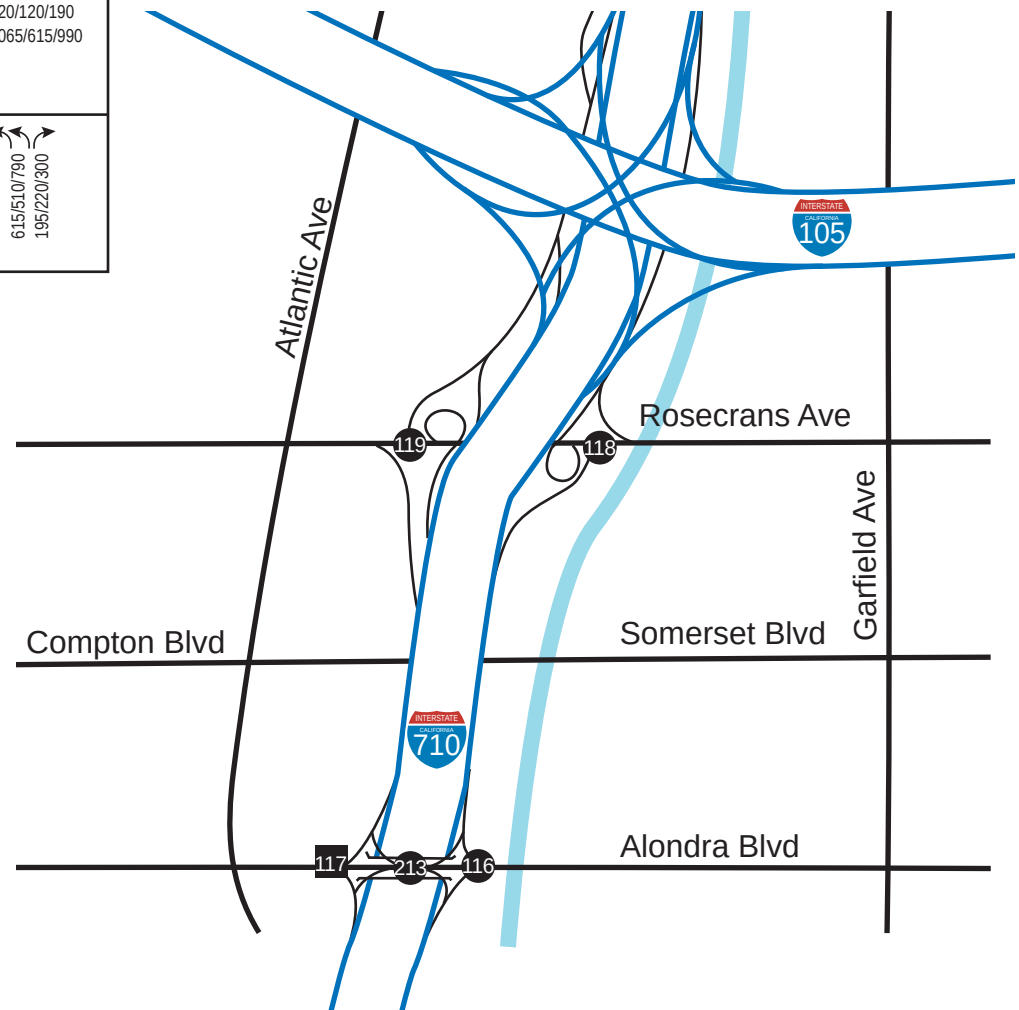
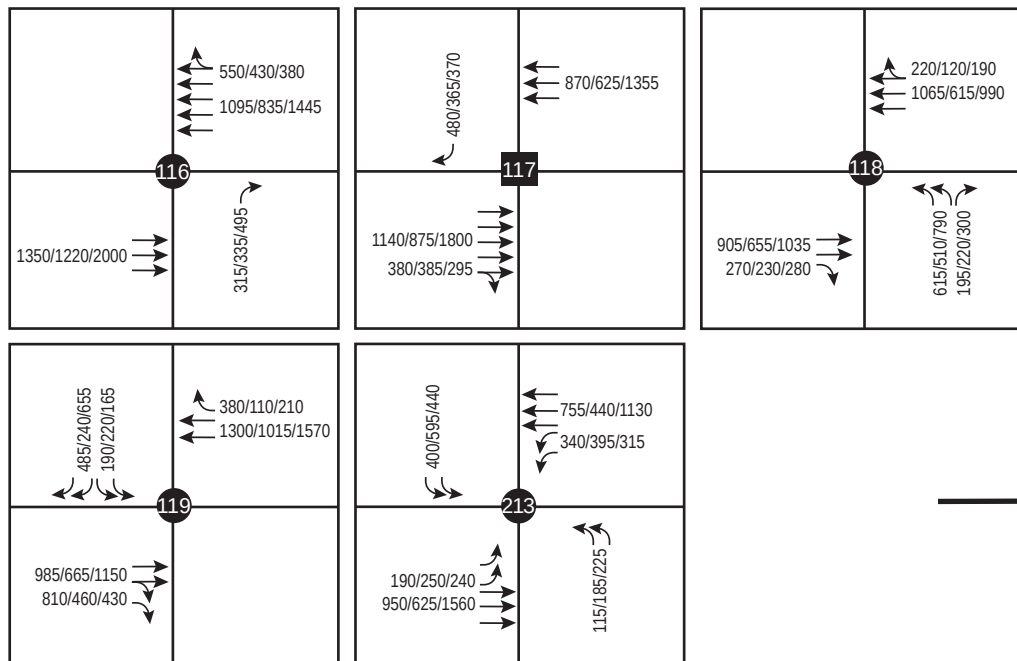
K:\2011\1-710\TOAR\ALT 5\Fig 9-9 Alt 5-Del Amo.ai



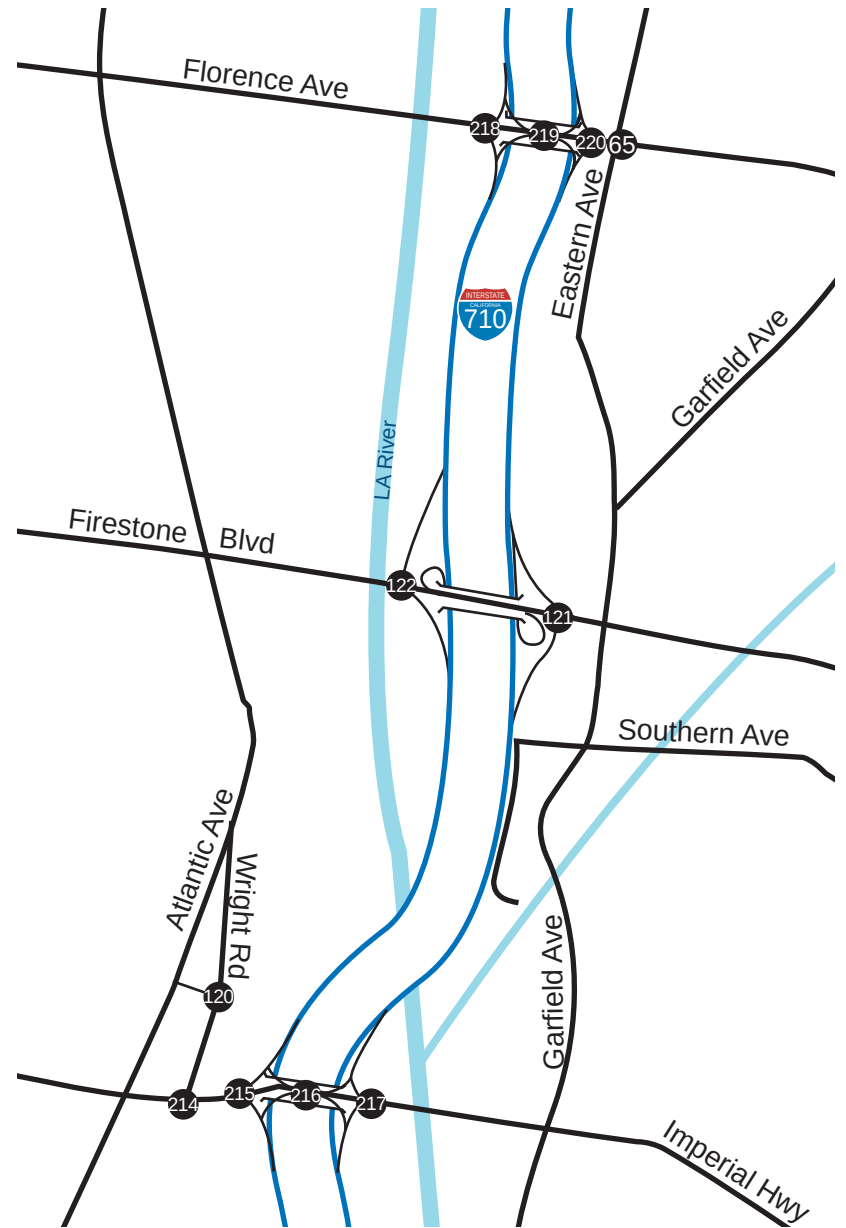
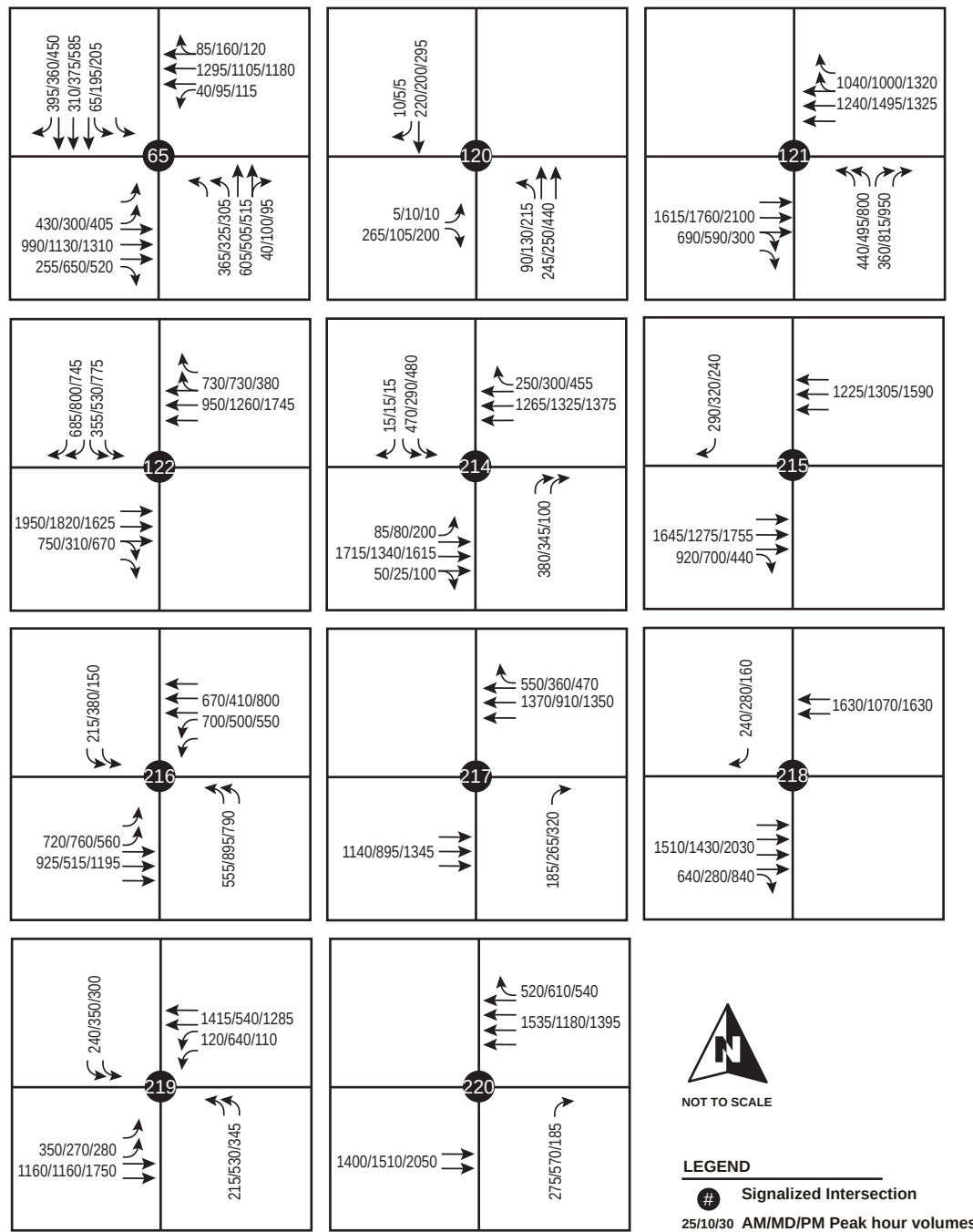
LEGEND
Signalized Intersection
25/10/30 AM/MD/PM Peak hour volumes

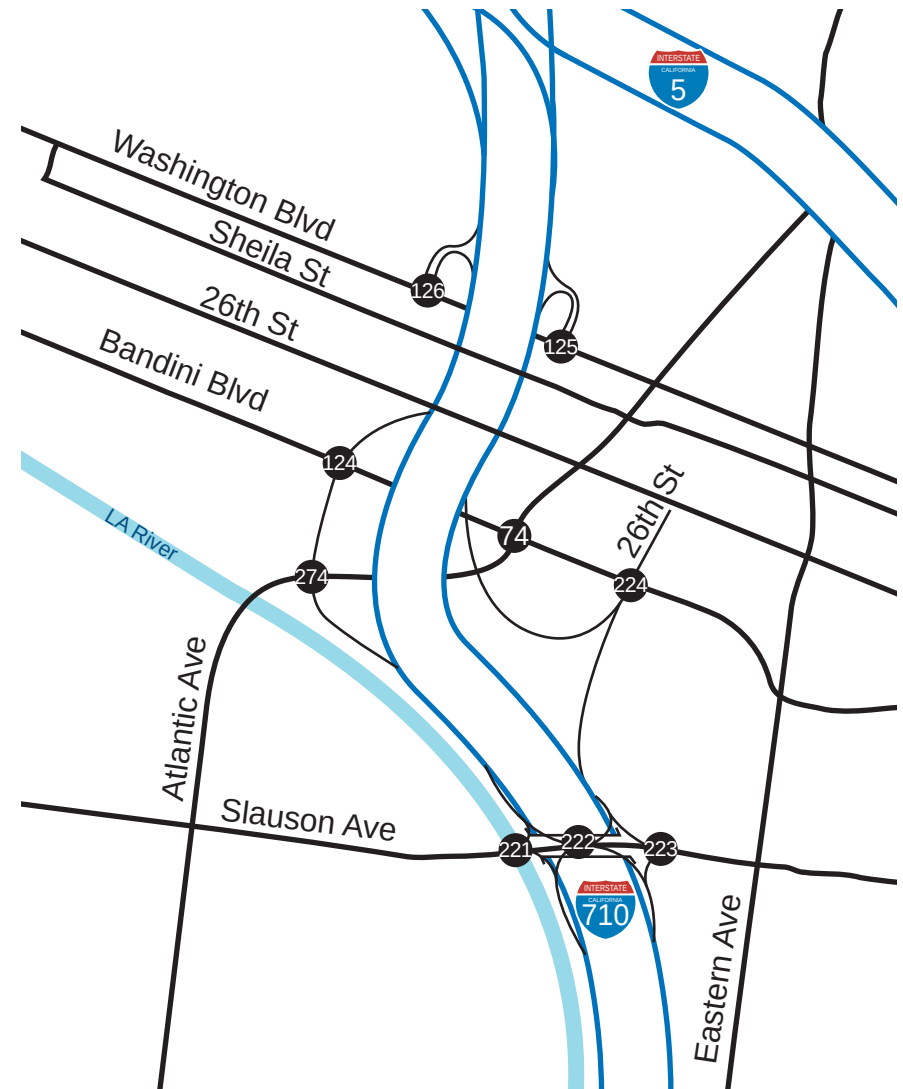
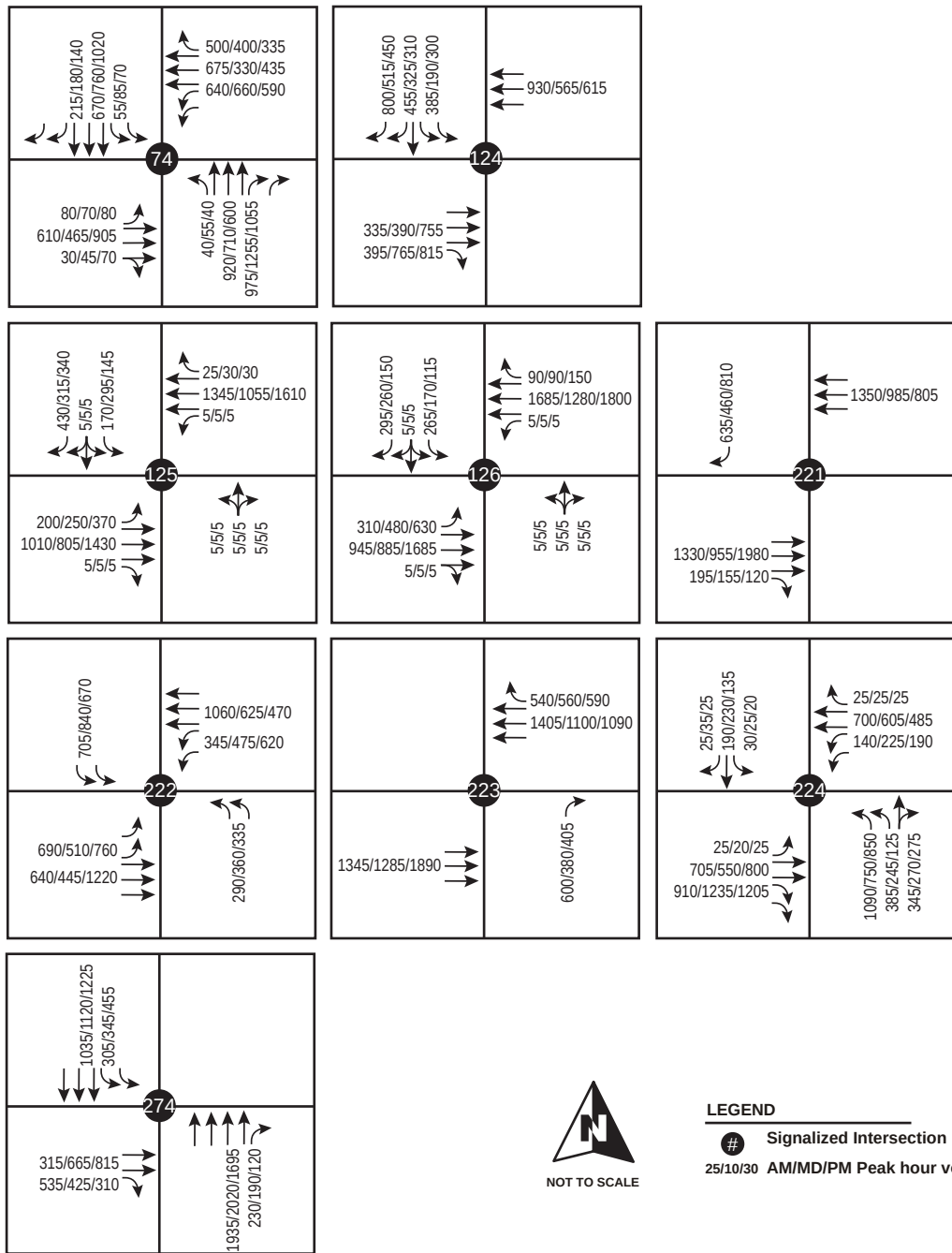


K:\2011\I-710\TOAR\ALT 5\Fig 9-10 Alt 5-Alondra.ai

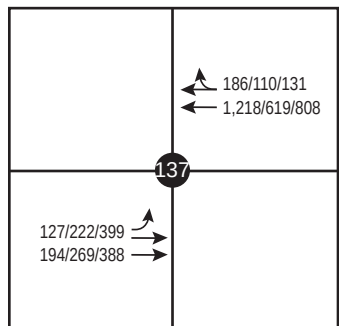
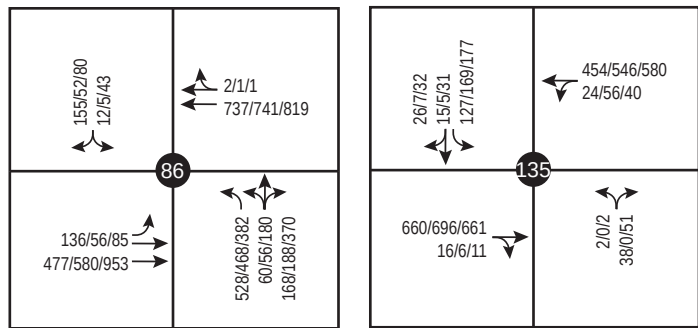


K:\2011\I-710\TOAR\ALT 5\Fig 9-11 Alt 5-Imperial.ai





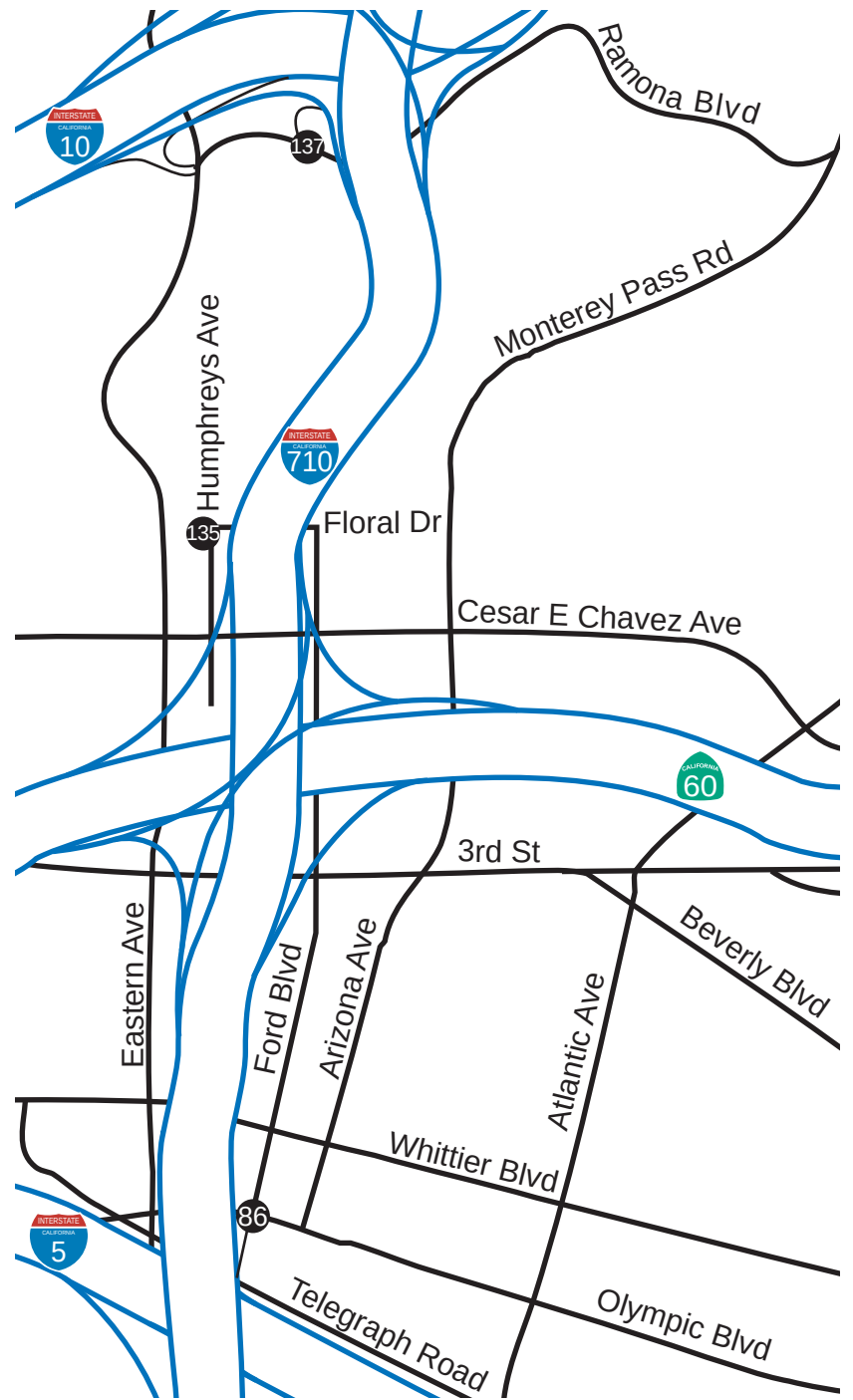
K:\2011\I-710\TOAR\ALT 5\Fig 9-13 Alt 5 Washington.ai



LEGEND

Signalized Intersection

25/10/30 AM/MD/PM Peak hour volumes

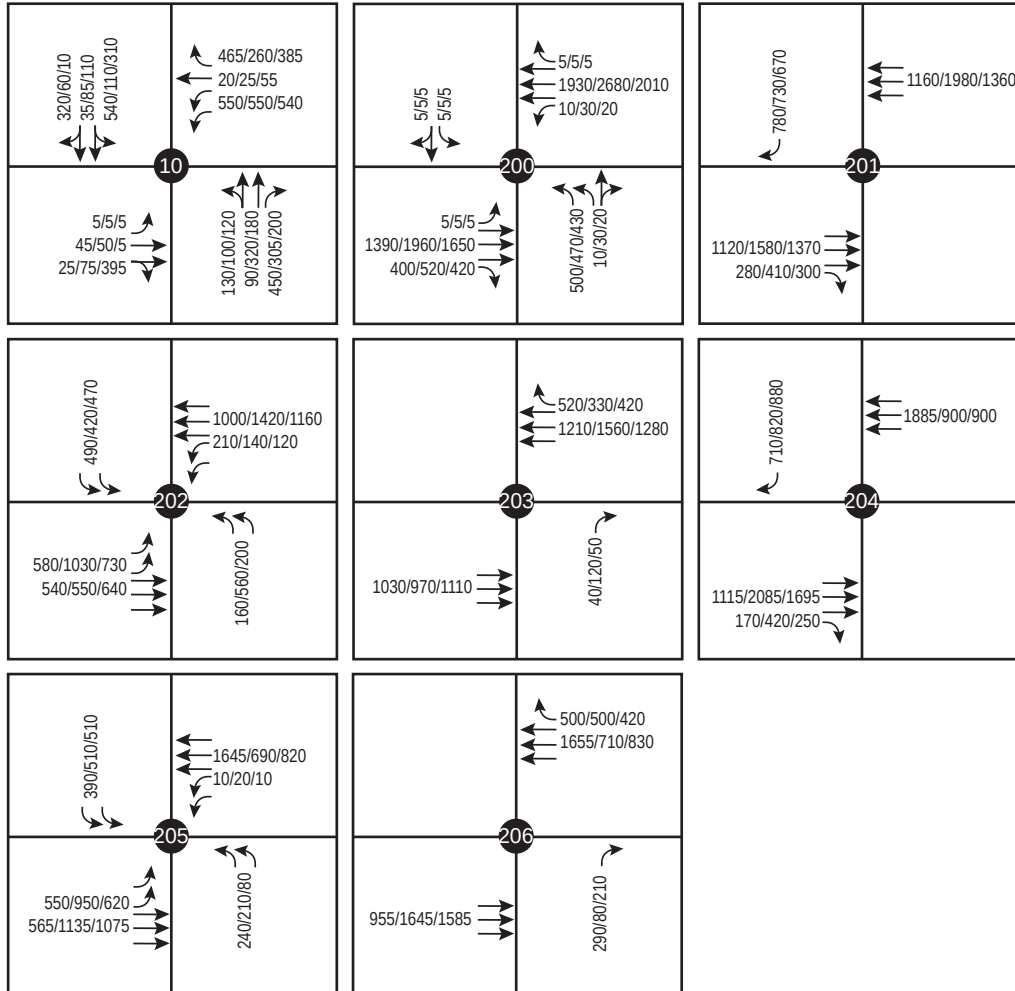


Project: I-710 PA-ED

ALT-5 YEAR 2035 WITH PROJECT TRAFFIC VOLUMES INTERCHANGES NORTH OF WASHINGTON BLVD

Figure 9-13



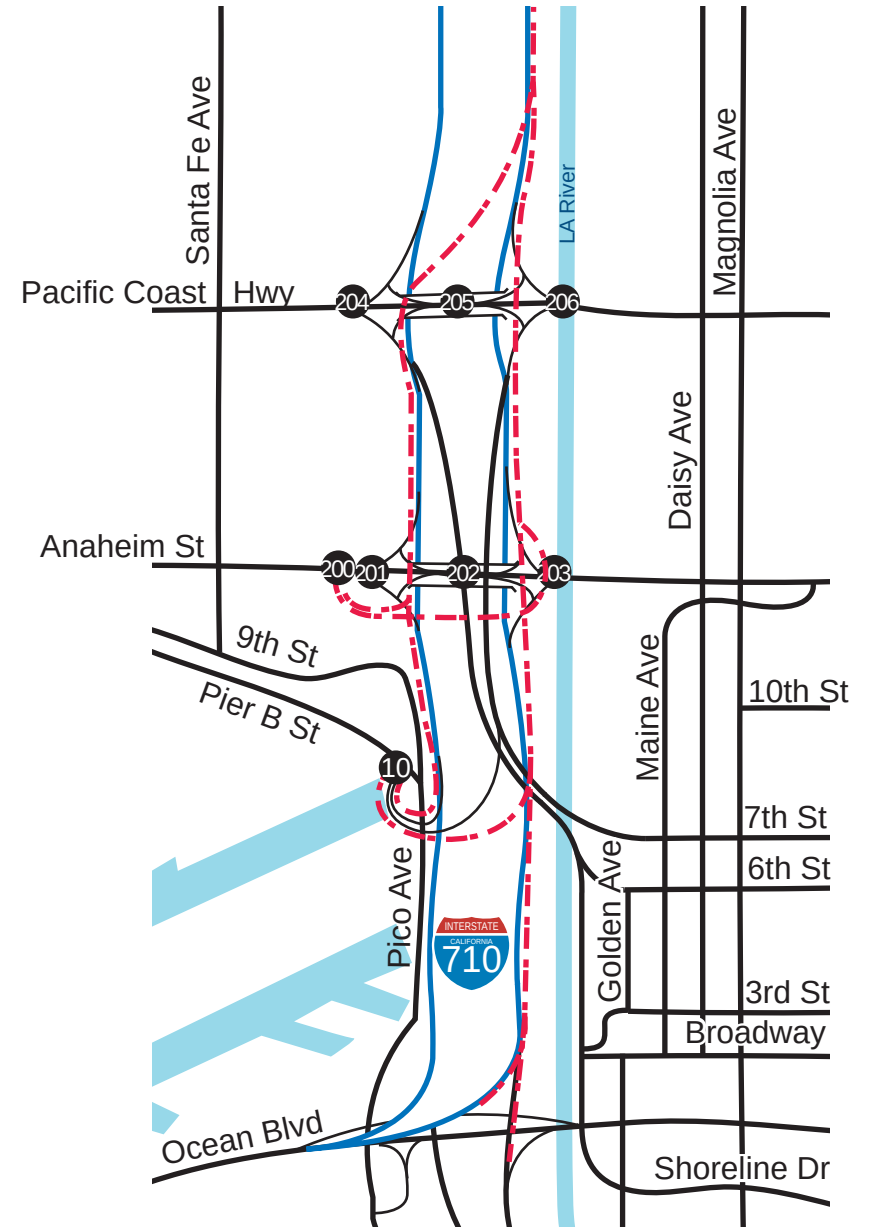


LEGEND

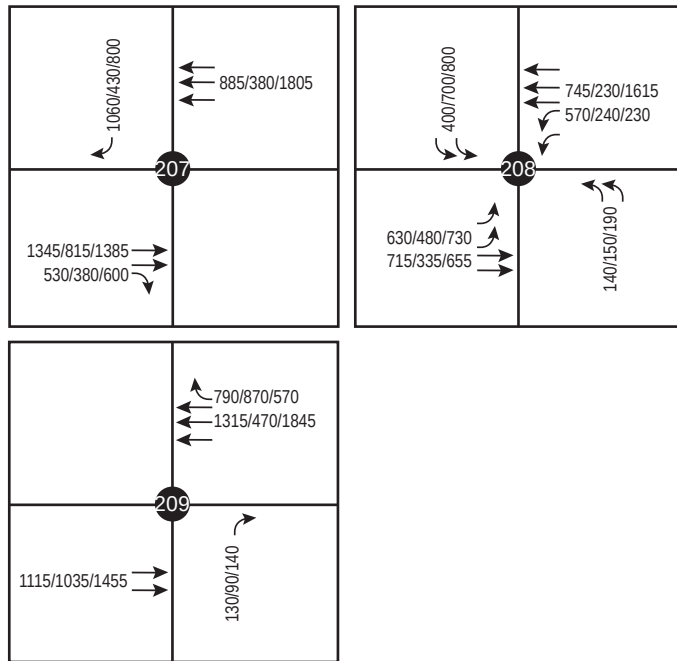
Signalized Intersection

25/10/30 AM/MD/PM Peak hour volumes

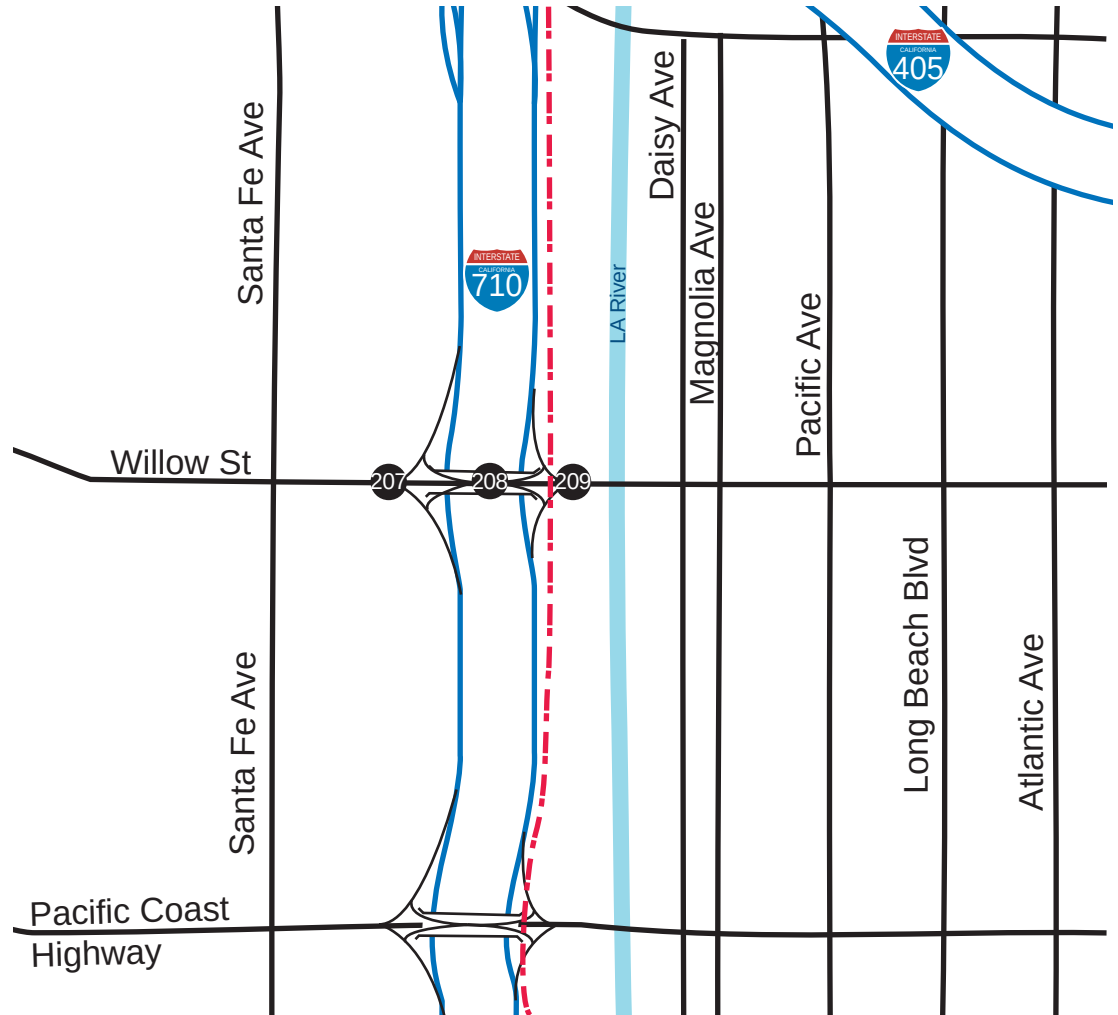
--- Freight Corridor



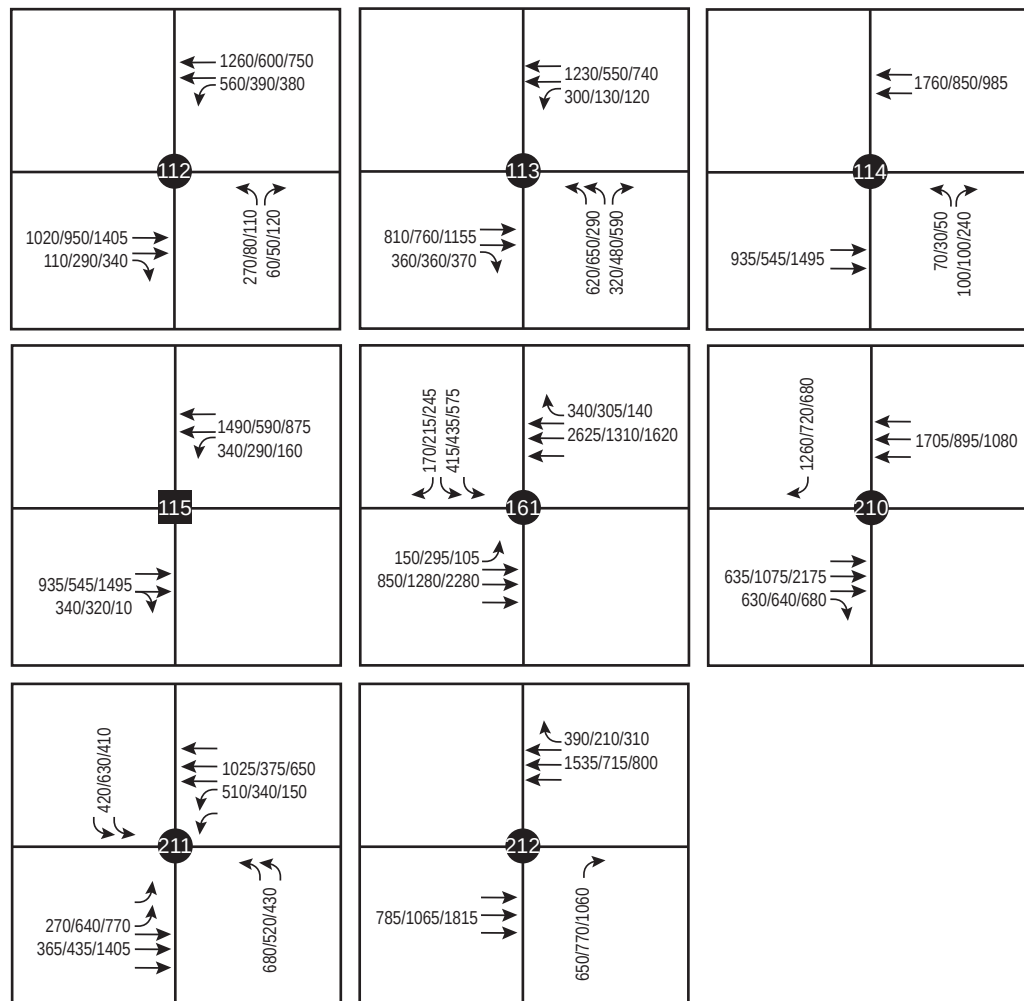
K:\2011\I-710\TOAR\ALT 6A\Fig 9-15 Alt 6-Willowwai



- LEGEND**
- # Signalized Intersection
 - 25/10/30 AM/MD/PM Peak hour volumes
 - Freight Corridor

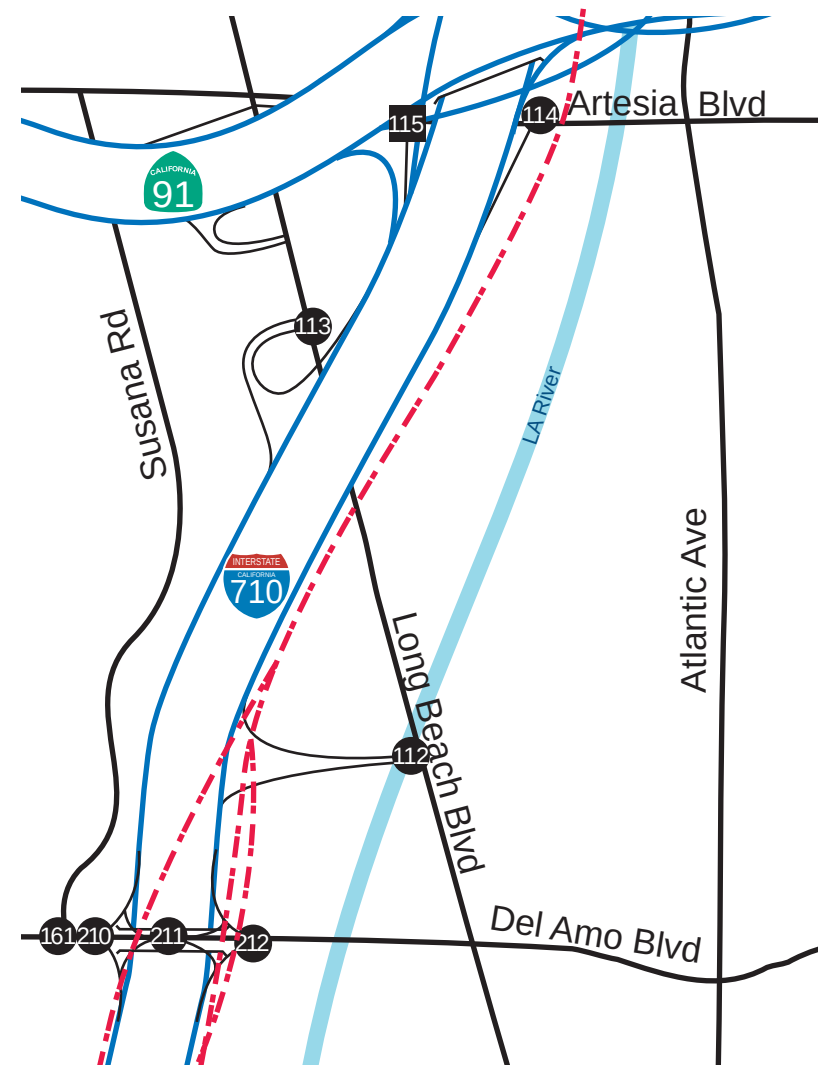


K:\2011\I-710\TOAR\ALT 6A\Fig 9-16 Alt 6-Del Amo.al

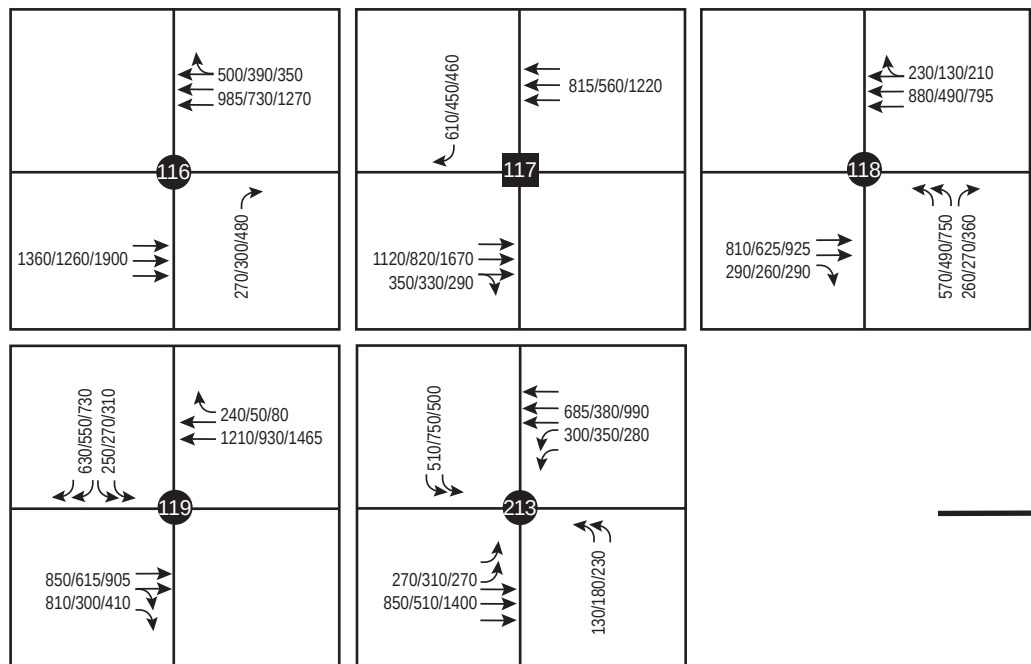


LEGEND

- # Signalized Intersection
- 25/10/30 AM/MD/PM Peak hour volumes
- Freight Corridor



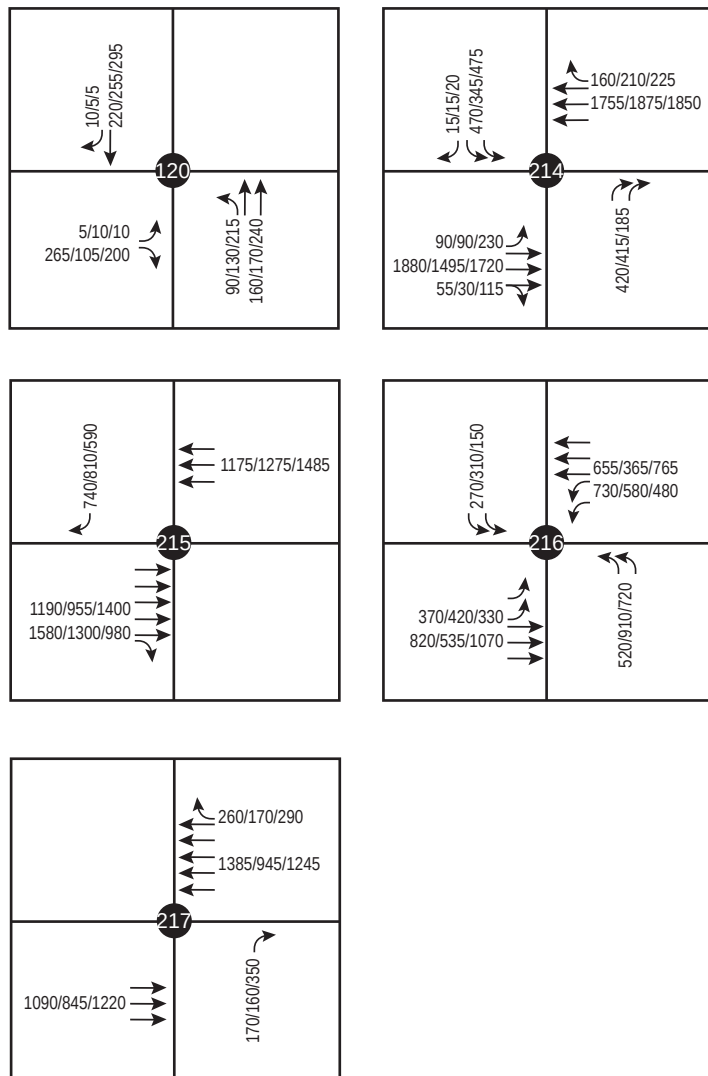
K:\2011\1-710\TOAR\ALT 6A\Fig 9-17 Alt c-Alondra.ai



LEGEND

- # Signalized Intersection
- 25/10/30 AM/MD/PM Peak hour volumes
- Freight Corridor

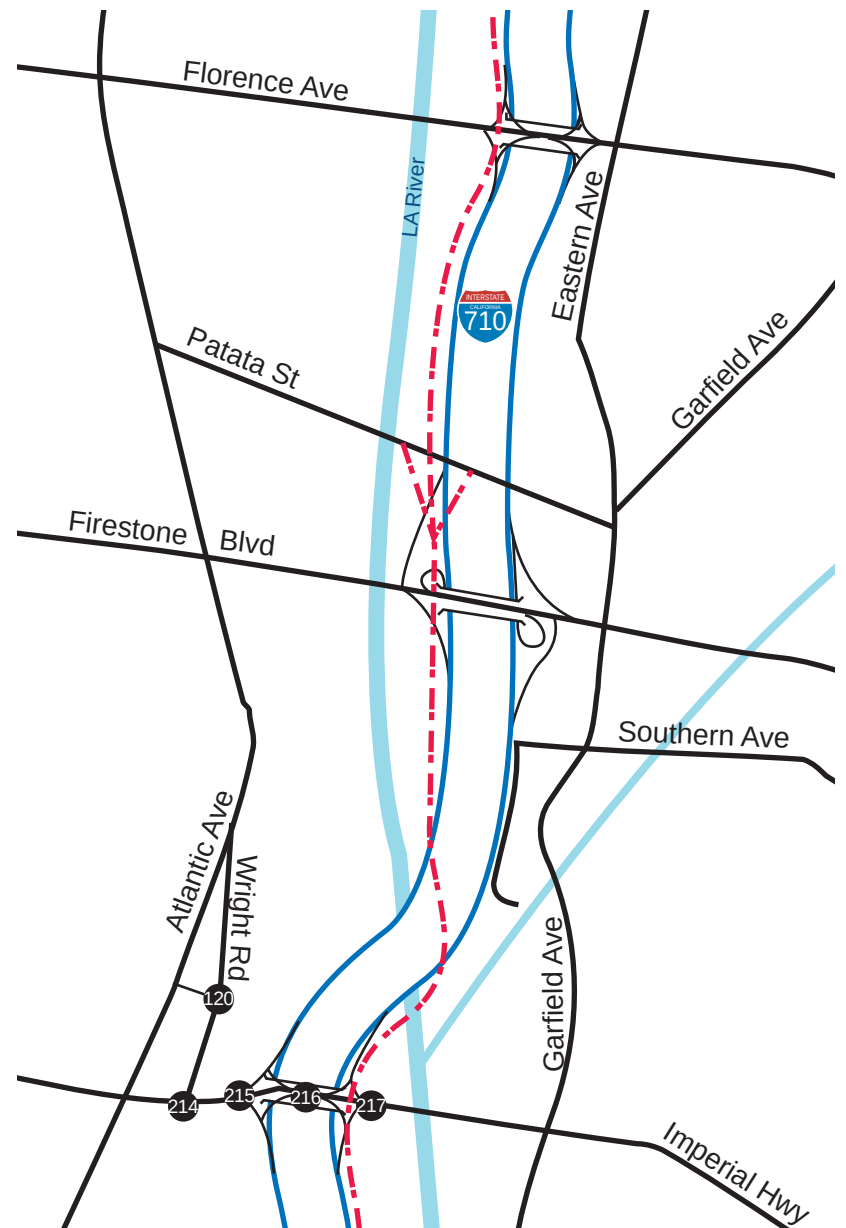
K:\2011\1710\TOAR\ALT 6A\Fig 9-18 Alt 6A-Imperial.ai



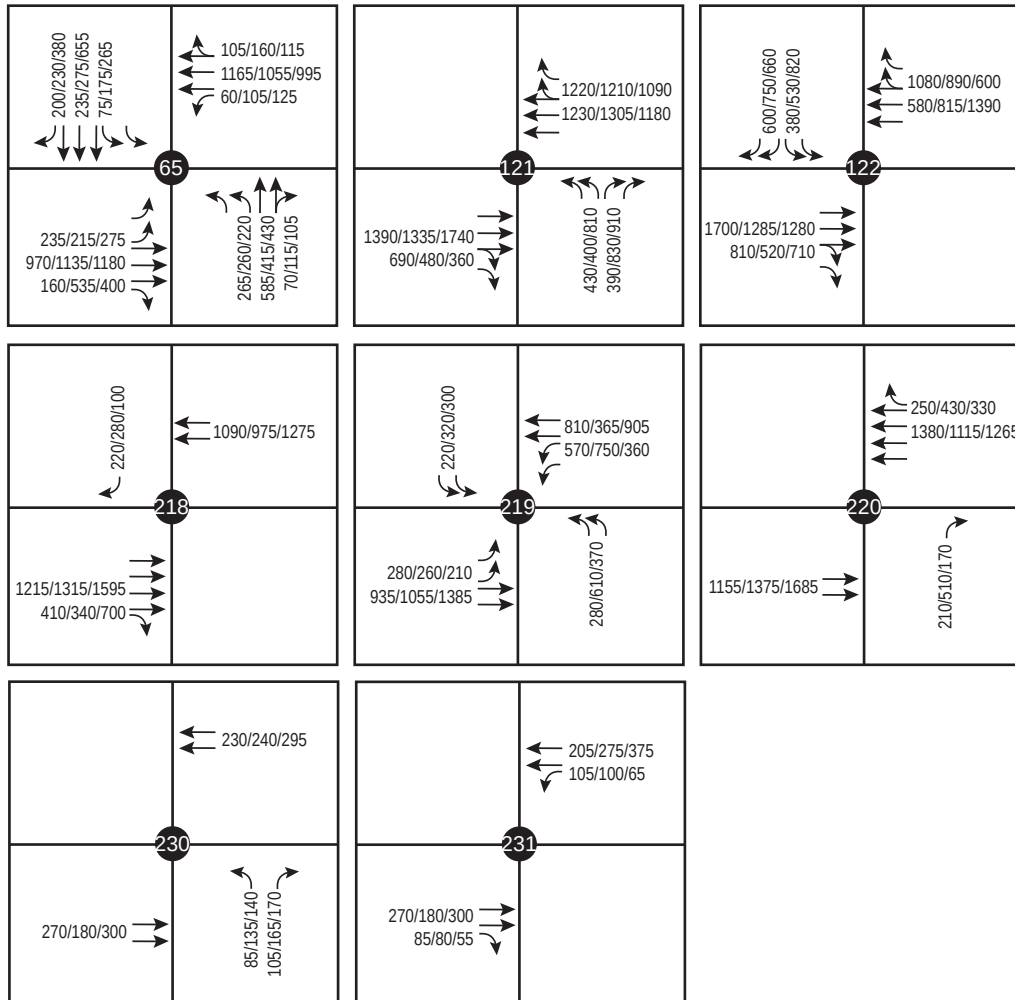
NOT TO SCALE

LEGEND

- # Signalized Intersection
- 25/10/30 AM/MD/PM Peak hour volumes
- Freight Corridor



K:\2011\1-710\TOAR\ALT 6A\Fig 9-19 Alt 6A-Imperial.ai



NOT TO SCALE

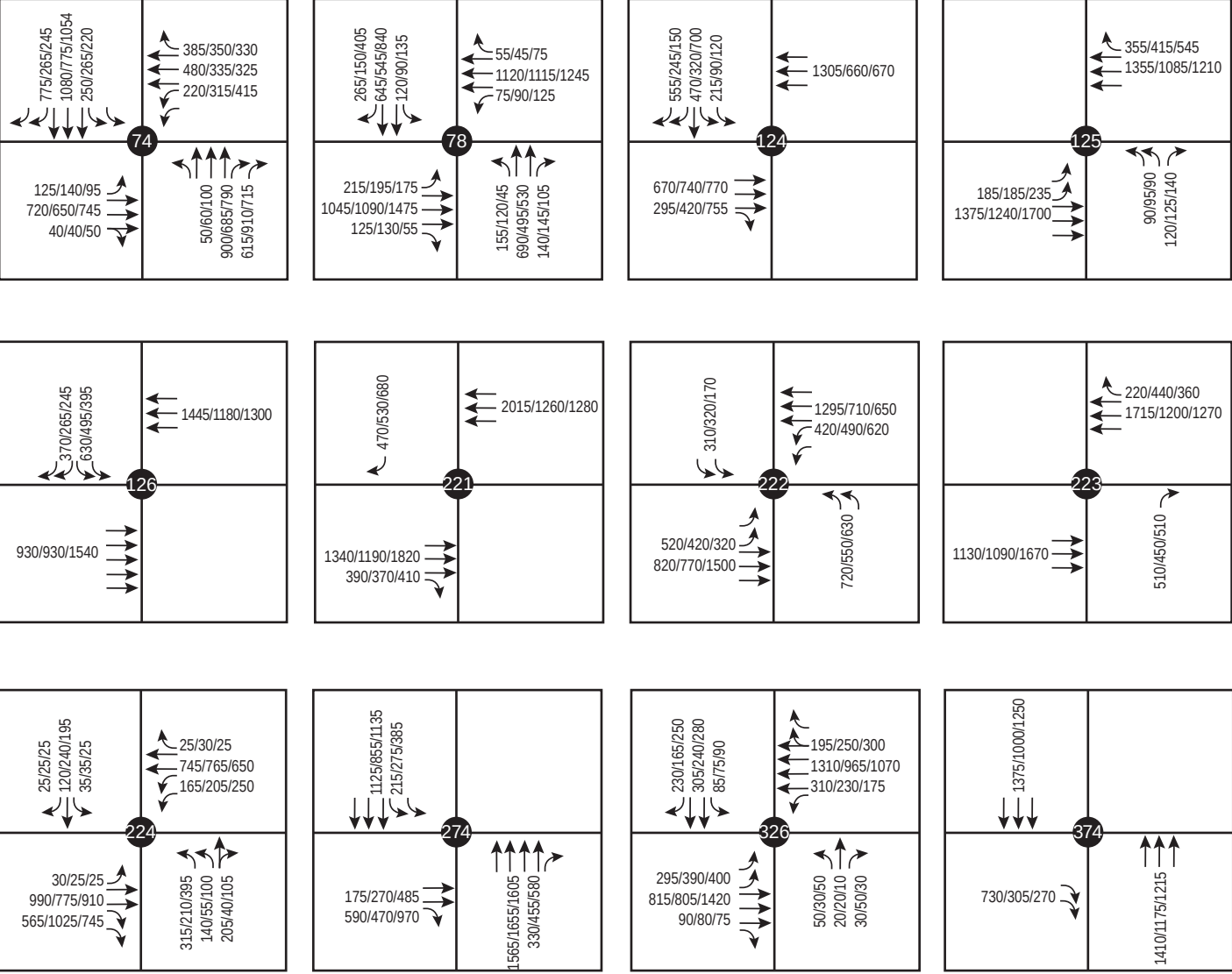
LEGEND

- Signalized Intersection
- AM/MD/PM Peak hour volumes
- Freight Corridor



This page intentionally left blank.

K:\2011\I-710\TOAR\ALT 6A\Fig 9-20 - Alt 6A - Opt 1.a

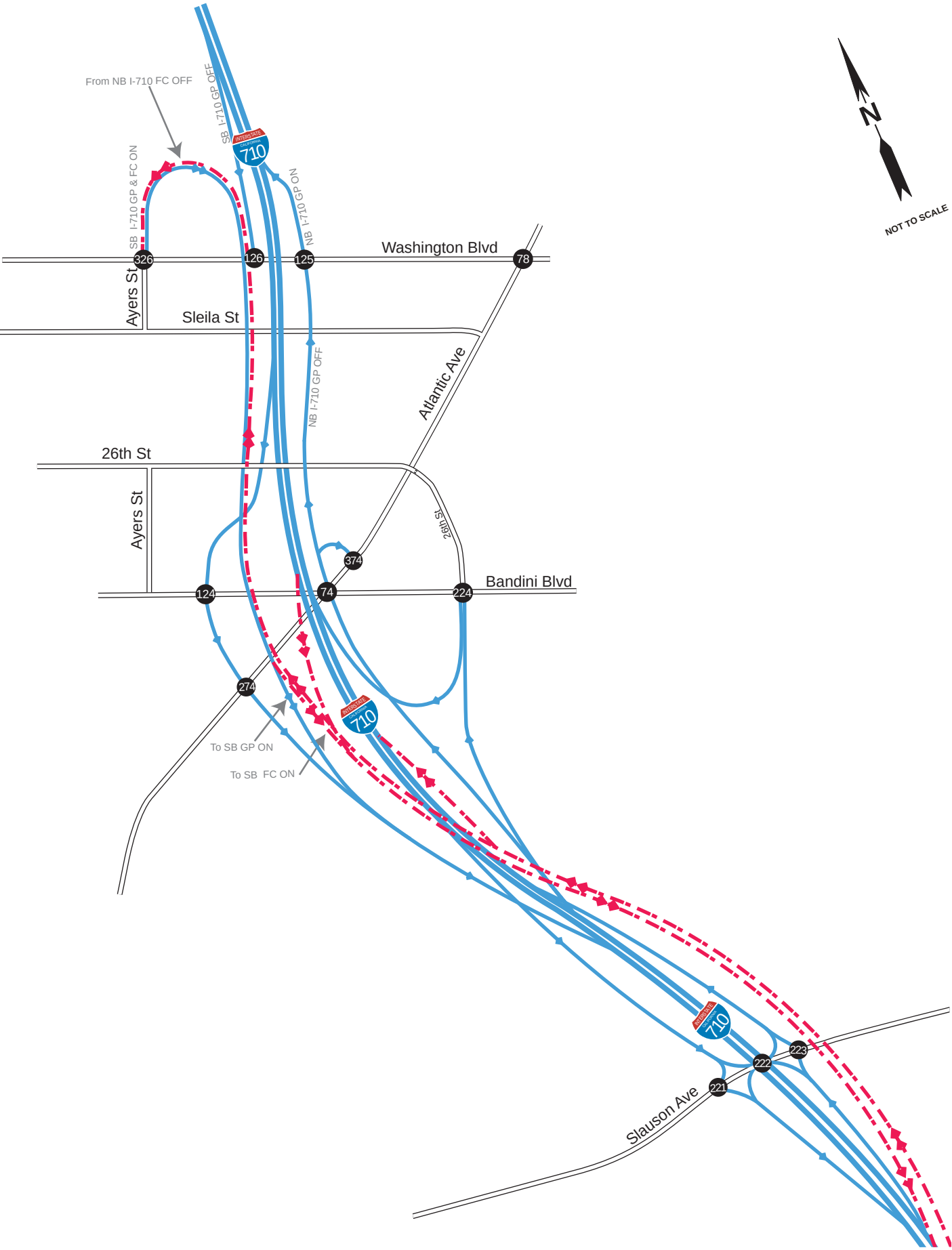


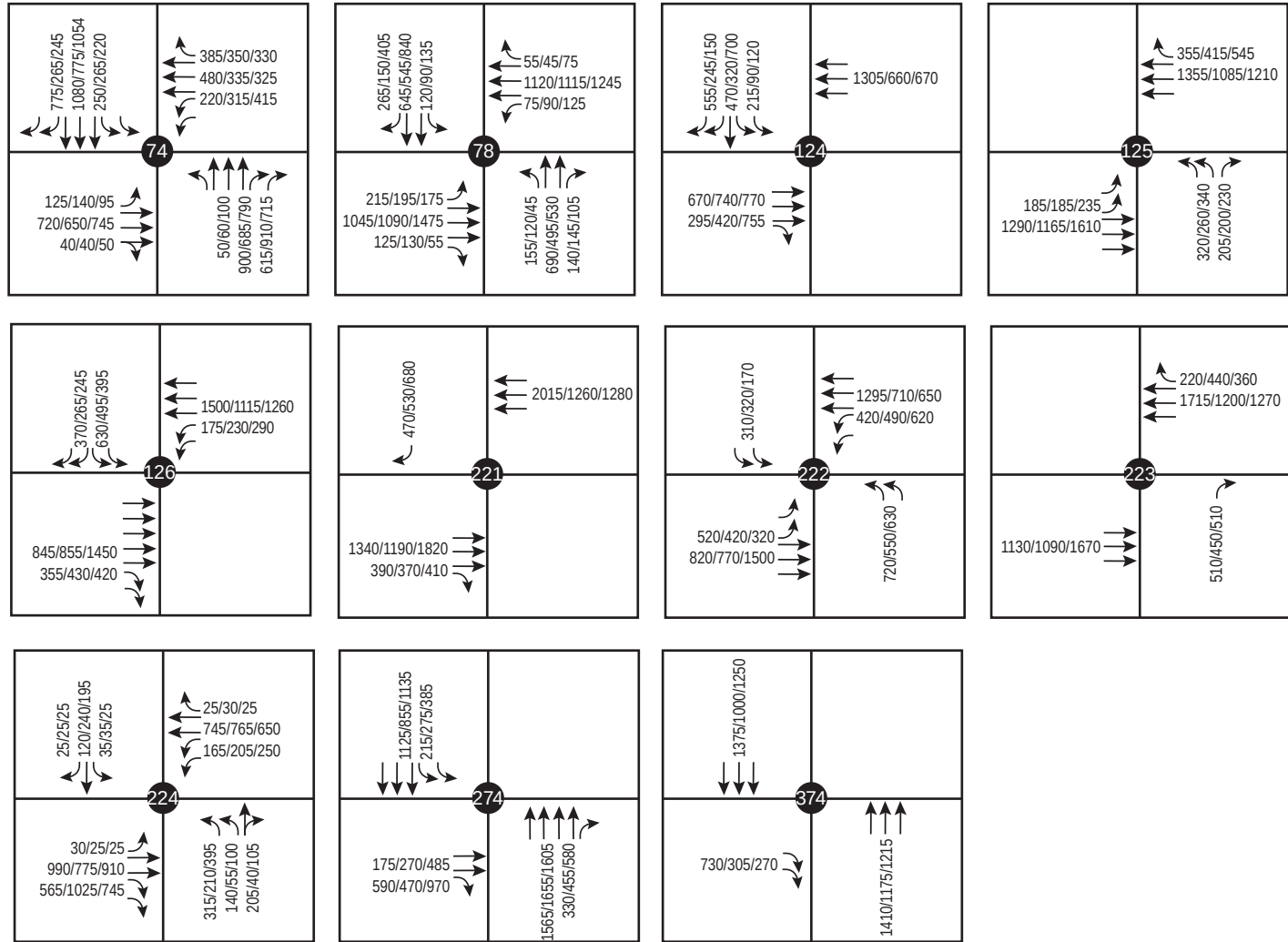
LEGEND

Signalized Intersection

250/150/300 AM/MD/PM Peak Hour Volume

--- Freight Corridor



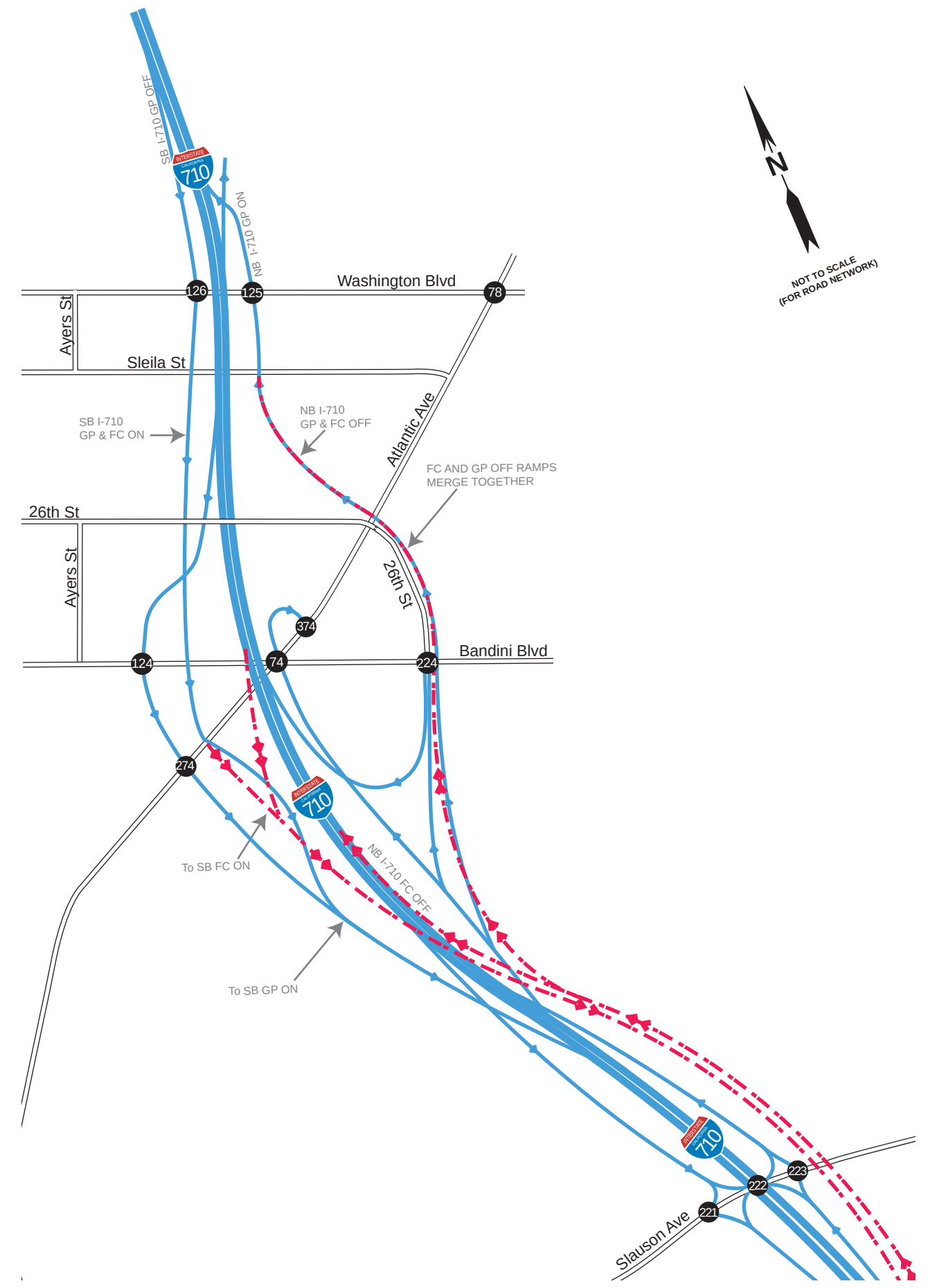


LEGEND

Signalized Intersection

250/150/300 AM/MD/PM Peak Hour Volume

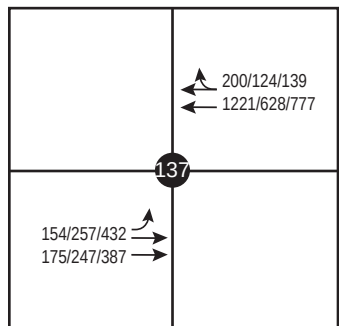
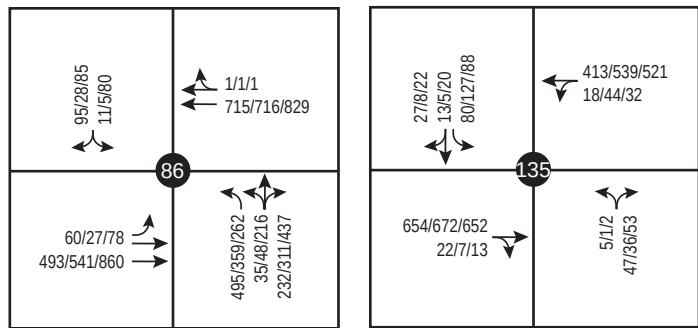
--- Freight Corridor



K:\2011\I-710\TOAR\ALT 6A\Fig 9-21 - Alt 6A - Opt 2.al



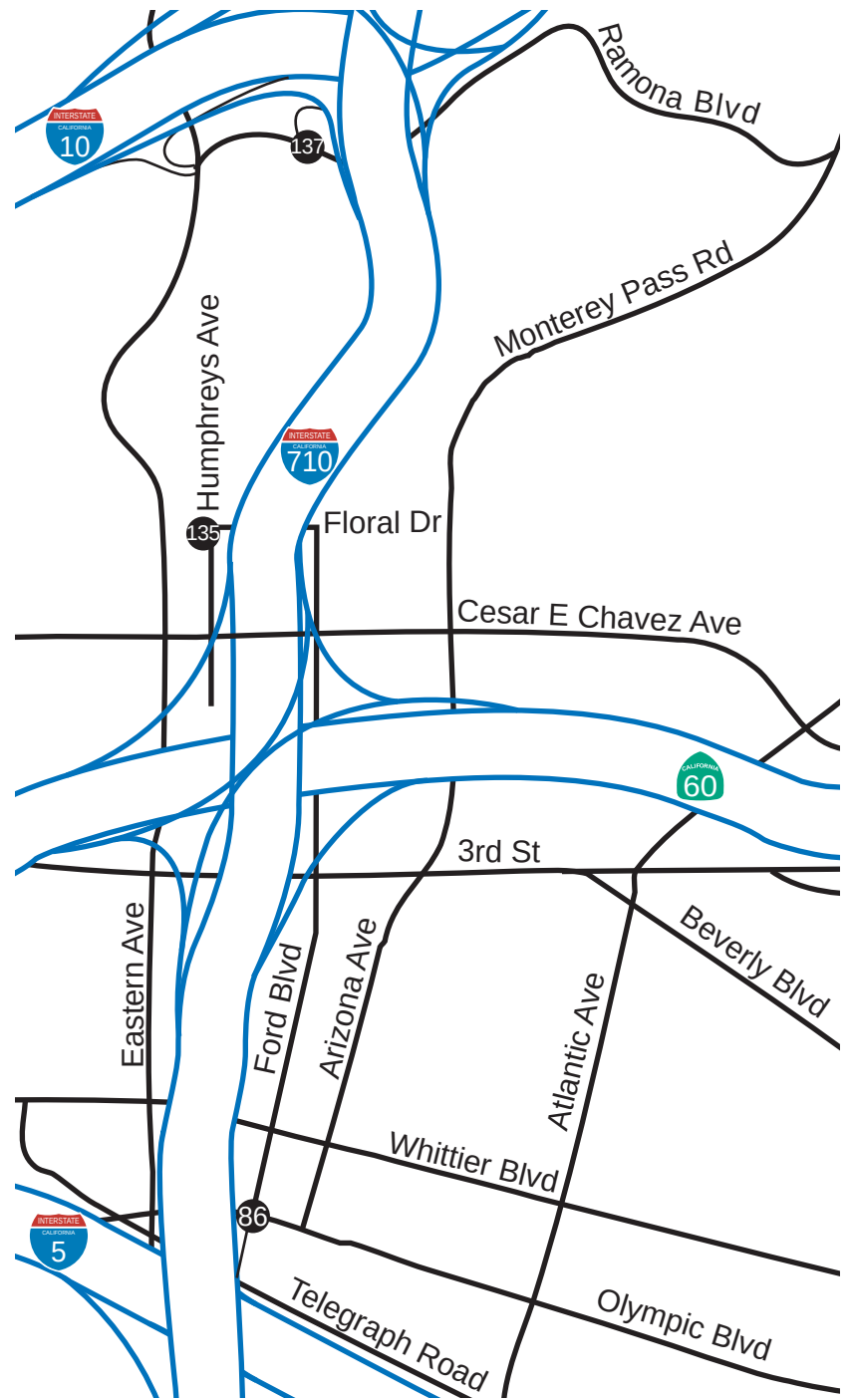
K:\2011\1-710\TOAR\ALT 6A\Fig 9-22 Alt 6A With Project-Washington.ai

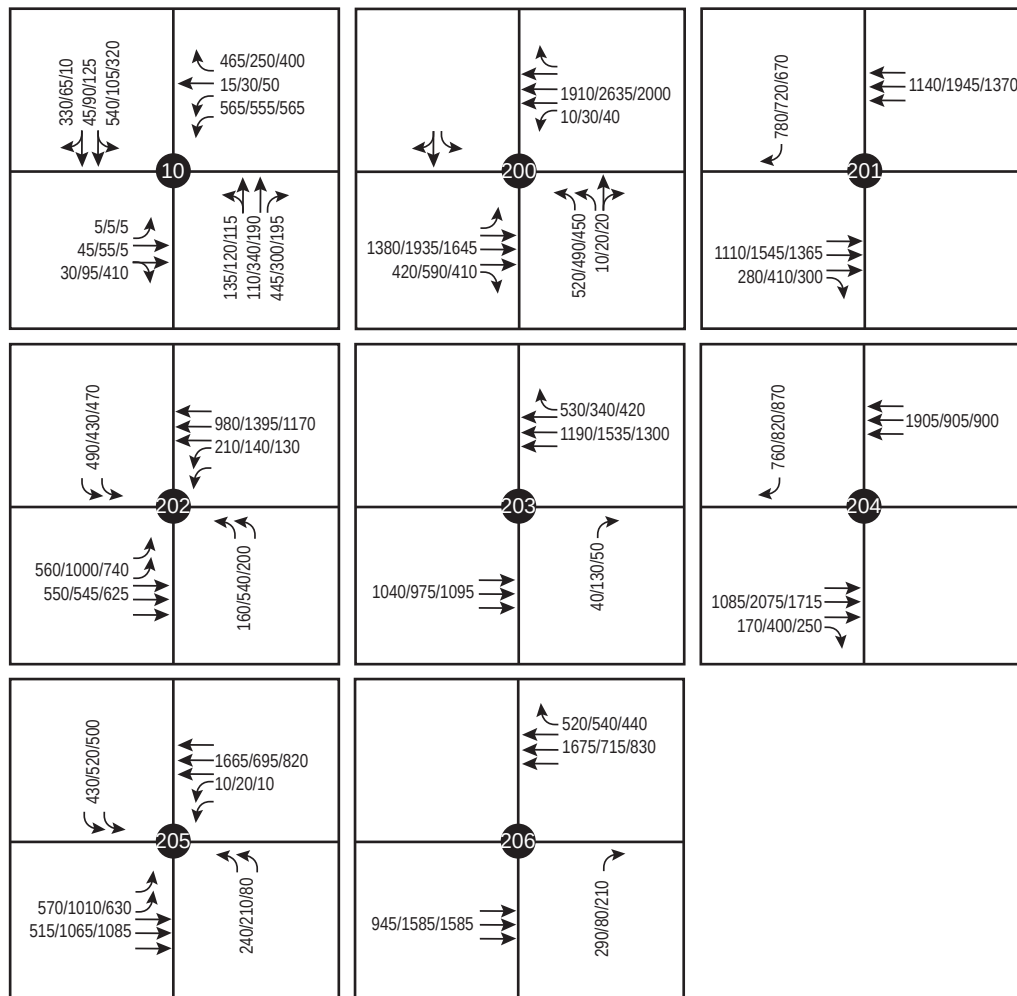


LEGEND

Signalized Intersection

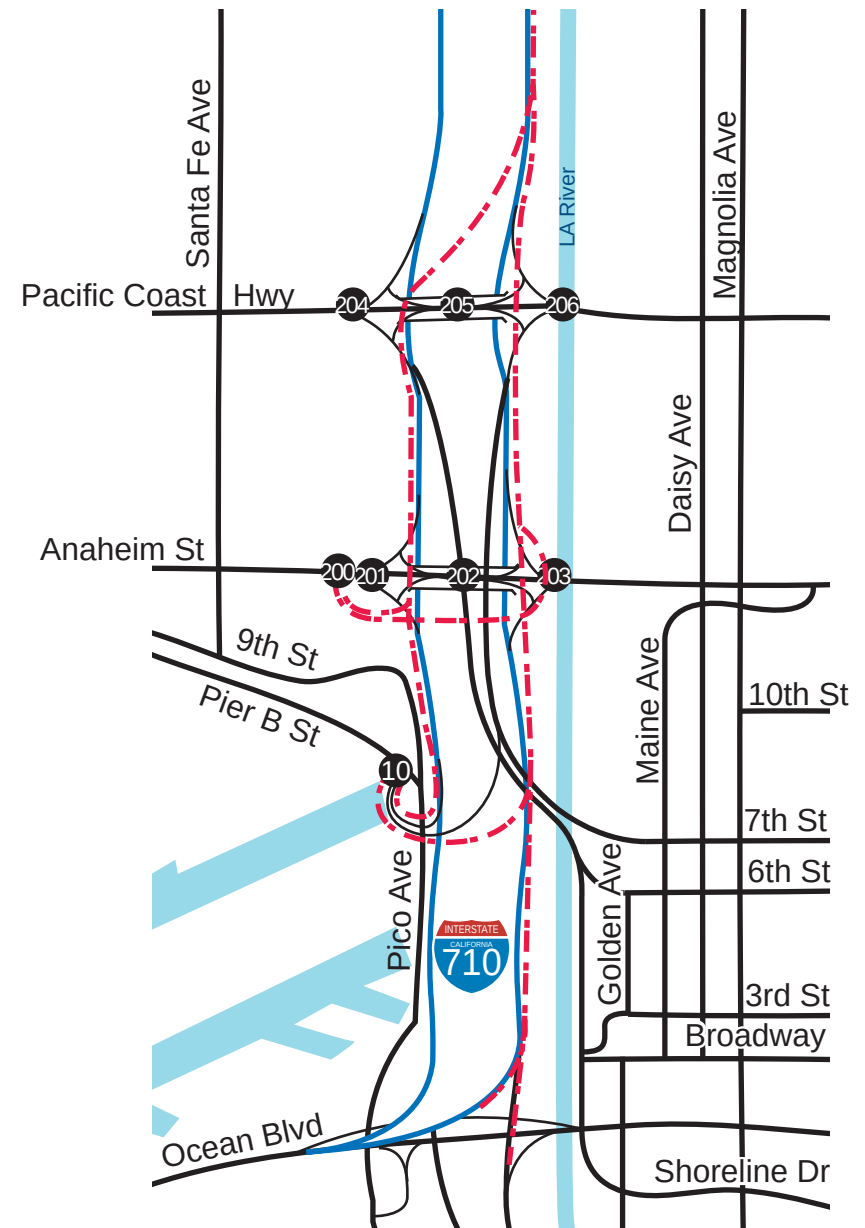
25/10/30 AM/MD/PM Peak hour volumes



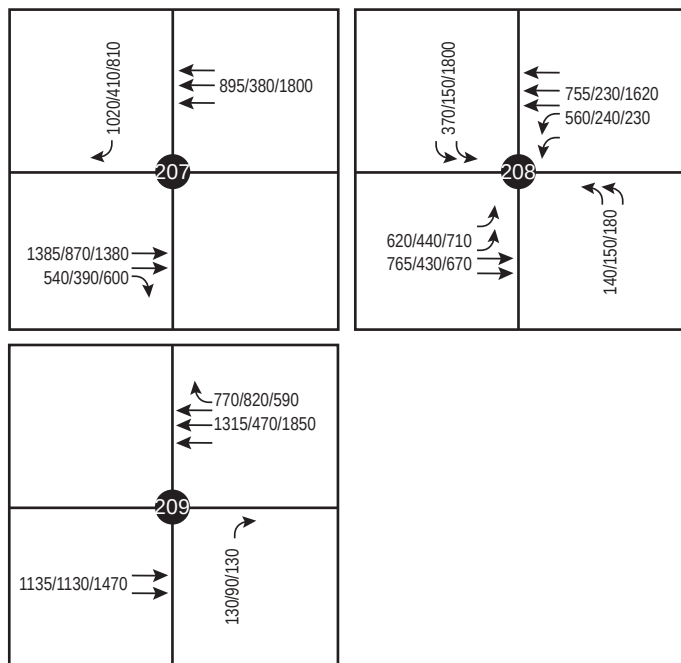


LEGEND

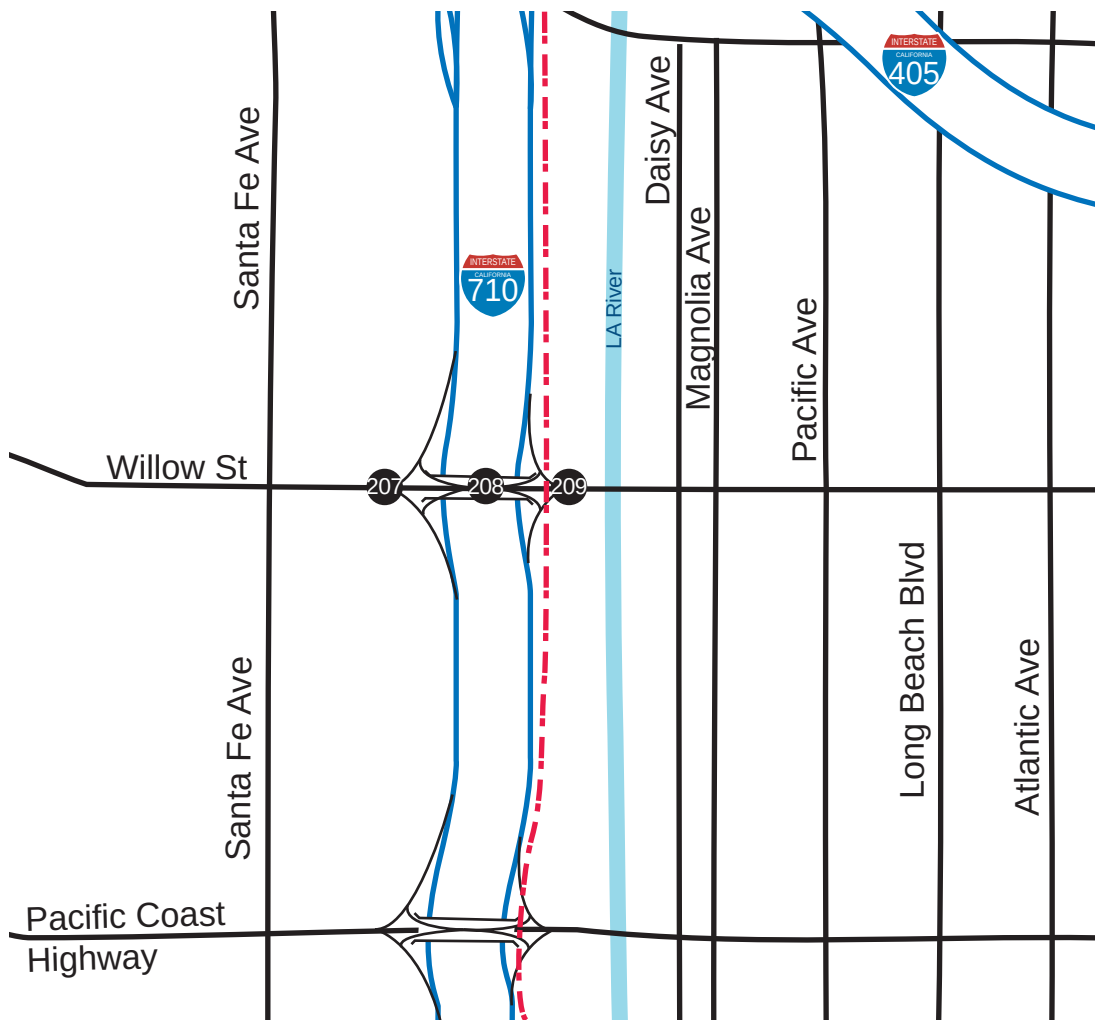
- # Signalized Intersection
- 25/10/30 AM/MD/PM Peak hour volumes
- Freight Corridor



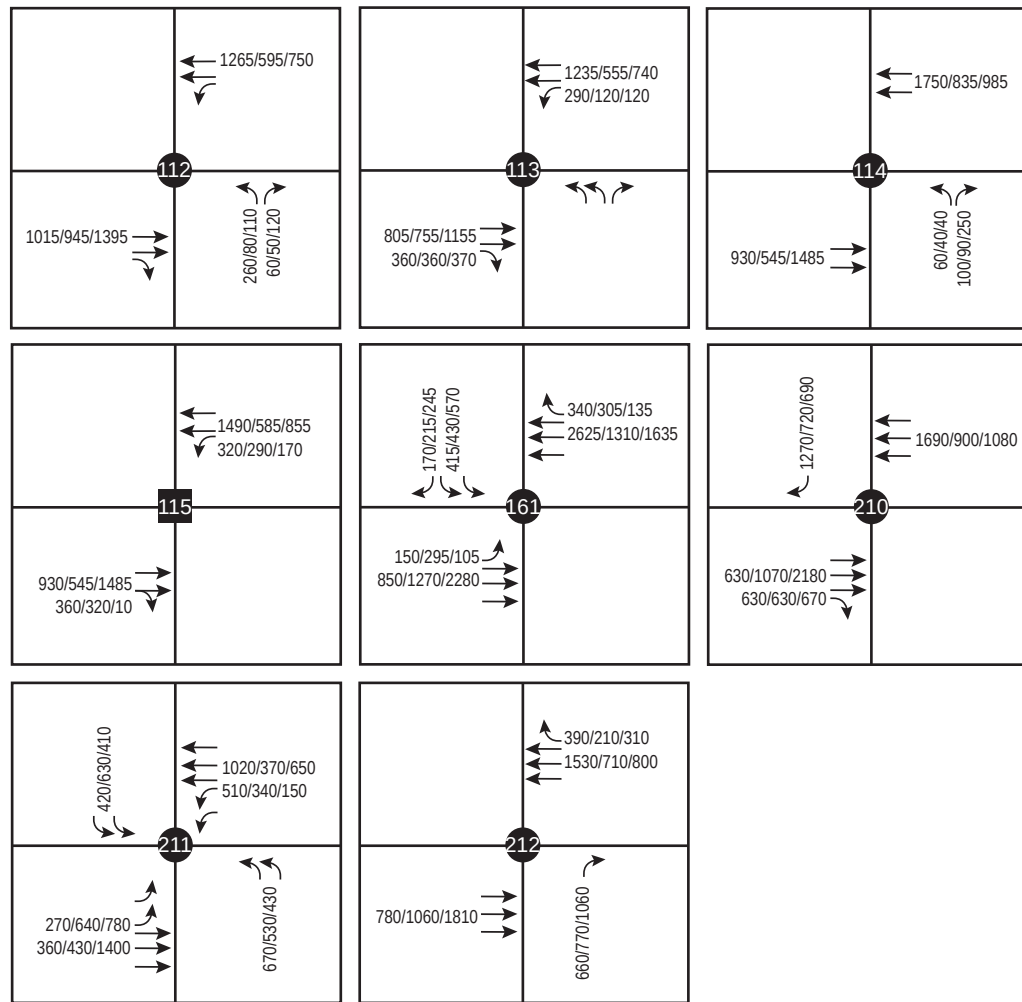
K:\2011\I-710\TOAR\ALT 6B\Fig 9-24 Alt 6B-Willow.ai



- LEGEND**
- # Signalized Intersection
 - 25/10/30 AM/MD/PM Peak hour volumes
 - Freight Corridor

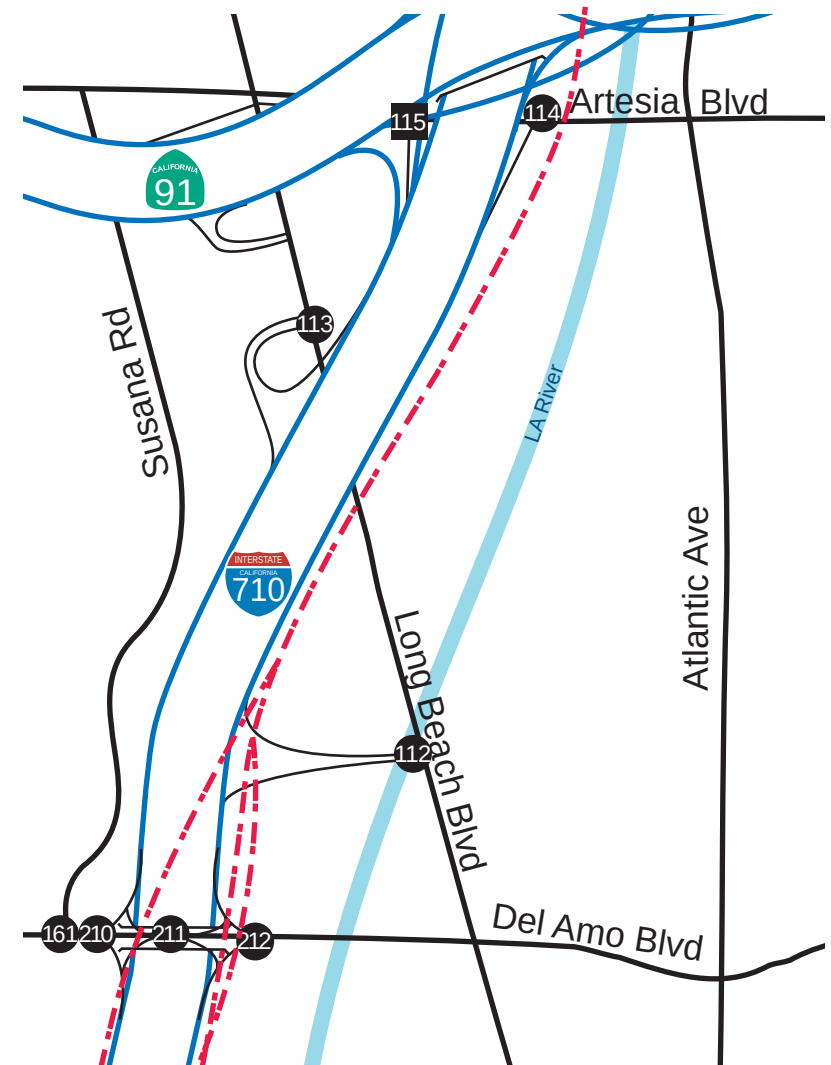


K:\2011\I-710\TOAR\ALT 6B\Fig 9-25 Alt 6B-Del Amo.ai



LEGEND

- # Signalized Intersection
- 25/10/30 AM/MD/PM Peak hour volumes
- Freight Corridor



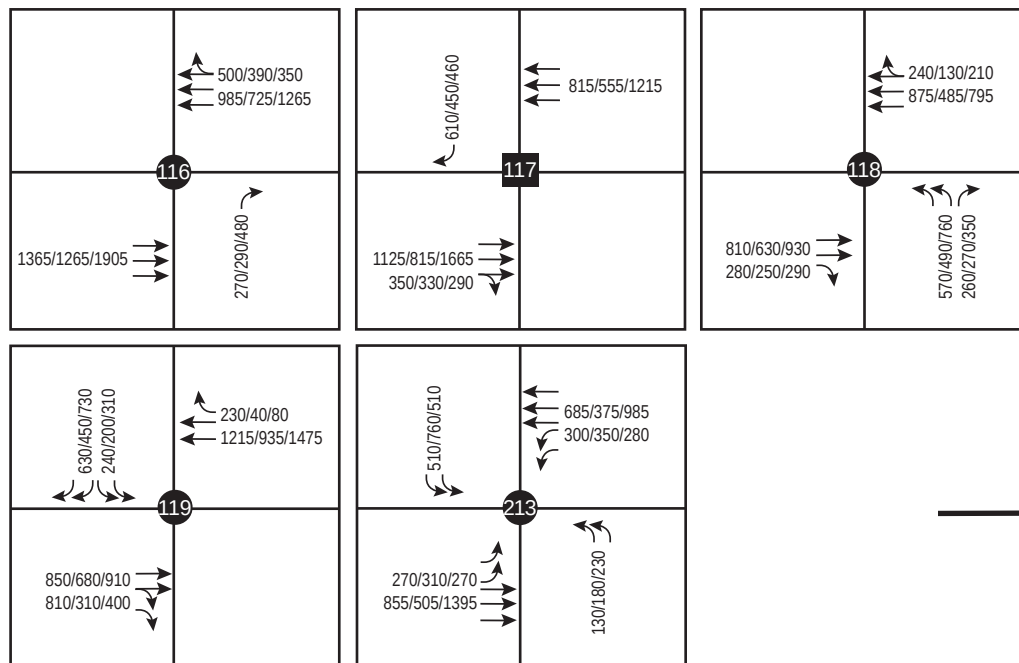
Project: I-710 PA-ED

ALT 6B - YEAR 2035 WITH PROJECT TRAFFIC VOLUMES DEL AMO, LONG BEACH, & ARTESIA INTERCHANGE

Figure 9-25

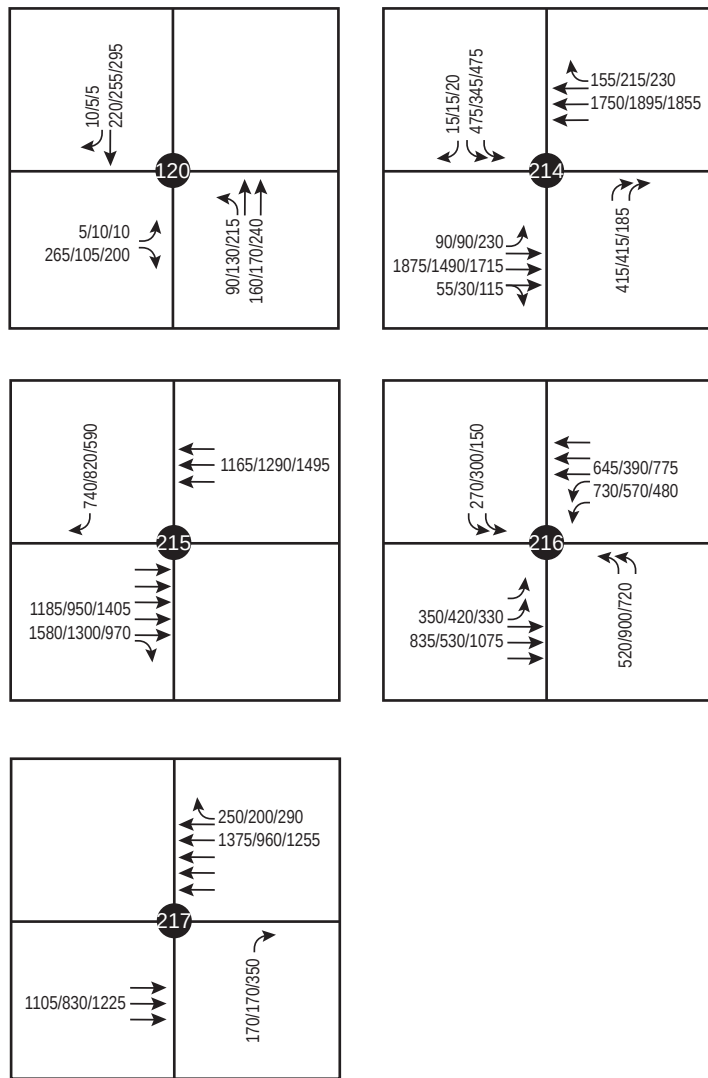


K:\2011\1-710\TOAR\ALT 6B\Fig 9-26 Alt 6B-Alondra.ai



- LEGEND**
- # Signalized Intersection
 - 25/10/30 AM/MD/PM Peak hour volumes
 - Freight Corridor

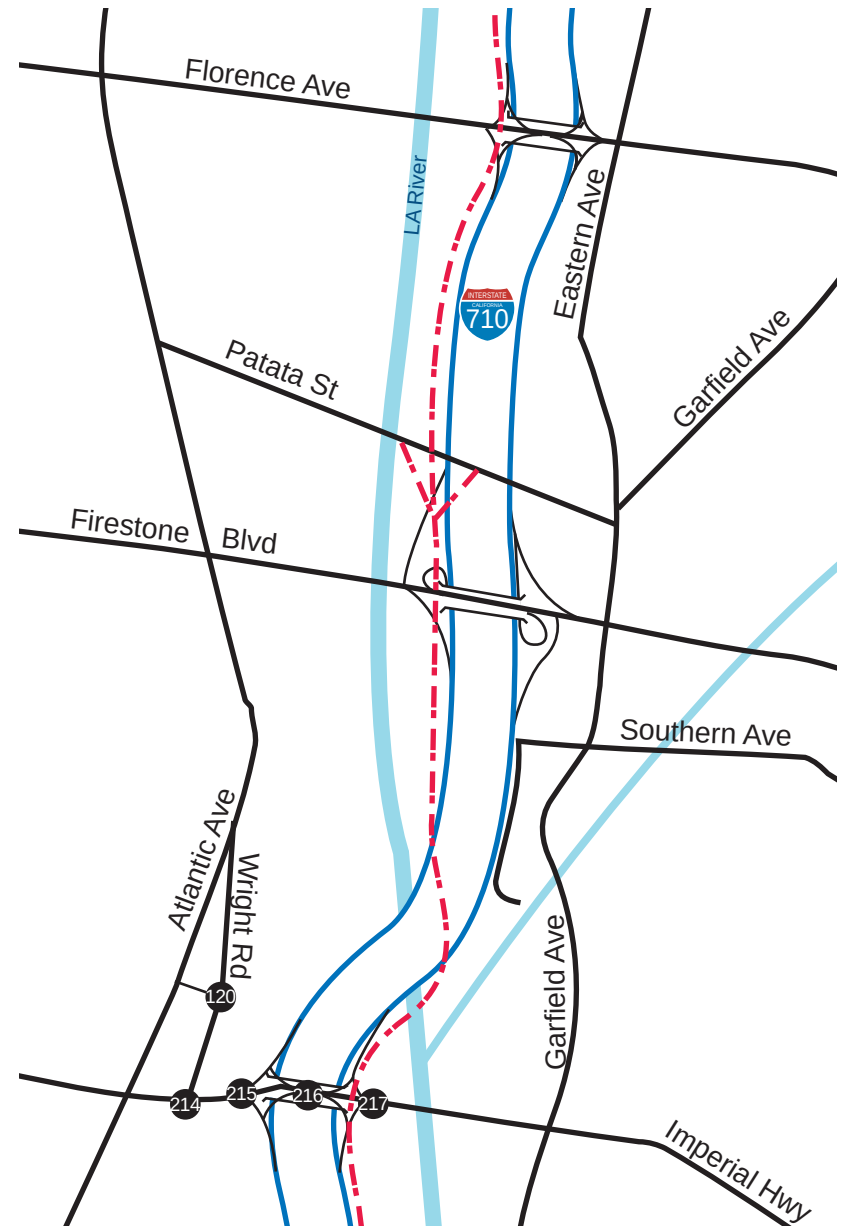
K:\2011\1-710\TOAR\ALT 6B\Fig 9-27 Alt 6B-Imperial.lai



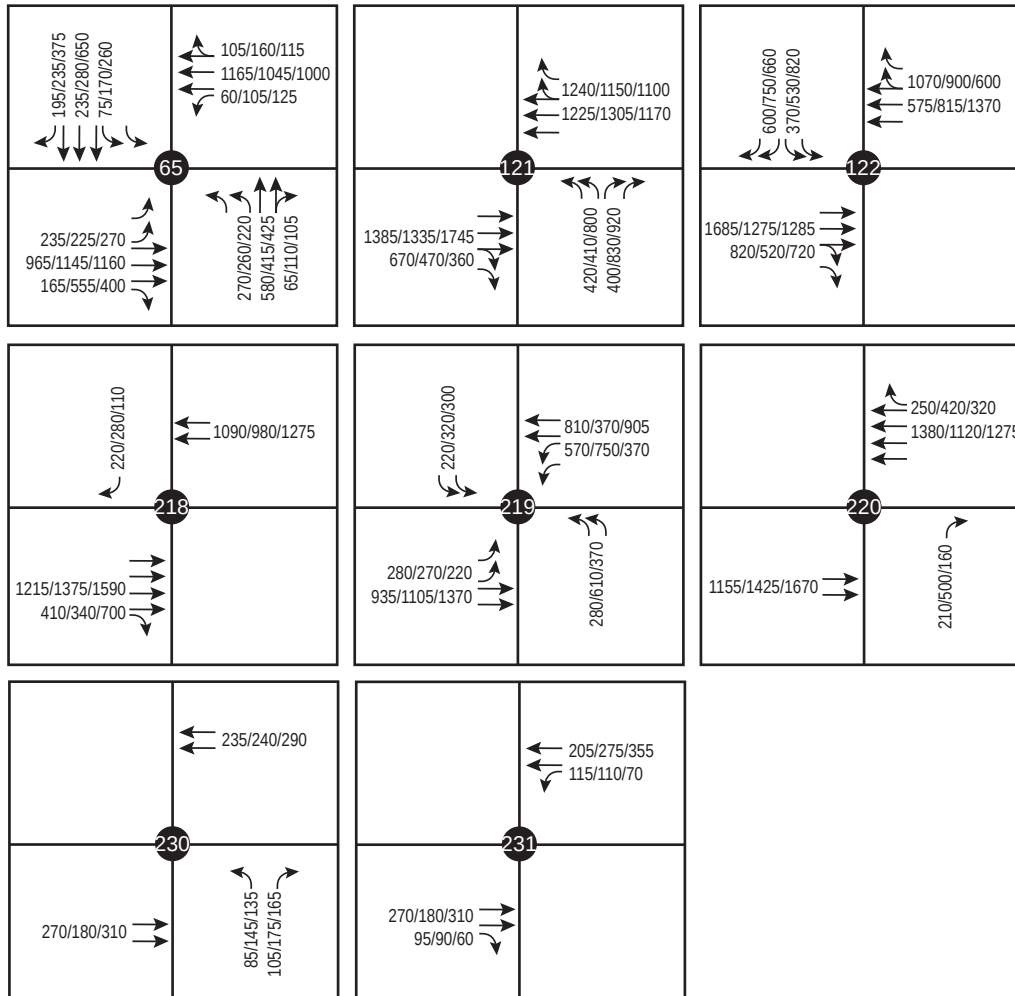
NOT TO SCALE

LEGEND

- # Signalized Intersection
- 25/10/30 AM/MD/PM Peak hour volumes
- Freight Corridor

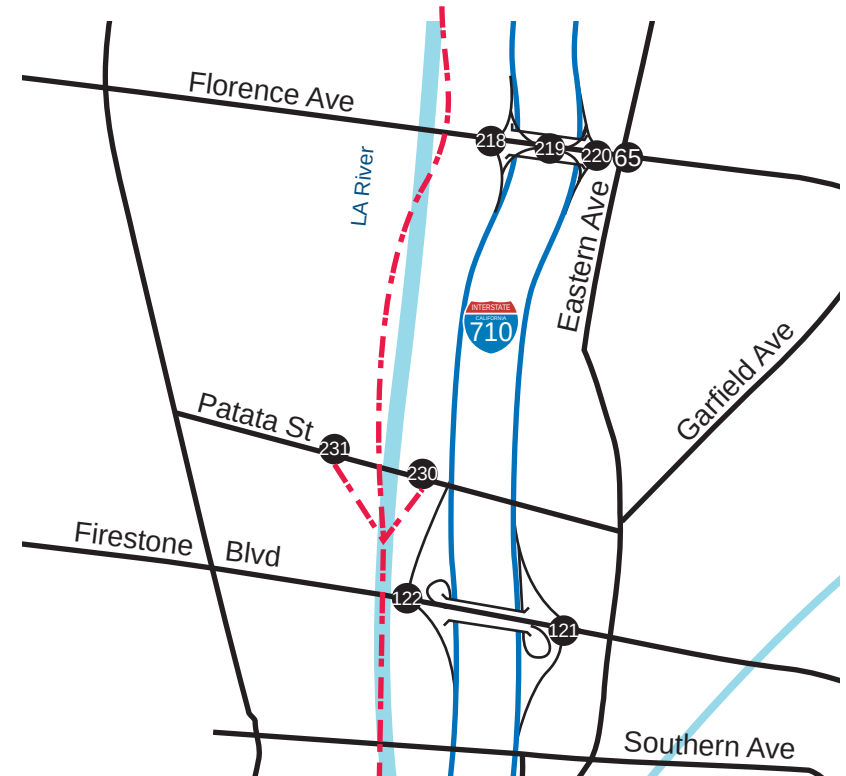


K:\2011\I-710\TOAR\ALT 6B\Fig 9-28 Alt cB-Imperial.ai



NOT TO SCALE

- LEGEND**
- # Signalized Intersection
 - 25/10/30 AM/MD/PM Peak hour volumes
 - Freight Corridor



Project: I-710 PA-ED

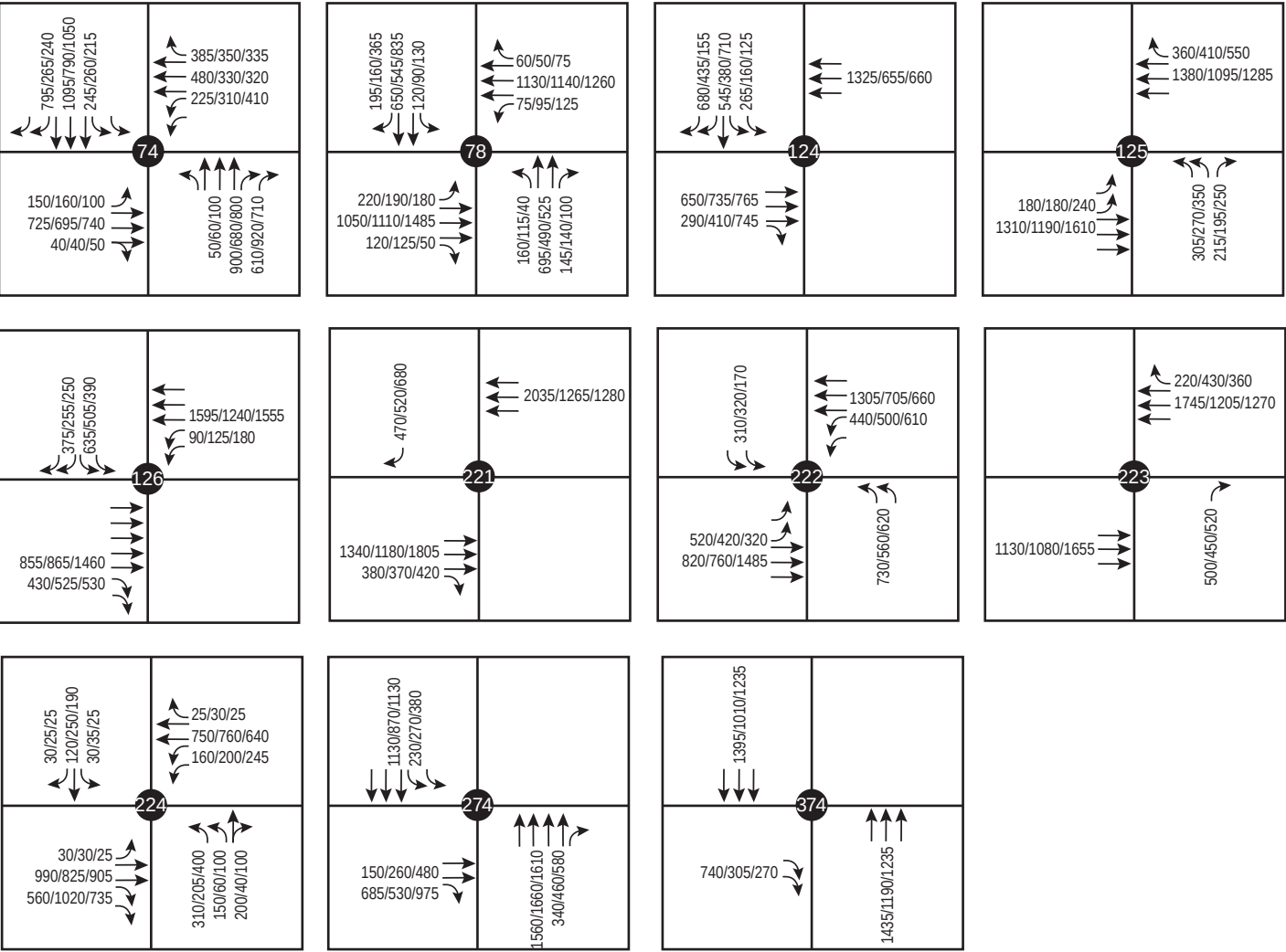
ALT 6B - YEAR 2035 WITH PROJECT TRAFFIC VOLUMES IMPERIAL, FIRESTONE & FLORENCE INTERCHANGE

Figure 9-28



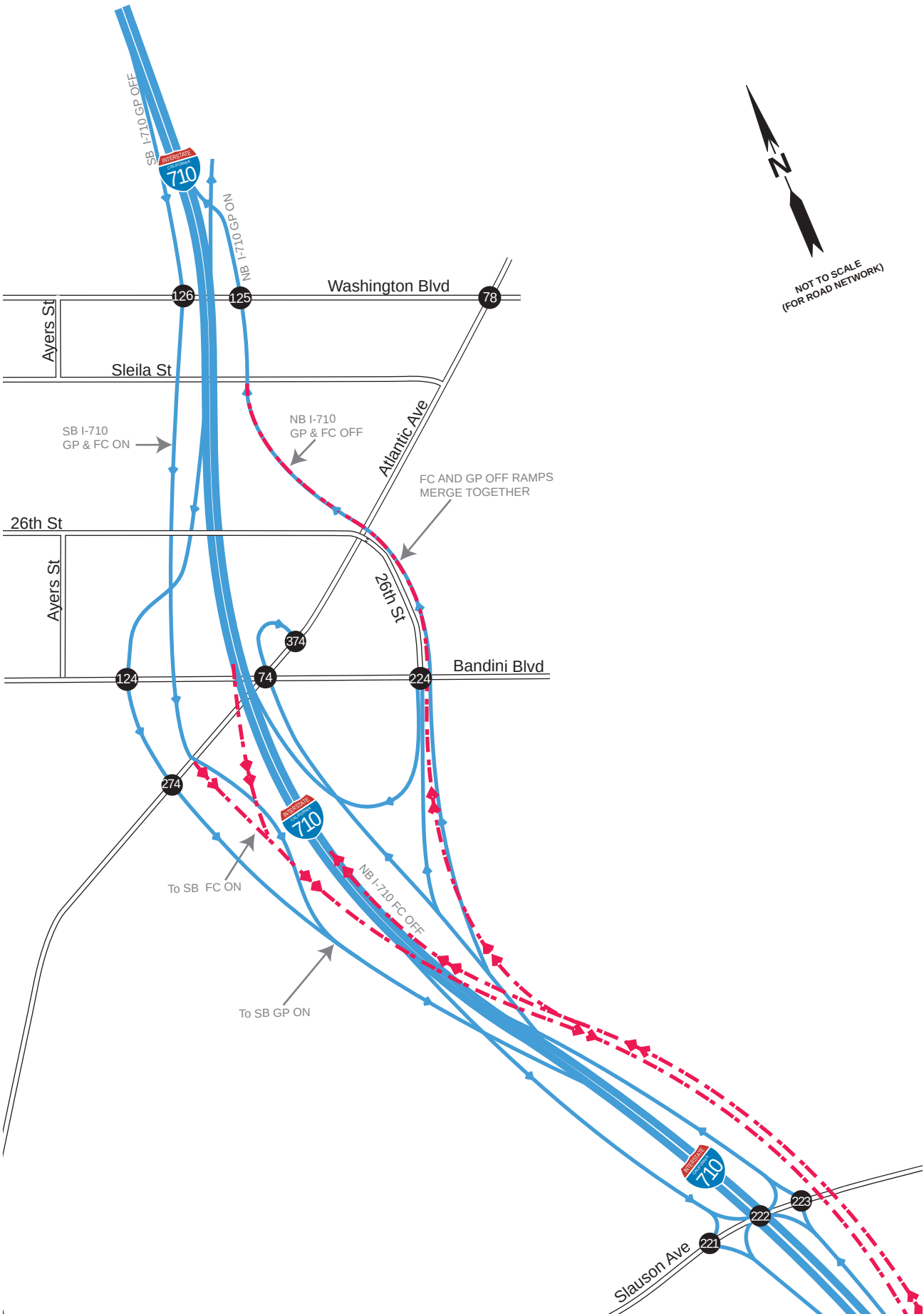
This page intentionally left blank.

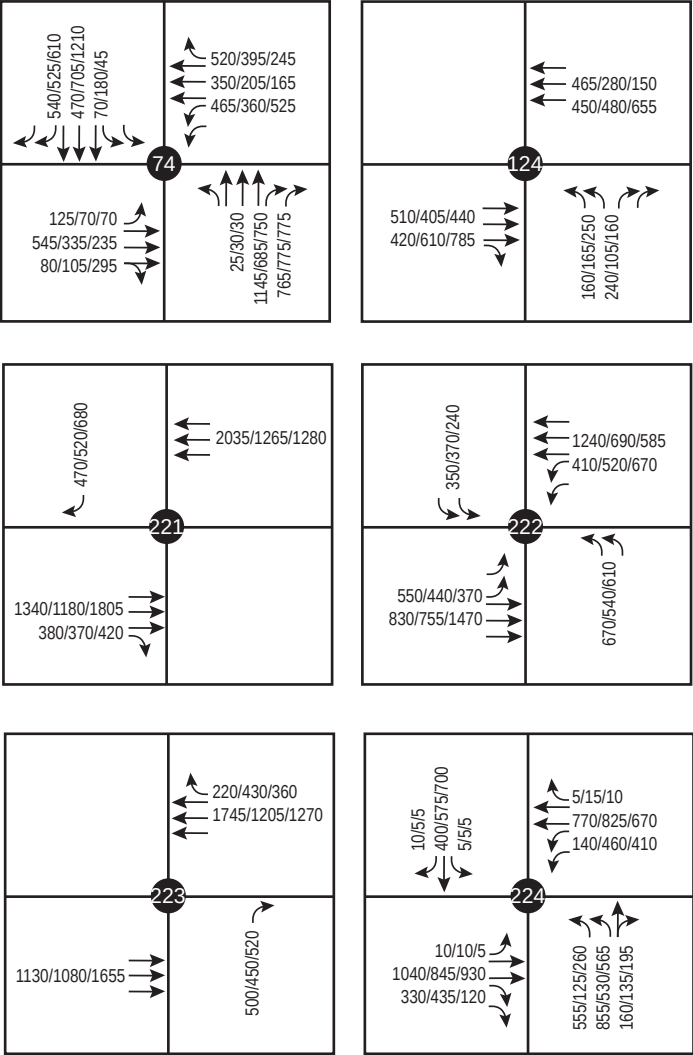
K:\2011\I-710\TOAR\ALT 6B\Fig 9-30-Alt 6B-Opt 2.ai



LEGEND

- # Signalized Intersection
- 250/150/300 AM/MD/PM Peak Hour Volume
- Freight Corridor



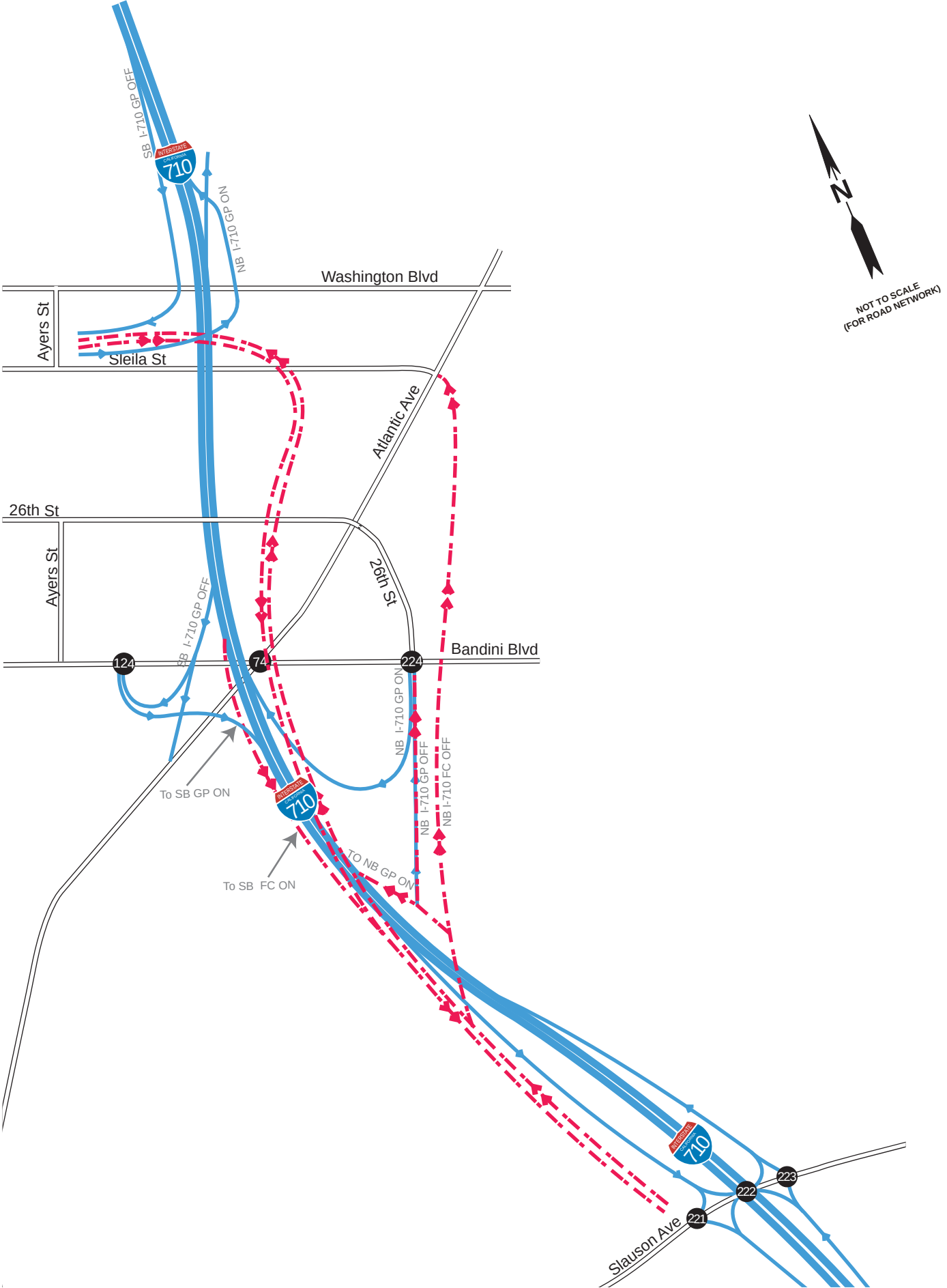


LEGEND

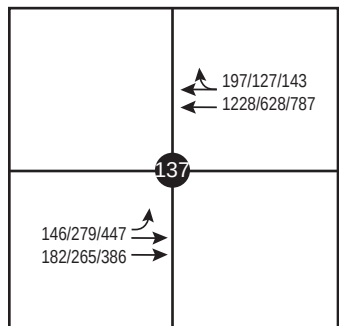
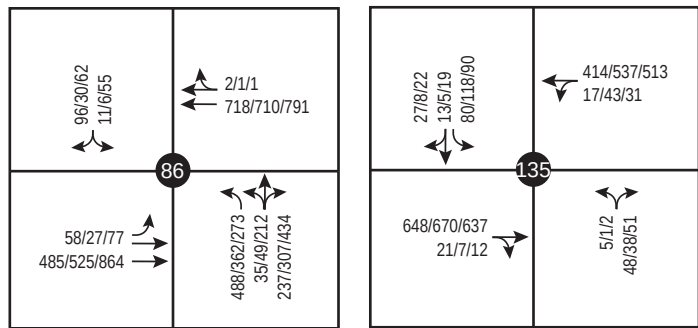
Signalized Intersection

250/150/300 AM/MD/PM Peak Hour Volume

--- Freight Corridor

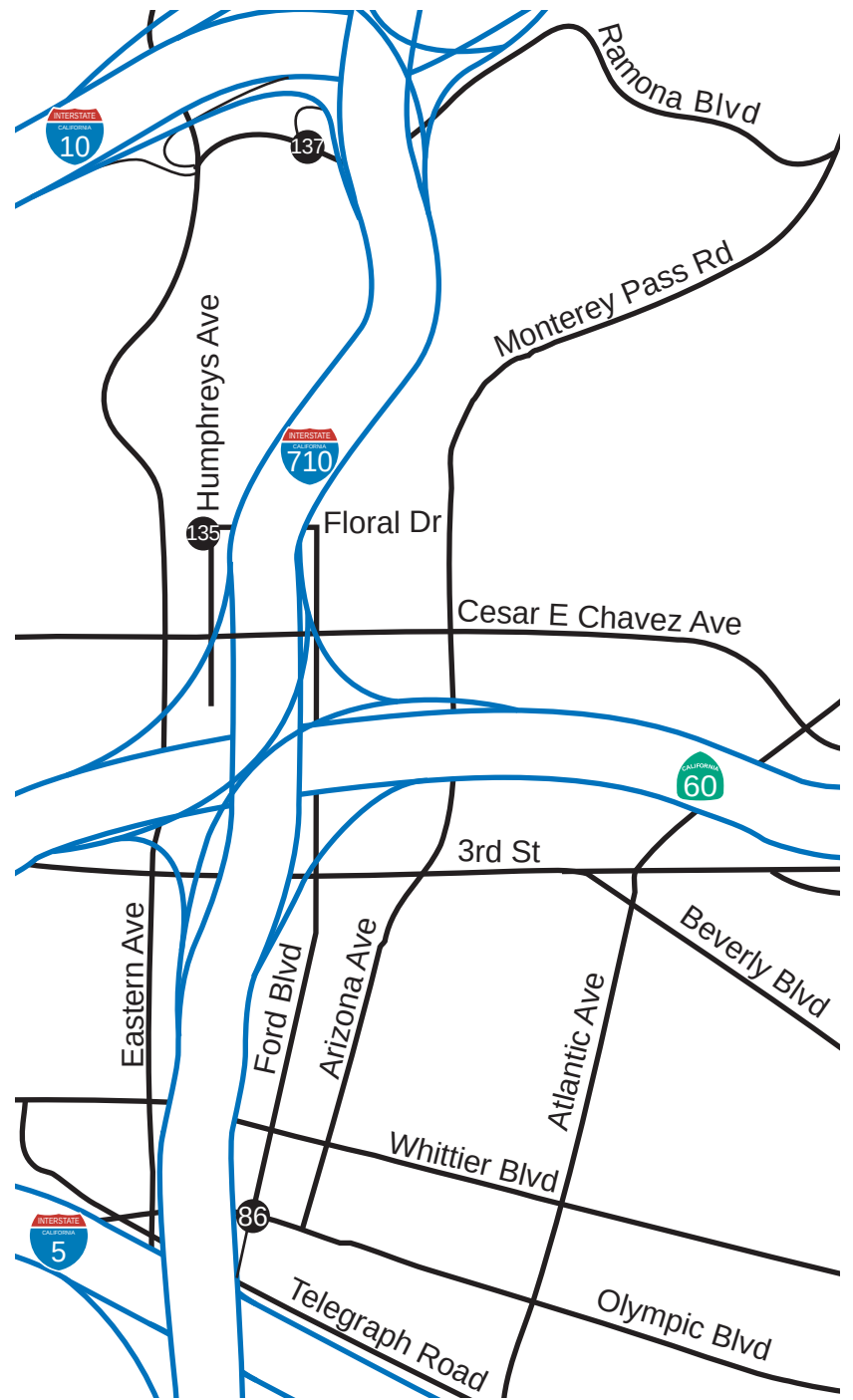


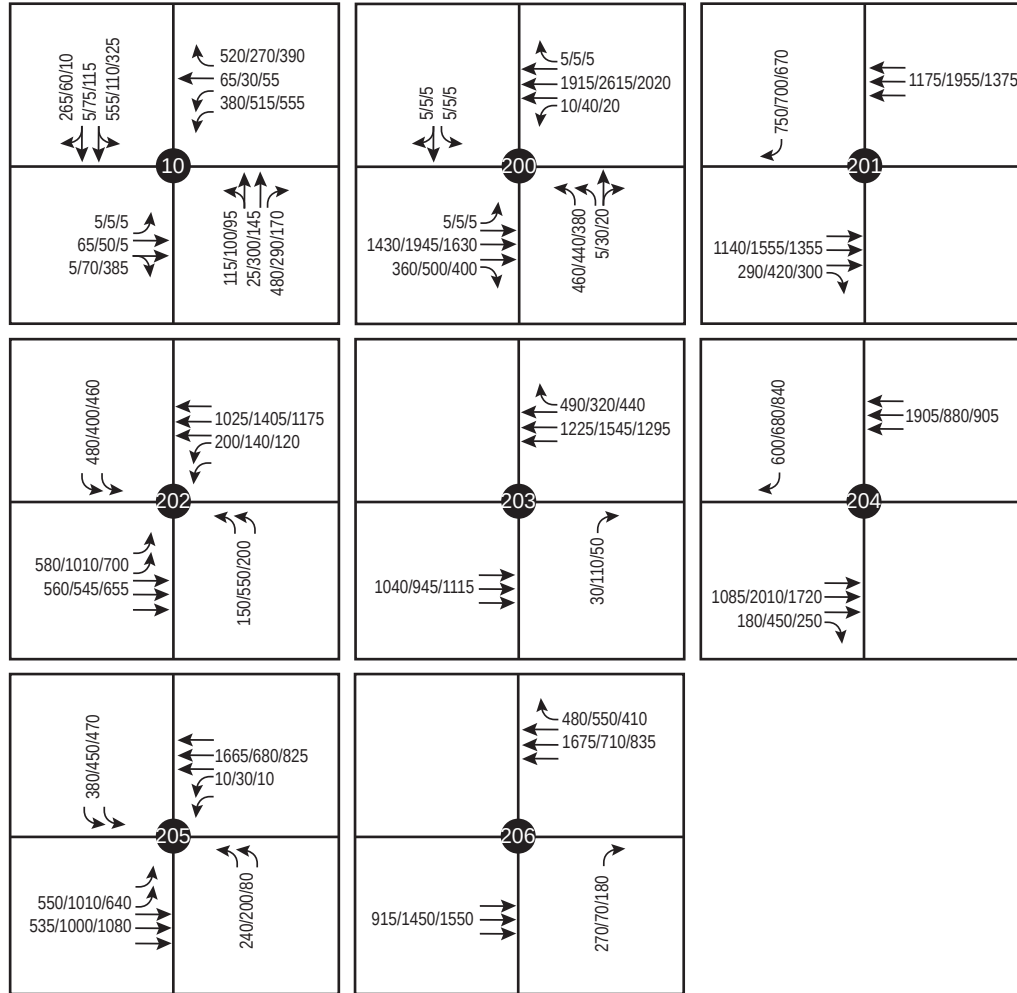
K:\2011\1-710\TOAR\ALT 6B\Fig 9-32 Alt 6B With Project-Washington.ai



LEGEND

- # Signalized Intersection
- 25/10/30 AM/MD/PM Peak hour volumes



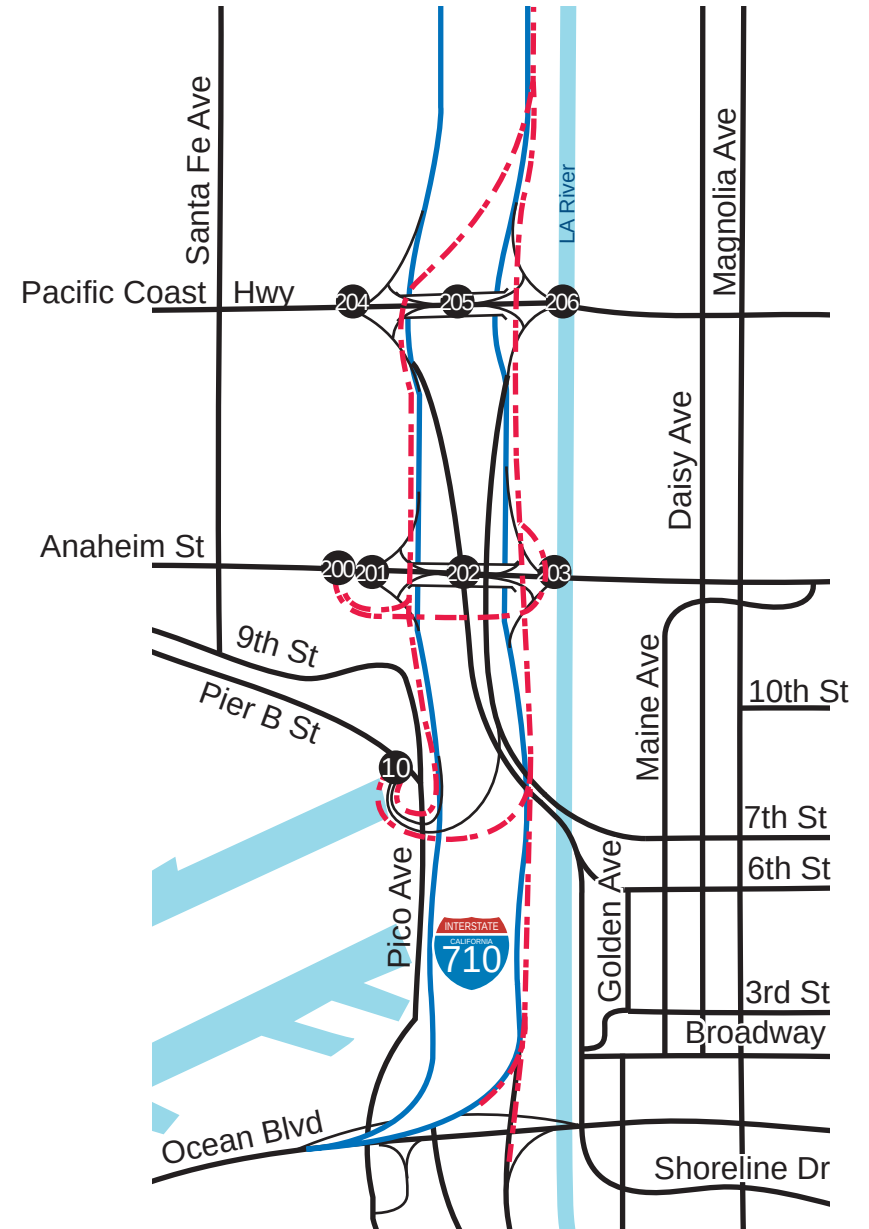


LEGEND

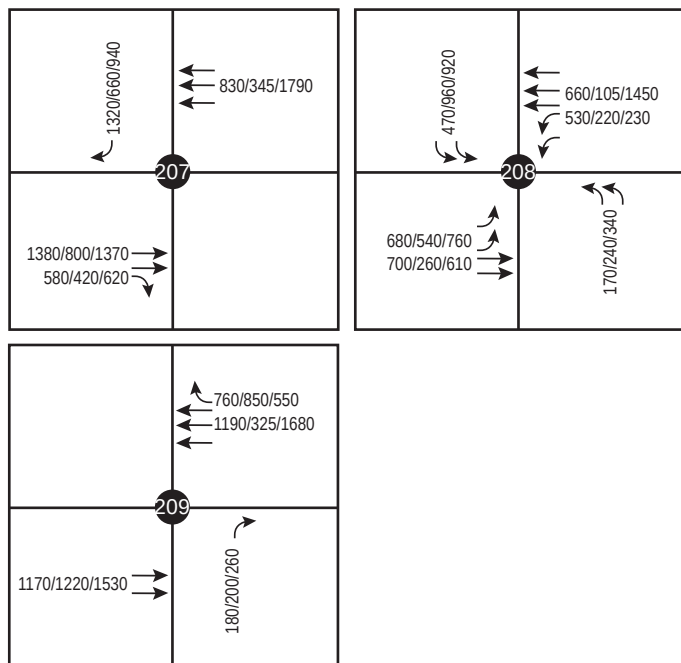
Signalized Intersection

25/10/30 AM/MD/PM Peak hour volumes

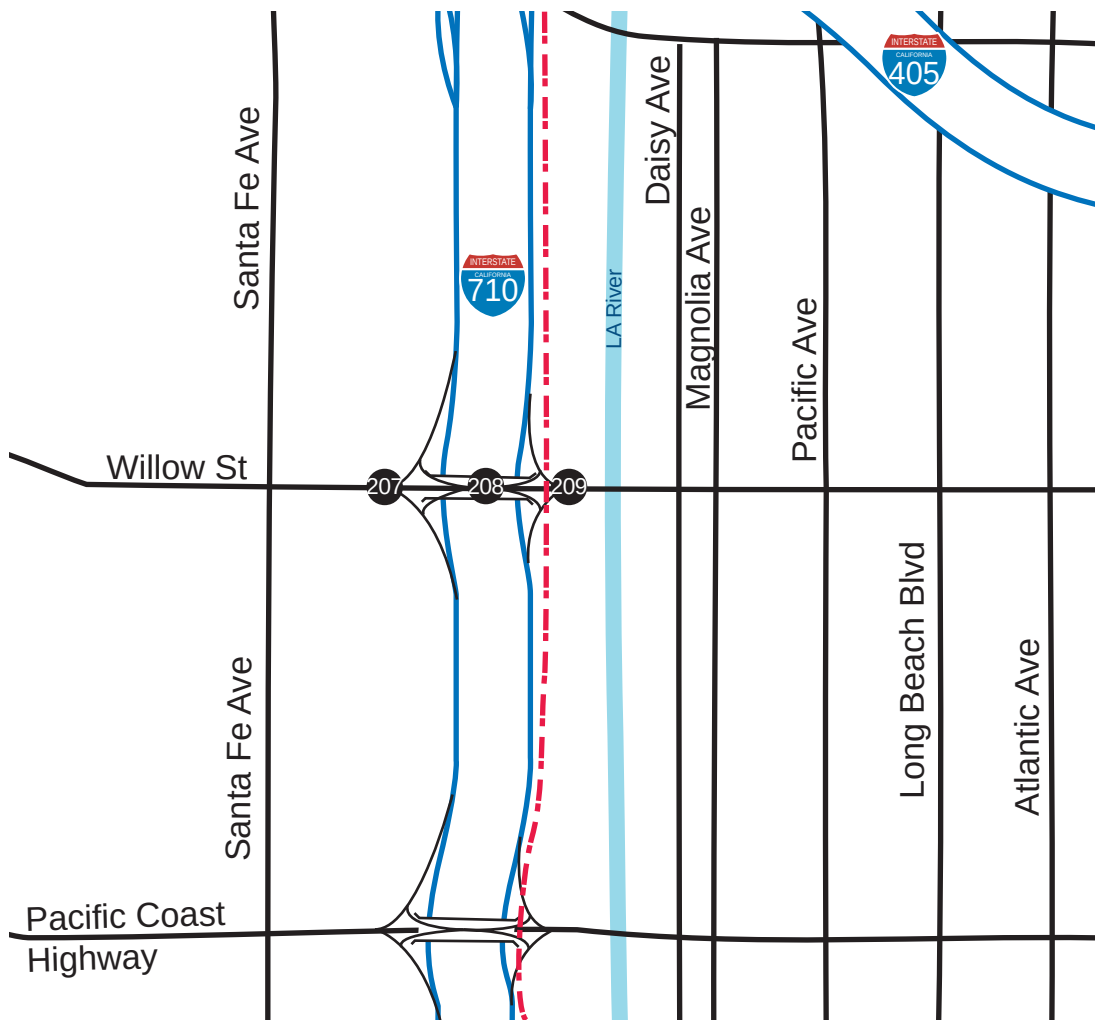
--- Freight Corridor



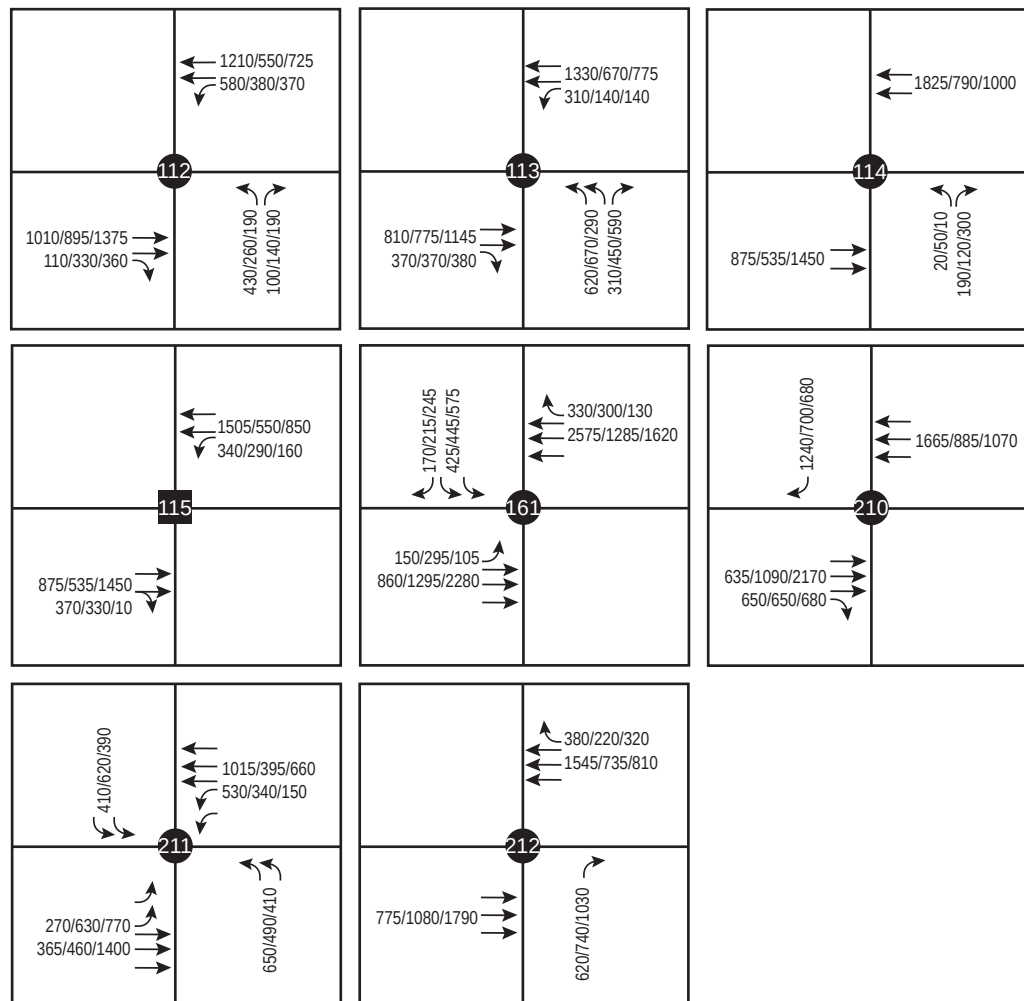
K:\2011\I-710\TOAR\ALT 6C\Fig 9-34 Alt 6C-Willow.ai



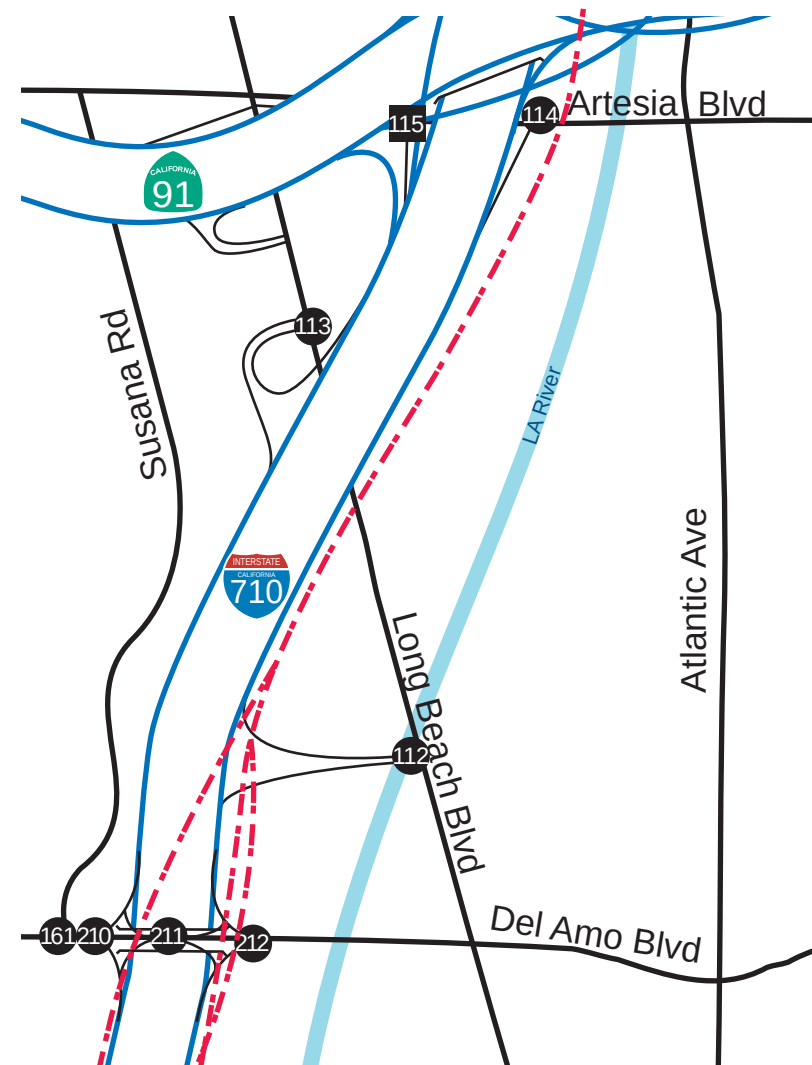
- LEGEND**
- # Signalized Intersection
 - 25/10/30 AM/MD/PM Peak hour volumes
 - Freight Corridor



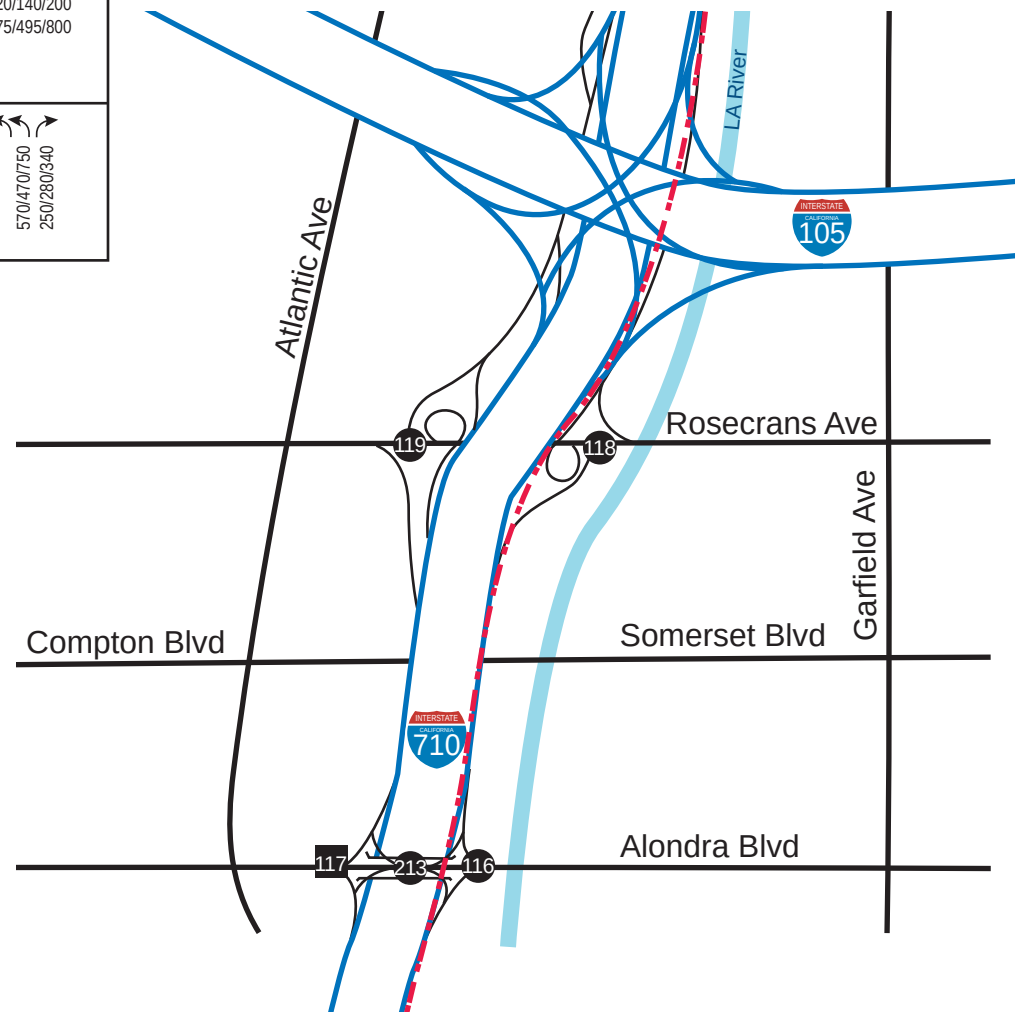
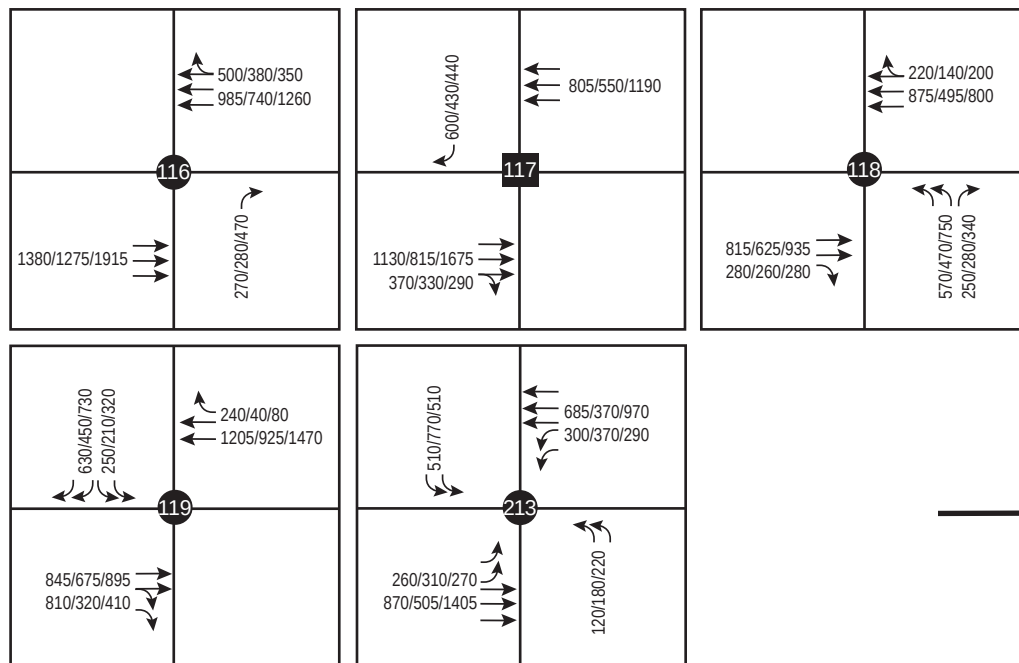
K:\2011\I-710\TOAR\ALT 6C\Fig 9-35 Alt 6C-Del Amo.ai



- LEGEND**
- # Signalized Intersection
 - 25/10/30 AM/MD/PM Peak hour volumes
 - Freight Corridor



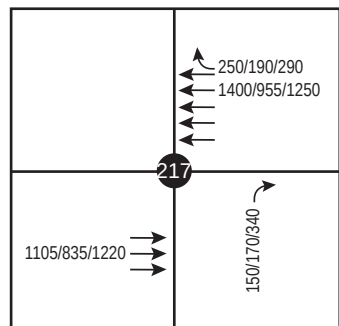
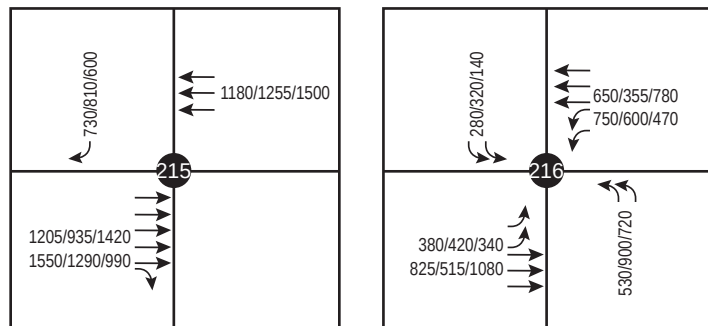
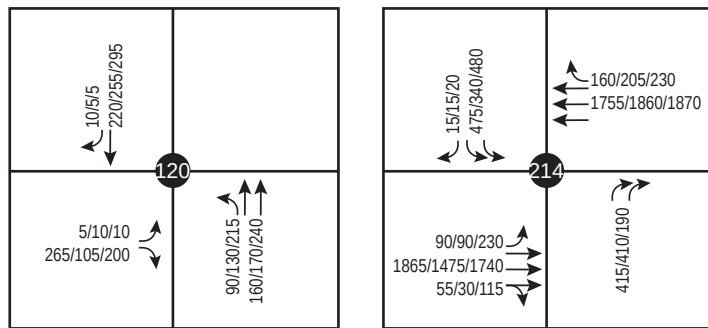
K:\2011\1-710\TOAR\ALT 6C\Fig 9-36 Alt 6C-Alondra.ai



LEGEND

- # Signalized Intersection
- 25/10/30 AM/MD/PM Peak hour volumes
- Freight Corridor

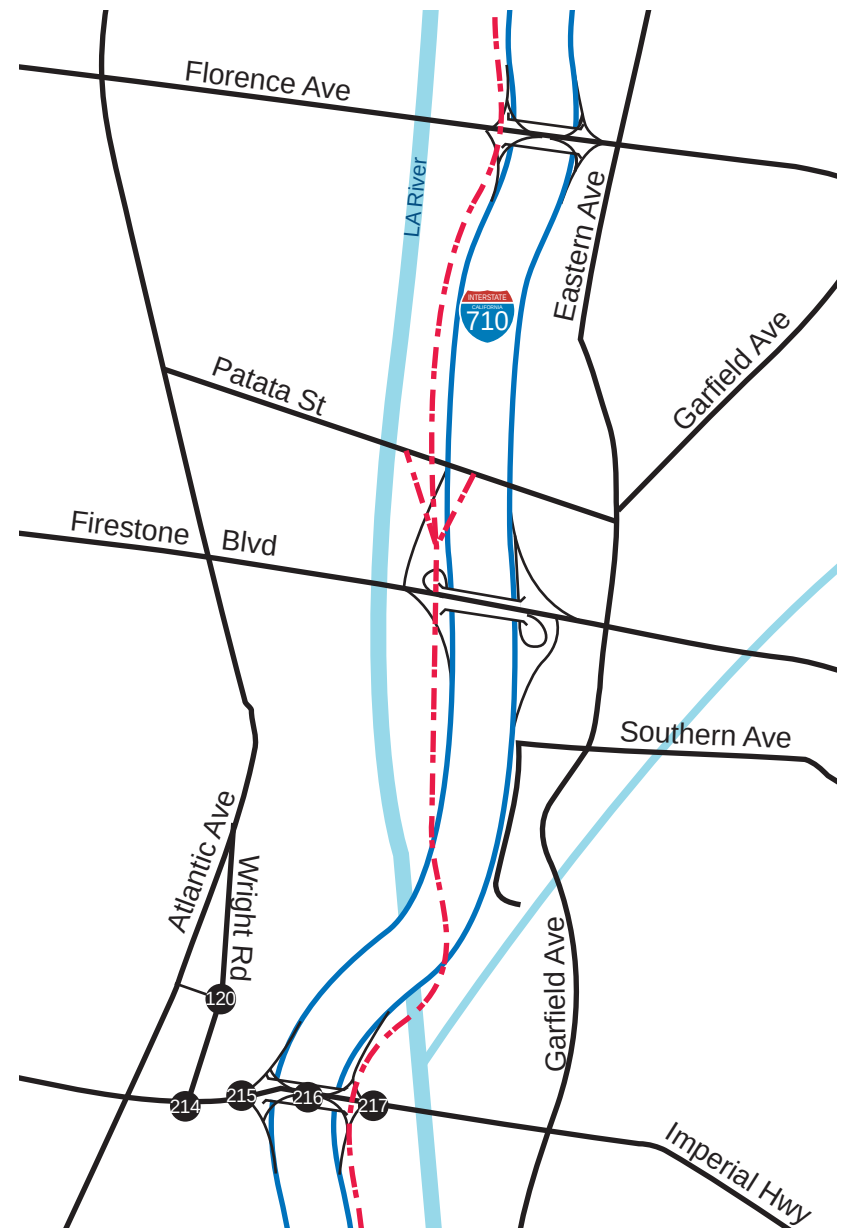
K:\2011\1710\TOAR\ALT 6C\Fig 9-37 Alt 6C-Imperial.ai



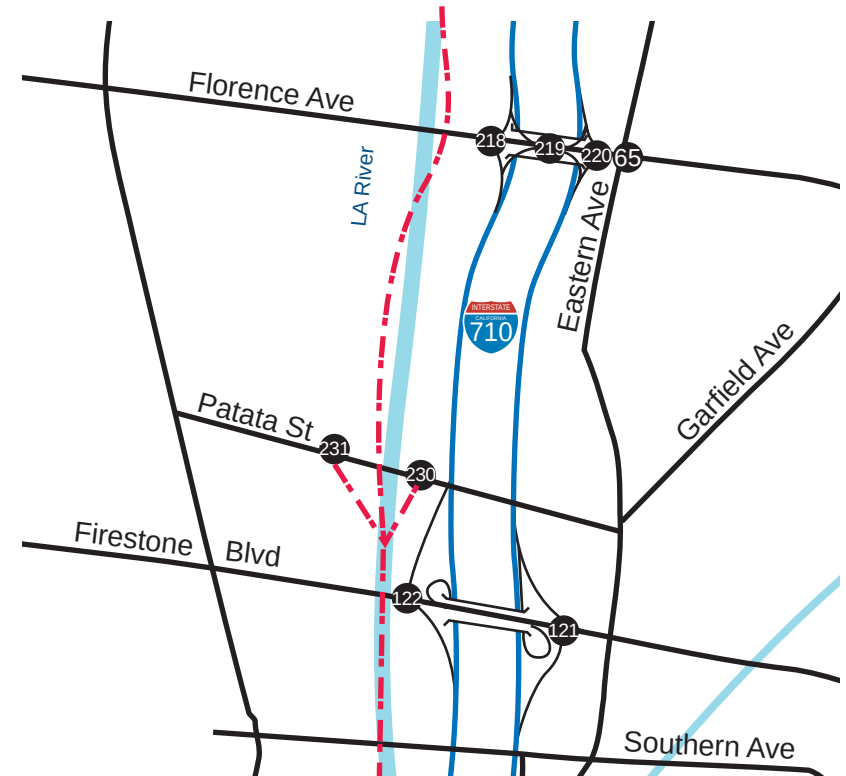
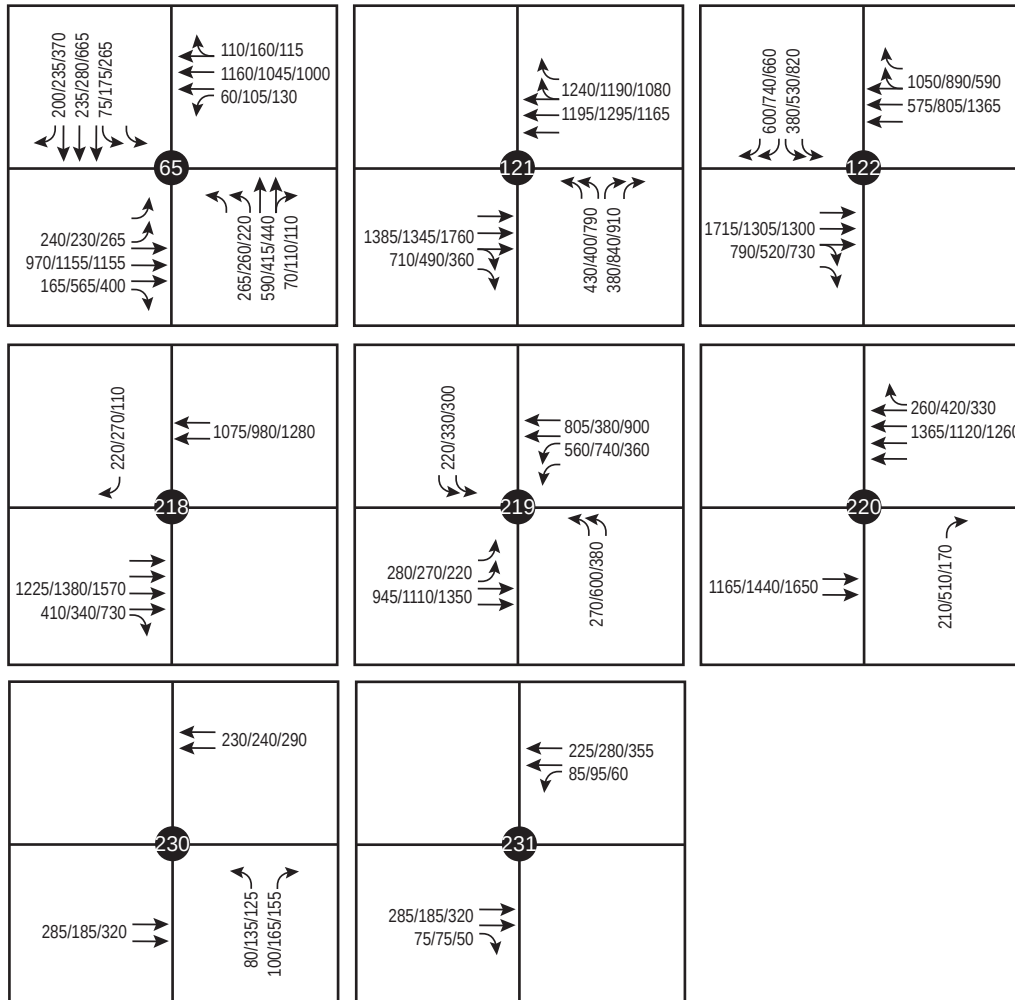
NOT TO SCALE

LEGEND

- # Signalized Intersection
- 25/10/30 AM/MD/PM Peak hour volumes
- Freight Corridor



K:\2011\1-710\TOAR\ALT 6C\Fig 9-38 Alt 6C-Imperial.ai

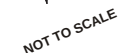
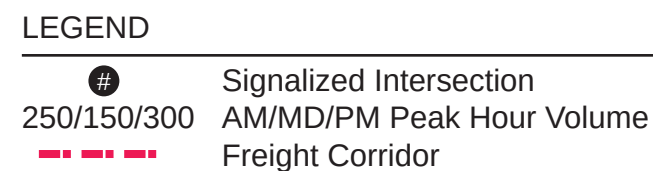


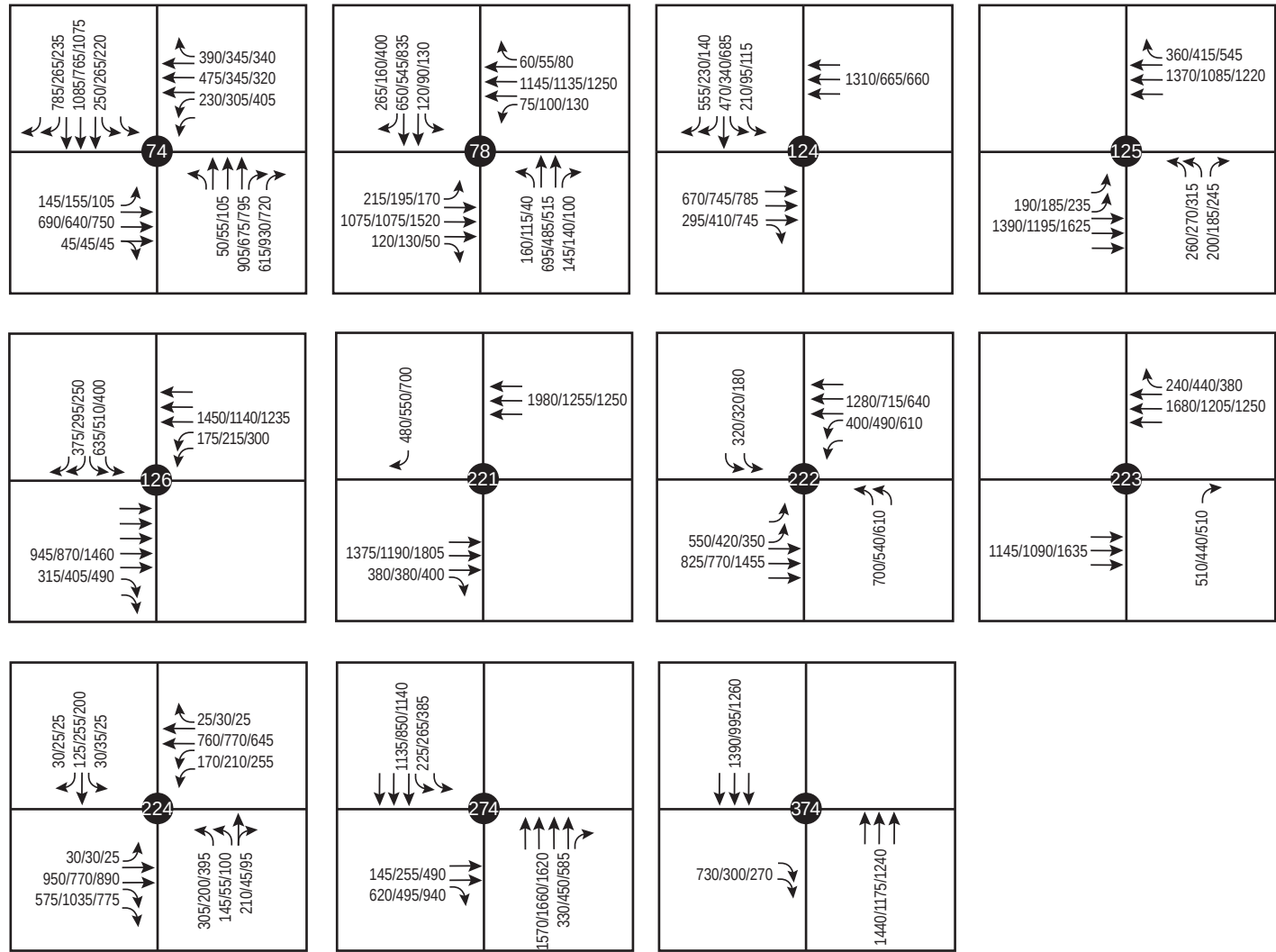
NOT TO SCALE

- LEGEND**
- # Signalized Intersection
 - 25/10/30 AM/MD/PM Peak hour volumes
 - Freight Corridor



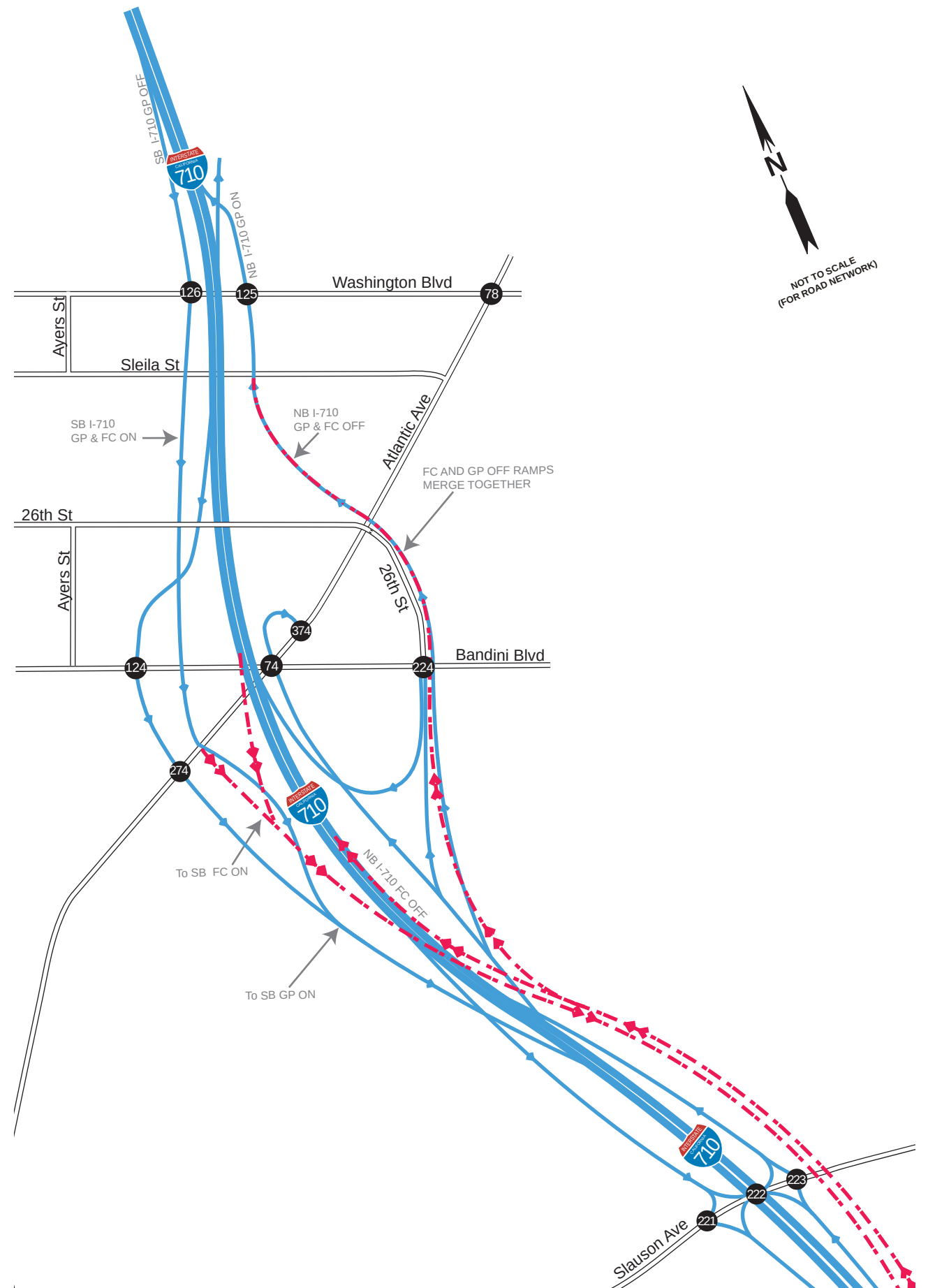
This page intentionally left blank.

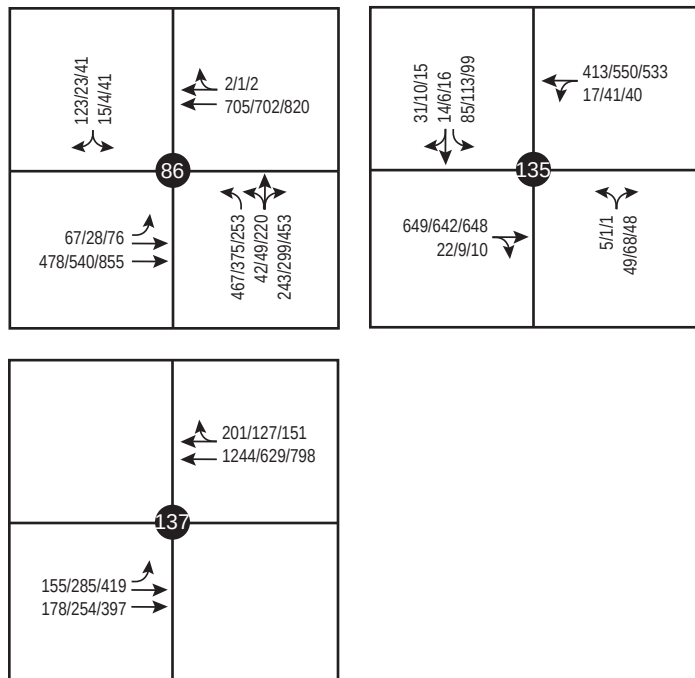




LEGEND

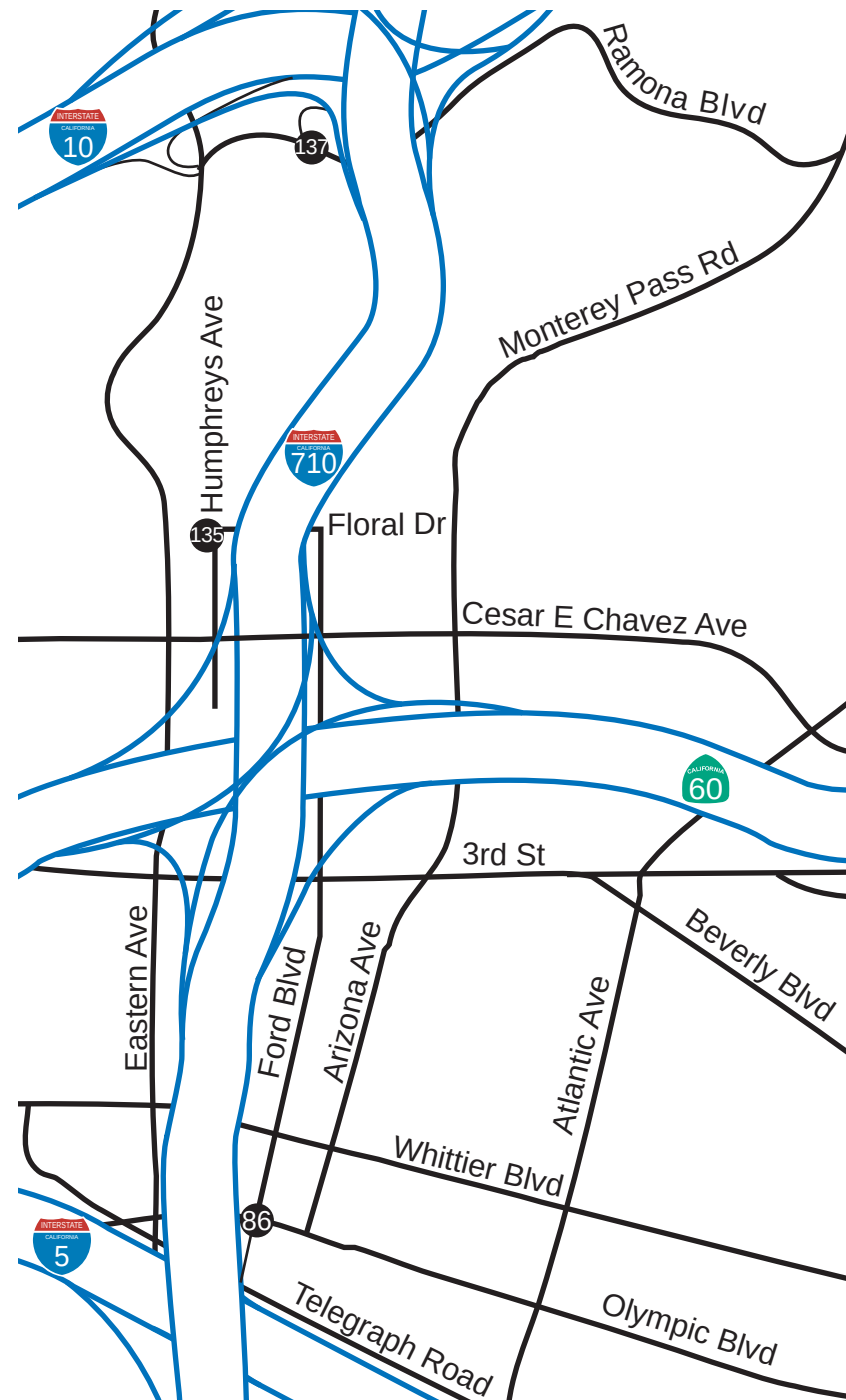
- # Signalized Intersection
- 250/150/300 AM/MD/PM Peak Hour Volume
- Freight Corridor

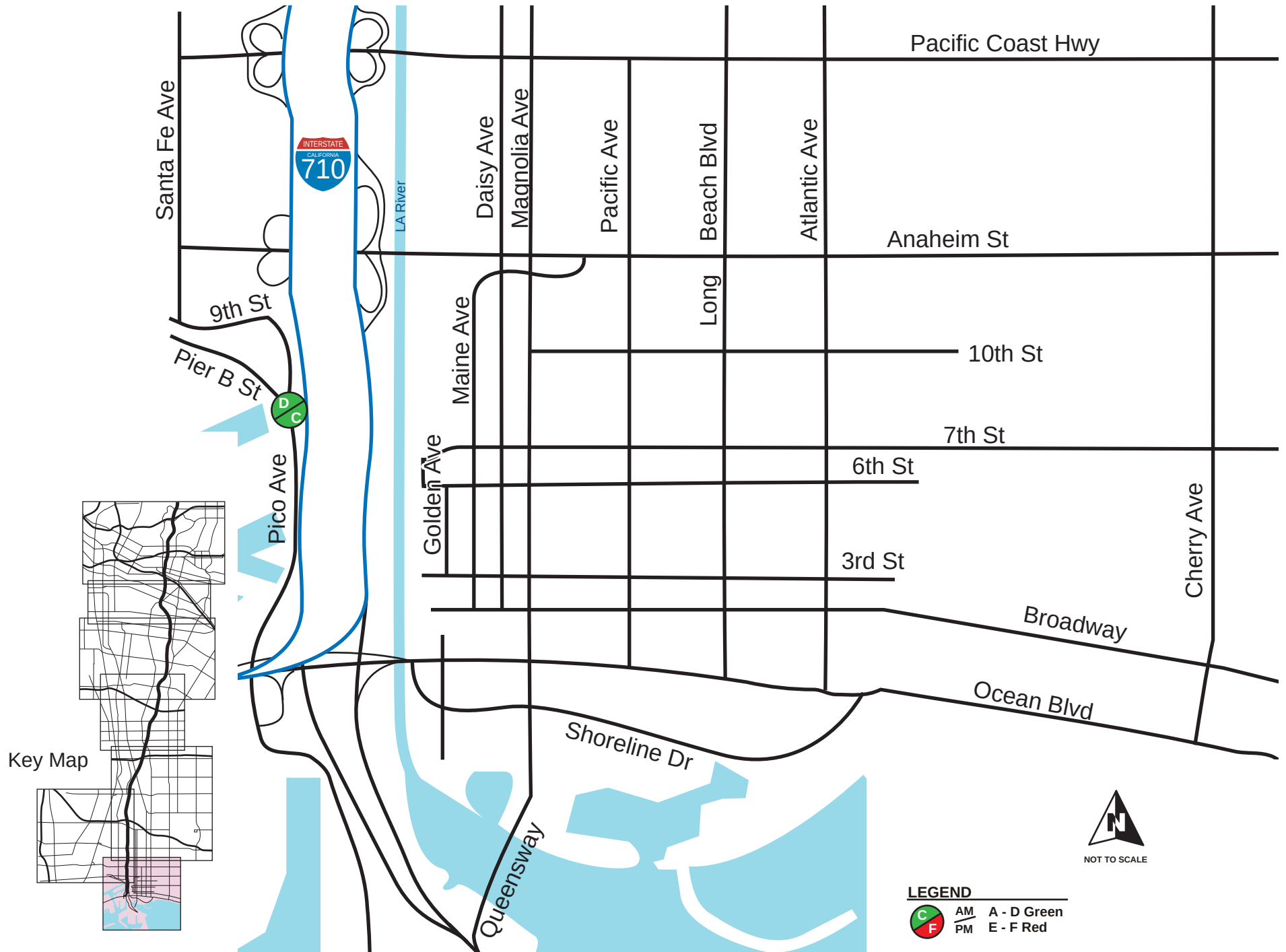


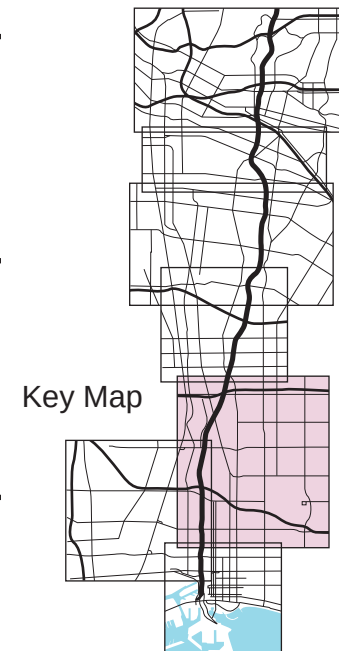
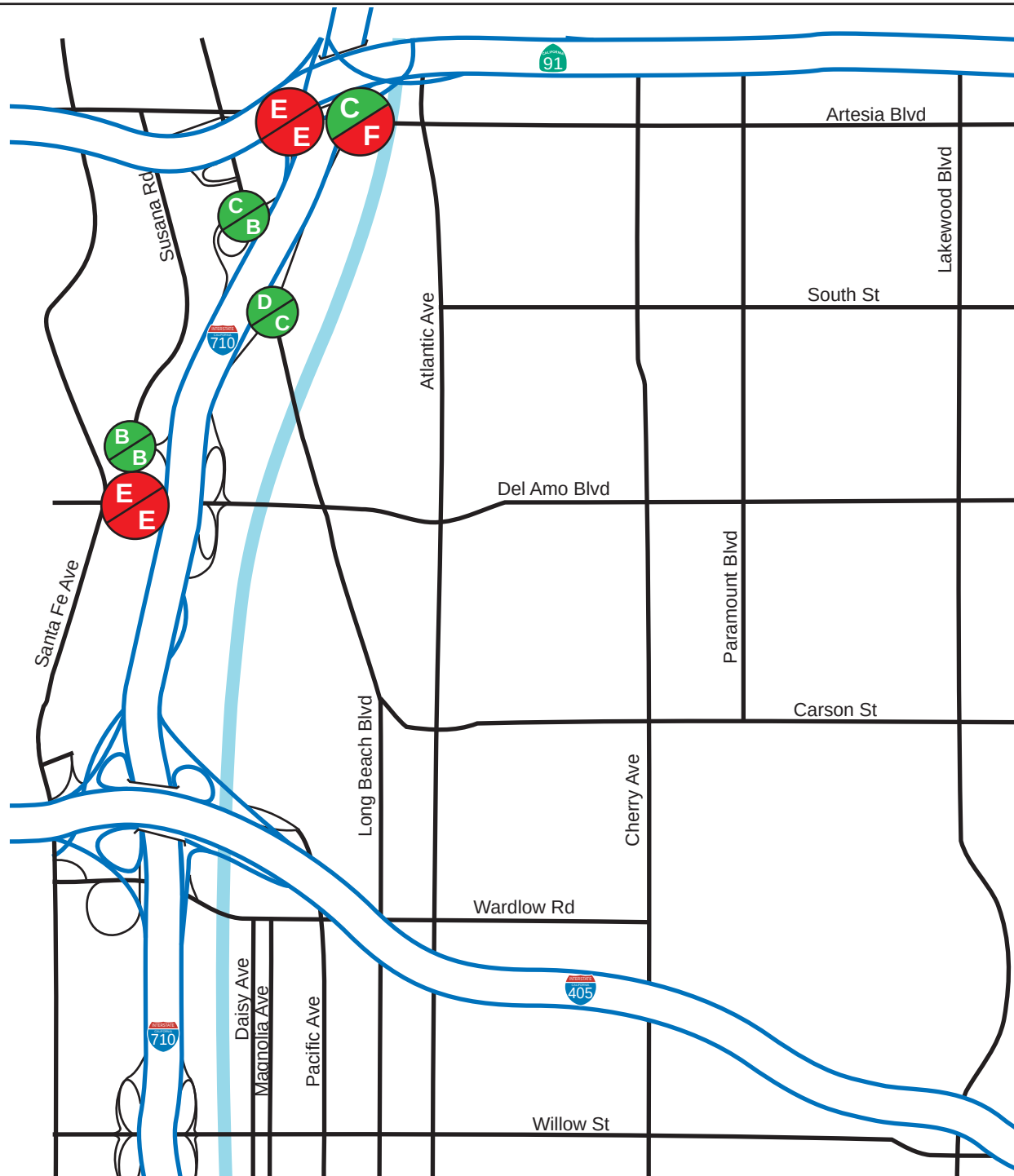


LEGEND

- # Signalized Intersection
- 25/10/30 AM/MD/PM Peak hour volumes

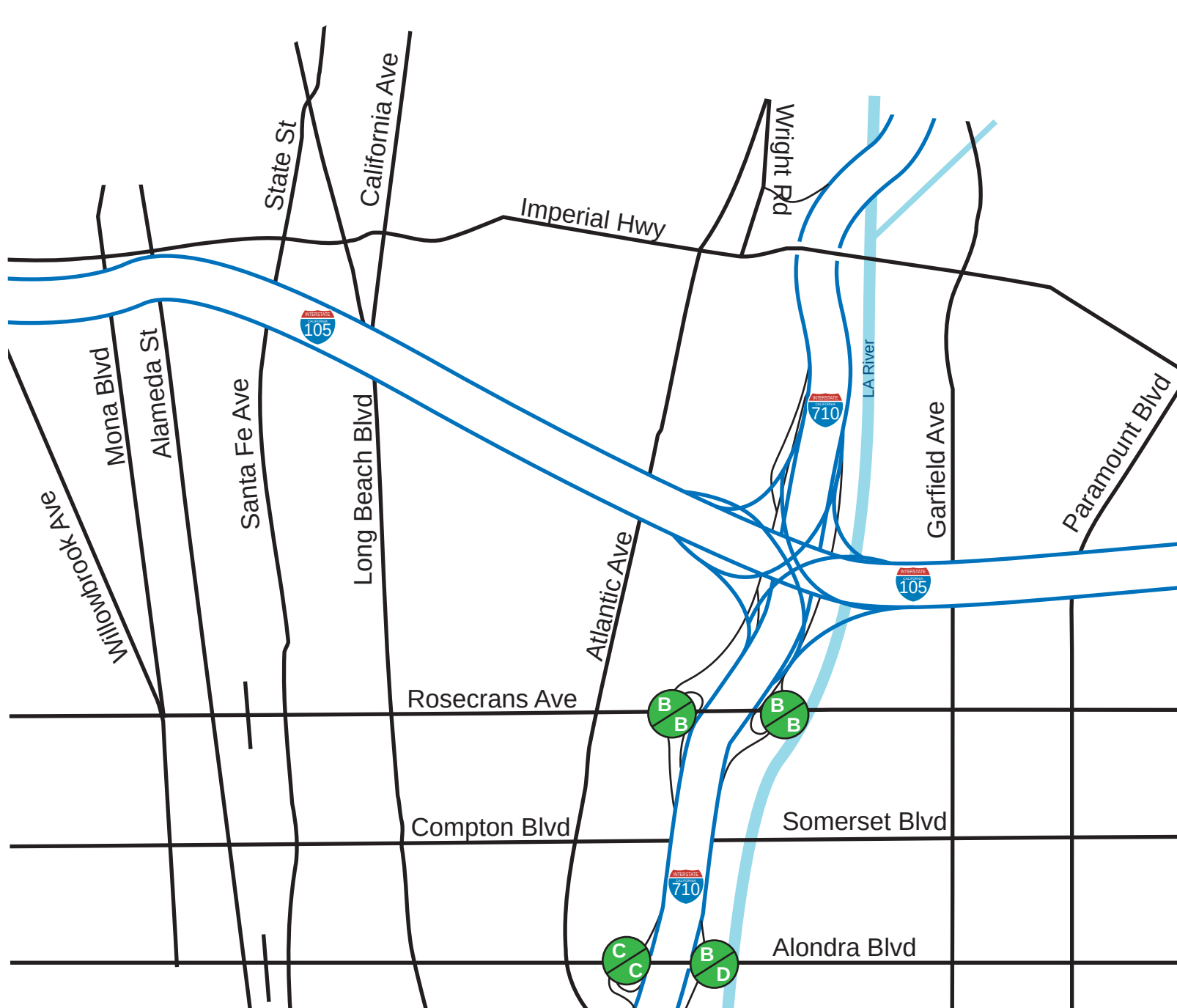






LEGEND

	AM	A - D Green
	PM	E - F Red



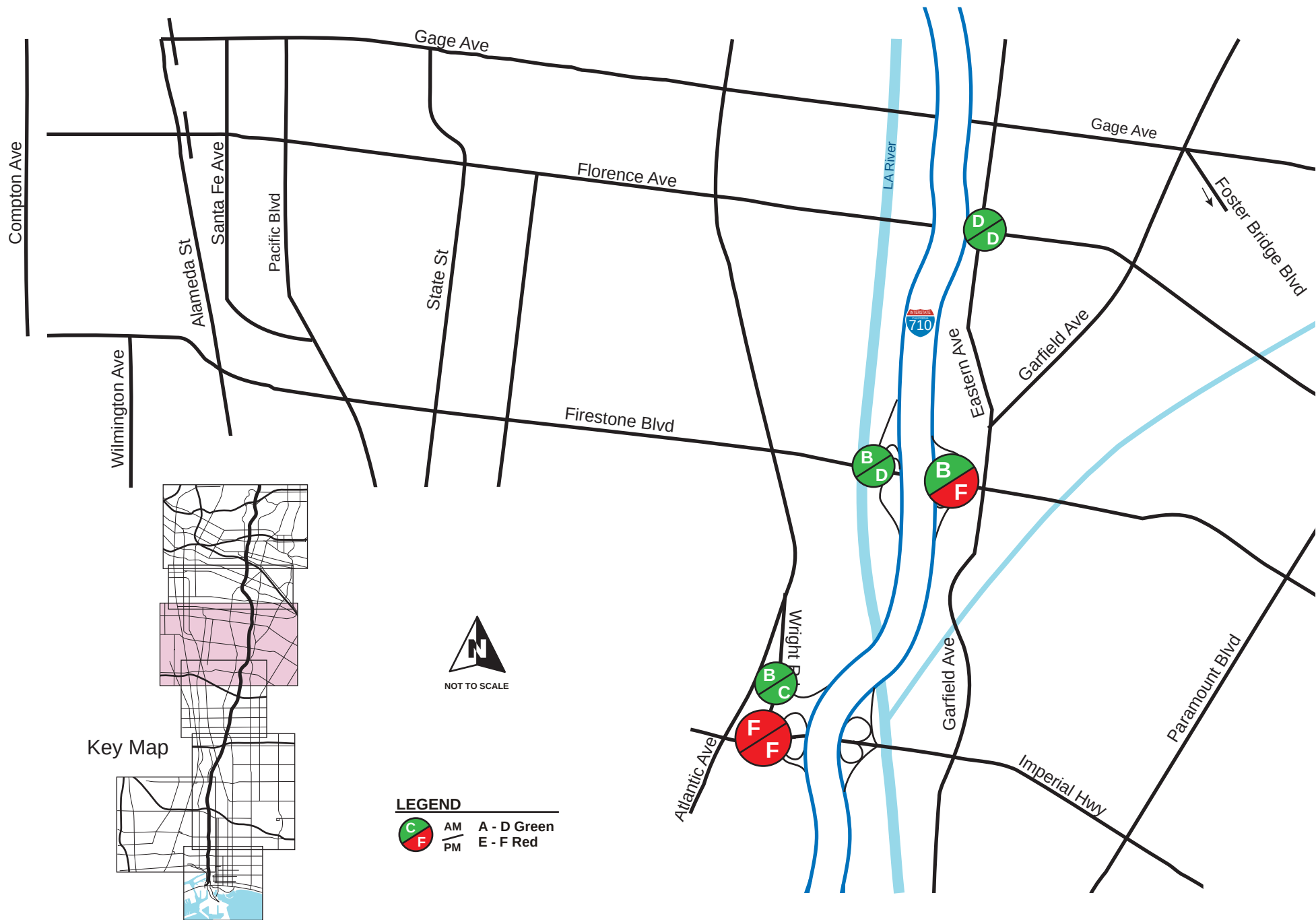
Key Map

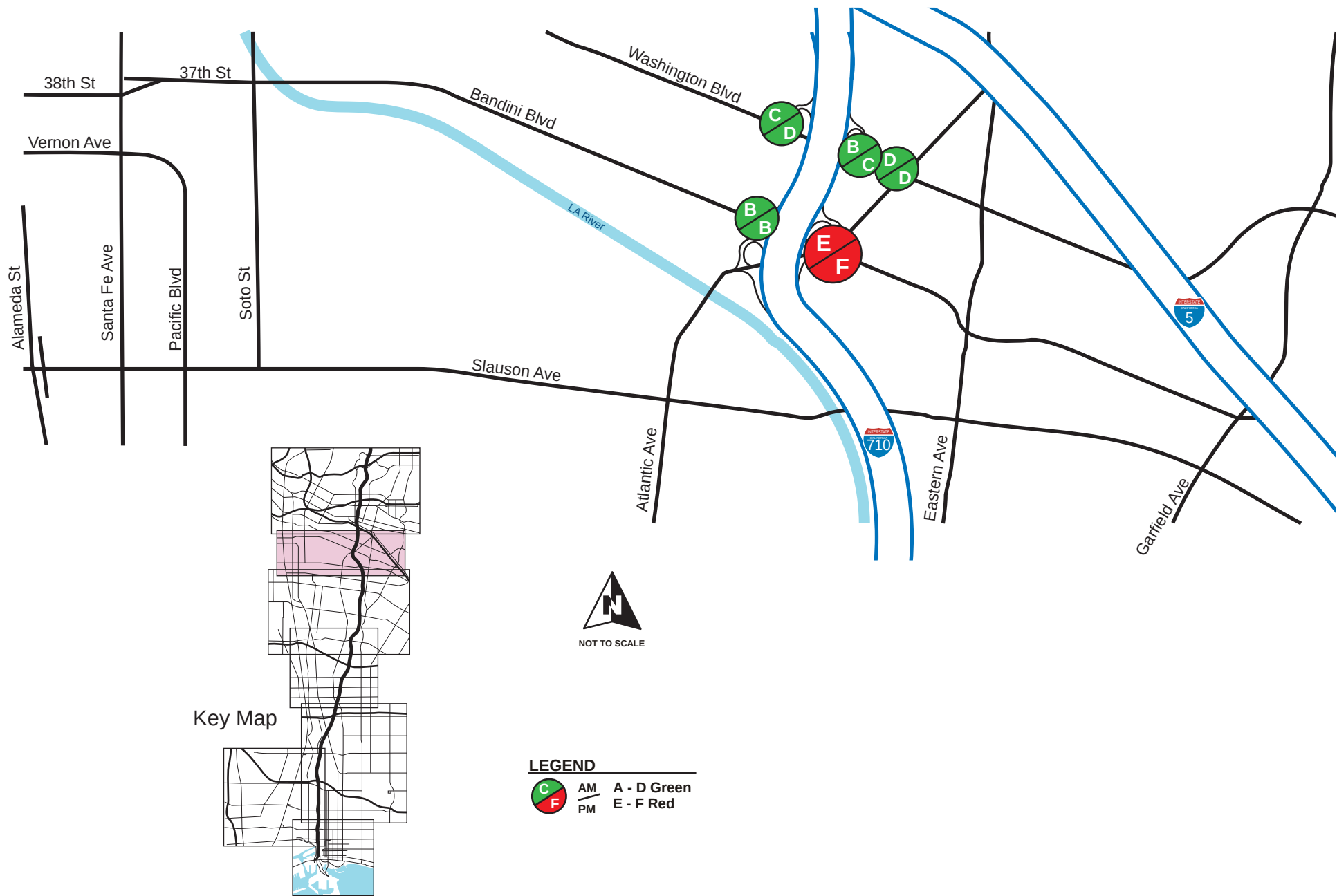


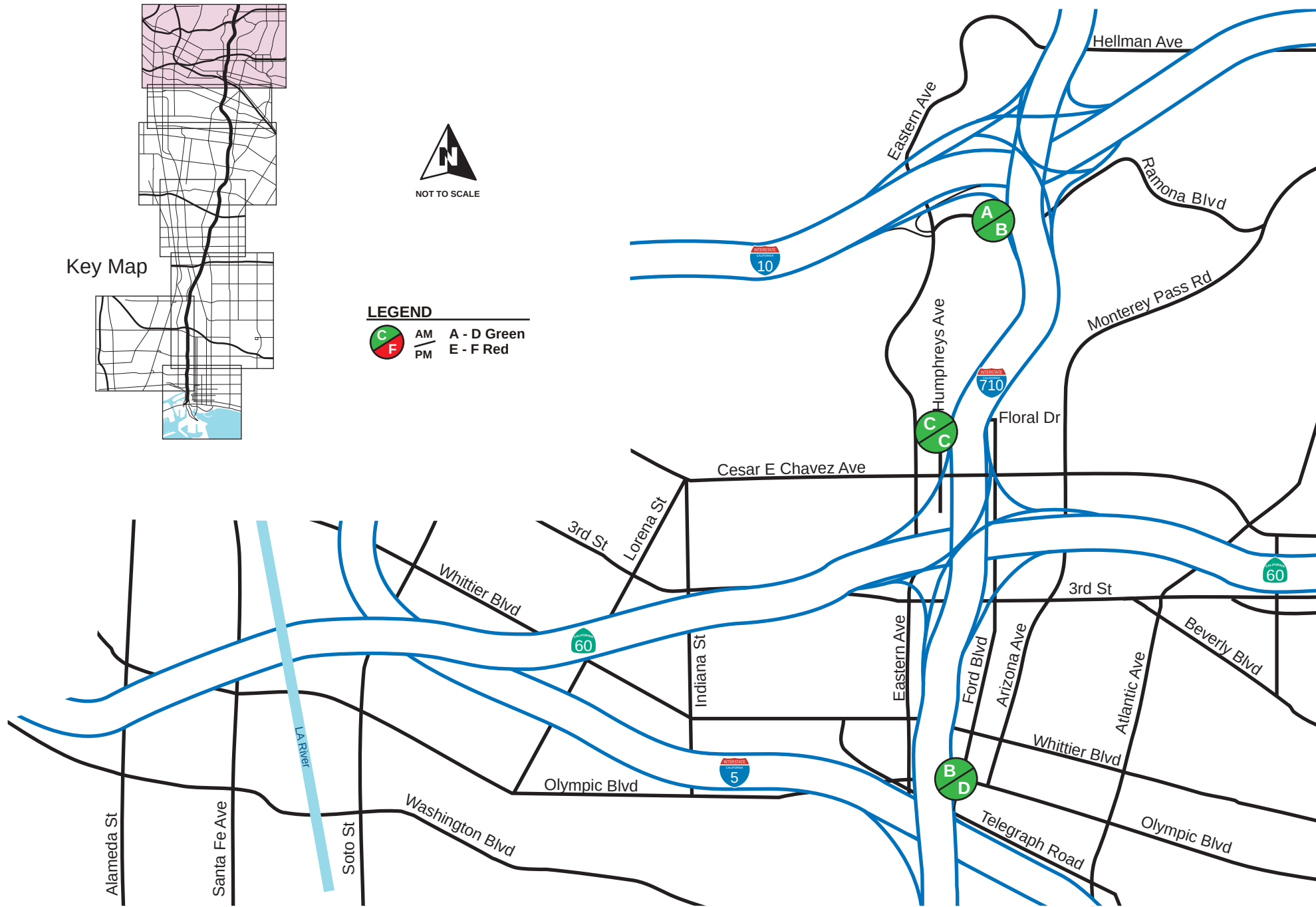
NOT TO SCALE

LEGEND

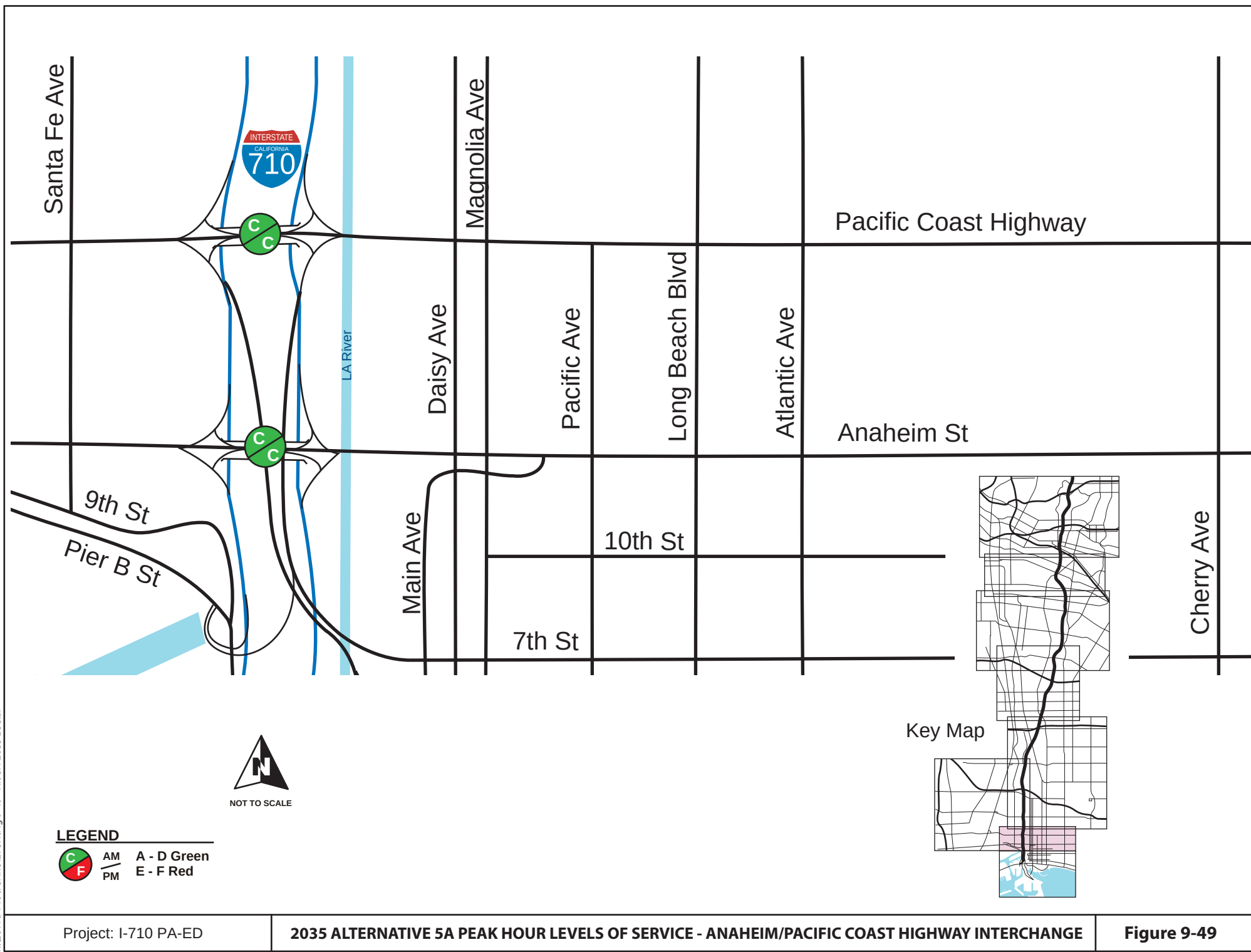
	AM	A - D Green
	PM	E - F Red

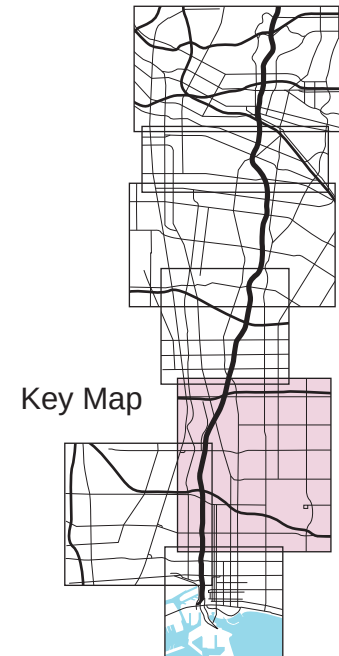
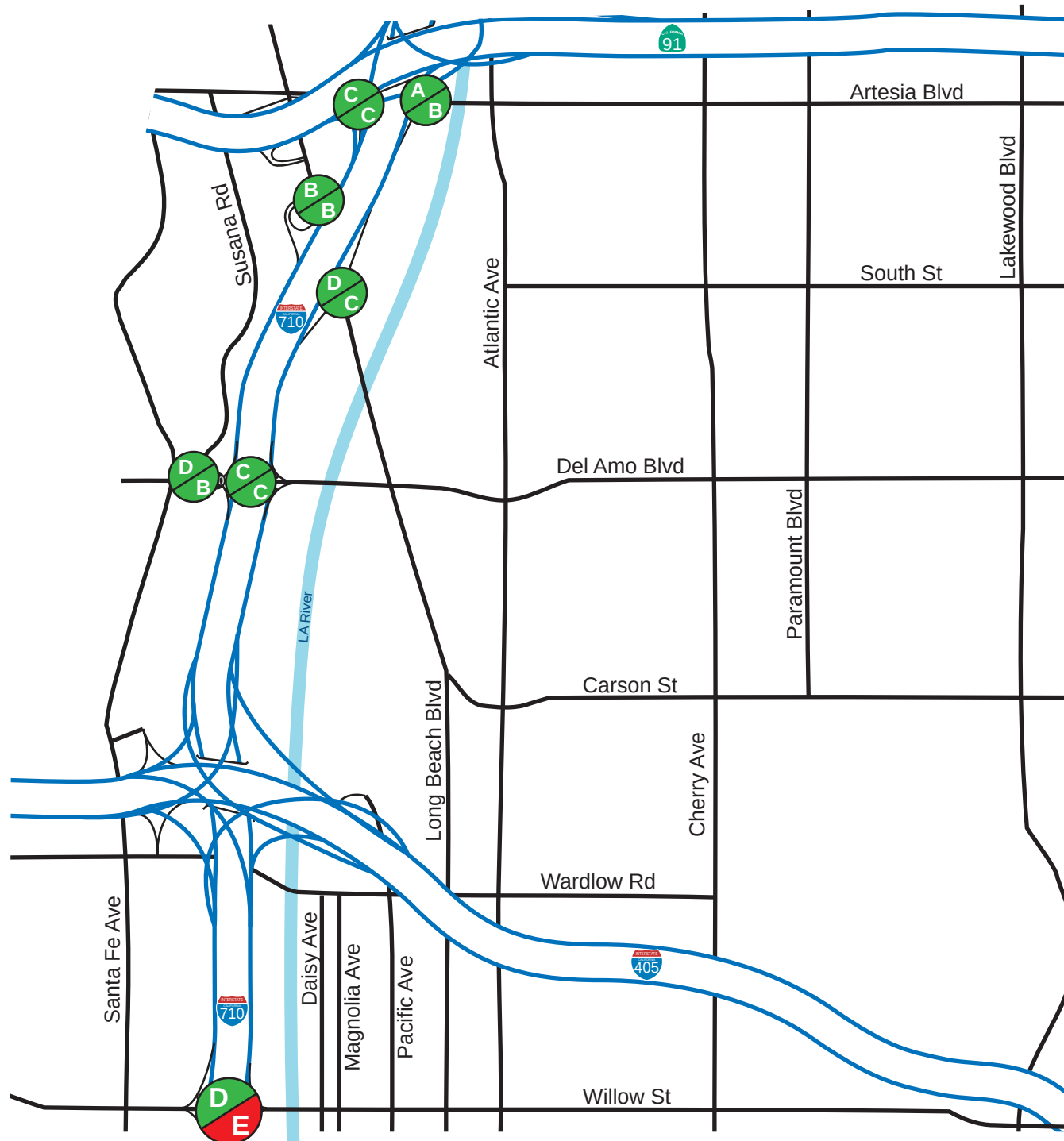










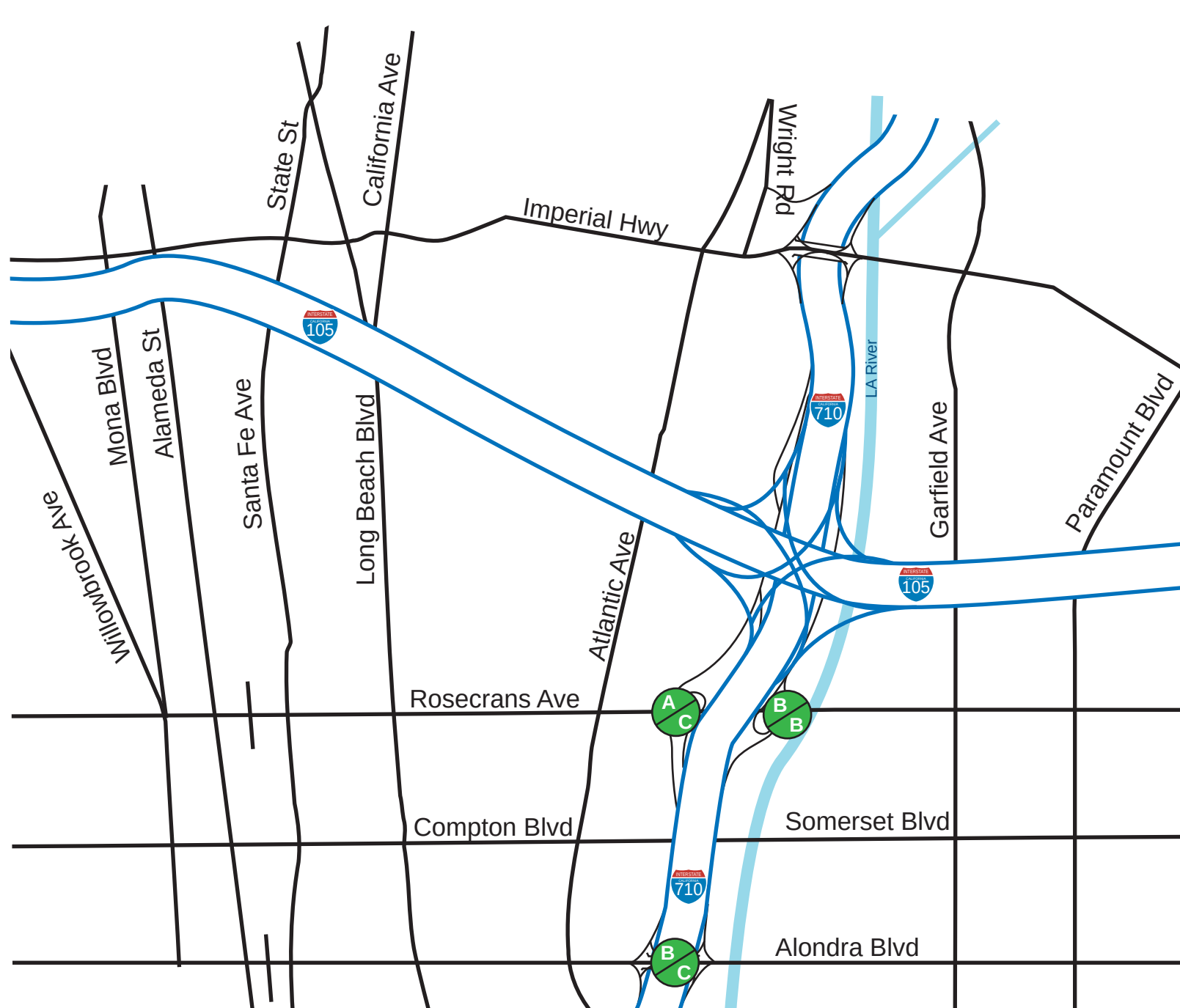


Key Map

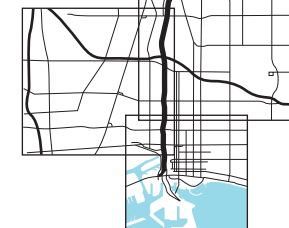


LEGEND

	AM	A - D Green
	PM	E - F Red

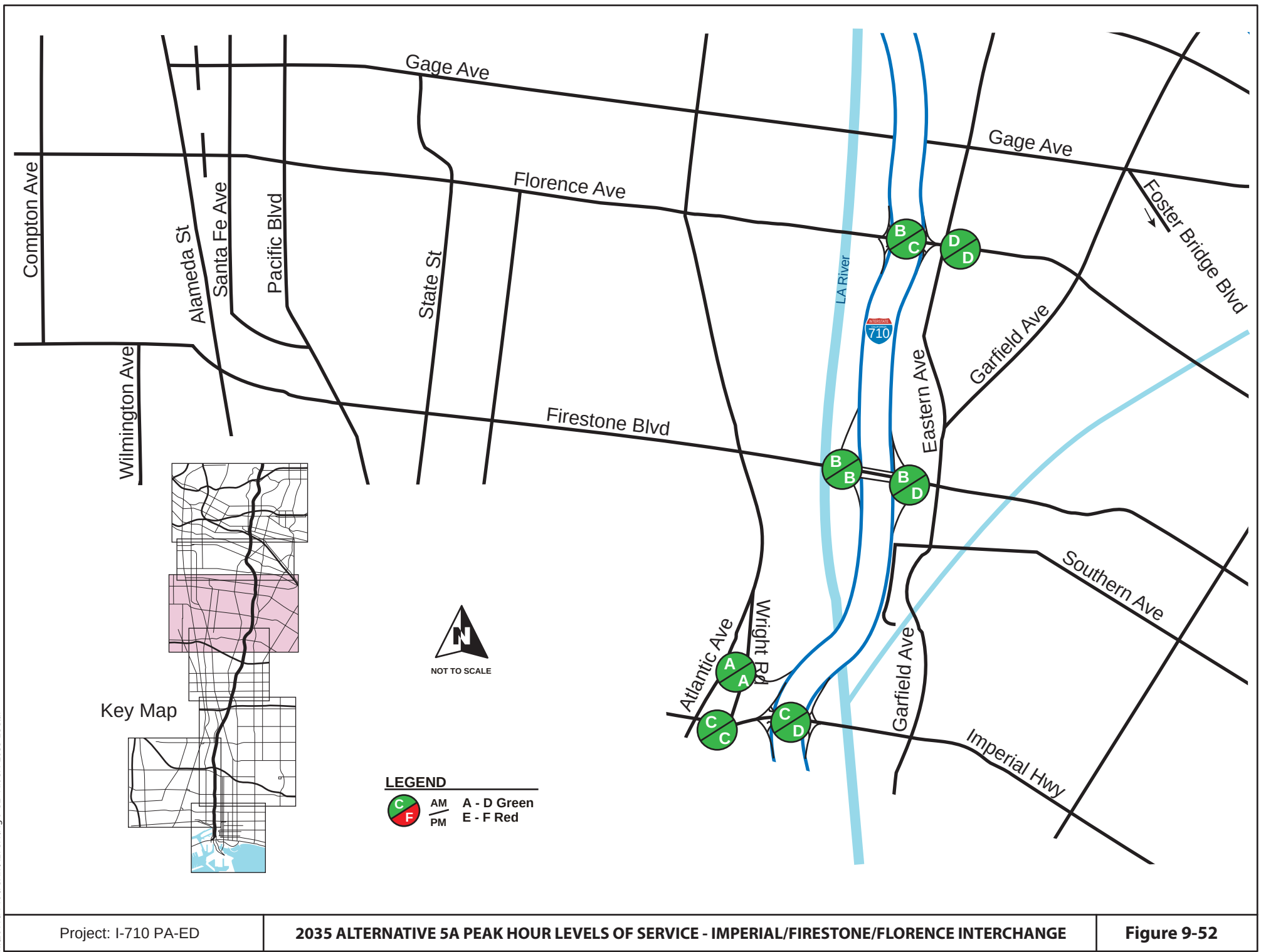


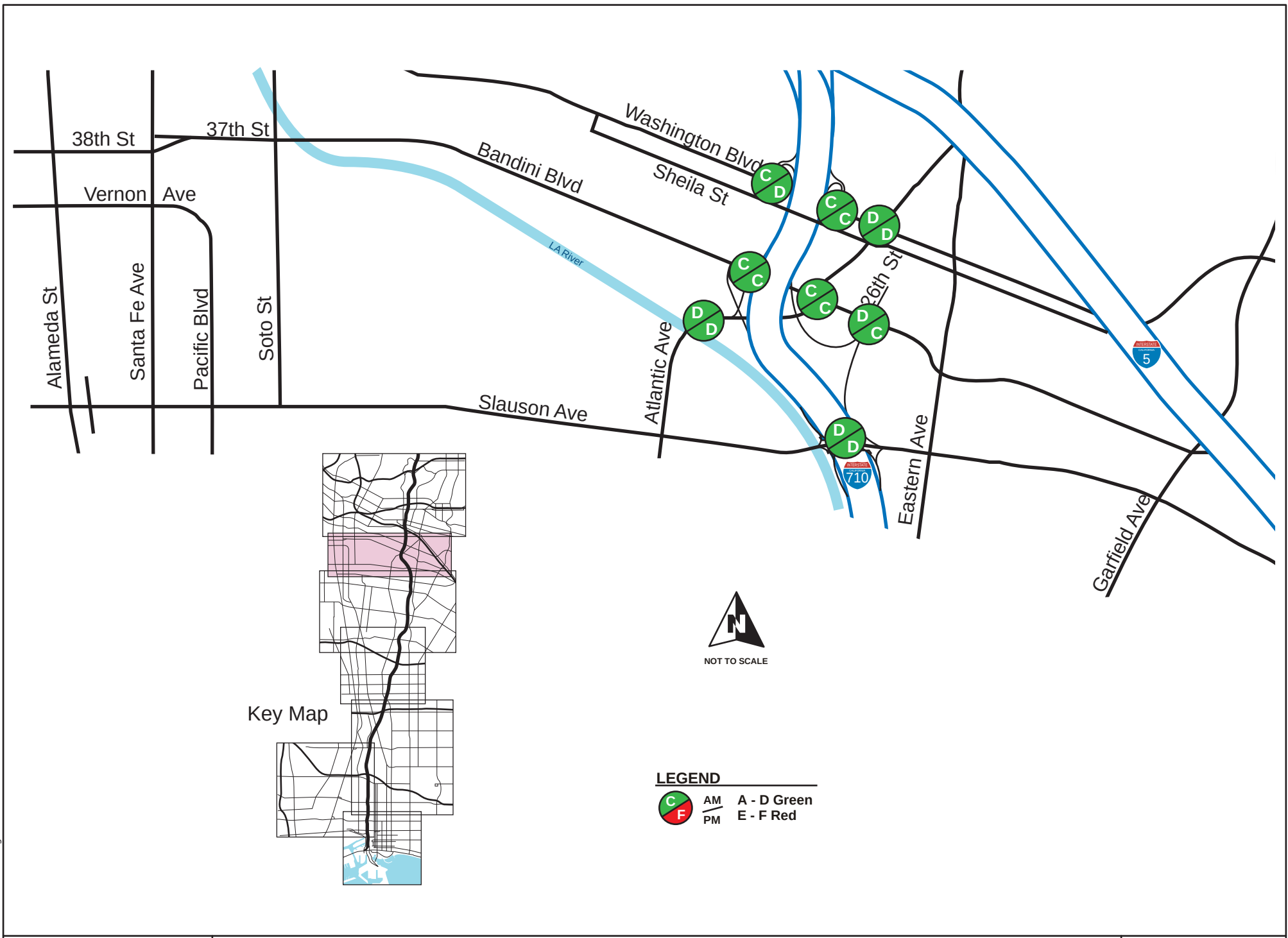
Key Map

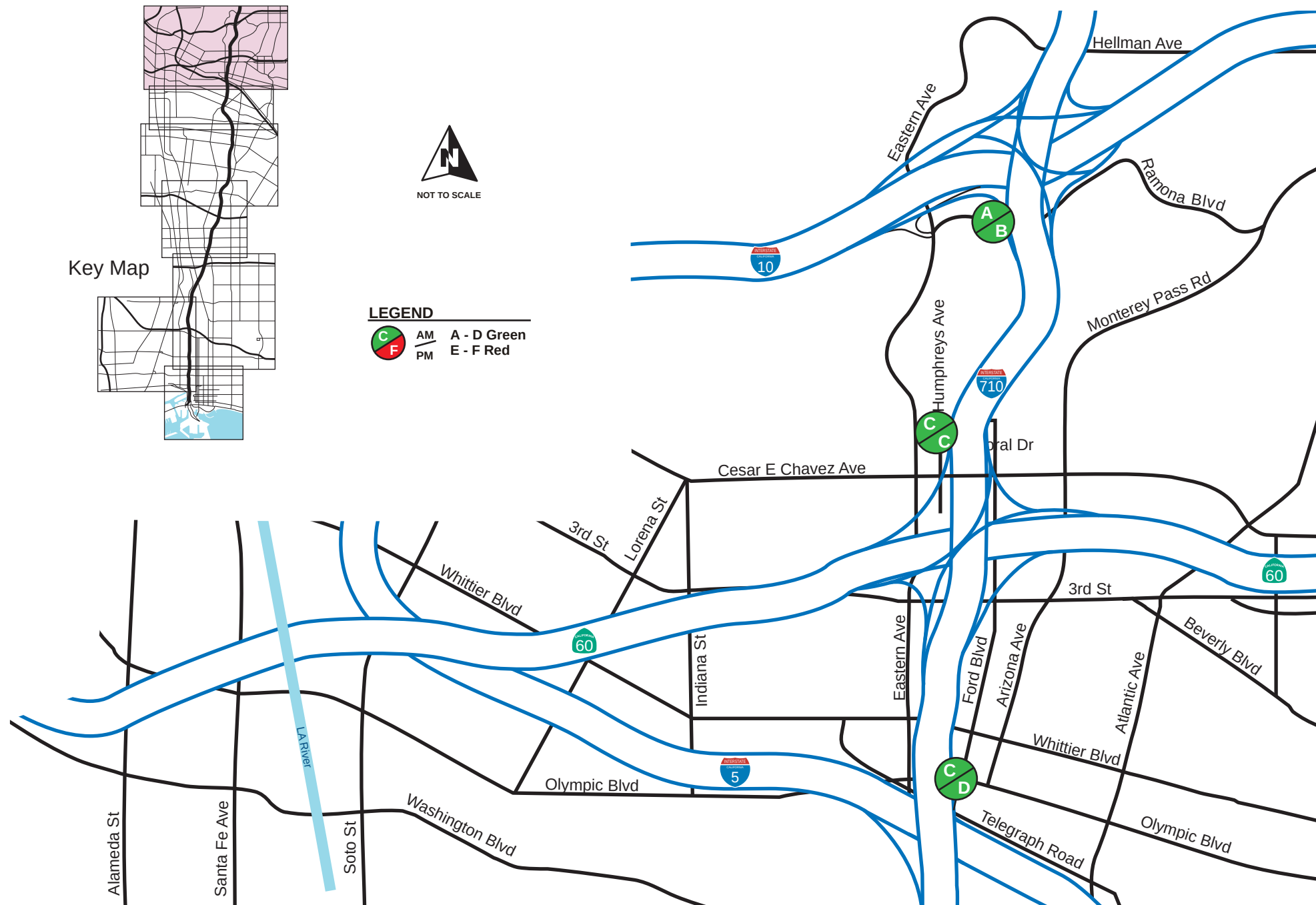


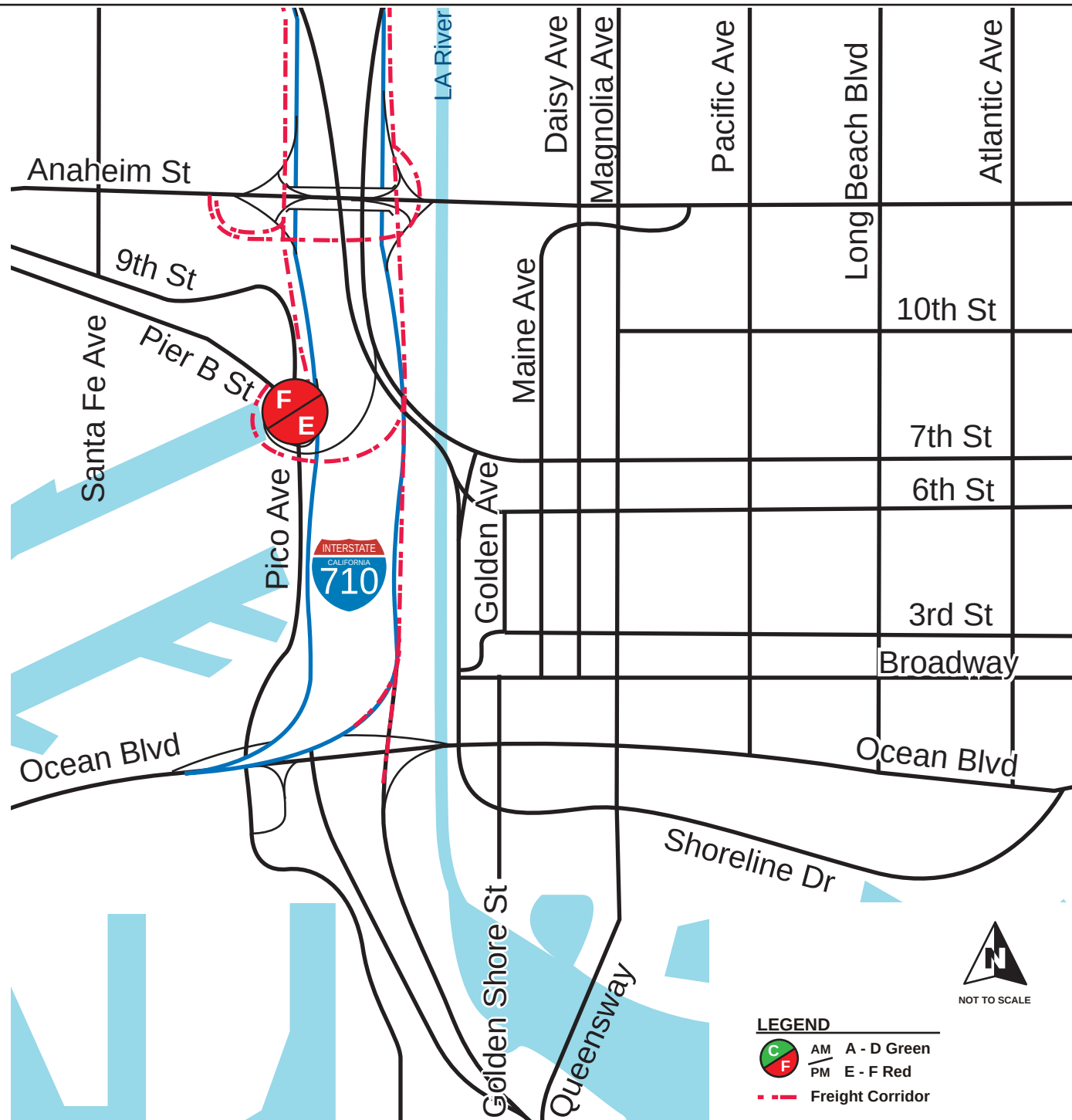
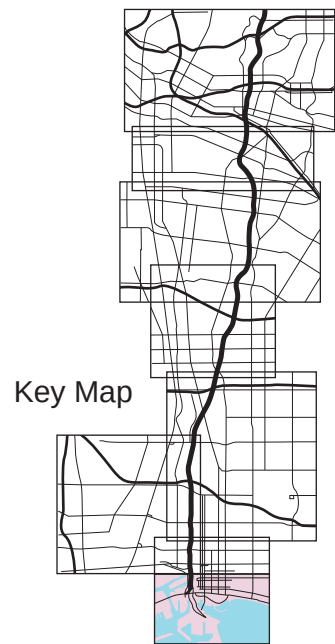
LEGEND

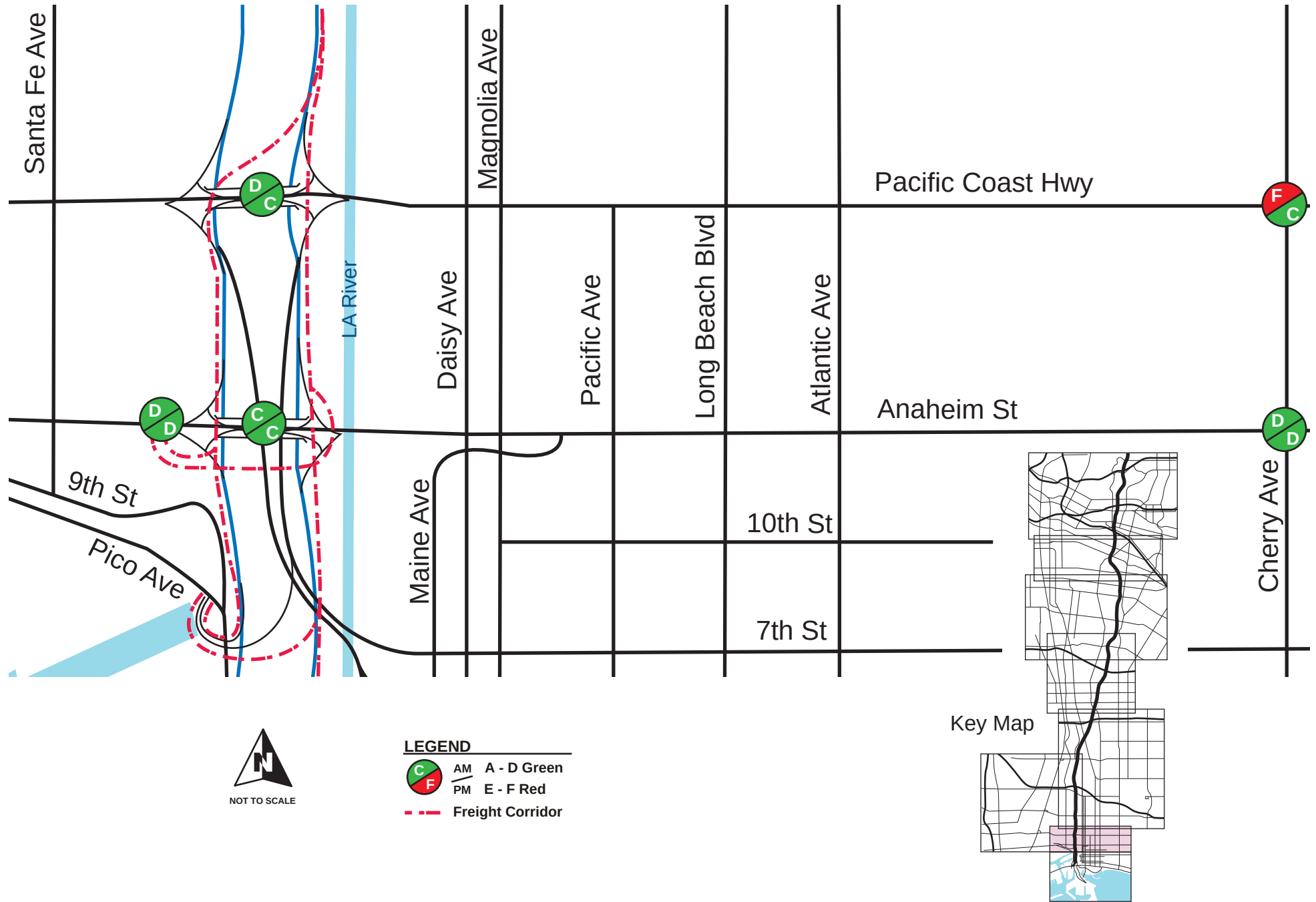
	AM	A - D Green
	PM	E - F Red

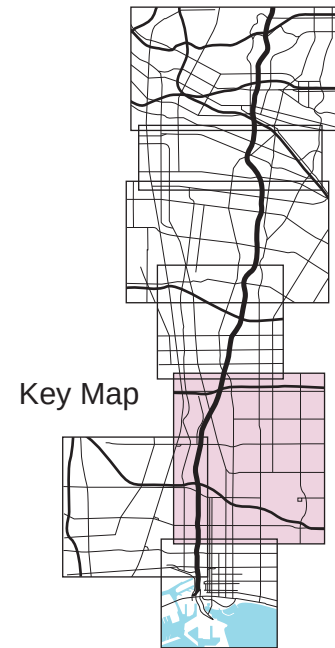
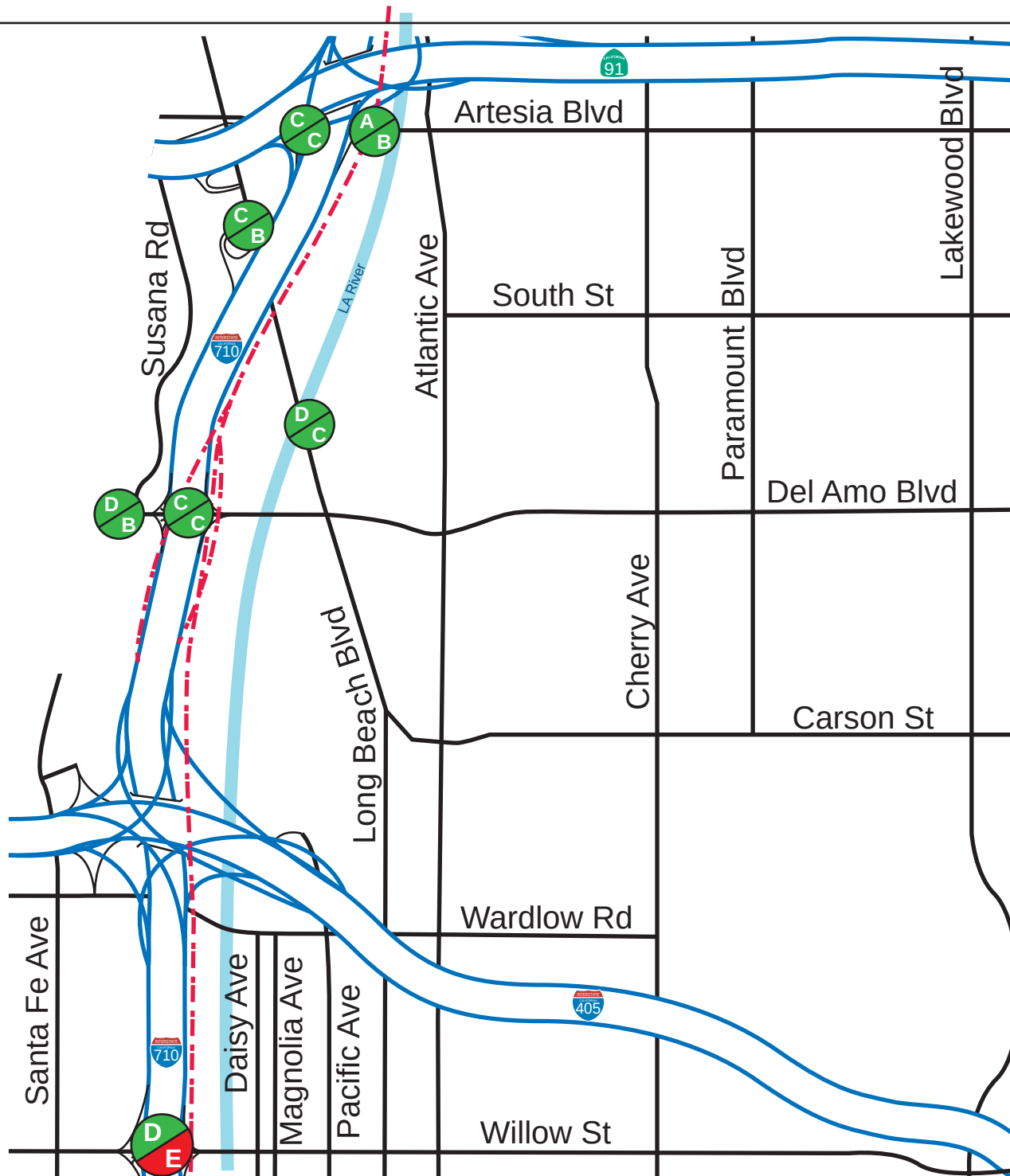






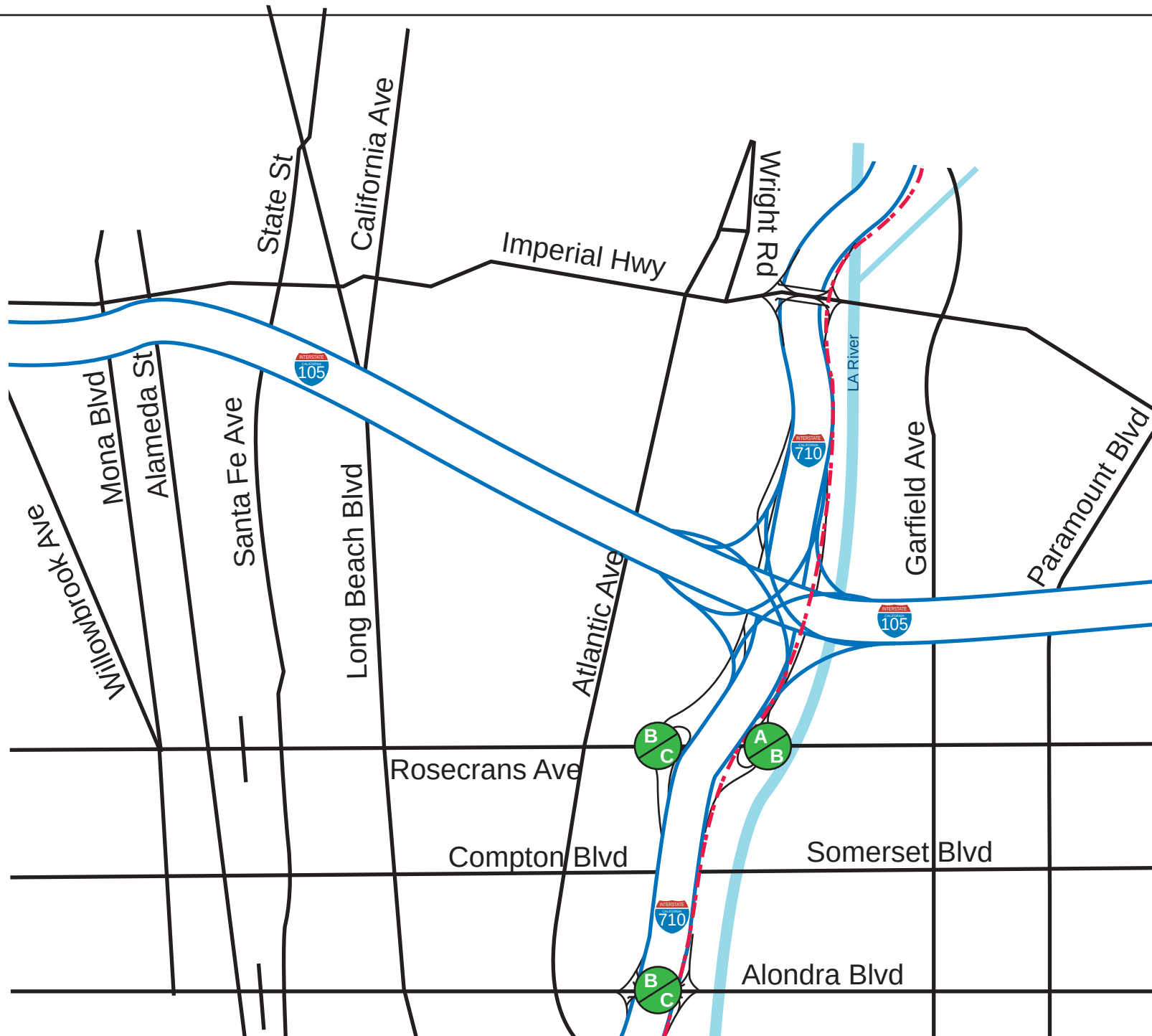




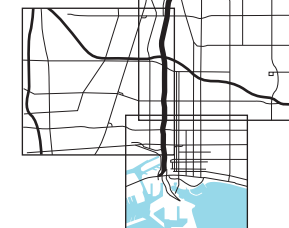


LEGEND

	AM A - D Green
	PM E - F Red
	Freight Corridor



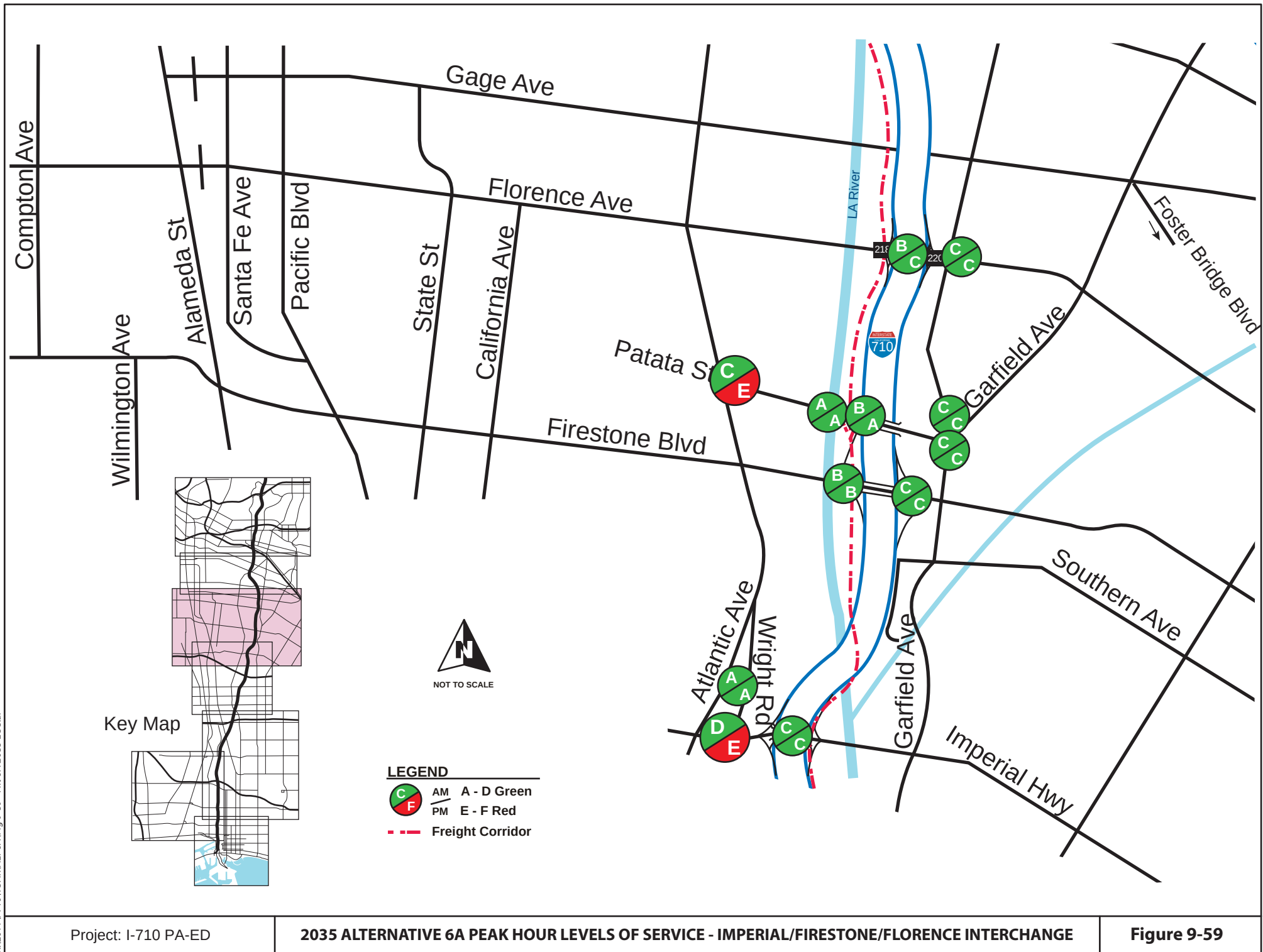
Key Map

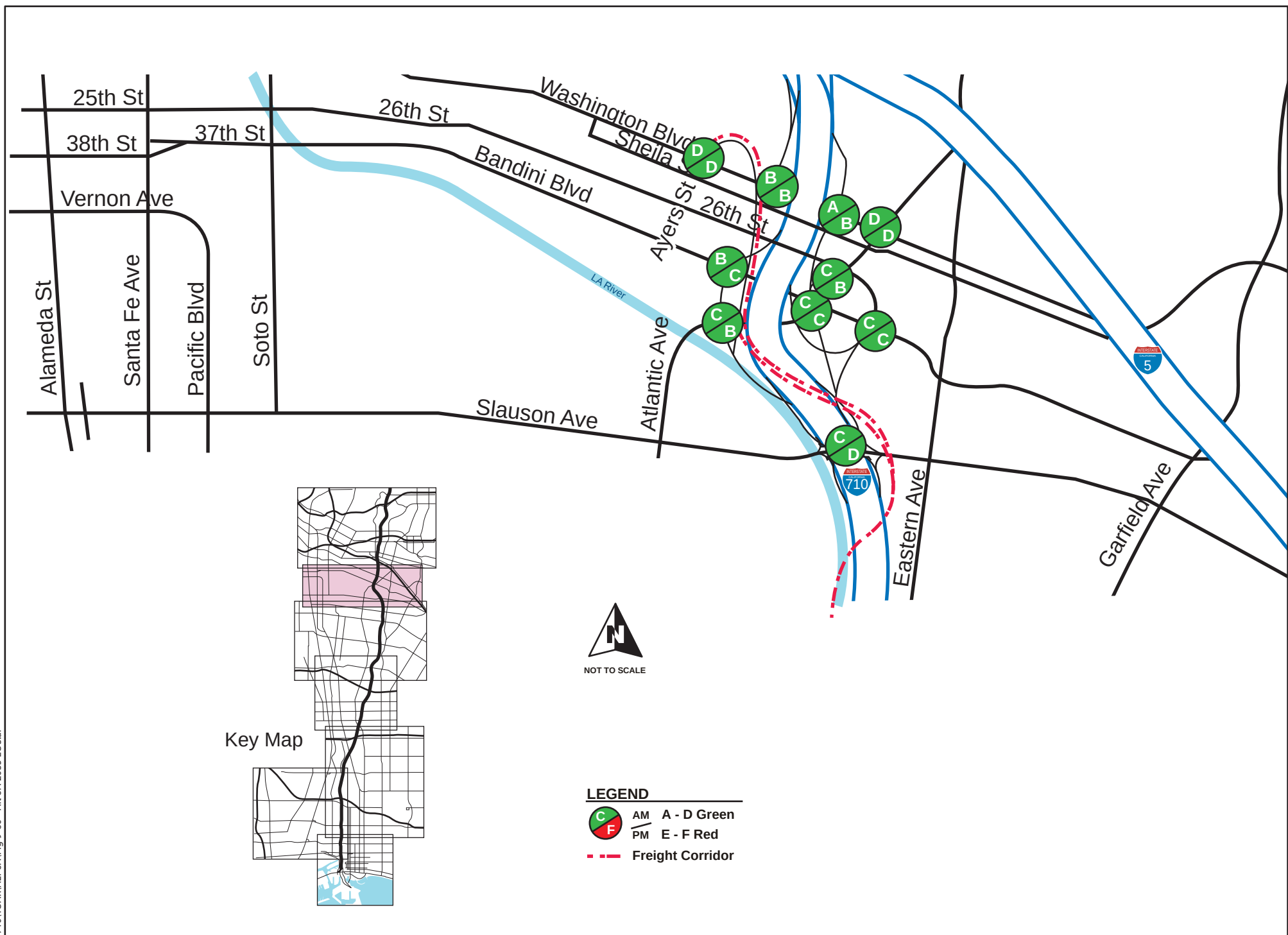


NOT TO SCALE

LEGEND

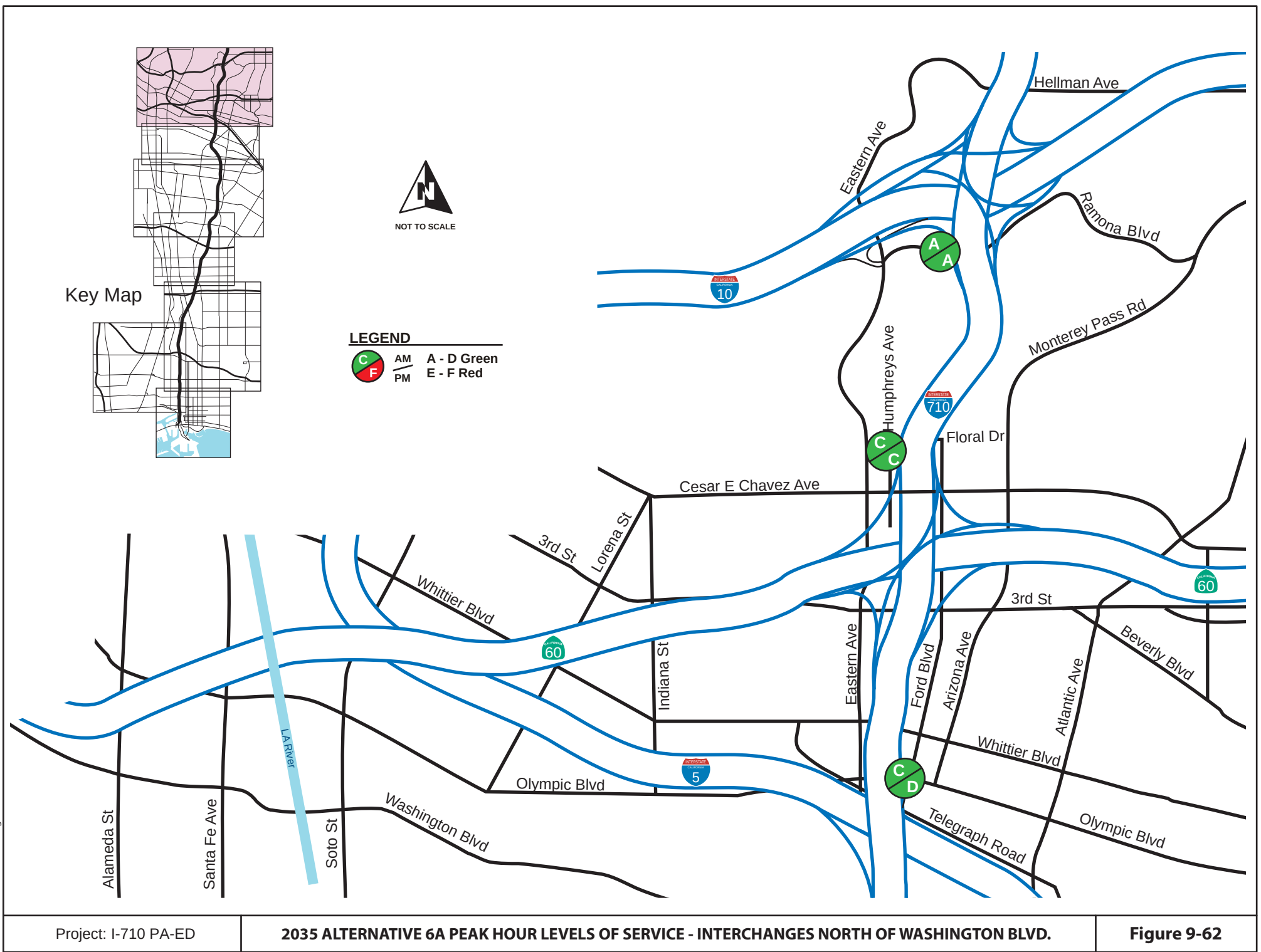
	AM	A - D Green
	PM	E - F Red
	Freight Corridor	

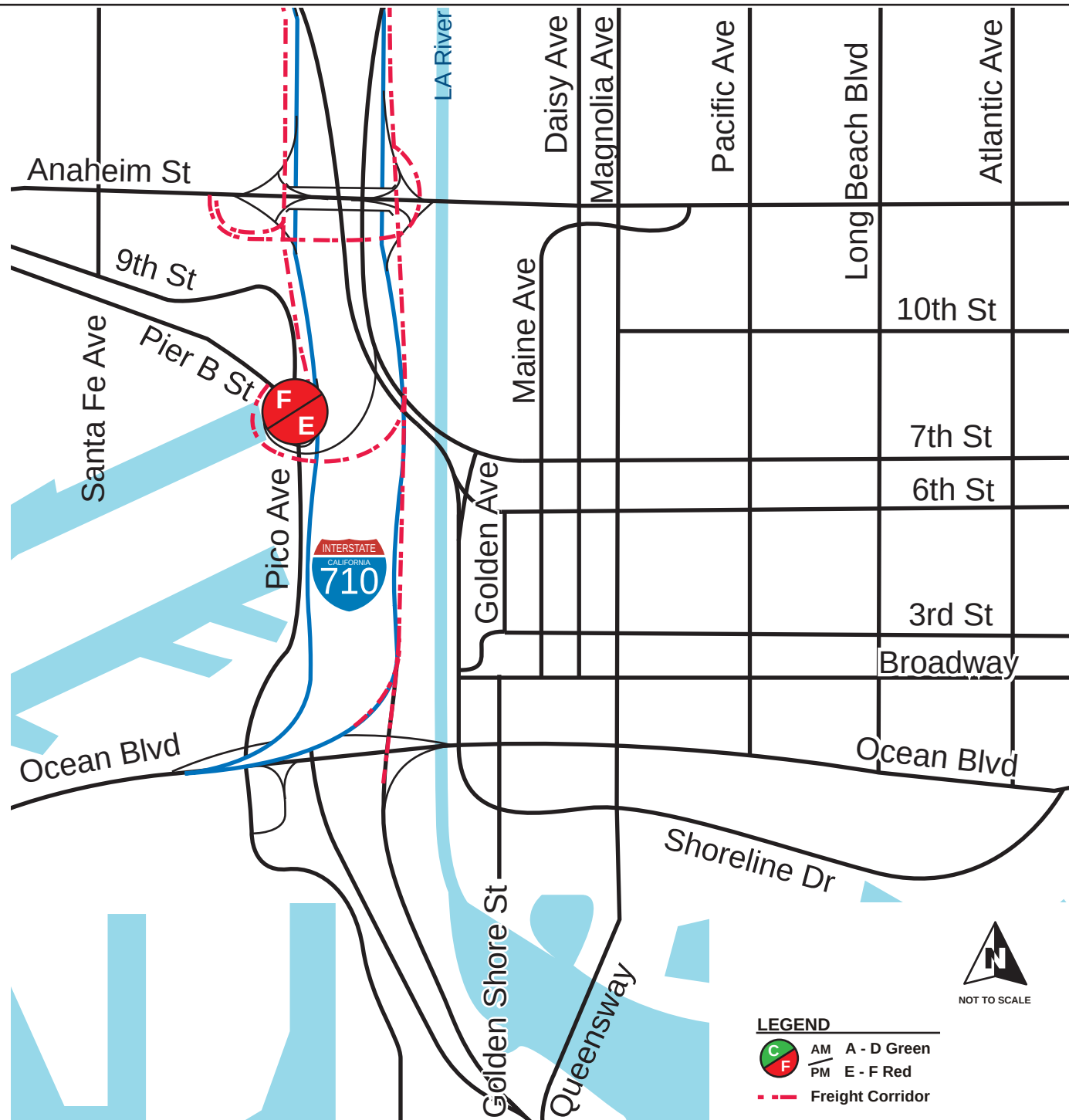
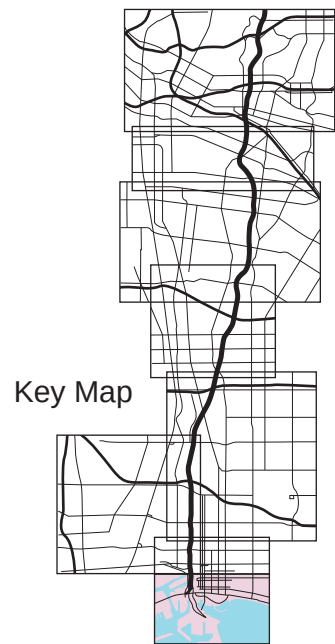


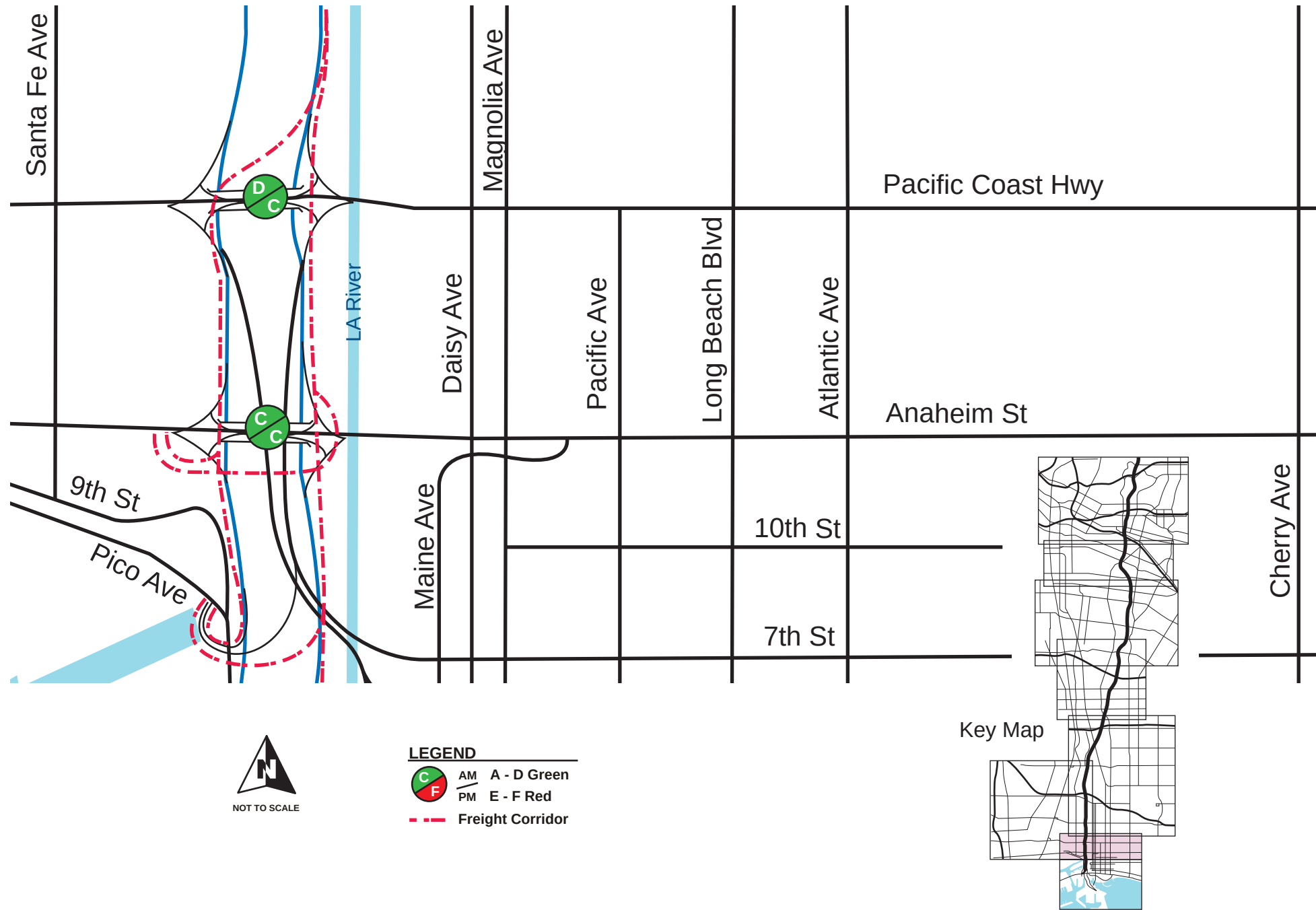


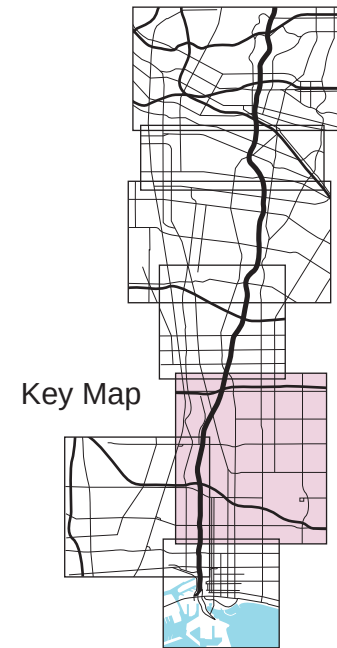
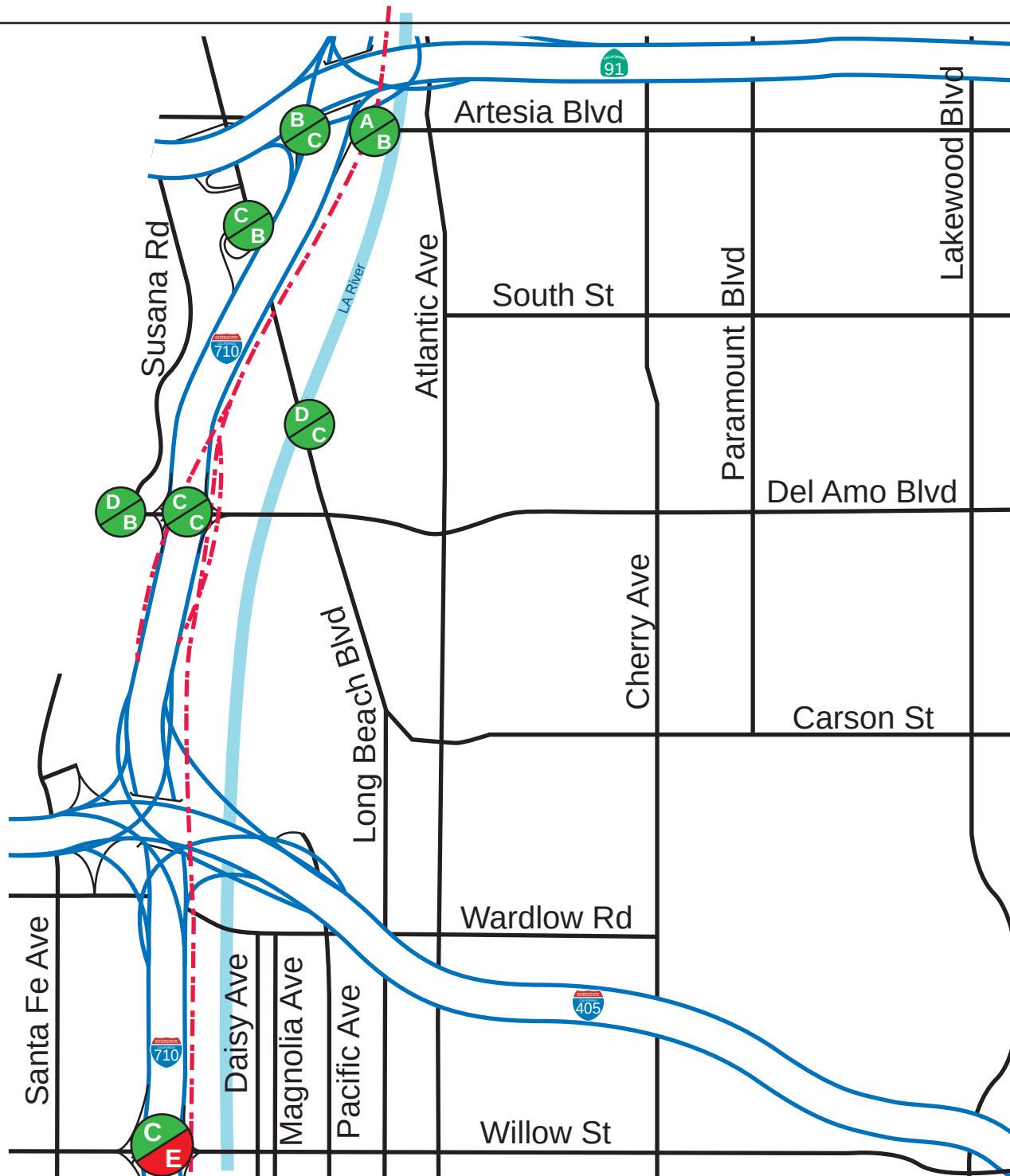


K:\2011\I-710\TOAR\ALT 6A\Fig 9-62 - Alt 6A 2035 LOS.ai



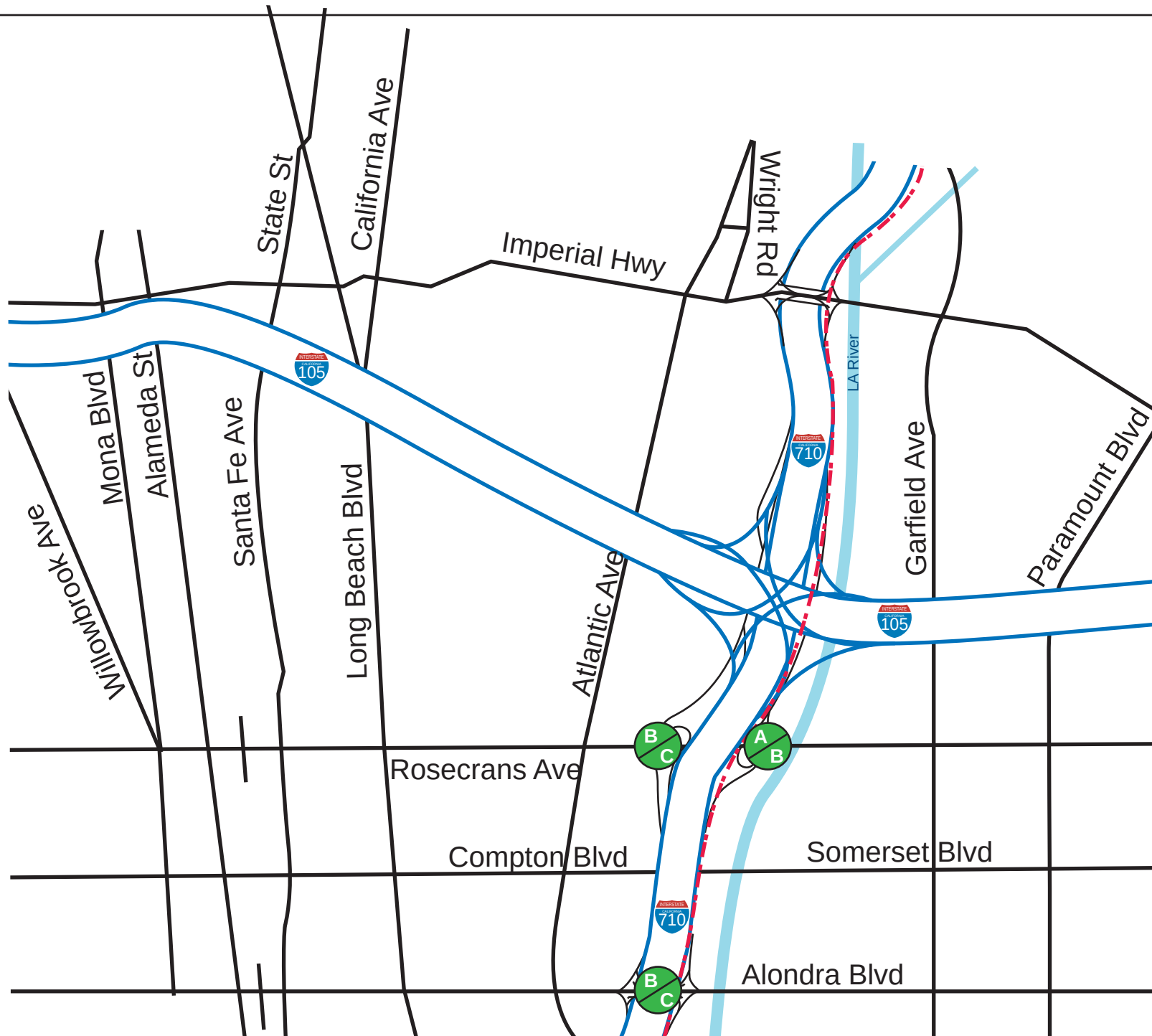






LEGEND

- C AM A - D Green
- F PM E - F Red
- Freight Corridor

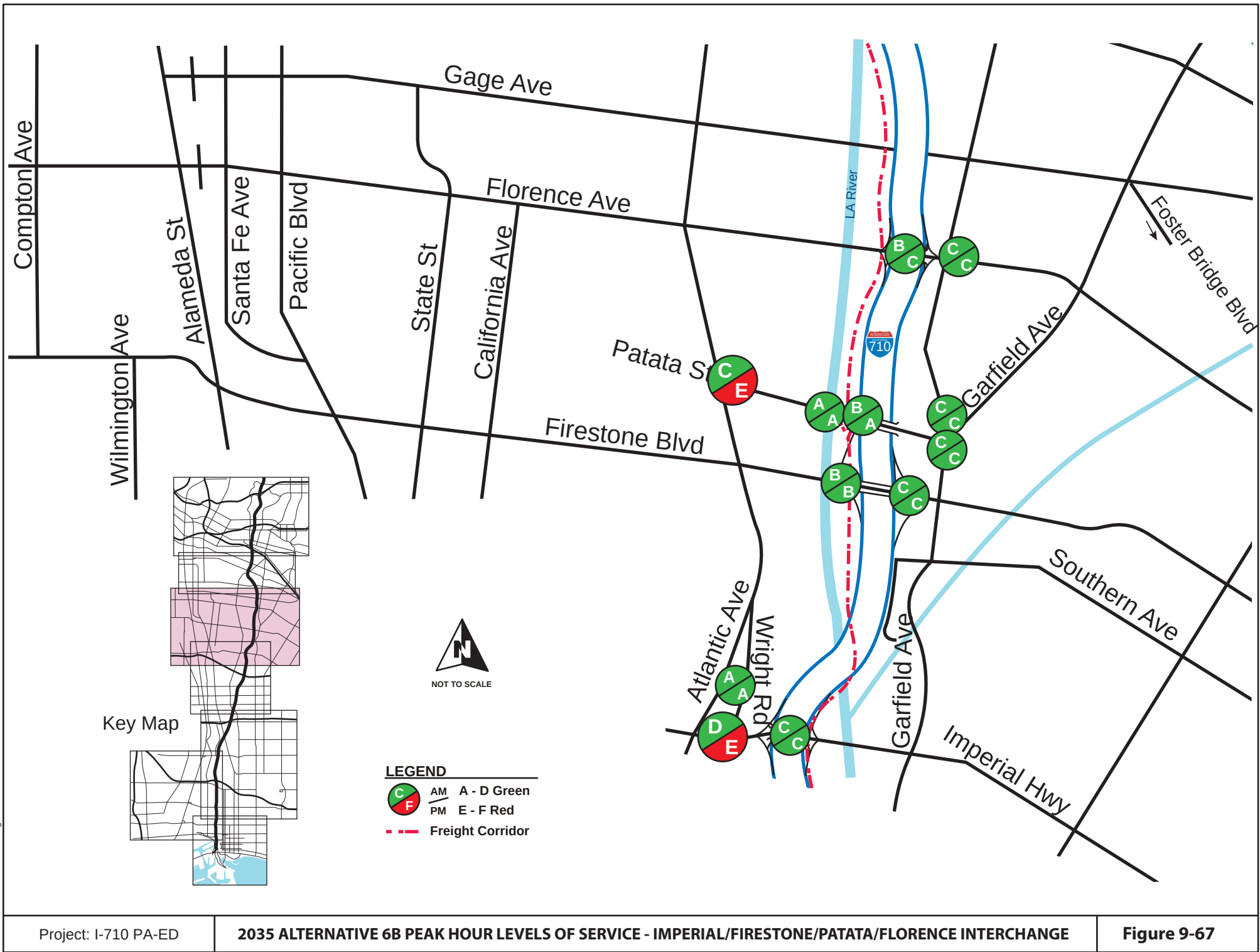


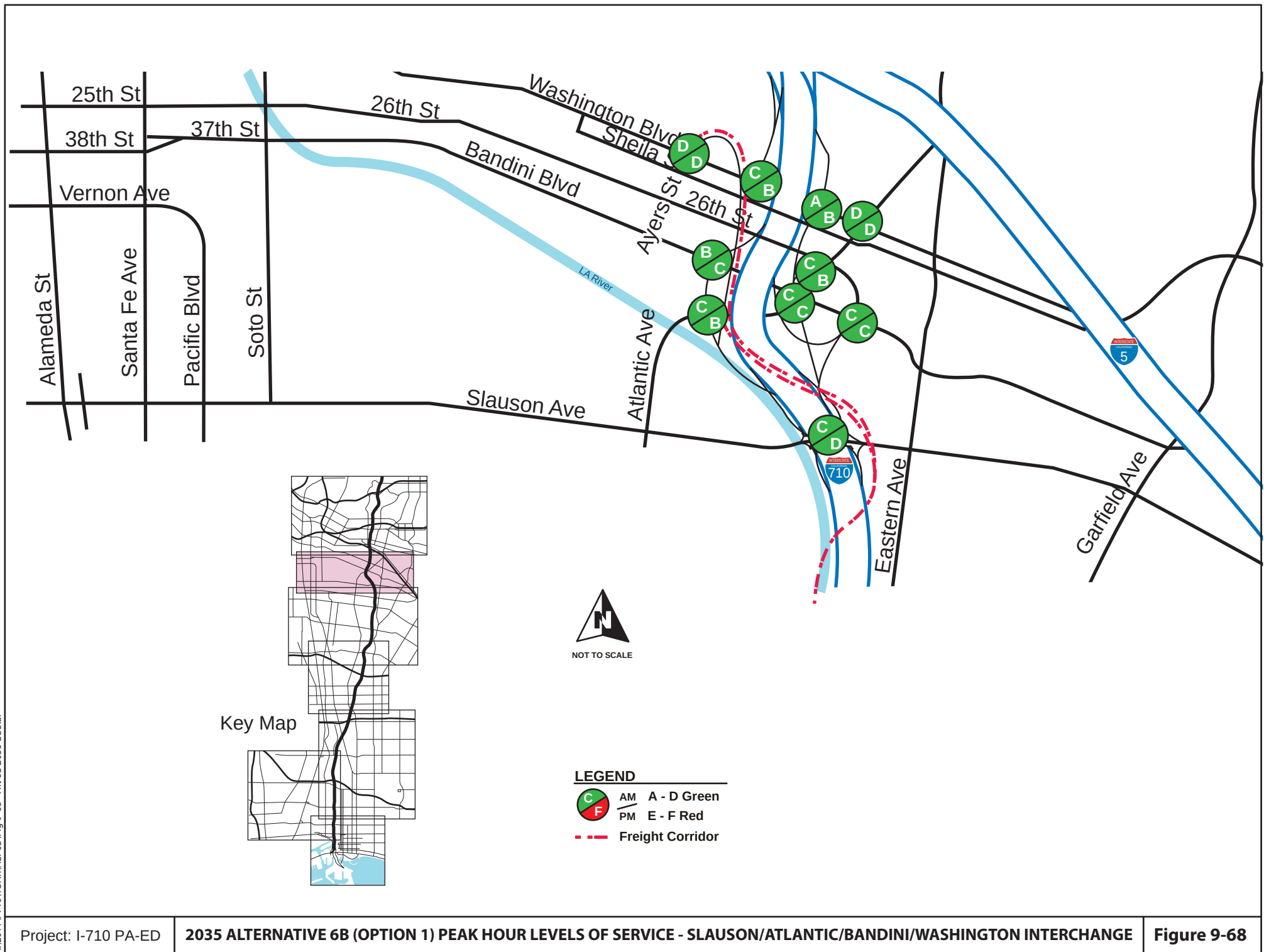
Key Map

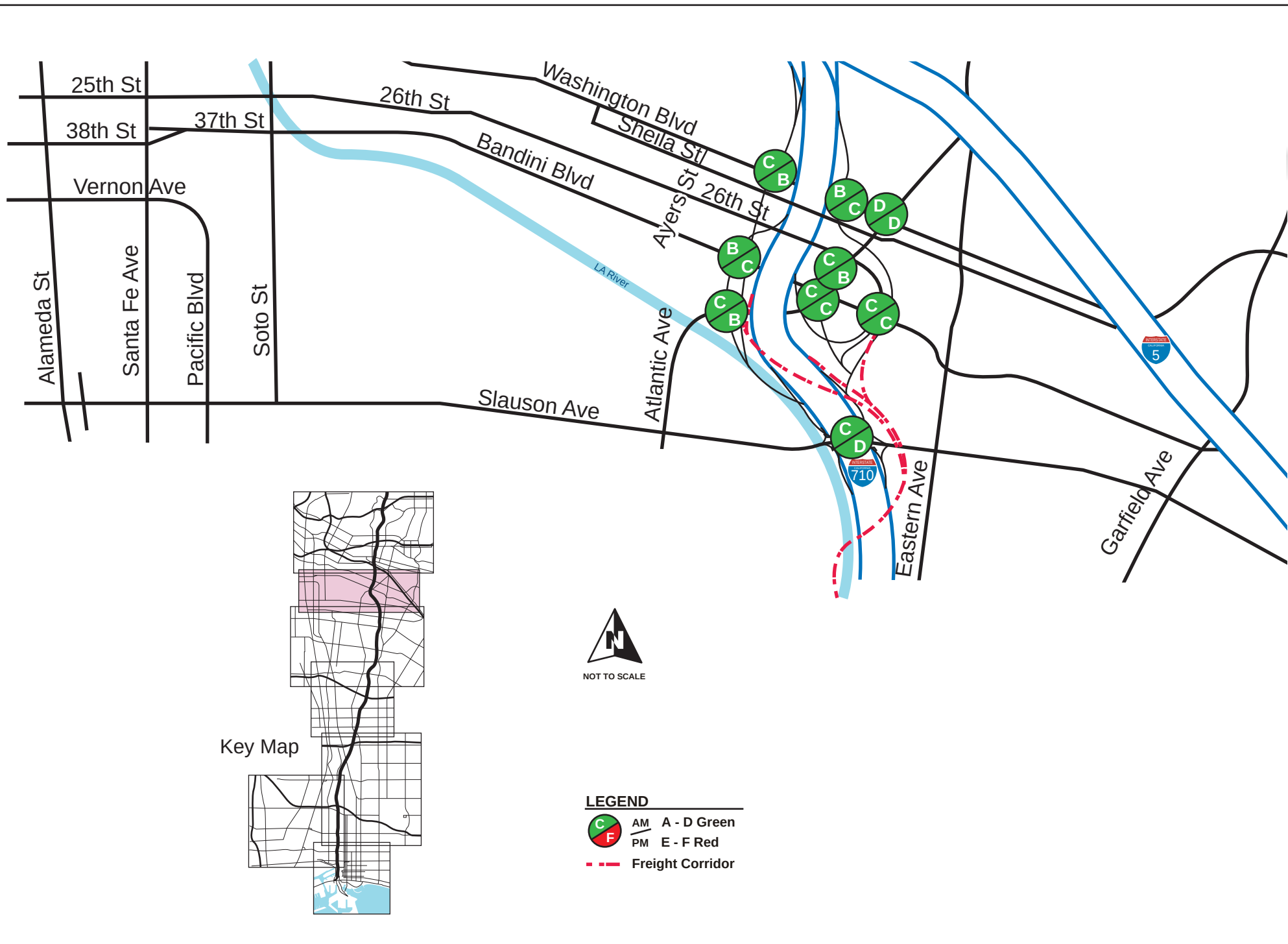


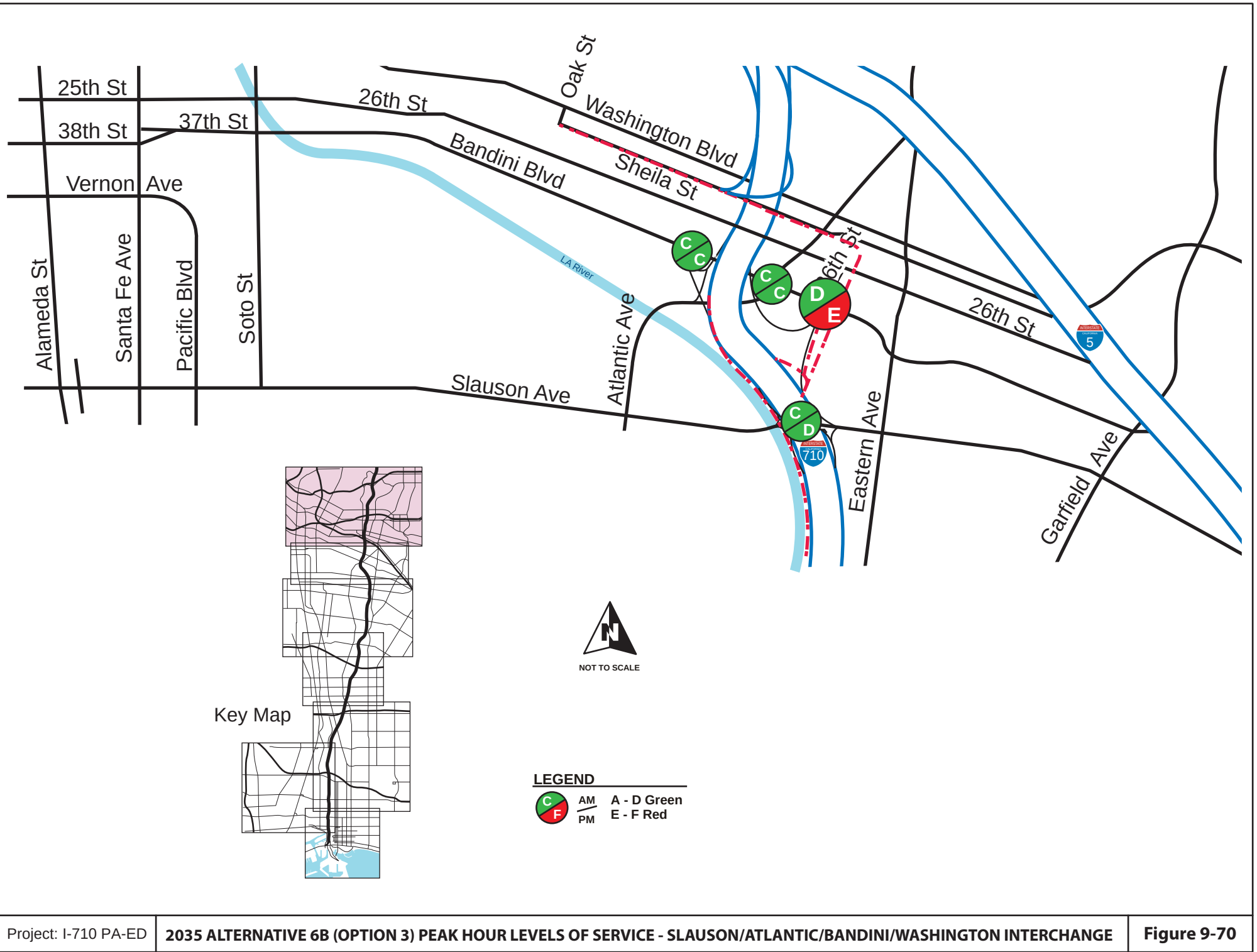
LEGEND

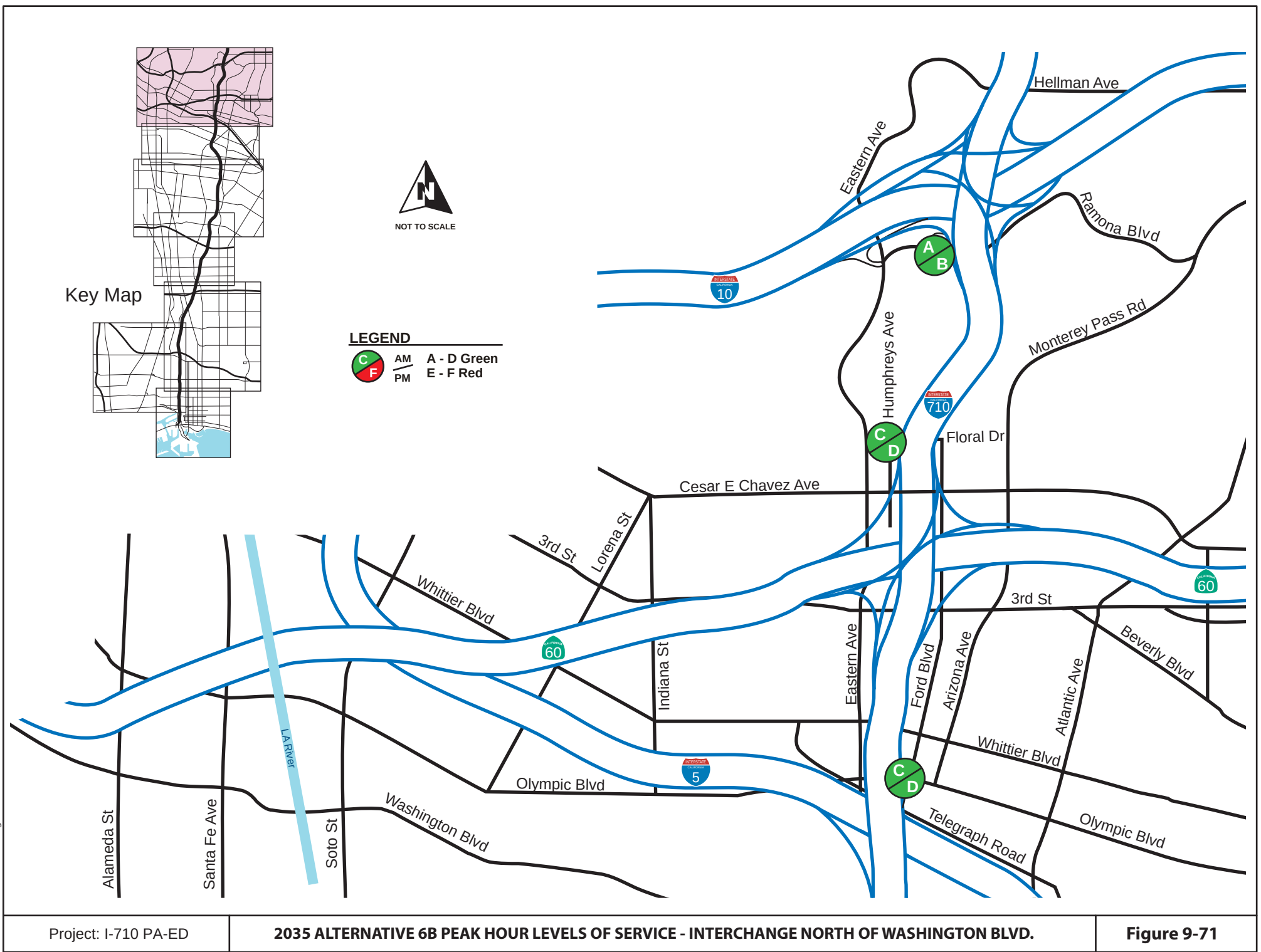
- C AM A - D Green
- F PM E - F Red
- Freight Corridor

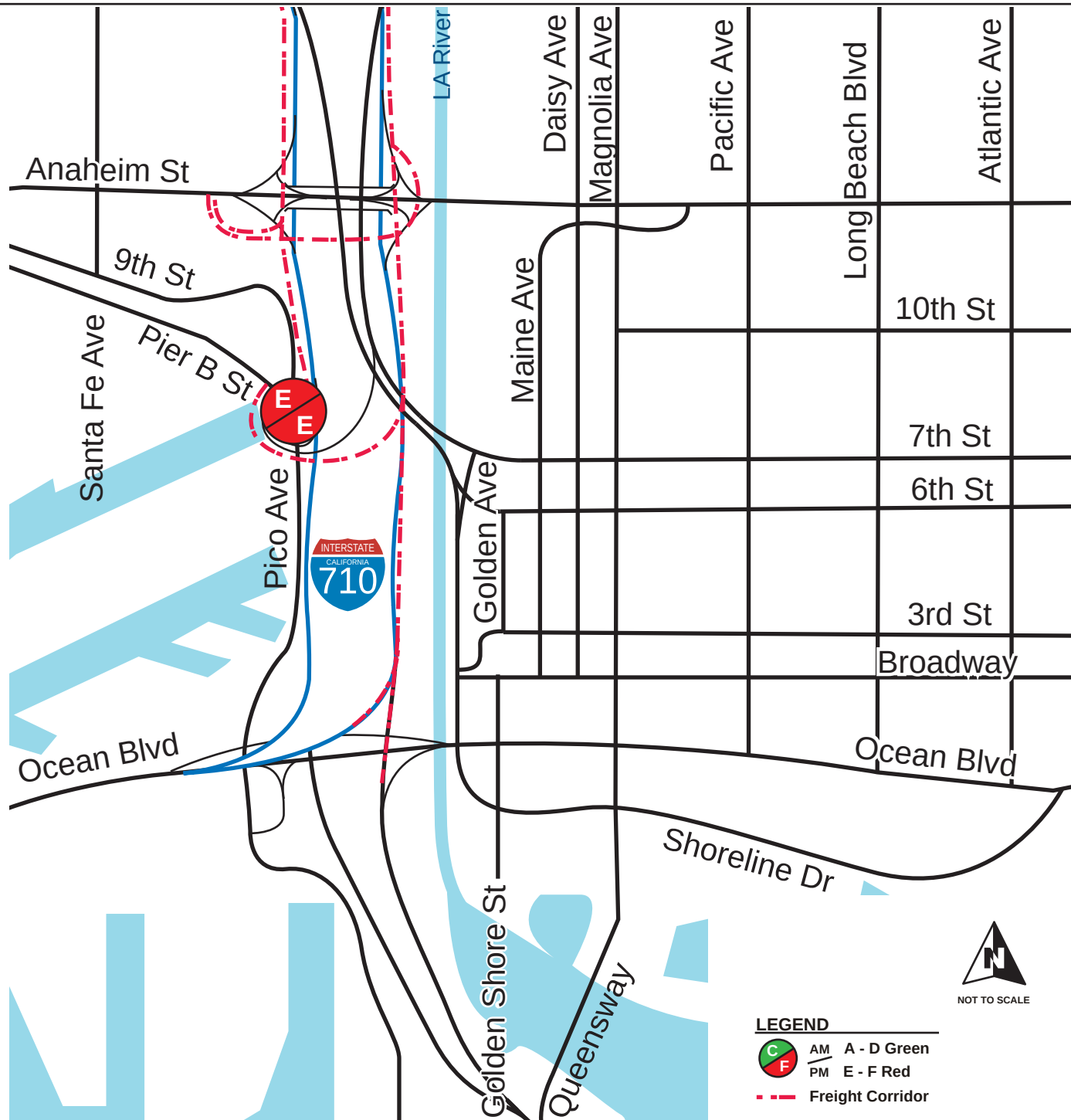
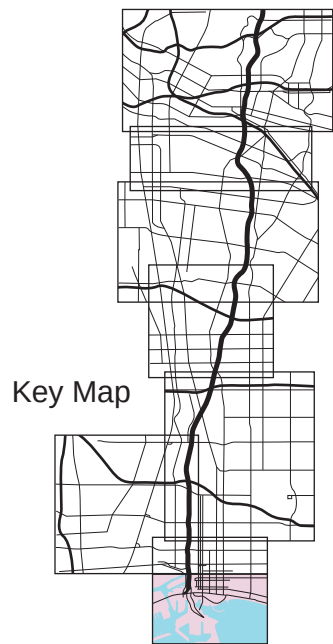


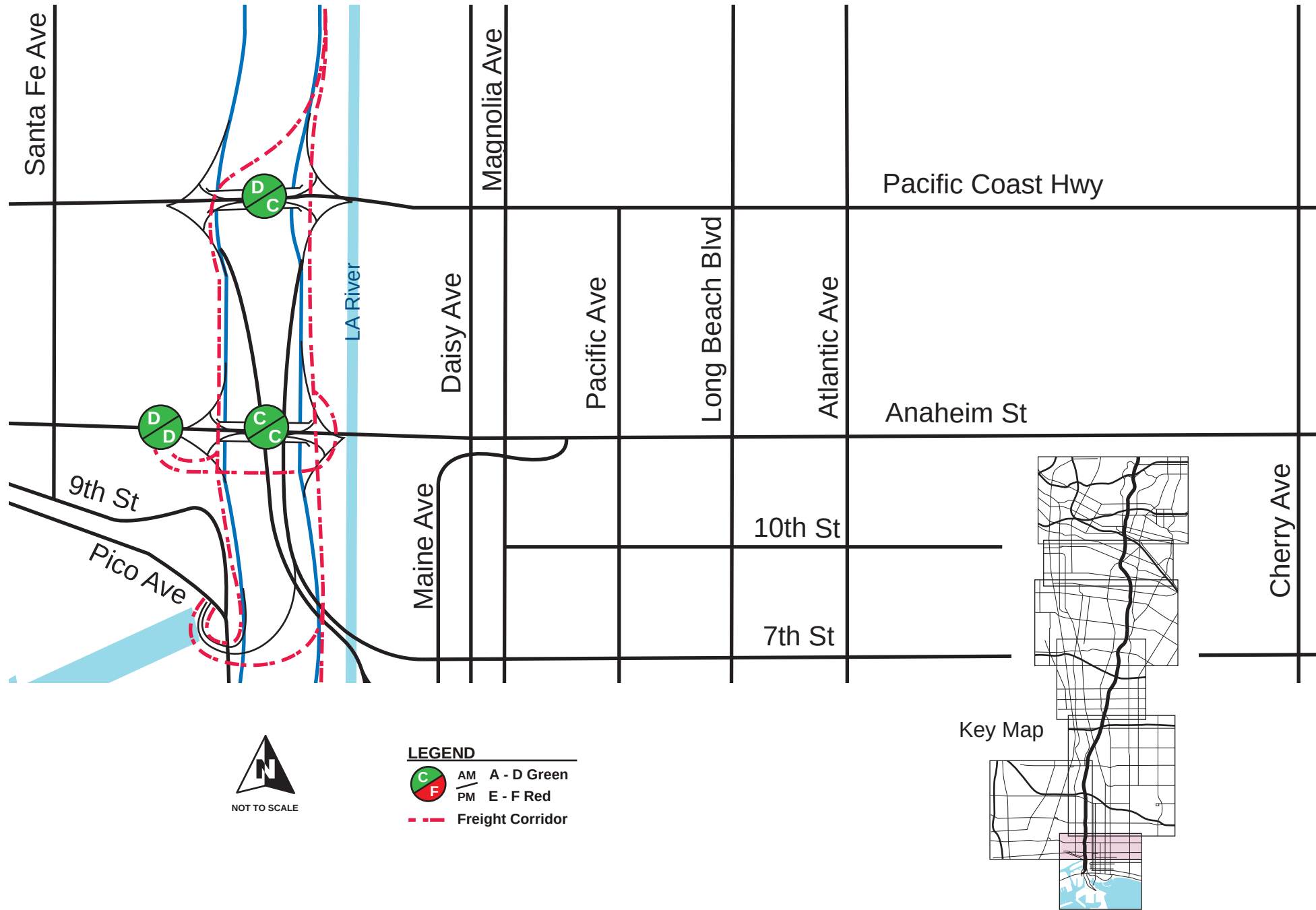


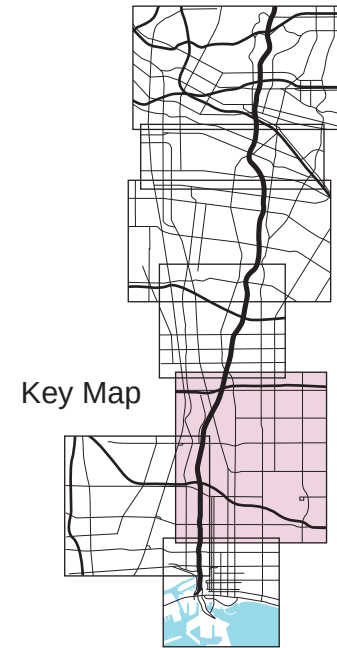






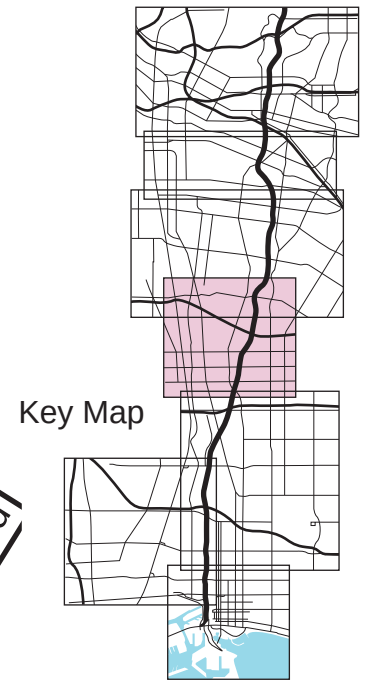
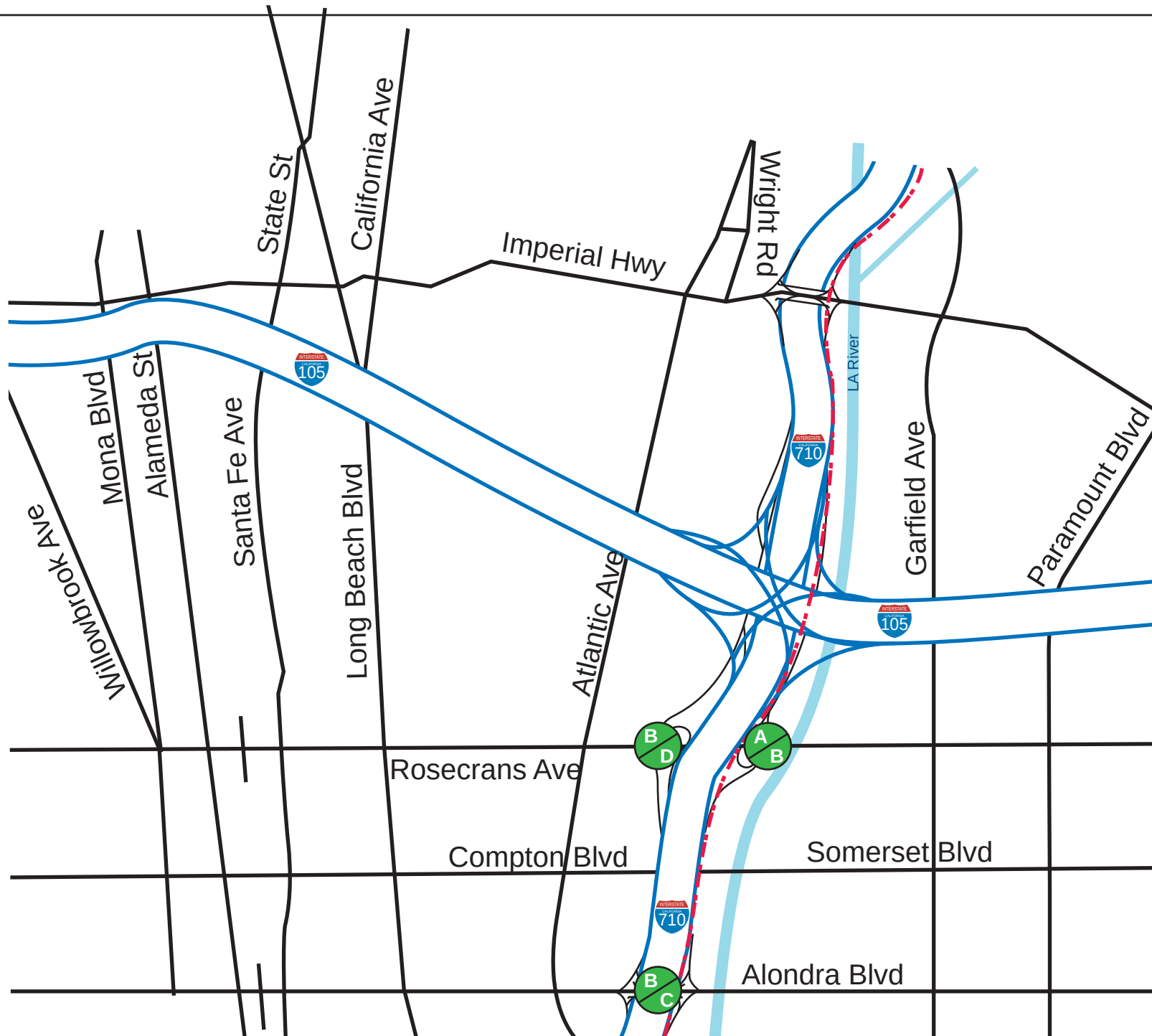






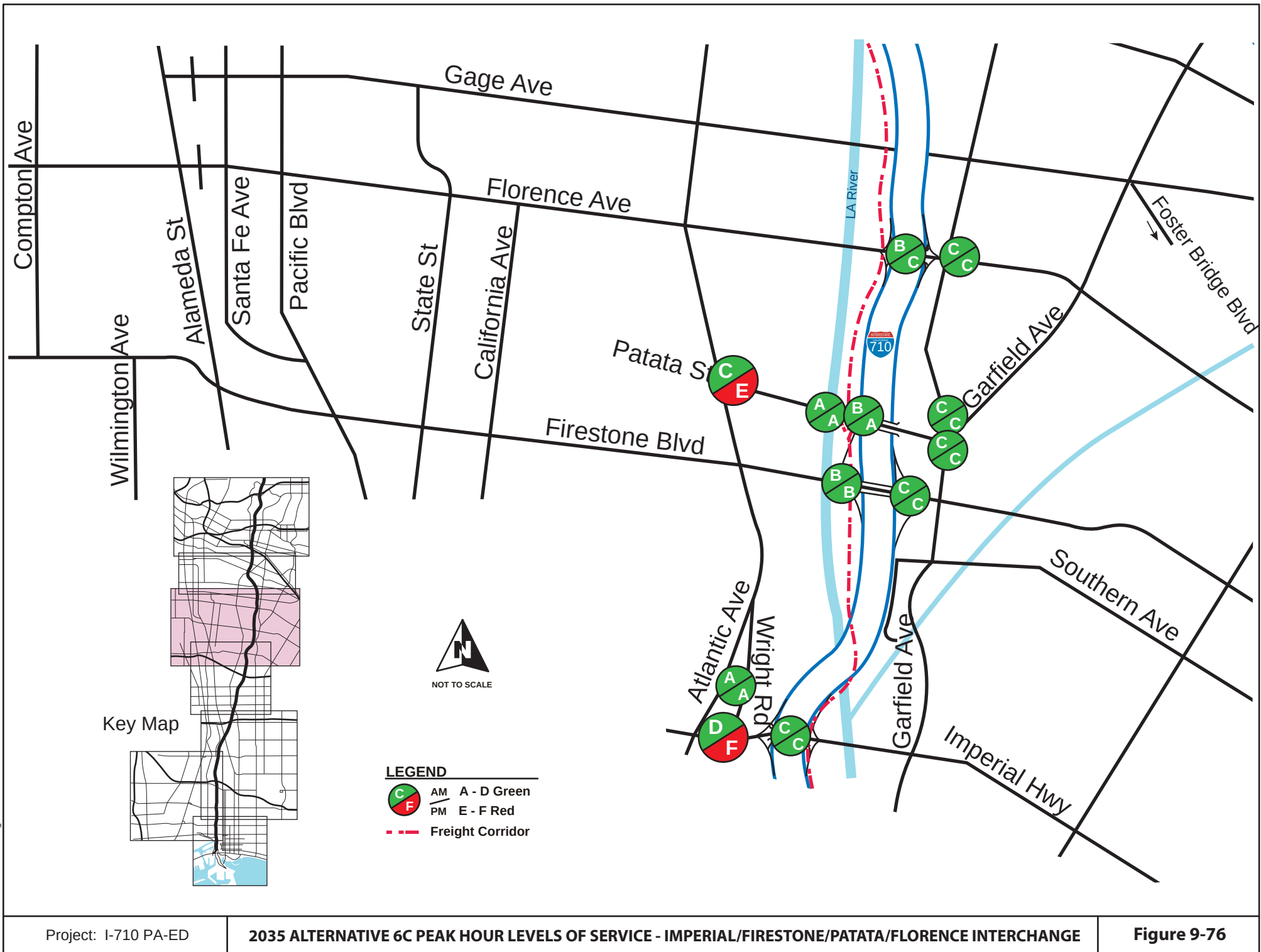
LEGEND

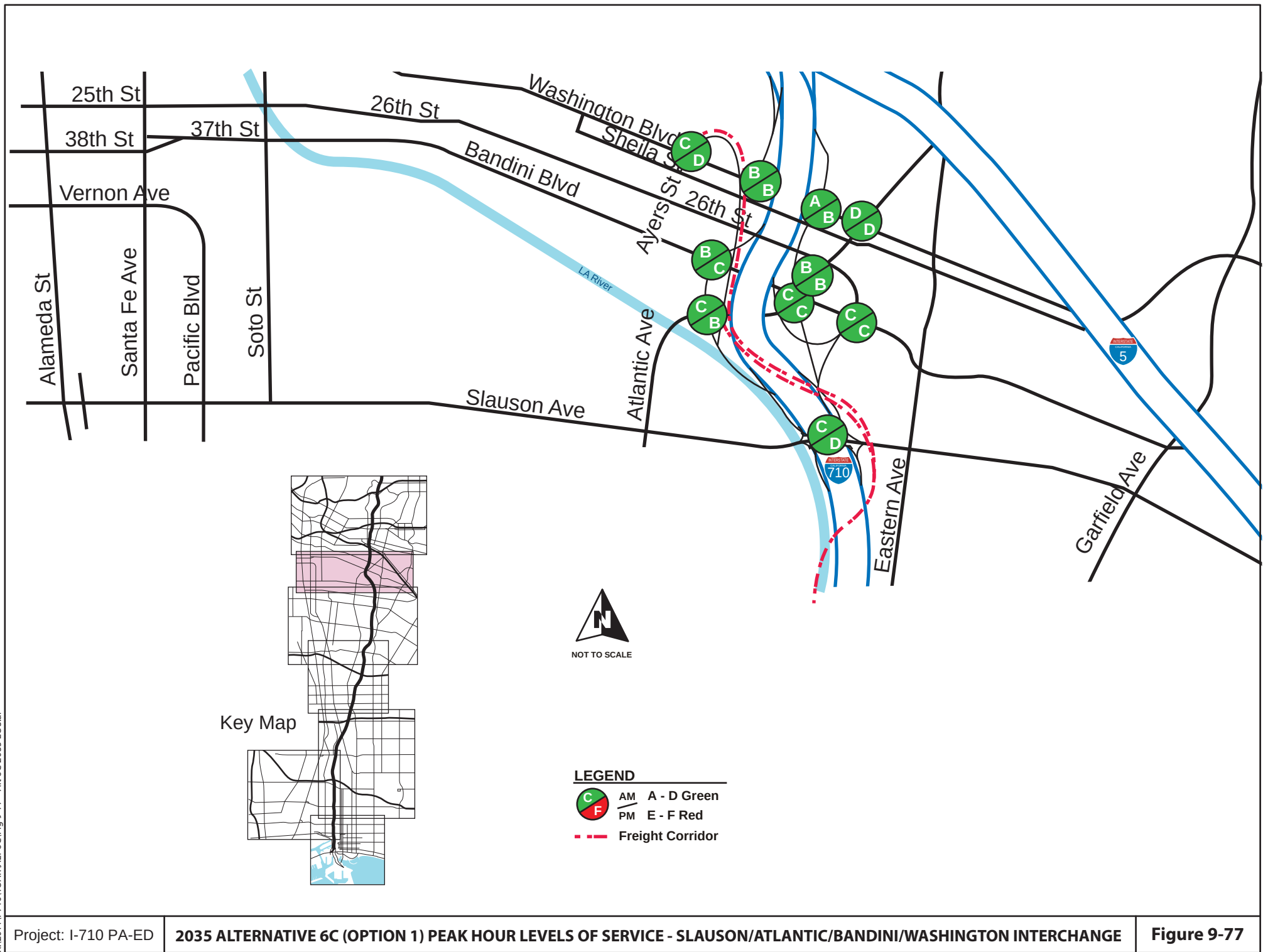
- AM A - D Green
- PM E - F Red
- Freight Corridor

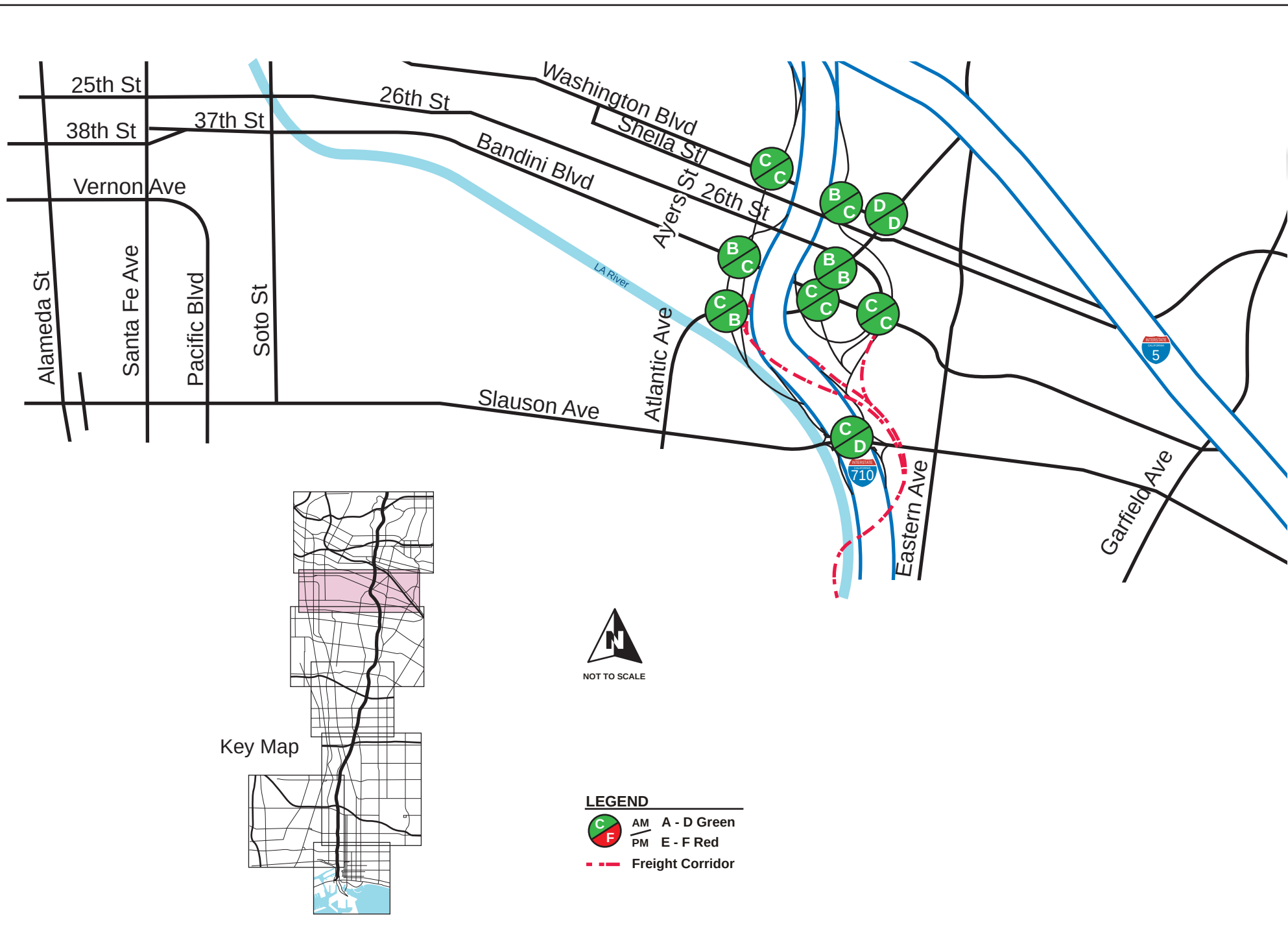


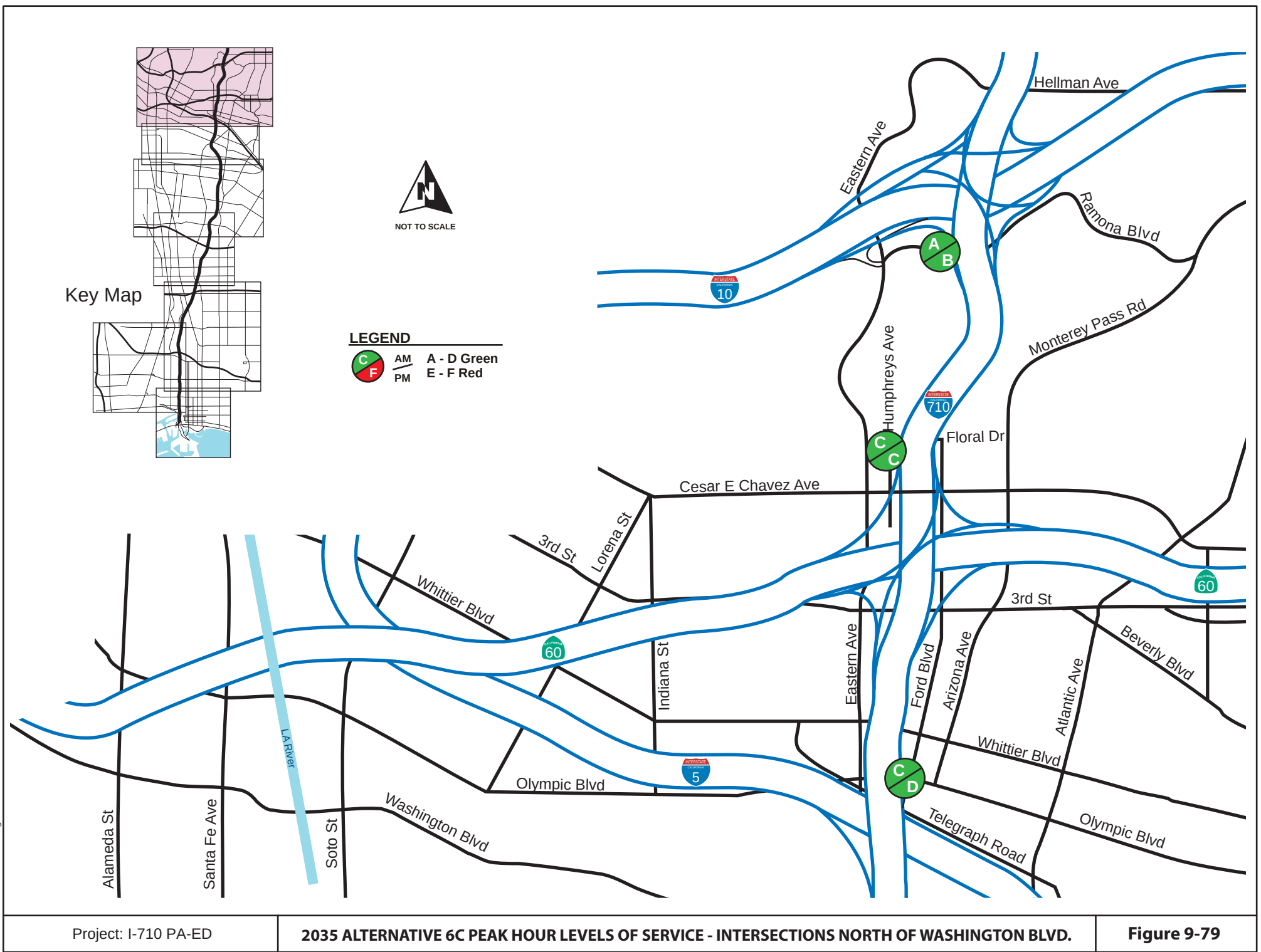
LEGEND

	AM A - D Green
	PM E - F Red
	Freight Corridor









This page intentionally left blank.

10.0 SUMMARY AND CONCLUSIONS

This section summarizes the existing and future traffic operating conditions within the I-710 from its southern termini in the City of Long Beach to the northern study limits just south of SR-60 are also included and summarized.

Summary tables are included to compare the Existing Conditions, No-Build and Future (Year 2035) Build alternative conditions. In addition to I-710, adjacent freeway segments at the I-405, SR-91, I-105 and I-5 interchanges were evaluated.

This TOAR provides a complete documentation of Existing and Future (Year 2035) No Build and Build traffic volumes and associated traffic operation analyses during the morning, midday, and the evening peak hours within the project study area for the following:

- Freeway mainline (basic segments);
- Critical weaving areas;
- Major merge and diverge areas;
- On- and off-ramp locations;
- Ramp Meter operations.

The results of the existing conditions analysis illustrate the constraints currently placed on daily commuters, commercial vehicle operations and goods movement activities along the I-710 Corridor from the City of Long Beach in the south to SR-60.

The primary objective of this section is to compare the four Build alternatives (Alternatives 5A, 6A, 6B and 6C) against the No-Build Conditions (Alternative 1) to illustrate whether or not the project meets its identified objectives as defined in the Project Need and Purpose provided in **Section 3** of this report. In short, the proposed project is intended to maintain or improve traffic operations on the I-710 Corridor, from its southern termini in the City of Long Beach to the northern study limits just south of SR-60, providing safe and efficient regional movement of people and goods through design year 2035.

The I-710 Traffic Impact Analysis Report (TIAR) has documented the results of the traffic analysis of the proposed I-710 Project, with specific focus on the local arterial roadway segments and intersections within the I-710 corridor study area. The results of the local arterial roadway and intersection based TIAR analysis show that without the proposed project related improvements, the arterials and intersections within the study area will experience worsening traffic conditions in the future 2035 No Build scenario (Alternative 1).

This document focuses on the I-710 mainline and ramp junction operations. Similar to the TIAR analysis results, the results of the analysis presented in this report (operational LOS) also shows that the implementation of either project Alternatives 5A, 6A, 6B and 6C will maintain or

improve traffic operations as compared to Alternative 1 along the I-710 corridor and the local circulation system. This thorough analysis indicates that traffic operations improves as capacity is increased on the I-710 and that arterial operations benefits from the higher truck carrying capacity of Alternatives 6A, 6B and 6C.

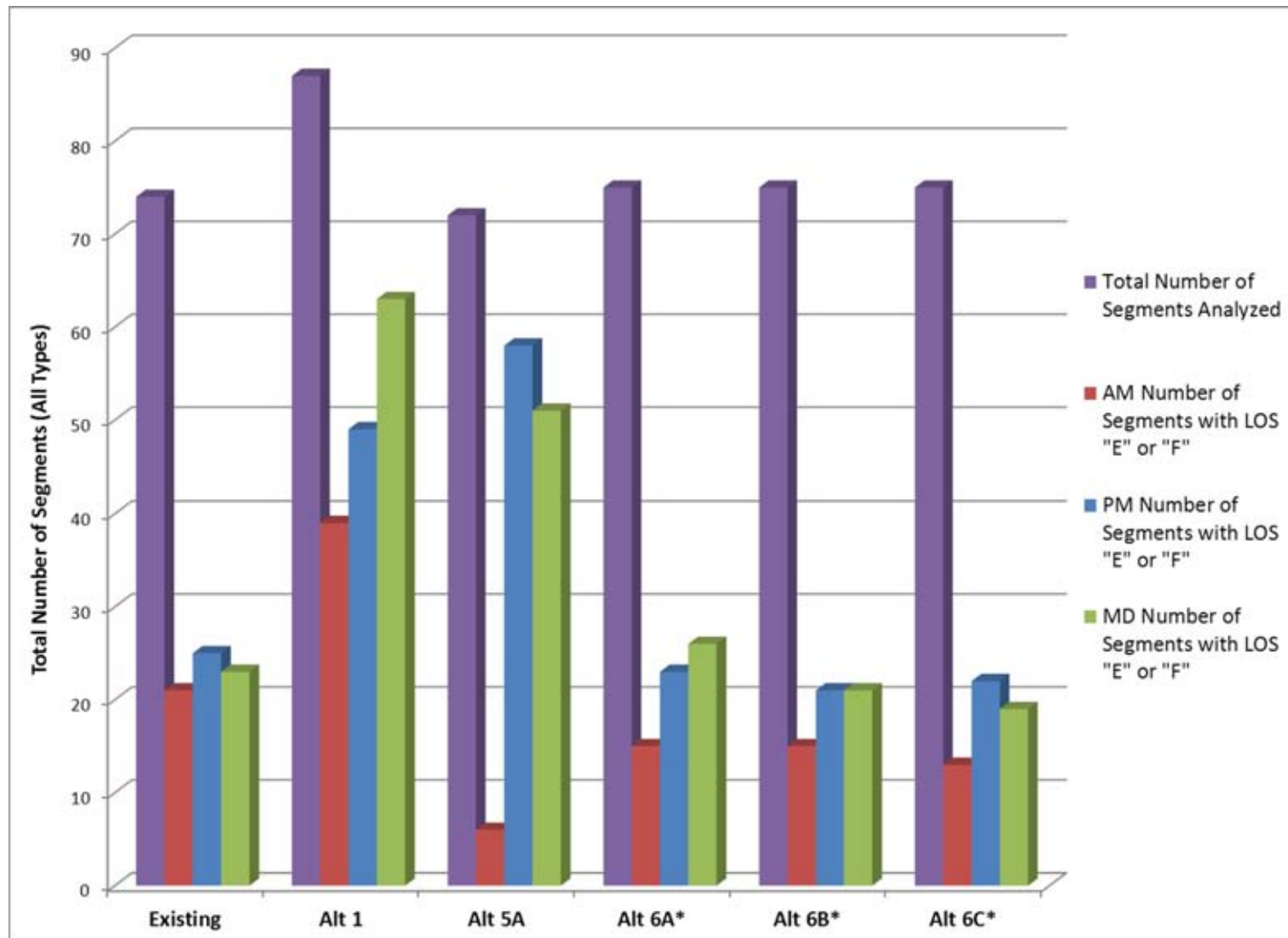
10.1 I-710 FREEWAY SEGMENTS

Figure 10-1 and **Figure 10-2** show the LOS comparison between Existing, Alternative 1, Alternative 5A, and Alternative 6A, 6B and 6C for morning, evening and midday peak hours in the northbound and south directions respectively. The figures focuses on the number of segments (all types) expected to operate at poor LOS E or F as compared to the total number of segments for both northbound and southbound directions of I-710. As shown in the figures, traffic operations are expected to improve significantly along both northbound and southbound directions of I-710 under 2035 Build conditions (Alternatives 5A, 6A, 6B and 6C) as compared to No Build conditions (Alternative 1).

In summary, the cumulative improvements for the 2035 Build alternatives are based on the geometric plans where several concepts were analyzed and refined to their full extent based on their feasibility and constructability. The following figures summarize the areas with poor LOS for Existing, Alternative 1, Alternatives 5A, 6A, 6B and 6C conditions for the morning, evening and midday peak hours.

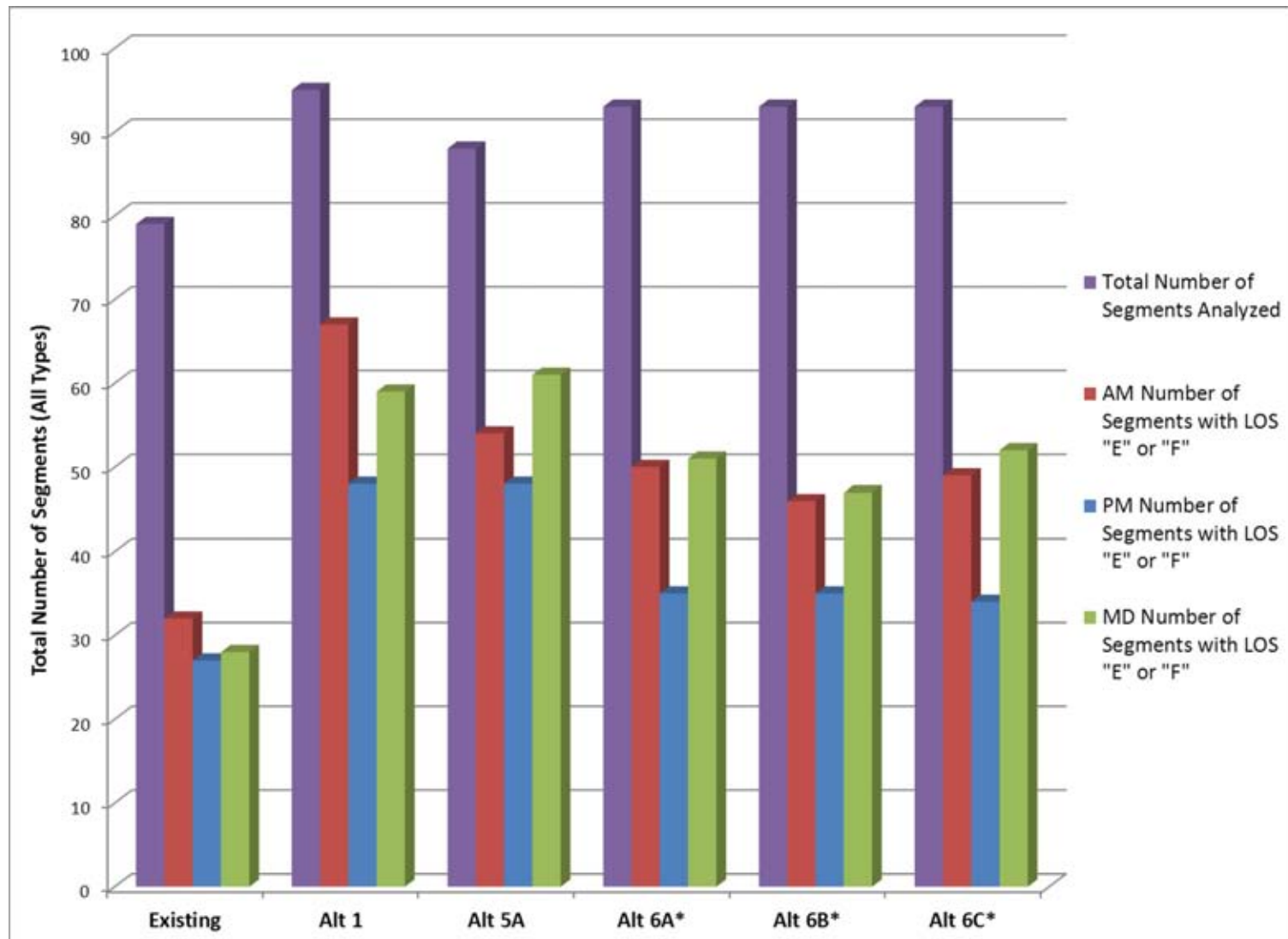
Figure 10-3 through **Figure 10-8** provides color coded LOS results along the I-710 general purpose lanes for morning, evening, and midday peak hours. As shown in the figures, traffic operations are expected to improve significantly along both northbound and southbound directions of I-710 under any 2035 Build conditions (Alternatives 5A, 6A, 6B and 6C) as compared to the No Build conditions (Alternative 1).

Figure 10-1
I-710 Northbound Peak Hour Level of Service Comparison



*Summary results include Northern Termini segments under Design Option 1 & 2 conditions.

Figure 10-2
I-710 Southbound Peak Hour Level of Service Comparison



*Summary results include Northern Termini segments under Design Option 1 & 2 conditions.

Figure 10-3
I-710 General Purpose Lanes Level of Service AM Peak Hour – Alternatives 1, 5A & 6A

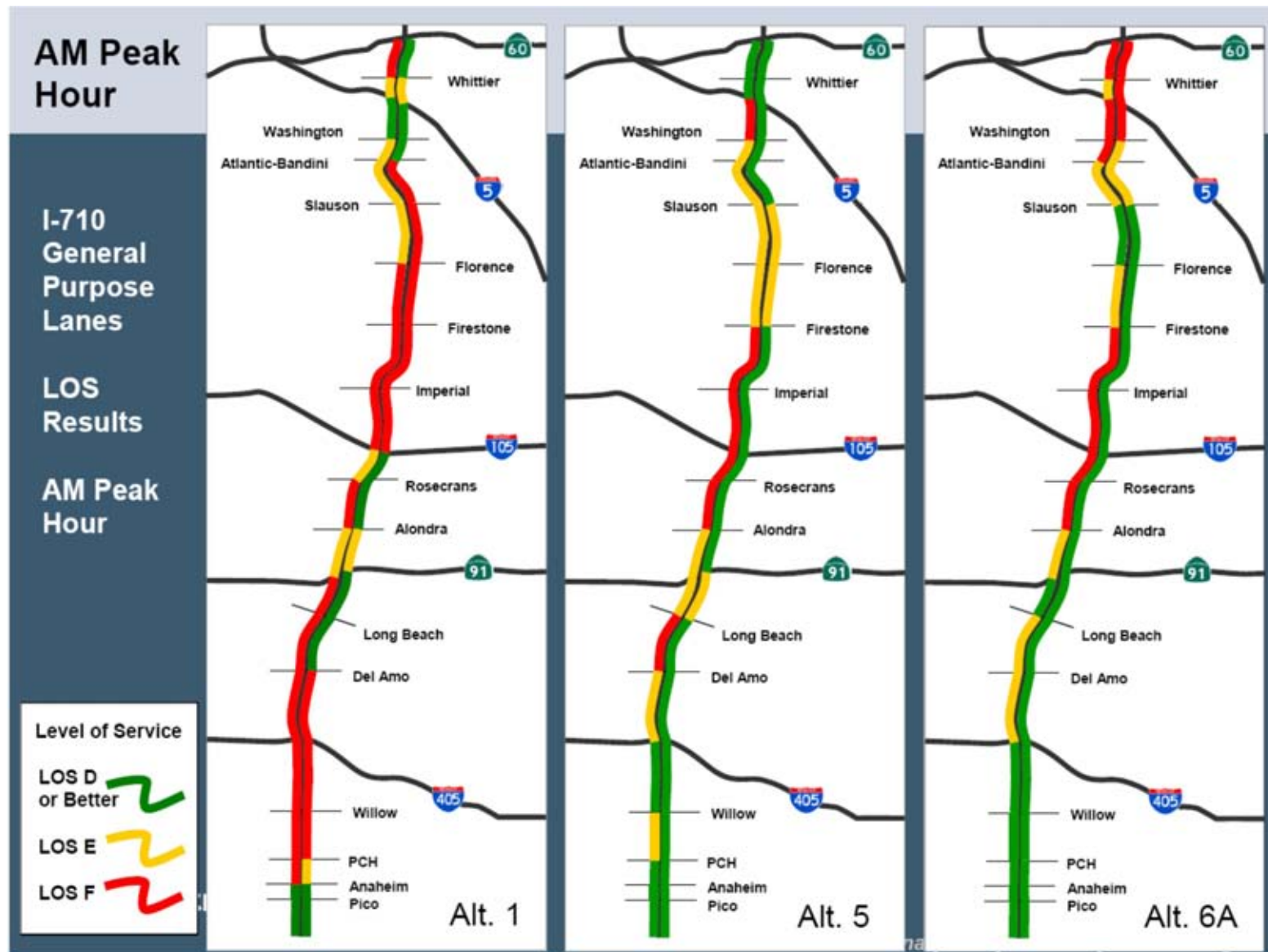


Figure 10-4

I-710 General Purpose Lanes Level of Service AM Peak Hour – Alternatives 6A, 6B & 6C

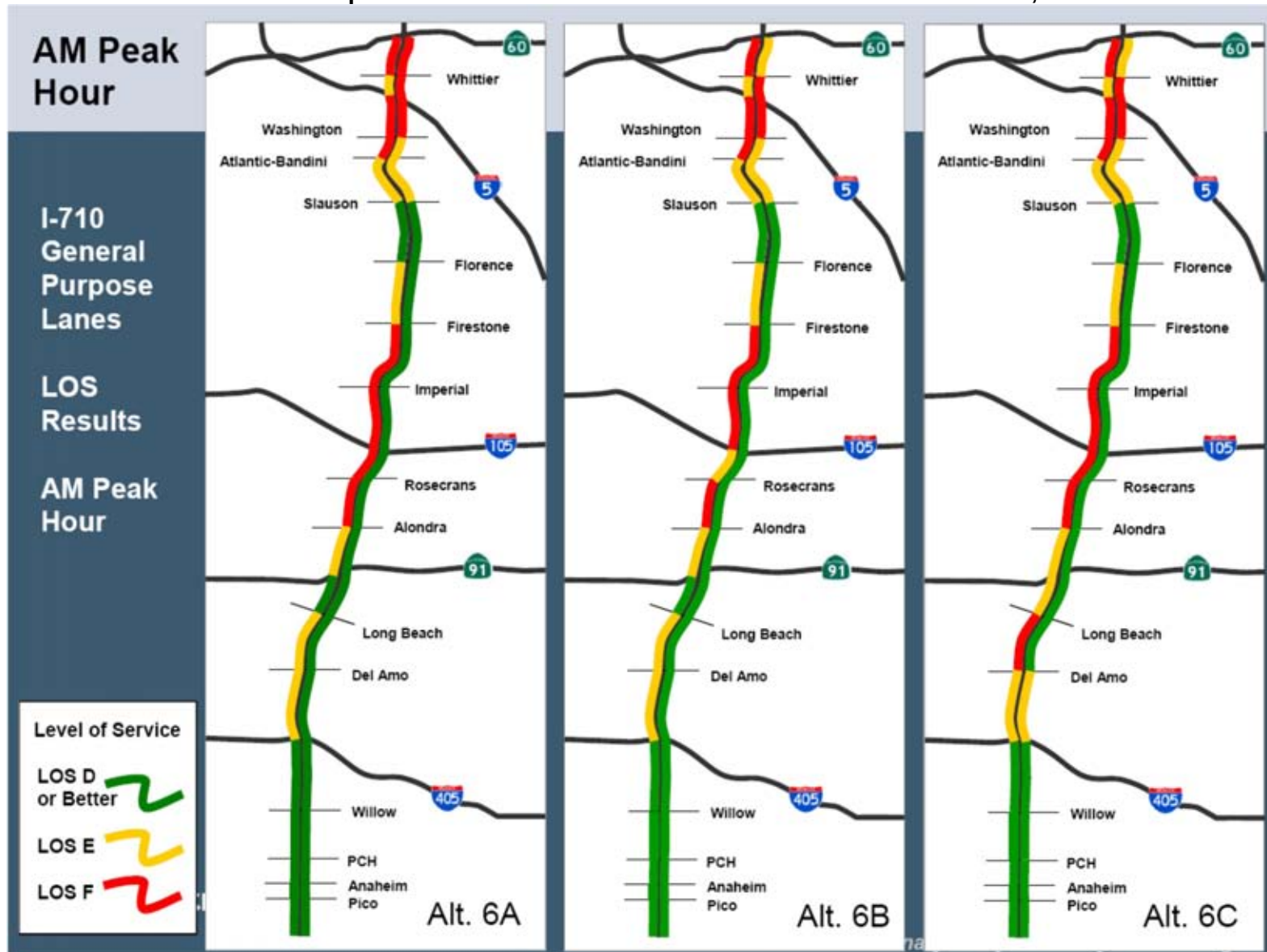


Figure 10-5
I-710 General Purpose Lanes Level of Service PM Peak Hour – Alternatives 1, 5A & 6A



Figure 10-6
I-710 General Purpose Lanes Level of Service PM Peak Hour – Alternatives 6A, 6B & 6C



Figure 10-7
I-710 General Purpose Lanes Level of Service MD Peak Hour – Alternatives 1, 5A & 6A



Figure 10-8
I-710 General Purpose Lanes Level of Service MD Peak Hour – Alternatives 6A, 6B & 6C



10.1.1 I-710 Freeway VISSIM Simulation

A traffic simulation using VISSIM was conducted for Alternative 1 (No Build) and an initial version of the 2035 Build FC Alternative (6A/6B) and was documented in a Technical Memorandum – Traffic Operations Comparison (March 2010) for purposes of providing operational analysis and design guidance. The simulations documented and presented in the report is a microsimulation for the segment of I-710 south of I-405. This section of the I-710 is more geometrically complex compared to other areas along the I-710, therefore, only this section was microsimulated.

The microsimulation for this section was conducted using the VISSIM program, which is a microscopic, time step, and behavior based simulation model developed to model urban traffic operations. Simulation was performed for Alternative 1 (No Build) and Alternative 6A/B traffic conditions. The result of the microsimulation shows the following:

- Compared to Alternative 1 (No Build) conditions, Alternative 6A/6B shows improved operational conditions. This is a result of the reduction in average travel time and delay for various segments along the I-710 mainline between I-405 and Ocean Boulevard.

These results are consistent with the summary of the analysis results and justify the conclusions that were presented in the previous sections. Details on the VISSIM microsimulation results are presented in **Appendix J**.

It is recommended that more detailed simulation be performed for the various segments of I-710 (such as I-710 freeway between I-5 and Atlantic-Bandini Interchange, Southbound I-710 between Firestone Boulevard and I-405, etc.) that are projected to operate at poor Level of Service with the Build improvements in place.

10.2 ADJACENT FREEWAYS

10.2.1 I-405 Freeway Segments

Table 10-1 and **Table 10-2** provide a summary of the freeway segment analysis for I-405. Key findings of the freeway segment analysis show the following:

Northbound I-405 operates at LOS E or F during at least one of the study peak hours at all study segments except for the following locations:

Existing

- Basic freeway segment north of Alameda On-ramp;
- Basic freeway segment between I-710 southbound Off-ramp and I-710 On-ramp.

Alternative 1

- Weave segment between Wardlow On-ramp and I-710 northbound Off-ramp;
- Santa Fe On-ramp on freeway collector-distributor.

Table 10-1
I-405 Peak Hour Level of Service Summary – Existing & 2035 Alternative 1

Location Description	Freeway Type	Existing			Alternative 1		
		AM	PM	MD	AM	PM	MD
Northbound							
North of Alameda Off	Basic	D	C	D	F	F	E
Alameda	Off	N/A	N/A	N/A	N/A	N/A	N/A
I-710 & Santa Fe On / Alameda Off	Weave B	F	E	E	F	F	F
I-710 & Santa Fe	On	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	D	D	D	F	F	D
Santa Fe	On ⁵	E	C	C	D	C	D
I-710 SB On / Santa Fe Off	Weave A ⁵	F	D	D	E	D	F
I-710 NB On / I-710 SB Off	Weave A ⁵	F	F	F	F	F	F
I-710 SB & Santa Fe	Off	N/A	N/A	N/A	N/A	N/A	N/A
Pacific On / I-710 SB & Santa Fe Off	Weave A	F	E	E	F	F	E
Pacific	On	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	E	D	D	F	F	E
I-710 NB	Off	N/A	N/A	N/A	N/A	N/A	N/A
Wardlow On / I-710 NB Off	Weave C	E	E	D	D	D	D
Wardlow	On	N/A	N/A	N/A	N/A	N/A	N/A
South of Wardlow On	Basic	E	D	D	E	E	D
Southbound							
North of Alameda On	Basic	C	D	C	D	E	D
Alameda	On	N/A	N/A	N/A	N/A	N/A	N/A
Alameda On/Wardlow & I-710 NB Off	Weave B	E	F	E	F	F	F
I-710 NB & Wardlow	Off	N/A	N/A	N/A	N/A	N/A	N/A
Wardlow On/Off	Weave A ⁵	C	F	D	F	F	F
--	Basic	D	D	D	E	F	E
I-710 SB	Off ⁴	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	D	E	E	E	F	E
Wardlow	On	N/A	N/A	N/A	N/A	N/A	N/A
Wardlow On / Pacific Off	Weave B	D	E	D	E	F	E
Pacific	Off	N/A	N/A	N/A	N/A	N/A	N/A
I-710 NB On / Pacific Off	Weave A ⁵	B	C	C	C	B	C
--	Basic	D	D	D	D	E	D
I-710	On	N/A	N/A	N/A	N/A	N/A	N/A
I-710 On / Long Beach Off	Weave B	E	F	F	E	E	E

Notes: Shaded and bold cells indicate LOS E or F.

⁴ Single-lane addition/drop; HCM methodology applied for analysis.

⁵ Operation occurs on freeway collector/distributor.

N/A = not applicable. LOS and/or density information are not shown for major merge areas, single-lane addition/drop, and merge/diverge operations within a weaving segment.

Table 10-2
I-405 Peak Hour Level of Service Summary – 2035 Alternative 5A, 6A, 6B & 6C

Location Description	Freeway Type	Alternative 5A			Alternative 6A			Alternative 6B			Alternative 6C		
		AM	PM	MD	AM	PM	MD	AM	PM	MD	AM	PM	MD
Northbound													
North of Alameda Off	Basic	F	F	E	F	E	D	F	E	D	F	E	D
Alameda	Off	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
I-710 NB & Santa Fe On / Alameda Off	Weave A	F	C	F	F	F	F	F	F	E	F	F	E
Santa Fe & I-710 NB	On	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	E	E	D	E	E	D	E	E	D	E	E	D
I-710 SB	Major On ²	F	F	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	F	N/A
--	Basic	F	F	D	E	E	D	E	E	D	E	F	D
Santa Fe	Off	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Pacific On / Santa Fe Off	Weave A	E	E	D	F	F	E	F	F	E	F	F	E
Pacific	On	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	F	F	D	F	F	D	F	F	D	F	F	D
I-710	Off	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Wardlow On / I-710 Off	Weave C	F	F	F	F	F	F	F	F	F	F	F	F
Wardlow	On	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
South of Wardlow On	Basic	E	E	D	E	E	E	E	E	E	E	E	E
Southbound													
North of Alameda On	Basic	D	E	D	D	E	D	D	E	D	D	E	D
Alameda	On	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Alameda On / I-710 NB & Wardlow Off	Weave B	F	F	F	F	F	F	F	F	F	F	F	F
I-710 NB & Wardlow	Off	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	F	F	E	E	F	D	E	F	D	E	F	E
I-710 SB	Major Off ³	F	F	F	E	F	E	E	F	E	E	F	E
--	Basic	F	F	F	E	F	E	E	F	E	E	F	E
Wardlow	On	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Wardlow On / Pacific Off	Weave B	D	E	D	E	F	E	E	F	E	E	F	E
Pacific	Off	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	D	E	D	D	E	D	D	E	D	D	E	D
I-710	Major On ²	N/A	F	N/A	N/A	F	N/A	N/A	F	N/A	N/A	F	N/A
--	Basic	E	F	E	E	F	E	E	F	E	E	E	E

Notes: Shaded and bold cells indicate LOS E or F.

² Major merge area; HCM methodology applied for analysis.

³ Major diverge area; HCM methodology applied for analysis.

N/A = not applicable. LOS and/or density information are not shown for major merge areas, single-lane addition/drop, and merge/diverge operations within a weaving segment.

Southbound I-405 operates at LOS E or F either during AM, PM or MD peak hours at all study segments except for the following locations:

Existing

- Basic freeway segment north of Alameda On-ramp;
- Basic freeway segment between I-710 northbound Off-ramp and I-710 southbound Off-ramp;
- Weave segment between I-710 northbound On-ramp and Pacific Off-ramp on freeway collector-distributor;
- Basic freeway segment between Pacific Off-ramp and I-710 On-ramp.

Alternative 1

- Weave segment between I-710 northbound On-ramp and Pacific Off-ramp on freeway collector-distributor.

Many segments of I-405 indicate poor LOS for all 2035 Build Alternatives 5A, 6A, 6B and 6C in the morning, midday and evening peak periods and in both directions of the freeway. Alternative 1 has different operational characteristics than the Build alternatives, as it maintains the existing collector-distributor (CD) system adjacent to the northbound and southbound lanes. The limited capacity and poor operation on the CD roads adversely affect the LOS at the diverge locations and contribute to the congestion on the mainline.

Figure 10-9 and **Figure 10-10** show the LOS comparison between Existing, Alternative 1, Alternative 5A, and Alternative 6A, 6B and 6C for morning, evening and midday peak hours for both the northbound and southbound directions respectively. The figures focus on the number of segments (all types) expected to operate at poor LOS E or F as compared to the total number of segments for both northbound and southbound directions of I-405. As shown in the figures, overall traffic operations are expected to improve along both northbound and southbound directions of I-405 under Build conditions compared to No Build conditions.

In summary, removing the CD road would eliminate the poor weaving conditions and may reduce the high accident rates in the area. In addition, the additional capacity provided on the proposed flyover connector ramps would provide safer operations among the options considered. Even though this results in a loss of circulation, there are alternative means of gaining access to I-710 and the demand for these movements are relatively low.

Under existing and Alternative 1 conditions, the operating conditions in these areas would deteriorate further without improvements. Compared to Alternative 1, under Alternative 5A, 6A, 6B and 6C condition, some of the segments improve as a result of the reduction in traffic on both the I-710 mainline and connector ramps. This is also a result of the diversion of truck traffic onto the FC. Therefore, Alternatives 5A, 6A, 6B and 6C would not only improve the overall operation, but also address the safety concerns in this area.

Figure 10-9
I-405 Northbound Peak Hour Level of Service Comparison

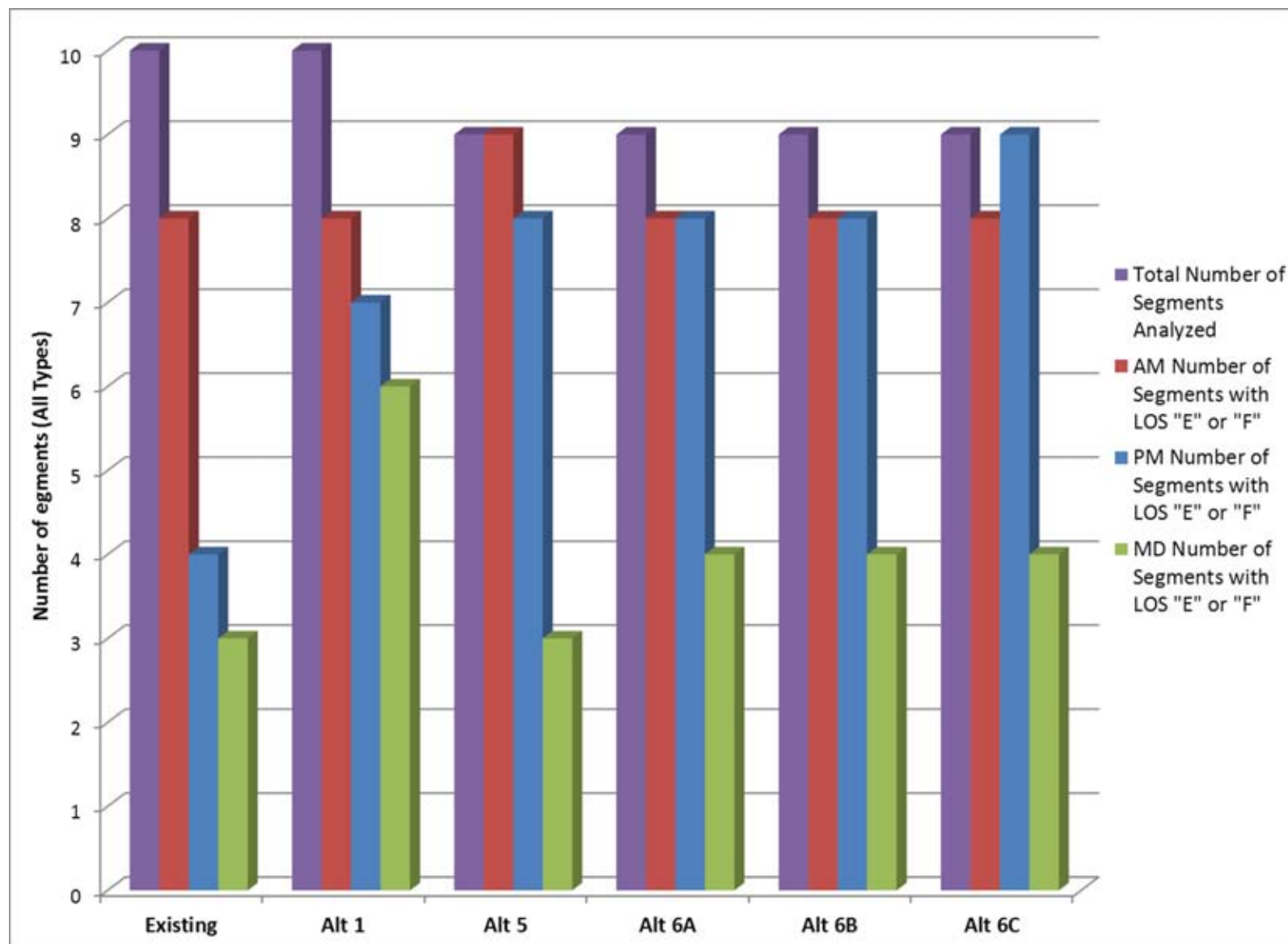
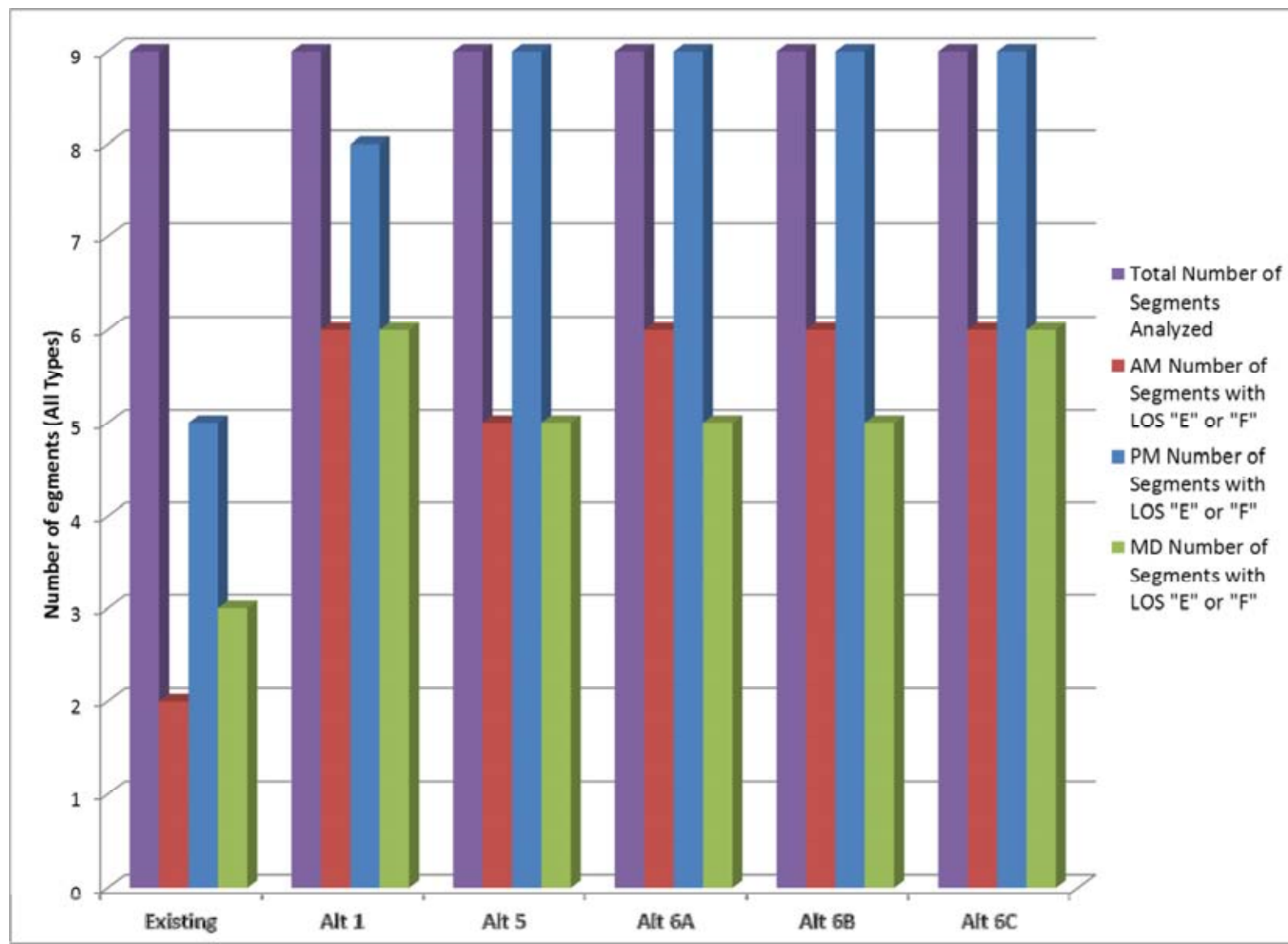


Figure 10-10
I-405 Southbound Peak Hour Level of Service Comparison



10.2.1.1 I-405 Freeway Ramp Queuing Analysis Summary

Table 10-3 and **Table 10-4** provide a summary of the freeway and arterial Ramp queuing analysis for I-405. **Table 10-3** indicates that the storage provided on all freeway-to-freeway ramp connectors with the proposed ramp metering for all 2035 Build alternatives are adequate using suggested meter rates with the exception of the following locations:

- I-710 southbound connector ramp to I-405 southbound (Alt 5A, 6A, 6B and 6C)

All ramp meter rates are per Caltrans Ramp Metering field rates; ramp metering discharge rate for 2 and 3 cars per green per lane is between 480 and 1200 and between 780 and 1380 vph/lane, respectively.

Table 10-4 indicates that the storage provided on all on-ramps with proposed ramp metering for the 2035 Build alternatives are adequate using suggested meter rates between 240 vph/lane and 900 vph/lane.

At locations where the required storage is not provided and the maximum meter rate is utilized, it is concluded that there are no feasible improvement recommendations. This is generally a result of physical and design constraints such as the proximity of community parks or commercial buildings. It must also be noted that a higher meter rate allows more throughput, but would generally cause turbulence at the merge area and increase congestion to the freeway.

Overall, the queue lengths at the on-ramps and freeway connectors, are generally maintained or improved in the morning, midday and evening peak periods when comparing the 2035 Build Alternatives 6A, 6B and 6C to Alternative 5A Conditions. Therefore, the on-ramp and freeway connector design is meeting its stated objectives and purpose and need.

10.2.2 SR-91 Freeway Segments

Table 10-5 and **Table 10-6** provide a summary of the freeway segment analysis for SR-91. Key findings of the freeway segment analysis show the following:

Eastbound SR-91 operates at LOS E or F during AM, PM or MD peak hours for the following locations:

Existing

- Basic freeway segment between I-710 southbound Off-ramp and Atlantic On-ramp.

Table 10-3
I-405 2035 Freeway Ramp Queuing Analysis Summary

Direction	Location	ALT 5A	ALT 6A	ALT 6B	ALT 6C	Provided SL ALT 5A & 6A/6B/6C
NB I-405	Off-ramp to I-710 NB Connector	Yes	Yes	Yes	Yes	2 lanes @ 2400'
NB I-405	Off-ramp to I-710 SB Connector	Yes	Yes	Yes	Yes	2 lanes @ 3100'
NB I-405	On-ramp from I-710 SB Connector	Yes	Yes	Yes	Yes	2 lane @ 1900'
NB I-405	On-ramp from I-710 NB Connector	Yes	Yes	Yes	Yes	2 lane @ 4200'
SB I-405	Off-ramp to I-710 NB Connector	Yes	Yes	Yes	Yes	2 lane @ 4600'
SB I-405	Off-ramp to I-710 SB Connector	Yes	Yes	Yes	Yes	2 lane @ 1900'
SB I-405	On-ramp from I-710 NB Connector	Yes	Yes	Yes	Yes	1 lane @ 1700'
SB I-405	On-ramp from I-710 SB Connector	No	No	No	No	2 lanes @ 4700'

Notes:

Shaded cells indicate insufficient storage

* Meter rate at 2 cars per green

** Meter rate at 3 cars per green

SL – Storage Length

Table 10-4
I-405 2035 Arterial Ramp Queuing Analysis Summary

Direction	Location	ALT 5A	ALT 6A	ALT 6B	ALT 6C	Provided SL ALT 5A & 6A/6B/6C
NB I-405	Pacific Place On-Ramp	Yes	Yes	Yes	Yes	1 lane @ 500'
SB I-405	Wardlow Road On-ramp	Yes	Yes	Yes	Yes	2 lane @ 365'
NB I-405	Hughes Way On-ramp	Yes	Yes	Yes	Yes	2 lane @ 200'

Notes:

SL – Storage Length

Table 10-5
SR-91 Peak Hour LOS Summary – Existing & 2035 Alternative 1

Location Description	Freeway Type	Existing			Alternative 1		
		AM	PM	MD	AM	PM	MD
Eastbound							
West of Santa Fe On	Basic	C	D	D	C	D	C
Santa Fe	On	N/A	N/A	N/A	N/A	N/A	N/A
Santa Fe On / Long Beach Off	Weave A	C	D	D	C	E	C
Long Beach	Off	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	C	D	D	D	E	D
Long Beach	On	N/A	N/A	N/A	N/A	N/A	N/A
Long Beach On / I-710 SB Off	Weave A	C	D	D	C	F	D
I-710 SB	Off	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	F	F	F	C	D	C
I-710 NB & Atlantic	Major Off ³	C	C	C	C	E	D
--	Basic	F	F	F	D	E	D
I-710 NB	On ⁴	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	F	F	F	D	D	D
I-710 SB	On ⁴	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	F	F	F	D	D	D
Atlantic	On	C	C	C	C	C	C
East of Atlantic On	Basic	C	D	D	D	E	D
Westbound							
West of Santa Fe Off	Basic	D	C	D	F	E	F
Santa Fe	Off	N/A	N/A	N/A	N/A	N/A	N/A
Long Beach On / Santa Fe Off	Weave C	C	B	B	D	D	D
Long Beach	On	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	F	B	F	D	D	E
Long Beach	Off	N/A	N/A	N/A	N/A	N/A	N/A
I-710 SB On / Long Beach Off	Weave C	F	D	D	F	F	F
I-710 SB	On	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	F	D	F	D	D	E
I-710 NB & Atlantic	Major On ²	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	F	D	F	D	E	D
I-710	Major Off ³	C	C	C	D	E	D
--	Basic	F	D	D	D	E	D
Atlantic	Off	B	B	A	B	B	B
--	Basic	F	C	C	E	E	E
Cherry	On	C	C	C	C	C	C

Notes: Shaded and bold cells indicate LOS E or F.

² Major merge area; HCM methodology applied for analysis.

³ Major diverge area; HCM methodology applied for analysis.

⁴ Single-lane addition/drop; HCM methodology applied for analysis.

N/A = not applicable. LOS and/or density information are not shown for major merge areas, single-lane addition/drop, and merge/diverge operations within a weaving segment.

Table 10-6
SR-91 Peak Hour Level of Service Summary – 2035 Alternatives 5A, 6A, 6B & 6C

Location Description	Freeway Type	Alternative 5A			Alternative 6A			Alternative 6B			Alternative 6C		
		AM	PM	MD	AM	PM	MD	AM	PM	MD	AM	PM	MD
Eastbound													
West of Santa Fe On	Basic	C	D	D	C	D	D	C	D	D	C	D	D
Santa Fe	On	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Santa Fe On / Long Beach Off	Weave A	C	E	C	D	E	C	D	D	C	D	E	C
Long Beach	Off	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	C	E	D	C	D	D	C	D	D	C	D	D
Long Beach	On	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Long Beach On / I-710 SB Off	Weave A	C	E	D	B	E	D	B	E	D	B	E	D
I-710 SB	Off	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	C	D	D	C	D	D	C	D	D	C	D	D
I-710 NB & Atlantic	Major Off ³	C	D	D	C	D	D	C	D	D	C	D	D
--	Basic	D	E	C	C	E	D	C	E	D	C	E	D
I-710 NB	On ⁴	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	D	D	C	B	D	C	B	D	C	C	D	C
I-710 SB	On ⁴	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	D	D	D	C	D	D	C	D	D	C	D	D
Atlantic	On	C	C	C	B	C	C	B	C	C	B	C	C
--	Basic	D	E	D	C	D	D	C	D	D	C	D	D
I-710 FC NB	On				N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
I-710 FC NB On / Cherry Off	Weave B				D	E	E	D	E	E	D	E	D
Cherry	Off				N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Westbound													
West of Santa Fe Off	Basic	E	E	F	F	E	E	E	E	E	F	E	E
Santa Fe	Off	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Long Beach On / Santa Fe Off	Weave C	D	D	E	D	D	D	D	D	D	D	D	D
Long Beach	On	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	C	C	D	C	C	C	C	C	C	C	C	C
I-710 NB	On ⁴	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	C	C	D	C	C	D	C	D	D	C	D	D
Long Beach	Off	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Table 10-6
SR-91 Peak Hour Level of Service Summary – 2035 Alternatives 5A, 6A, 6B & 6C

Location Description	Freeway Type	Alternative 5A			Alternative 6A			Alternative 6B			Alternative 6C		
		AM	PM	MD	AM	PM	MD	AM	PM	MD	AM	PM	MD
I-710 SB On / Long Beach Off	Weave B	E	D	E	E	D	D	E	D	D	E	D	D
I-710 SB	On	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	C	D	D	C	D	C	C	D	C	C	D	C
Atlantic	On ⁴	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	D	E	D	D	D	D	D	D	D	D	D	D
I-710	Major Off ³	D	E	D	D	D	D	D	D	D	D	D	D
--	Basic	D	D	D	D	D	D	D	D	D	D	D	D
Atlantic	Major Off ³	D	D	D	D	D	D	D	D	D	D	D	D
--	Basic	E	E	D	D	D	D	D	D	D	D	D	D
I-710 FC SB	Off				N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Cherry On / I-710 FC SB Off	Weave A				D	D	D	D	D	D	D	D	D
Cherry	On	C	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
East of Cherry On	Basic				D	D	D	D	D	D	D	D	D

Notes: Shaded and bold cells indicate LOS E or F.

³ Major diverge area; HCM methodology applied for analysis.

⁴ Single-lane addition/drop; HCM methodology applied for analysis.

N/A = not applicable. LOS and/or density information are not shown for major merge areas, single-lane addition/drop, and merge/diverge operations within a weaving segment.

Figure 10-11
SR-91 Eastbound Peak Hour Level of Service Comparison

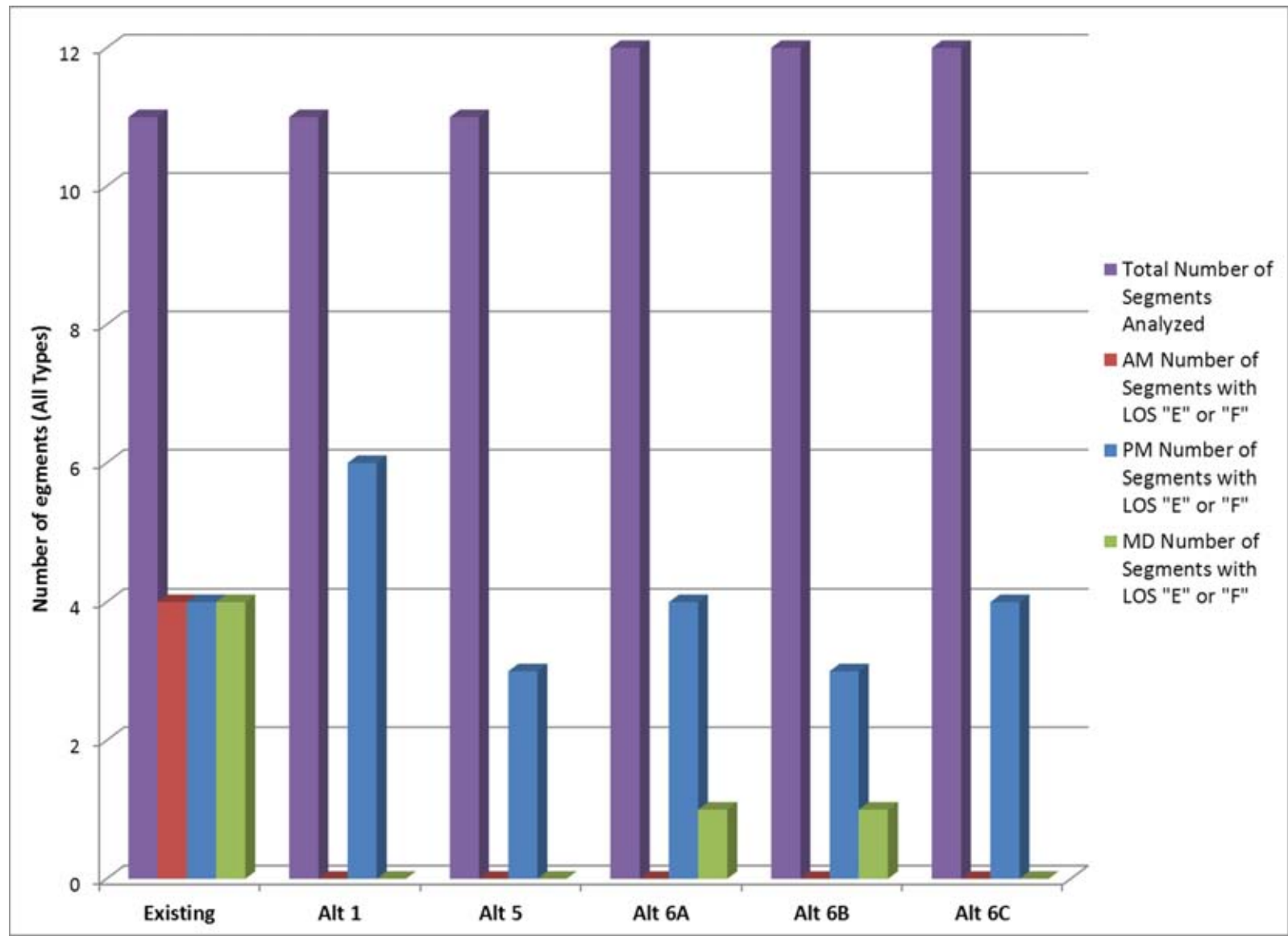
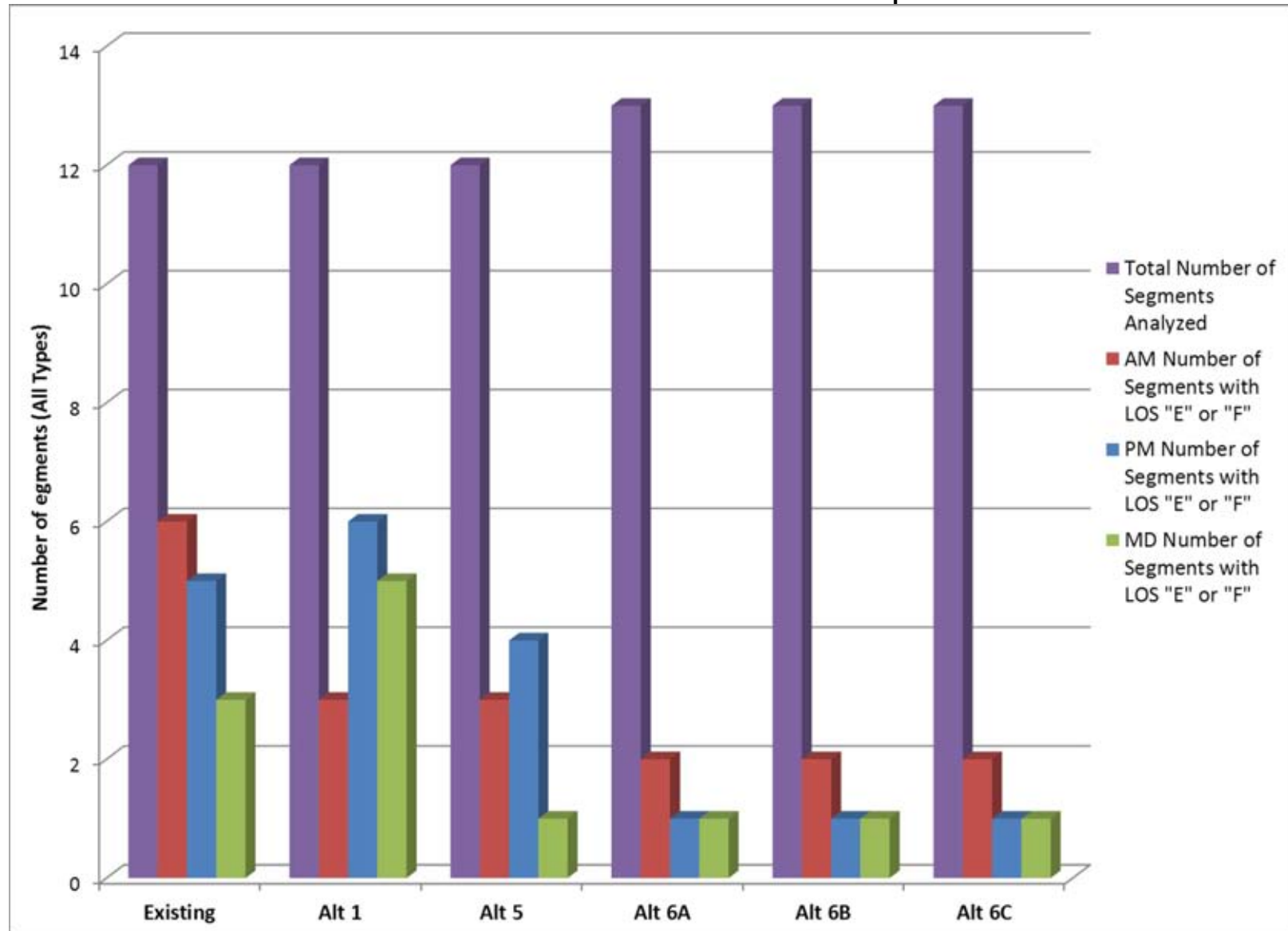


Figure 10-12
SR-91 Westbound Peak Hour Level of Service Comparison



Alternative 1

- Basic freeway segment between Long Beach Boulevard ramps;
- Weave segment between Santa Fe On-ramp and I-710 southbound Off-ramp;
- I-710 northbound and Atlantic Major Off-ramp;
- Basic freeway segment between I-710 northbound/Atlantic Off-ramp and I-710 northbound On-ramp;
- Basic freeway segment east of Atlantic On-ramp.

Alternative 5A, 6A, 6B and 6C

- Weave segment between Santa Fe On-ramp and Long Beach Off-ramp;
- Weave segment between Long Beach On-ramp and I-710 SB Off-ramp;
- Basic freeway segment between Long Beach Boulevard ramps;
- Basic freeway segment between I-710 northbound/Atlantic Off-ramp and I-710 northbound On-ramp;
- Basic freeway segment east of Atlantic On-ramp;
- Weave segment between Truckway On-ramp and Cherry Off-ramp.

Westbound SR-91 operates at LOS E or F during AM, PM or MD peak hours for the following locations:

Existing and Alternative 1

- Basic freeway segment between Cherry On-ramp and Long Beach On-ramp;
- Weave segment between I-710 southbound On-ramp and Long Beach Off-ramp;
- I-710 Major Off-ramp (Alternative 1 only);
- Basic freeway segment west of Santa Fe Off-ramp (Alternative 1 only).

Alternative 5A

- I-710 Major Off-ramp;
- Basic freeway segment between I-710 Off-ramp and Atlantic On-ramp;
- Weave segment between I-710 southbound On-ramp and Long Beach Off-ramp;
- Weave segment Long Beach On-ramp and Santa Fe Off-ramp;
- Basic freeway segment west of Santa Fe Off-ramp.

Alternatives 6A, 6B and 6C

- Weave segment between I-710 southbound On-ramp and Long Beach Off-ramp;
- Basic freeway segment west of Santa Fe Off-ramp.

The above findings indicate that these areas are near or exceed capacity and operating under congested conditions through this section. Under 2035 Build conditions, the traffic operations show improvement along these segments.

The LOS on the freeway basic and weaving segments and major merge and diverge areas and on- and off-ramp locations of SR-91 freeway segments, are generally maintained or improved in the morning, midday and evening peak periods and in both directions of the freeway when comparing the 2035 Build (Alternatives 5A, 6A, 6B and 6C) to No Build (Alternative 1) Conditions.

Figure 10-11 and **Figure 10-12** show the LOS comparison between Existing, Alternative 1, Alternatives 6A, 6B and 6C for the morning, evening and midday peak hours for both eastbound and westbound directions respectively. The figures focuses on the number of segments (all types) expected to operate at poor E or F as compared to the total number of segments for both eastbound and westbound directions of SR-91. As shown in the figures, overall traffic operations are expected to improve along both eastbound and westbound directions of SR-91 under Build conditions as compared to No Build conditions.

In summary, few segments of SR-91 experience poor LOS under 2035 No-Build and all Build Conditions in the morning, midday and evening peak periods and in both directions of the freeway. For existing and No Build conditions, the operational conditions will deteriorate further without improvements. Compared to Alternative 1, under Alternatives 6A, 6B and 6C conditions, the majority of the segments improved as a result of the reduction of traffic on the I-710 mainline and connector ramps. This is also a result of the diversion of truck traffic onto the FC. Therefore, Alternatives 6A, 6B and 6C would not only improve the overall operation, but also provide the additional capacity required to accommodate projected future 2035 traffic demand.

10.2.2.1 SR-91 Freeway Ramp Queuing Analysis Summary

Table 10-7 and **Table 10-8** provide a summary of the freeway and arterial Ramp queuing analysis for SR-91. **Table 10-7** indicates that the storage provided on the freeway-to-freeway ramp connectors with the proposed ramp metering for all 2035 Build alternatives are adequate using suggested meter rates with the exception to the following locations:

- WB SR-91 connector ramp to SB I-710 (Alternative 5A, 6A, 6B and 6C)

All meter rates are per Caltrans Ramp Metering field rates; ramp metering discharge rate for 2 and 3 cars per green per lane is between 480 and 1200 and between 780 and 1380 vph/lane, respectively.

Table 10-7
SR-91 2035 Freeway Ramp Queuing Analysis Summary

Direction	Location	ALT 5A	ALT 6A	ALT 6B	ALT 6C	Provided SL ALT 5A & 6A/6B/6C
EB SR-91	Off-ramp to I-710 NB Connector	Yes	Yes	Yes	Yes	2 lanes @ 4800'
EB SR-91	Off-ramp to I-710 SB Connector	Yes	Yes	Yes	Yes	1 lane @ 2200'
EB SR-91	On-ramp from I-710 NB Connector	Yes	Yes	Yes	Yes	2 lanes @ 1700'
EB SR-91	On-ramp from I-710 SB Connector	Yes	Yes	Yes	Yes	2 lanes @ 5800'
WB SR-91	Off-ramp to I-710 NB Connector	Yes	Yes	Yes	Yes	2 lanes @ 2050'
WB SR-91	Off-ramp to I-710 SB Connector	Yes	Yes	Yes	Yes	2 lanes @ 2160'
WB SR-91	On-ramp from I-710 NB Connector	Yes	Yes	Yes	Yes	2 lanes @ 2900'
WB SR-91	On-ramp from I-710 SB Connector	No	No	No	No	2 lanes @ 1500'

Notes:
Shaded cells indicate insufficient storage
SL – Storage Length

Table 10-8 indicates that the storage provided on all on-ramps with proposed ramp metering for the 2035 Build Alternatives 5A, 6A, 6B and 6C are adequate using suggested meter rates between 240 vph/lane and 900 vph/lane for 1 car per green and between 480 vph/lane and 1200 vph/lane for 2 cars per green.

Table 10-8
SR-91 2035 Arterial Ramp Queuing Analysis Summary

Direction	Location	ALT 5A	ALT 6A	ALT 6B	ALT 6C	Provided SL ALT 5A & 6A/6B/6C
EB SR-91	Long Beach On-Ramp	Yes	Yes	Yes	Yes	1 lane @ 925'
EB SR-91	Atlantic On-ramp	Yes	Yes	Yes	Yes	2 lanes @ 280'
WB SR-91	Atlantic On-ramp	Yes	Yes	Yes	Yes	2 lanes @ 1275'
WB SR-91	Long Beach On-Ramp	Yes	Yes	Yes	Yes	2 lanes @ 610'

Notes:
SL – Storage Length

Overall, the queue length at the on-ramps and freeway connectors, are generally maintained or improved in the morning, midday and evening peak periods.

10.2.3 I-105 Freeway Segments

Table 10-9 and **Table 10-10** provide a summary of the freeway segment analysis for I-105. Key findings of the freeway segment analysis show the following:

Eastbound I-105 operates at LOS E or F for the following locations:

Existing

- Basic freeway segment west of I-710 Off-ramp (3 Lanes);
- NB I-710 major on-ramp;
- Basic freeway segment between NB I-710 On-ramp and SB I-710 On-ramp;
- Basic freeway segment east of I-710 On-ramp;

Alternative 1, 5A, 6A, 6B and 6C

- Basic freeway segment West of I-710 Off-ramp(3 Lanes);
- I-710 major off-ramp;
- Basic freeway segment east of I-710 On-ramp.

Westbound I-105 operates at LOS E or F for the following locations:

Existing

- Basic freeway segment east of I-710 Off-ramp;
- Basic freeway segment between I-710 Off-ramp and Garfield On-ramp;
- Basic freeway segment between Garfield On-ramp and I-710 southbound On-ramp;
- Basic freeway segment between I-710 southbound On-ramp and I-710 northbound On-ramp;
- Basic freeway segment west of I-710 northbound On-ramp (4 lanes);
- Basic freeway segment west of I-710 northbound On-ramp (3 lanes).

Alternative 1

- Basic freeway segment between Garfield On-ramp and I-710 southbound On-ramp;;
- SB I-710 On-ramp;
- Basic freeway segment between SB I-710 On-ramp and NB I-710 On-ramp;
- Basic freeway segment west of NB I-710 On-ramp (4 lanes);
- Basic freeway segment west of NB I-710 On-ramp (3 lanes);

Alternatives 5A and 6A, 6B and 6C

- Basic freeway segment between Garfield On-ramp and I-710 SB On-ramp;
- I-710 SB On-ramp;

- Basic freeway segment between I-710 southbound On-ramp and I-710 northbound On-ramp;
- Basic freeway segment west of I-710 northbound On-ramp (3 lanes);
- Long Beach Boulevard off;
- Basic freeway segment west of Long Bach Boulevard Off-ramp;

This indicates that these areas are near or exceed capacity and operating under congested conditions through this section.

Table 10-9
I-105 Peak Hour Level of Service Summary – Existing & 2035 Alternative 1

Location Description	Freeway Type	Existing			Alternative 1		
		AM	PM	MD	AM	PM	MD
Eastbound							
West of I-710 Off (3 Lanes)	Basic	E	E	F	F	F	E
West of I-710 Off (4 Lanes)	Basic	D	D	D	D	D	D
I-710	Major Off ³	D	D	D	D	E	D
--	Basic	C	C	C	D	D	C
Garfield	Off	B	B	A	B	B	B
--	Basic	C	C	C	C	C	C
I-710 NB	Major On ²	N/A	F	N/A	N/A	N/A	N/A
--	Basic	B	F	F	C	C	C
I-710 SB	On	B	B	B	B	B	B
East of I-710 On	Basic	D	F	F	F	F	F
Westbound							
West of I-710 NB On (3 Lanes)	Basic	F	F	F	F	F	E
West of I-710 NB On (4 Lanes)	Basic	F	F	D	D	E	D
I-710 NB	On ⁴	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	F	E	E	F	F	E
I-710 SB	On	B	C	C	F	F	E
--	Basic	F	F	C	D	E	D
Garfield	On	B	C	C	C	D	C
--	Basic	F	F	F	D	D	C
I-710	Major Off ³	C	B	C	D	D	C
East of I-710 Off	Basic	E	D	D	C	C	C

Notes: Shaded and bold cells indicate LOS E or F.

² Major merge area; HCM methodology applied for analysis.

³ Major diverge area; HCM methodology applied for analysis.

⁴ Single-lane addition/drop; HCM methodology applied for analysis.

N/A = not applicable. LOS and/or density information are not shown for major merge areas, single-lane addition/drop, and merge/diverge operations within a weaving segment.

Figure 10-13 and **Figure 10-14** show the LOS comparison between Existing, Alternative 1, Alternative 5A, and Alternatives 6A, 6B and 6C for the morning, evening and midday peak hours in the eastbound and westbound directions respectively. The figures focuses on the number of segments (all types) expected to operate at poor LOS E or F as compared to the total number of segments for both eastbound and westbound directions of I-105. As shown in the figures, the

overall traffic operations are expected to remain the same along both eastbound and westbound directions of I-105 under the Build conditions as compared to No Build conditions.

The LOS on the freeway basic and weaving segments and major merge and diverge areas and on- and off-ramp locations of I-105 freeway segments, are generally maintained or improved in the morning and evening peak periods and in both directions of the freeway when comparing 2035 Build (Alternatives 5A, 6A, 6B and 6C) to No-Build (Alternative 1) Conditions. There is a noted decrease in performance on westbound I-105 during the midday peak hour under Alternatives 6A, 6B and 6C.

In summary, segments of eastbound I-105 near the northbound and southbound I-710 ramp transition areas will experience poor LOS under 2035 No-Build and Build conditions in the morning, midday and evening peak periods. The majority of the segments of westbound I-105 will similarly experience poor LOS under Alternatives 6A/6B/6C during the midday peak hour only. Compared to existing and Alternative 1, there is a marked improvement in overall operation conditions under Alternatives 5A, 6A, 6B and 6C conditions with the exceptions described above.

Table 10-10
I-105 Peak Hour Level of Service Summary – 2035 Alternatives 5A, 6A, 6B & 6C

Location Description	Freeway Type	Alternative 5A			Alternative 6A			Alternative 6B			Alternative 6C		
		AM	PM	MD	AM	PM	MD	AM	PM	MD	AM	PM	MD
Eastbound													
West of I-710 Off	Basic	F	F	E	F	F	E	F	F	E	F	F	E
Lane Addition	Basic	D	D	D	D	D	D	D	D	D	D	D	D
I-710	Major Off ³	D	E	D	D	E	D	D	E	D	D	E	D
--	Basic	C	D	C	D	D	C	D	D	D	D	D	C
Garfield	Off	B	B	B	B	B	B	B	B	B	B	B	B
--	Basic	C	D	C	C	D	C	C	D	C	C	D	C
I-710 NB	Major On ²	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	C	C	C	C	C	C	C	C	C	C	C	C
I-710 SB	On	B	C	C	B	C	B	B	C	B	B	C	B
--	Basic	C	D	D	C	D	C	C	D	C	C	D	C
East of I-710 On (Lane Drop)	Basic	F	F	F	F	F	F	F	F	F	F	F	F
Westbound													
West of Long Beach Off	Basic	E	F	D	D	D	F	D	D	F	D	D	F
Long Beach	Off	F	F	E	E	E	F	E	E	F	E	E	F
Lane Drop	Basic	F	F	E	D	D	F	D	D	F	D	D	F
--	Basic	D	D	C	C	C	E	C	C	E	C	C	E
I-710 NB	On ⁴	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	F	F	E	D	D	F	D	D	F	D	D	F
I-710 SB	On	F	F	E	D	D	F	D	D	F	D	D	F
--	Basic	D	D	C	C	C	E	C	C	E	C	C	E
Garfield	On	C	C	C	C	C	D	C	C	C	C	C	D
--	Basic	C	D	C	C	C	D	C	C	D	C	C	D
I-710	Major Off ³	C	D	C	C	C	D	C	C	D	C	C	D
East of I-710 Off	Basic	C	C	C	C	C	D	C	C	C	C	C	D

Notes: Shaded and bold cells indicate LOS E or F.

² Major merge area; HCM methodology applied for analysis.

³ Major diverge area; HCM methodology applied for analysis.

⁴ Single-lane addition/drop; HCM methodology applied for analysis.

N/A = not applicable. LOS and/or density information are not shown for major merge areas, single-lane addition/drop, and merge/diverge operations within a weaving segment.

Figure 10-13
I-105 Eastbound Peak Hour Level of Service Comparison

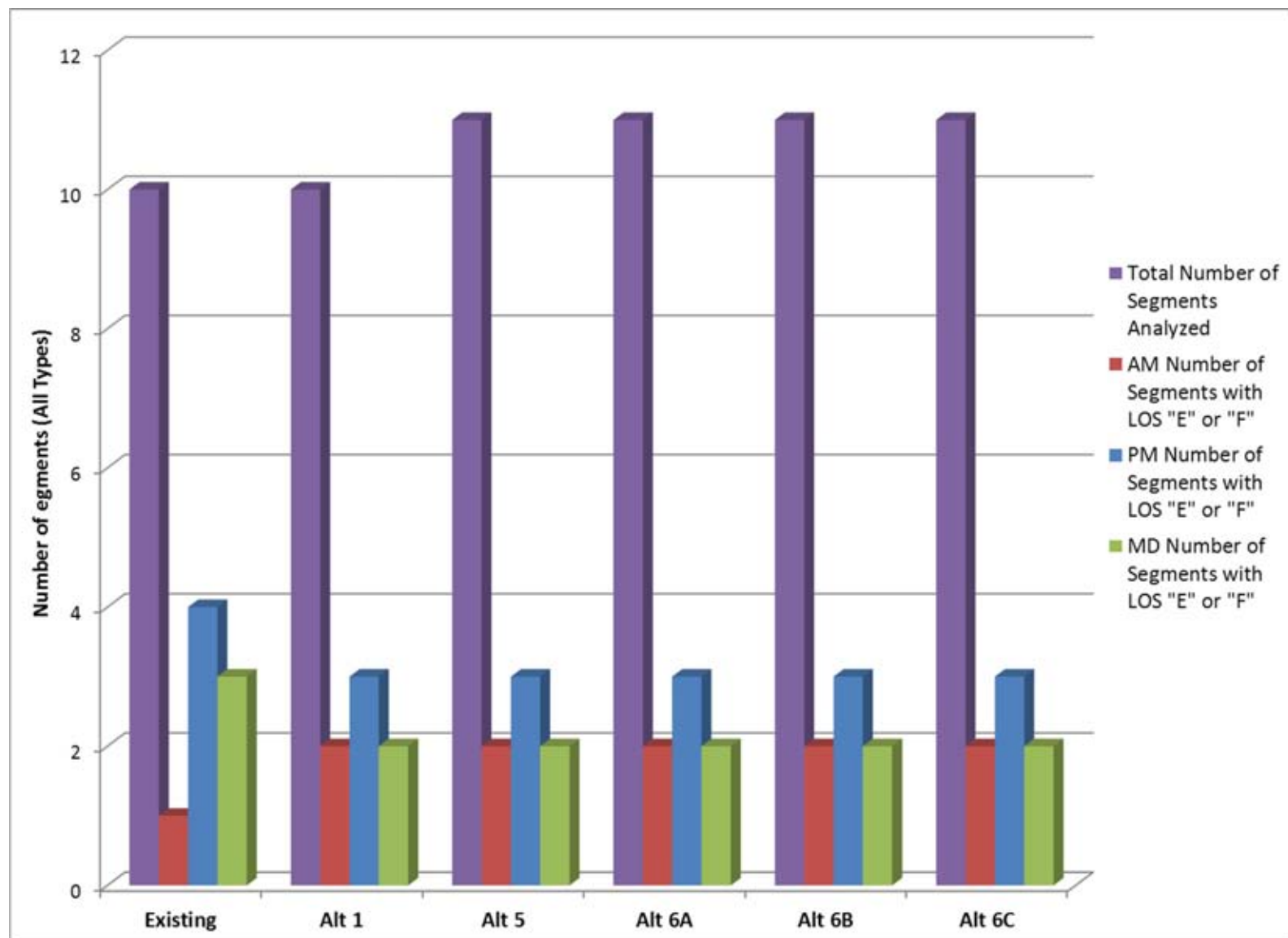
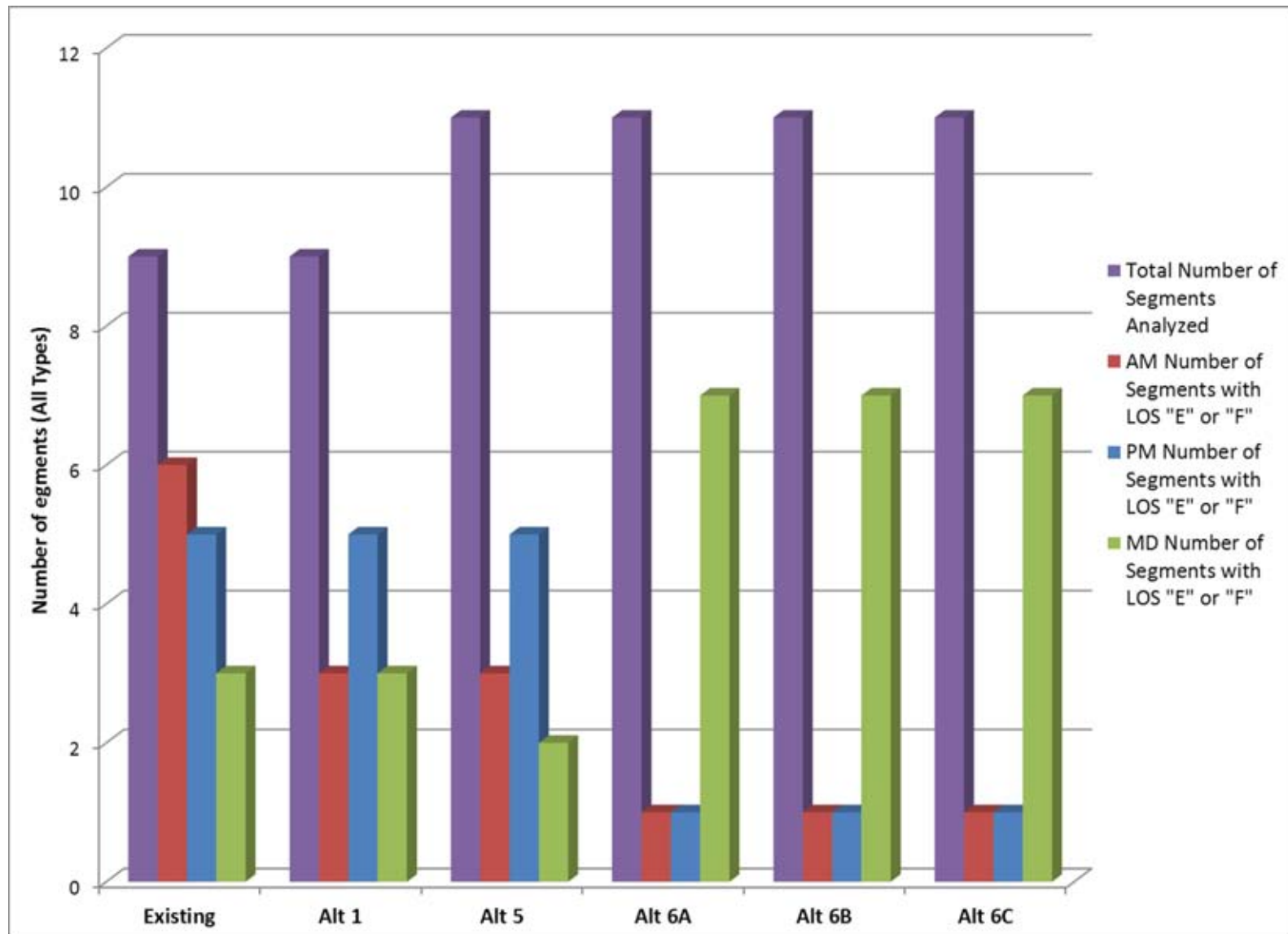


Figure 10-14
I-105 Westbound Peak Hour Level of Service Comparison



10.2.3.1 I-105 Freeway Ramp Queuing Analysis Summary

Table 10-11 provides a summary of the freeway Ramp queuing analysis for I-105. **Table 10-11** indicates that the storage provided on freeway-to-freeway ramp connectors with proposed ramp metering for all 2035 Build alternatives are adequate using suggested meter rates with the exception to the following:

- WB & EB I-105 connectors to NB I-710 (Alt 6A, 6B and 6C)
- WB & EB I-105 connectors to SB I-710 (Alt 5A)
- NB I-710 connector ramp to EB I-105 (Alt 5A)

Table 10-11
I-105 2035 Freeway Ramp Queuing Analysis Summary

Direction	Location	ALT 5A	ALT 6A	ALT 6B	ALT 6C	Provided SL ALT 5A & 6A/6B/6C
WB&EB I-105	Off-ramp to I-710 NB Connector	Yes	No	No	No	2 lanes @ 1000'
WB I-105	On-ramp from I-710 SB Connector	Yes	Yes	Yes	Yes	1 lane @ 2240'
WB I-105	On-ramp from I-710 NB Connector	Yes	Yes	Yes	Yes	2 lanes @ 4065'
WB&EB I-105	Off-ramp to I-710 SB Connector	No	Yes	Yes	Yes	2 lanes @ 1580'
EB I-105	On-ramp from I-710 SB Connector	Yes	Yes	Yes	Yes	2 lanes @ 4015'
EB I-105	On-ramp from I-710 NB Connector	No	Yes	Yes	Yes	2 lanes @ 1115'

Notes:
 Shaded cells indicate insufficient storage
 * Meter rate at 2 cars per green
 ** Meter rate is 3 cars per green
 SL – Storage Length

All meter rates are per Caltrans Ramp Metering field rates; ramp metering discharge rate for 2 and 3 cars per green per lane is between 480 and 1200 and between 780 and 1380 vph/lane, respectively.

Overall, the queue lengths at the freeway connectors, are generally maintained or improved in the morning, midday and evening peak periods when the 2035 Build Alternatives 6A, 6B and 6C are compared to Alternative 5A Conditions.

10.2.4 I-5 Freeway Segments

Table 10-12 and **Table 10-13** provide a summary of the freeway segment analysis for I-5. Key findings of the freeway segment analysis show the following:

Northbound I-5 operates at LOS E or F for AM, PM, or midday peak hours for the following locations:

Existing, Alternative 1

- Basic freeway segment between south of Camfield/Telegraph Off-ramp and McBride Avenue;
- Ditman & Dennison Off-ramp, Woods & Telegraph Off-ramp, and Camfield & Telegraph Off-ramp (Alternative 1 only);
- Basic freeway segment between I-710 NB On-ramp and north of Dennison On-ramp. However, segment between NB I-710 On-ramp and Downey On-ramp operates at LOS D or better under existing conditions.

Alternative 5A, 6A, 6B and 6C

- Basic freeway segment between south of Camfield/Telegraph Off-ramp and McBride Avenue;
- Basic freeway segment from I-710 NB On-ramp to north of Dennison On-ramp;
- Ditman & Dennison Off-ramp, Woods & Telegraph Off-ramp, and Camfield & Telegraph Off-ramp.

Southbound I-5 operates at LOS E or F during at least one of the analyzed peak hours at the following locations:

Existing, Alternative 1

- Basic freeway segment from north of Ditman Off-ramp to south of Ditman On-ramp (Alternative 1 only);
- Basic freeway segment between SB I-710 Off-ramp and Stevens/Eastern Off-ramp;
- Basic freeway segment south of Stevens/Eastern Off-ramp (Alternative 1 only).

Alternative 6A, 6B and 6C

- Basic freeway segment from north of Ditman Off-ramp to I-710 Southbound Off-ramp;
- Boswell Off-ramp and I-710 Southbound Off-ramp;

Figure 10-15 and **Figure 10-16** show the LOS comparison between Existing, Alternative 1, Alternative 5A, 6A, 6B and 6C for morning, evening and midday peak hours. The figures focus on the number of segments (all types) expected to operate at LOS E or F as compared to the total number of segments analyzed for both northbound and southbound directions of I-5. As

shown in the figures, overall traffic operations on I-5 are expected to maintain or improve along both northbound and southbound directions under all Build conditions compared to No Build conditions.

In summary, for existing and No Build conditions, the operational conditions will deteriorate further without improvements. The northbound lanes show heavy congestion in the morning and midday peak hours for all No Build and Build alternatives. In the southbound direction, I-5 segments within Project vicinity experience congestion during morning and midday peak hours under No Build conditions. Under Build conditions, however, traffic operations are expected to improve and capacity deficiency is limited to just the segments north of I-710 interchange during midday peak hour. Compared to Alternative 1, the majority of the segments improved slightly as a result of the reduction of traffic on the I-710 mainline and connector ramps under Alternatives 6A, 6B and 6C conditions.

Table 10-12
I-5 Peak Hour Level of Service Summary – Existing & 2035 Alternative 1

Location Description	Freeway Type	Existing			Alternative 1		
		AM	PM	MD	AM	PM	MD
Northbound							
North of Dennison On	Basic	D	C	E	E	D	F
Dennison	On	B	B	C	C	B	C
--	Basic	D	C	E	E	D	F
Ditman & Dennison	Off	D	C	D	D	C	F
--	Basic	D	C	E	E	D	F
Telegraph & Downey	On	B	B	C	C	B	C
--	Basic	D	C	D	E	D	E
I-710 NB	On ⁴	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	C	B	D	D	C	D
I-710 NB	Major Off ³	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	C	C	D	D	D	D
McBride & Telegraph	Off	C	C	C	D	C	D
--	Basic	D	C	D	D	D	D
--	Basic	D	D	E	E	D	F
Woods & Telegraph	On	B	B	C	C	C	C
--	Basic	D	C	E	E	D	E
Woods & Telegraph	Off	D	C	D	E	D	E
--	Basic	D	D	E	E	E	E
Camfield & Telegraph	On	B	B	C	C	B	C
--	Basic	D	C	E	E	D	E
Camfield & Telegraph	Off	D	C	D	E	D	E
South of Camfield & Telegraph Off	Basic	D	C	E	F	D	F
Southbound							
North of Ditman Off	Basic	D	C	D	D	D	E
Ditman	Off	C	C	D	C	C	D
--	Basic	D	C	D	D	C	E
Ditman	On	B	B	B	B	B	C
--	Basic	D	C	D	D	D	E
Boswell	Off	C	C	D	D	C	D
--	Basic	D	C	D	D	C	D
I-710 SB	Major Off ³	D	C	D	D	C	D
--	Basic	D	C	E	D	D	E
I-710 SB	On ⁴	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	D	D	D	E	D	E
Triggs	Off	D	D	D	D	D	D
--	Basic	D	D	D	D	D	E
Triggs	On	B	B	B	B	B	C
--	Basic	D	D	E	E	E	E
Stevens & Eastern	Off	D	D	D	D	D	D
South of Stevens & Eastern Off	Basic	D	D	D	D	D	E

Notes:

³ Major diverge area; HCM methodology applied for analysis.⁴ Single-lane addition/drop; HCM methodology applied for analysis.

N/A = not applicable. LOS and/or density information are not shown for major merge areas, single-lane addition/drop, and merge/diverge operations within a weaving segment.

Table 10-13
I-5 Peak Hour Level of Service Summary – 2035 Alternatives 5A, 6A, 6B & 6C

Location Description	Type	Alternative 5A			Alternative 6A			Alternative 6B			Alternative 6C		
		AM	PM	MD	AM	PM	MD	AM	PM	MD	AM	PM	MD
Northbound													
North of Dennison On	Basic	D	C	E	E	C	F	E	C	F	E	C	F
Dennison	On	C	B	C	C	B	D	C	B	D	C	B	D
--	Basic	D	C	E	D	C	E	D	C	E	D	C	E
Ditman & Dennison	Off	D	C	E	D	C	E	D	C	E	D	C	E
--	Basic	D	C	E	E	C	E	E	C	E	E	C	E
Telegraph & Downey	On	C	B	C	C	B	C	C	B	C	C	B	C
--	Basic	D	C	E	D	C	E	D	C	E	D	C	E
I-710 NB	On ⁴	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	C	B	D	C	C	D	C	C	D	C	C	D
I-710 NB	Off ⁴	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	D	C	D	D	C	D	D	C	D	D	C	D
McBride & Telegraph	Off	D	C	D	D	C	D	D	C	D	D	C	D
--	Basic	D	C	D	D	C	D	D	C	D	D	C	D
--	Basic	E	D	E	E	D	E	E	D	E	E	D	E
Woods & Telegraph	On	C	B	C	C	C	C	C	B	C	C	C	C
--	Basic	E	D	E	E	D	E	E	D	E	E	D	E
Woods & Telegraph	Off	E	D	E	E	D	E	E	D	E	E	D	E
--	Basic	E	D	E	E	D	E	E	D	E	E	D	E
Camfield & Telegraph	On	C	B	C	C	B	C	C	B	C	C	B	C
--	Basic	D	D	E	E	D	E	E	D	E	E	D	E
Camfield & Telegraph	Off	E	D	E	E	D	F	E	D	F	E	D	F
South of Camfield & Telegraph Off	Basic	E	D	F	E	D	F	E	D	F	E	D	F
Southbound													
North of Ditman Off	Basic	D	C	D	D	C	E	D	C	E	D	C	E
Ditman	Off	D	C	D	D	C	D	D	C	D	D	C	D
--	Basic	D	C	D	C	C	E	C	C	E	C	C	E
Ditman	On	B	B	C	B	B	C	B	B	C	B	B	C
--	Basic	D	C	D	C	C	E	C	C	E	C	C	E
Boswell	Off	D	C	D	D	C	E	D	C	E	D	C	E

Table 10-13
I-5 Peak Hour Level of Service Summary – 2035 Alternatives 5A, 6A, 6B & 6C

Location Description	Type	Alternative 5A			Alternative 6A			Alternative 6B			Alternative 6C		
		AM	PM	MD	AM	PM	MD	AM	PM	MD	AM	PM	MD
--	Basic	D	C	D	C	C	E	C	C	E	C	C	E
I-710 SB	Major Off ³	D	D	C	D	C	E	D	C	E	D	C	E
--	Basic	D	C	D	B	B	D	B	B	D	B	B	D
I-710 SB	On ⁴	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
--	Basic	D	D	D	C	C	C	C	C	C	C	C	C
Triggs	Off	D	D	D	C	C	C	C	C	C	C	C	C
--	Basic	D	D	D	B	C	C	B	C	C	C	C	C
Triggs	On	B	B	C	B	B	B	B	B	B	B	B	B
--	Basic	D	D	D	C	C	C	C	C	C	C	C	C
Stevens & Eastern	Off	D	D	D	C	C	C	C	C	C	C	C	C
South of Stevens & Eastern Off	Basic	D	D	D	B	C	C	B	C	C	B	C	C

Notes:

³ Major diverge area; HCM methodology applied for analysis.

⁴ Single-lane addition/drop; HCM methodology applied for analysis.

N/A = not applicable. LOS and/or density information are not shown for major merge areas, single-lane addition/drop, and merge/diverge operations within a weaving segment.

Figure 10-15
I-5 Northbound Peak Hour Level of Service Comparison

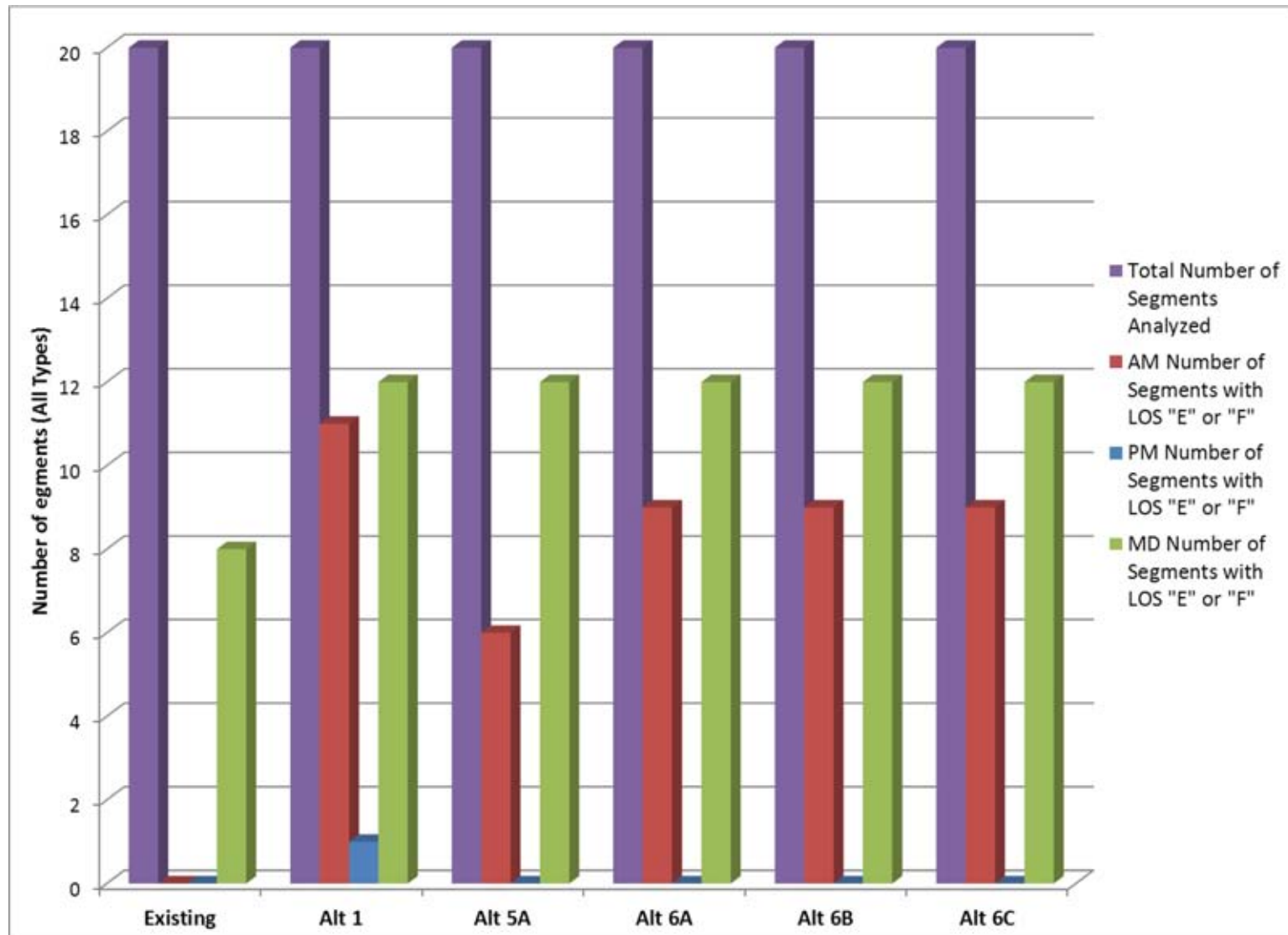
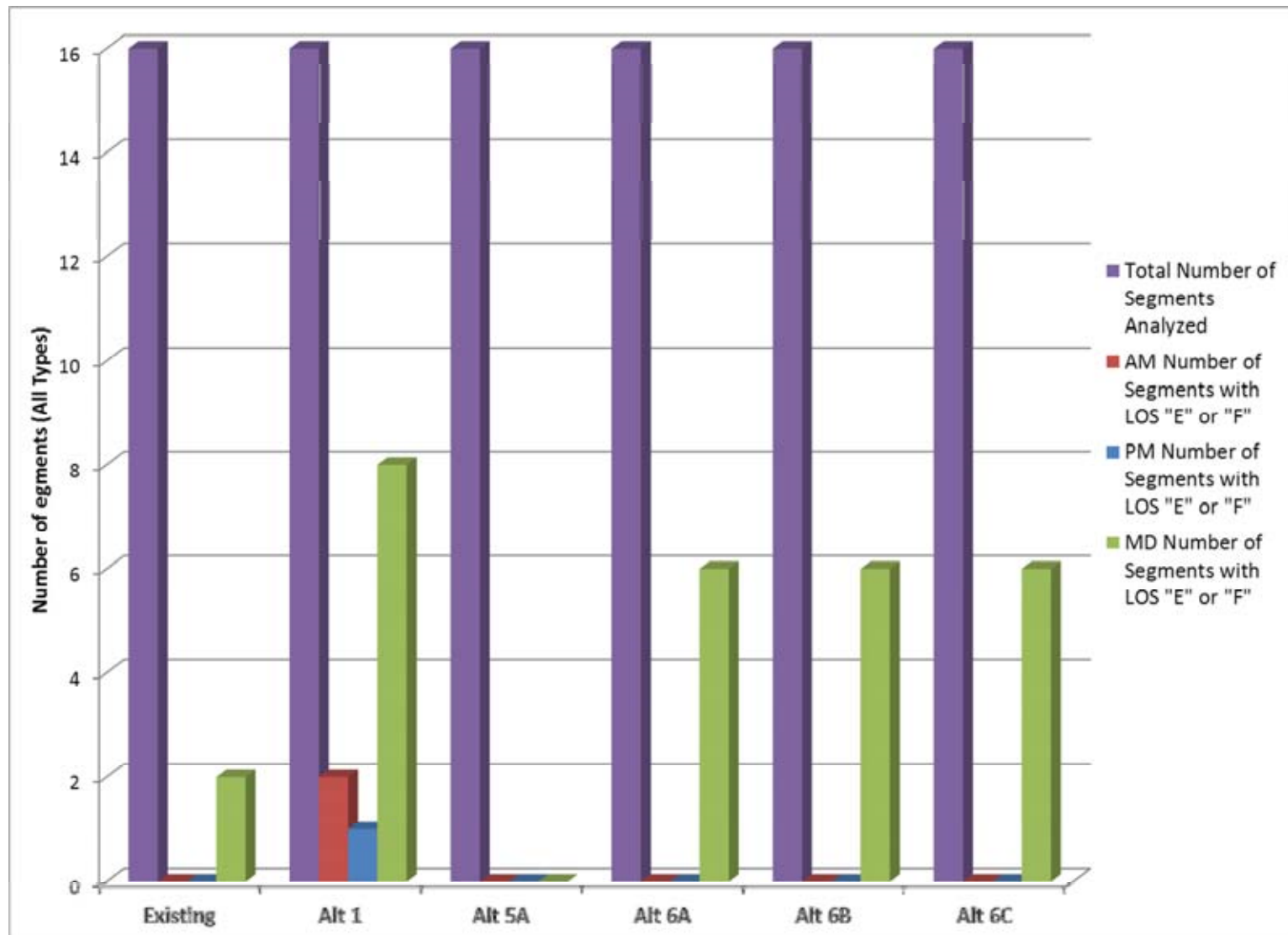


Figure 10-16
I-5 Southbound Peak Hour Level of Service Comparison



10.2.4.1 I-5 Ramp Queuing Analysis

Table 10-4 provides a summary of the freeway ramp queuing analysis for I-5. The results indicate that the storage provided on freeway-to-freeway ramp connectors with proposed ramp metering for 2035 Build alternatives are adequate using suggested meter rates except for the following:

- NB I-5 connector from NB I-710 (Alt 5A, 6A, 6B and 6C)
- SB I-5 connector to SB I-710 (Alt 5A, 6A, 6B and 6C)

Overall, the queue length adequacy at the freeway connectors is generally maintained for all three 2035 Build alternatives during the morning, midday and evening peak periods with the exception to the connectors described above.

Table 10-14
I-5 2035 Freeway Ramps Queuing Analysis

Direction	Location	ALT 5A	ALT 6A	ALT 6B	ALT 6C	Provided SL ALT 5A, 6A, 6B & 6C
NB I-5	Off-ramp to I-710 NB Connector	Yes	Yes	Yes	Yes	2 Lanes @ 1300'
SB I-5	On-ramp from I-710 SB Connector	Yes	Yes	Yes	Yes	2 Lanes @ 1800'
NB I-5	On-ramp from I-710 NB Connector	No	No	No	No	2 Lanes @ 4500'
SB I-5	Off-ramp to I-710 SB Connector	No	No	No	No	2 Lanes @ 2200'

Notes:
Shaded cell indicate insufficient storage; SL – Storage Length

10.3 INTERSECTIONS

10.3.1 I-710 Intersection Summary

Table 10-15 provides a summary of the intersection operational analysis for interchanges along I-710 study corridor. The intersections operate at LOS E or F for Existing, Future Year 2035 Alternative 1 No Build, and Future Year 2035 Alternatives 5A, 6A, 6B and 6C conditions at the following locations:

Existing

- Artesia Boulevard at I-710 NB ramps (PM peak hour);
- Firestone Boulevard at I-710 NB and SB ramps (PM peak hour);
- Atlantic at Bandini Boulevard (PM peak hour);

Alternative 1

- Del Amo Boulevard at Susana (AM and PM peak hours);
- Artesia Boulevard at I-710 NB ramps (PM peak hour);

- Artesia Boulevard at I-710 SB ramps (AM and PM peak hours);
- Imperial Highway at Wright Road (all peak hours);
- Firestone Boulevard at I-710 NB ramps (PM and MD peak hours);
- Atlantic Boulevard at Bandini Boulevard (AM and PM peak hours);
- Washington Boulevard at I-710 SB ramps (MD peak hour).

Alternative 5A

- Anaheim Street at I-710 ramps (MD peak hour);
- Willow Street at I-710 ramps (PM peak hour);

Alternatives 6A, 6B and 6C

- Pico Avenue at I-710 ramps (AM and PM peak hours);
- Anaheim Street at I-710 ramps (MD peak hour);
- Anaheim Street at Freight Corridor Access (MD peak hour - Alt 6B);
- Pacific Coast Highway at I-710 ramps (MD peak hour – Alt 6B)
- Willow Street at I-710 ramps (PM peak hour);
- Long Beach Boulevard at I-710 NB ramp (AM peak hour - Alt 6C);
- Imperial Highway at Wright Road (PM peak hour);
- Florence Avenue at I-710 ramps (MD hour - Alt 6B);
- Bandini Boulevard at I-710 NB ramps/26th Street (PM peak hour - Alt 6B Design Option 3).

Table 10-15
I-710 Intersection Peak Hour Level of Service Summary

Street / I-710 Interchange	Existing			Alt 1			Alt 5A			Alt 6A			Alt 6B			Alt 6C		
	AM	PM	MD	AM	PM	MD	AM	PM	MD	AM	PM	MD	AM	PM	MD	AM	PM	MD
Pico / I-710 Ramps	B	B	B	D	C	C	D	C	D	F	E	D	F	E	D	E	E	D
Anaheim Street/I-710 Ramps	--	--	--	--	--	--	C	C	F	C	C	E	C	C	E	C	C	E
Anaheim Street/Freight Corridor Ramps	--	--	--	--	--	--	--	--	--	D	D	D	D	D	E	D	C	D
PCH / I-710 Ramps	--	--	--	--	--	--	C	C	D	D	C	D	D	C	E	D	C	D
Willow / I-710 Ramps	--	--	--	--	--	--	C	E	D	D	E	D	C	E	D	D	E	D
Del Amo / I-710 Ramps	B	B	B	B	B	B	--	--	--	--	--	--	--	--	--	--	--	--
Del Amo / Susana	D	D	D	E	E	D	--	--	--	--	--	--	--	--	--	--	--	--
Long Beach / I-710 NB Ramps	C	C	B	D	C	B	B	B	A	D	C	B	D	C	B	F	D	C
Long Beach / I-710 SB Ramps	B	C	B	C	B	B	B	B	B	C	B	B	C	B	B	C	B	B
Artesia / NB I-710 Ramps	B	E	B	C	F	B	A	B	A	A	B	A	A	B	A	A	B	A
Artesia / SB I-710 Ramps	B	C	A	E	F	B	D	D	B	C	C	B	B	C	B	B	C	B
Alondra / NB I-710 Ramps (Signalized)	B	C	B	B	D	C	--	--	--	--	--	--	--	--	--	--	--	--
Alondra / SB I-710 Ramps (Unsignalized)	C	C	C	C	C	C	--	--	--	--	--	--	--	--	--	--	--	--
Alondra / NB I-710 Ramps (Signalized)	--	--	--	--	--	--	B	B	B	B	C	B	B	C	B	B	C	B
Rosecrans / I-710 NB Ramps	B	B	B	B	B	B	B	B	A	A	B	A	A	B	A	A	B	A
Rosecrans / I-710 SB Ramps	B	B	A	B	B	A	A	C	A	B	C	A	B	C	A	B	D	A
Imperial / I-710 Ramps	--	--	--	--	--	--	C	D	C	C	C	C	C	C	C	C	C	C
Wright Road / SB I-710 Ramp	B	C	B	B	C	B	--	--	--	--	--	--	--	--	--	--	--	--
Imperial / Wright Road	--	--	--	F	F	E	C	C	B	D	E	D	D	E	C	D	F	D
Firestone / I-710 NB Ramps	B	E	D	B	F	E	B	D	D	C	C	C	C	C	D	C	C	C
Firestone / I-710 SB Ramps	C	E	D	B	D	B	B	B	C	B	B	B	B	B	B	B	B	B
Patata / I-710 NB Ramps	--	--	--	--	--	--	--	--	--	B	A	B	B	A	B	B	A	B
Patata / I-710 SB Ramps	--	--	--	--	--	--	--	--	--	A	A	A	A	A	A	A	A	A
Florence / I-710 Ramps	--	--	--	--	--	--	B	C	D	B	C	D	B	C	E	B	C	D

Table 10-15
I-710 Intersection Peak Hour Level of Service Summary

Street / I-710 Interchange		Existing			Alt 1			Alt 5A			Alt 6A			Alt 6B			Alt 6C		
		AM	PM	MD	AM	PM	MD	AM	PM	MD	AM	PM	MD	AM	PM	MD	AM	PM	MD
Florence / Eastern		D	C	C	D	D	C	D	D	C	C	C	C	C	C	C	C	C	C
Atlantic/ Bandini (I-710 NB Ramps)	Options 1 & 2	D	E	D	E	F	D	C	C	C	C	C	D	C	C	D	C	C	D
Bandini/I-710 SB Ramps	Options 1 & 2	B	B	B	B	B	B	C	C	D	B	C	B	B	C	B	B	C	B
Bandini/I-710 NB Ramps (26th St)	Options 1 & 2	--	--	--	--	--	--	D	C	D	C	C	C	C	C	C	C	C	C
Atlantic/ Bandini (I-710 SB Ramps)	Options 1 & 2	--	--	--	--	--	--	D	D	D	C	B	B	C	B	C	C	B	B
Atlantic/ Bandini (I-710 NB Loop Off)	Options 1 & 2	--	--	--	--	--	--	--	--	--	C	B	A	C	B	A	B	B	A
Atlantic/ Bandini (I-710 NB Ramps)	Option 3	--	--	--	--	--	--	--	--	--	--	--	--	C	C	C	--	--	--
Bandini/I-710 SB Ramps	Option 3	--	--	--	--	--	--	--	--	--	--	--	--	C	C	B	--	--	--
Bandini/I-710 NB Ramps (26th St)	Option 3	--	--	--	--	--	--	--	--	--	--	--	--	D	E	D	--	--	--
Washington / Atlantic (I-710 Ramps)	Option 1	D	D	C	D	D	C	D	D	C	D	D	C	D	D	D	D	D	D
Washington / I-710 NB Ramps	Option 1	B	C	B	B	C	B	C	C	C	A	B	A	A	B	A	A	B	A
Washington / I-710 SB Ramps	Option 1	B	B	B	C	D	E	C	D	C	B	B	B	C	B	B	B	B	B
Washington / SB FC Ramps	Option 1	--	--	--	--	--	--	--	--	--	D	D	D	D	D	D	C	D	D
Washington / Atlantic (I-710 Ramps)	Option 2	D	D	C	D	D	C	D	D	C	D	D	C	D	D	D	D	D	C
Washington / I-710 NB Ramps	Option 2	--	--	--	--	--	--	--	--	--	C	C	C	B	C	C	B	C	C
Washington / I-710 SB Ramps	Option 2	--	--	--	--	--	--	--	--	--	C	C	C	C	B	B	C	C	C
I-710 SB on-ramp/Ramona Blvd		A	A	A	A	B	A	A	B	A	A	A	A	A	B	A	A	B	A
I-710 SB off-ramp-Humphreys Ave/Floral		C	C	D	C	C	D	C	C	D	C	C	C	C	D	C	C	C	C
Ford Blvd – I-710 NB off-ramp/Olympic Blvd		B	C	B	B	D	B	C	D	C	C	D	B	C	D	B	C	D	C

Notes:

Shaded and bold cells indicated LOS E or F

"--" Not applicable to this scenario

Table 10-16 shows a summary of the total number of intersections analyzed, and the number of intersections and the percent of intersections with poor operating conditions (LOS E or F) for Existing, Future Year 2035 Alternative 1 No Build, and Future Year 2035 Alternatives 5A, 6A, 6B and 6C conditions.

Table 10-16
I-710 Intersection Peak Hour Level of Service (LOS E or F)

Scenario	Total Number of Intersections Analyzed	Number of Intersections with LOS E or F			Percent of Intersections with LOS E or F		
		AM	PM	MD	AM	PM	MD
Existing	22	0	4	0	0%	18%	0%
2035 Alt 1	25	4	6	3	16%	24%	12%
2035 Alt 5A	28	0	1	1	0%	4%	4%
2035 Alt 6A	35	1	3	1	3%	9%	3%
2035 Alt 6B	38	1	4	4	3%	11%	11%
2035 Alt 6C	35	2	3	1	6%	9%	3%

Overall, the LOS and delay on the intersection locations of I-710 freeway are generally maintained or improved during the morning, midday and evening peak periods when comparing the 2035 Build (Alternatives 5A, 6A, 6B and 6C) to 2035 No-Build (Alternative 1) Conditions. Therefore, the intersection design is meeting its stated objectives, purposes and needs. The following summarizes the intersection LOS analysis results with the combination of the recommended geometric enhancements along the freeway, ramps, and interchange reconfiguration changes:

- The percent of intersections that operate at LOS E or F will be decreased from a range of 12% to 24% under the 2035 No Build condition (Alternative 1) to a range of 0% to 11% under the 2035 Build conditions (Alternatives 5A, 6A, 6B, and 6C) during the AM, PM and MD peak hours.
- Among seven (7) intersections that operate at LOS E or F under the 2035 No Build conditions, six (6) of them will be improved to an acceptable LOS under 2035 Build alternatives.
- Only nine (9) intersections will operate at LOS E or F during at least one of the peak hours analyzed under the 2035 Build conditions.
- The number of intersections with poor operating conditions is the highest during the evening peak hour for all scenarios except for Alternative 6B.

10.3.2 Queuing Analysis Summary

The queuing analysis includes intersection queuing analysis and ramp queuing analysis. The intersection queuing analysis investigates the lane storage capacity for the intersections at the interchanges along the I-710 highway. The ramp queuing analysis examines the ramp storage capacity for the on- and off-ramps along the I-710 mainline and the intersecting highways.

Table 10-17 provides a summary of the intersection queuing analysis for the study intersections at the interchanges along the I-710. The following summarizes the intersection queuing analysis results with the combination of the recommended geometric enhancements along the freeway, ramps, and interchange reconfiguration changes:

- An average of 94% intersection movements on the south side of Slauson Avenue will provide adequate storage to serve future vehicle queuing during AM, PM and MD periods under the 2035 Build conditions (Alternatives 5A, 6A, 6B, and 6C).
- An average 84% intersection movements on the north side of Slauson Avenue (North Termini) will provide adequate storage to serve future vehicle queuing during AM, PM and MD periods under the 2035 Build conditions (Alternatives 5A, 6A, 6B, and 6C).
- The majority of the inadequate storage locations are generally located near the northern and southern termini along I-710.

Below is the list for the intersections that will not be able to provide adequate storage during AM, PM and MD periods under the 2035 Build conditions (Alternatives 5A, 6A, 6B, and 6C).

- Eastbound Anaheim Street to I-710 northbound (Alt 5A, 6A, and 6C only);
- Eastbound Anaheim Street to Freight Corridor Access (Alt 6B Only);
- Eastbound Pacific Coast Highway to I-710 northbound;
- Westbound Del Amo Boulevard through at Susana Road;
- Eastbound Del Amo Boulevard to northbound Susana Road (Alt 5A and 6B Only);
- Eastbound Long Beach Boulevard to I-710 northbound (Alt 6A and 6C only);
- West Rosecrans Avenue to I-710 southbound;
- Eastbound Imperial Highway to I-710 northbound (Alt 5A only);
- Westbound Firestone Boulevard to I-710 northbound (Alt 6A, 6B, and 6C only);
- Eastbound Florence Avenue to I-710 southbound (Alt 5A only);
- Northern termini
- Eastbound Slauson Avenue to I-710 southbound (All Alternatives);
- Westbound Slauson Avenue to I-710 southbound (Alt 6C Design Options 1 and 2);

- Westbound Bandini Boulevard (L) to I-710 northbound (Alt 5A and Alt 6B Design Option 3);
- Westbound Bandini Boulevard (R) to northbound Atlantic Boulevard (Alt 6B Design Option 3)
- Southbound Atlantic Boulevard (L) at Atlantic Boulevard/Bandini Boulevard intersection (Alt 6B Design Option 3);
- Westbound Washington Boulevard at I-710 southbound (Alt 5A only);
- Eastbound Washington Boulevard at I-710 southbound (Alt 5A only);
- Westbound Washington Boulevard at I-710 northbound (Alt 5A, 6A, 6B, and 6C Design Option 2);
- Northbound I-710 off-ramp at Olympic Boulevard (Alt 5A, 6A, 6B, and 6C).

Table 10-17
I-710 Intersection Queuing Analysis

Direction	Location	ALT 5A	ALT 6A	Alt 6B	Alt 6C
Pico Ave at I-710					
SB I-710	Pico Ave off-ramp	Yes	Yes	Yes	Yes
Anaheim St at I-710					
WB Anaheim St	NB I-710 on-ramp	Yes	Yes	Yes	Yes
WB Anaheim St	SB I-710 on-ramp	Yes	Yes	Yes	Yes
EB Anaheim St	NB I-710 on-ramp	No	No	Yes	No
EB Anaheim St	SB I-710 on-ramp	Yes	Yes	Yes	Yes
EB Anaheim St	Freight Corridor Access/Harbor	N/A	Yes	No	Yes
WB Anaheim St	Freight Corridor Access/Harbor	N/A	Yes	Yes	Yes
NB I-710	WB Anaheim St off-ramp	Yes	Yes	Yes	Yes
NB I-710	EB Anaheim St off-ramp	N/A	N/A	N/A	N/A
SB I-710	WB Anaheim St off-ramp	N/A	N/A	N/A	N/A
SB I-710	EB Anaheim St off-ramp	Yes	Yes	Yes	Yes
Pacific Coast Highway (PCH) at I-710					
WB PCH	NB I-710 on-ramp	Yes	Yes	Yes	Yes
WB PCH	SB I-710 on-ramp	Yes	Yes	Yes	Yes
EB PCH	NB I-710 on-ramp	No	No	No	No
EB PCH	SB I-710 on-ramp	Yes	Yes	Yes	Yes
NB I-710	WB PCH off-ramp	Yes	Yes	Yes	Yes
NB I-710	EB PCH off-ramp	N/A	N/A	N/A	N/A
SB I-710	WB PCH off-ramp	N/A	N/A	N/A	N/A
SB I-710	EB PCH off-ramp	Yes	Yes	Yes	Yes
Willow St at I-710					
WB Willow St	NB 710 on-ramp	Yes	Yes	Yes	Yes
WB Willow St	SB 710 on-ramp	Yes	Yes	Yes	Yes
EB Willow St	NB 710 on-ramp	Yes	Yes	Yes	Yes
EB Willow St	SB 710 on-ramp	Yes	Yes	Yes	Yes
NB 710	WB Willow St off-ramp	Yes	Yes	Yes	Yes
NB 710	EB Willow St off-ramp	N/A	N/A	N/A	N/A

Table 10-17
I-710 Intersection Queuing Analysis

Direction	Location	ALT 5A	ALT 6A	Alt 6B	Alt 6C
SB 710	WB Willow St off-ramp	N/A	N/A	N/A	N/A
SB 710	EB Willow St off-ramp	Yes	Yes	Yes	Yes
Del Amo Blvd at I-710					
WB Del Amo Blvd	NB I-710 on-ramp	Yes	Yes	Yes	Yes
WB Del Amo Blvd	SB I-710 on-ramp	Yes	Yes	Yes	Yes
EB Del Amo Blvd	NB I-710 on-ramp	Yes	Yes	Yes	Yes
EB Del Amo Blvd	SB I-710 on-ramp	Yes	Yes	Yes	Yes
NB I-710	WB Del Amo off-ramp	Yes	Yes	Yes	Yes
NB I-710	EB Del Amo off-ramp	N/A	N/A	N/A	N/A
SB I-710	WB Del Amo off-ramp	N/A	N/A	N/A	N/A
SB I-710	EB Del Amo off-ramp	Yes	Yes	Yes	Yes
WB Del Amo Blvd	NB Susana Rd	Yes	Yes	Yes	Yes
WB Del Amo Blvd	Susana Rd	No	No	No	No
EB Del Amo Blvd	NB Susana Rd	No	Yes	No	Yes
SB Susana Rd	WB Del Amo Blvd	Yes	Yes	Yes	Yes
SB Susana Rd	EB Del Amo Blvd	Yes	Yes	Yes	Yes
Long Beach Blvd at I-710					
WB Long Beach Blvd	SB I-710 on-ramp	Yes	Yes	Yes	Yes
WB Long Beach Blvd	NB I-710 on-ramp	Yes	Yes	Yes	Yes
EB Long Beach Blvd	NB I-710 on-ramp	Yes	No	Yes	No
EB Long Beach Blvd	SB I-710 on-ramp	Yes	Yes	Yes	Yes
NB I-710	WB Long Beach Blvd off-ramp	Yes	Yes	Yes	Yes
NB I-710	EB Long Beach Blvd off-ramp	Yes	Yes	Yes	Yes
SB I-710	WB Long Beach Blvd off-ramp	Yes	Yes	Yes	Yes
SB I-710	EB Long Beach Blvd off-ramp	Yes	Yes	Yes	Yes
Artesia Blvd at I-710					
NB I-710	WB Artesia Blvd off-ramp	Yes	Yes	Yes	Yes
NB I-710	EB Artesia Blvd off-ramp	Yes	Yes	Yes	Yes
Alondra Blvd at I-710					
WB Alondra Blvd	NB I-710 on-ramp	Yes	Yes	Yes	Yes
WB Alondra Blvd	SB I-710 on-ramp	Yes	Yes	Yes	Yes
EB Alondra Blvd	NB I-710 on-ramp	Yes	Yes	Yes	Yes
EB Alondra Blvd	SB I-710 on-ramp	Yes	Yes	Yes	Yes
NB I-710	WB Alondra Blvd off-ramp	Yes	Yes	Yes	Yes
NB I-710	EB Alondra Blvd off-ramp	N/A	N/A	N/A	N/A
SB I-710	WB Alondra Blvd off-ramp	N/A	N/A	N/A	N/A
SB I-710	EB Alondra Blvd off-ramp	Yes	Yes	Yes	Yes
Rosecrans Ave at I-710					
WB Rosecrans Ave	NB I-710 on-ramp	Yes	Yes	Yes	Yes
WB Rosecrans Ave	SB I-710 on-ramp	No	No	No	No
EB Rosecrans Ave	NB I-710 on-ramp	Yes	Yes	Yes	Yes
EB Rosecrans Ave	SB I-710 on-ramp	Yes	Yes	Yes	Yes
NB I-710	WB Rosecrans Ave off-ramp	Yes	Yes	Yes	Yes
NB I-710	EB Rosecrans Ave off-ramp	Yes	Yes	Yes	Yes
SB I-710	WB Rosecrans Ave off-ramp	Yes	Yes	Yes	Yes

Table 10-17
I-710 Intersection Queuing Analysis

Direction	Location	ALT 5A	ALT 6A	Alt 6B	Alt 6C
SB I-710	EB Rosecrans Ave off-ramp	Yes	Yes	Yes	Yes
Imperial Hwy at I-710					
WB Imperial Hwy	NB I-710 on-ramp	Yes	Yes	Yes	Yes
EB Imperial Hwy	SB I-710 on-ramp	Yes	Yes	Yes	Yes
WB Imperial Hwy	SB I-710 on-ramp	Yes	Yes	Yes	Yes
EB Imperial Hwy	NB I-710 on-ramp	No	Yes	Yes	Yes
NB I-710	WB Imperial Hwy off-ramp	Yes	Yes	Yes	Yes
NB I-710	EB Imperial Hwy off-ramp	N/A	N/A	N/A	N/A
SB I-710	WB Imperial Hwy off-ramp	N/A	N/A	N/A	N/A
SB I-710	EB Imperial Hwy off-ramp	Yes	Yes	Yes	Yes
WB Imperial Hwy (R)	NB Wright Rd	Yes	Yes	Yes	Yes
EB Imperial Hwy (L)	NB Wright Rd	Yes	Yes	Yes	Yes
EB Imperial Hwy (R)	SB Duncan Ave	Yes	Yes	Yes	Yes
NB Duncan Ave (R)	EB Imperial Hwy	Yes	Yes	Yes	Yes
SB Wright Rd (R)	WB Imperial Hwy	Yes	Yes	Yes	Yes
SB Wright Rd (L)	EB Imperial Hwy	Yes	Yes	Yes	Yes
NB Wright Rd (L)	WB Abbott Rd	Yes	Yes	Yes	Yes
Firestone Blvd at I-710					
WB Firestone Blvd	NB I-710 on-ramp	Yes	No	No	No
WB Firestone Blvd	SB I-710 on-ramp	Yes	Yes	Yes	Yes
EB Firestone Blvd	NB I-710 on-ramp	Yes	Yes	Yes	Yes
EB Firestone Blvd	SB I-710 on-ramp	Yes	Yes	Yes	Yes
NB I-710	WB Firestone Blvd off-ramp	Yes	Yes	Yes	Yes
NB I-710	EB Firestone Blvd off-ramp	Yes	Yes	Yes	Yes
SB I-710	WB Firestone Blvd off-ramp	Yes	Yes	Yes	Yes
SB I-710	EB Firestone Blvd off-ramp	Yes	Yes	Yes	Yes
Florence Ave at I-710					
WB Florence Ave	NB I-710 on-ramp	Yes	Yes	Yes	Yes
WB Florence Ave	SB I-710 on-ramp	Yes	Yes	Yes	Yes
EB Florence Ave	NB I-710 on-ramp	Yes	Yes	Yes	Yes
EB Florence Ave	SB I-710 on-ramp	No	Yes	Yes	Yes
NB I-710	WB Florence Ave off-ramp	Yes	Yes	Yes	Yes
NB I-710	EB Florence Ave off-ramp	N/A	N/A	N/A	N/A
SB I-710	WB Florence Ave off-ramp	N/A	N/A	N/A	N/A
SB I-710	EB Florence Ave off-ramp	Yes	Yes	Yes	Yes
Slauson Ave at I-710					
Alternative 5A					
WB Slauson Ave	NB I-710 on-ramp	Yes	(See Design Options below)		
WB Slauson Ave	SB I-710 on-ramp	Yes			
EB Slauson Ave	NB I-710 on-ramp	Yes			
EB Slauson Ave	SB I-710 on-ramp	No			
NB I-710	WB Slauson Ave off-ramp	Yes			
NB I-710	EB Slauson Ave off-ramp	N/A			
SB I-710	WB Slauson Ave off-ramp	N/A			
SB I-710	EB Slauson Ave off-ramp	Yes			

Table 10-17
I-710 Intersection Queuing Analysis

Direction	Location	ALT 5A	ALT 6A	Alt 6B	Alt 6C
Alternatives 6A, 6B, and 6C – Design Option 1					
WB Slauson Ave	NB I-710 on-ramp	N/A	Yes	Yes	Yes
WB Slauson Ave	SB I-710 on-ramp	N/A	Yes	Yes	No
EB Slauson Ave	NB I-710 on-ramp	N/A	Yes	Yes	Yes
EB Slauson Ave	SB I-710 on-ramp	N/A	No	No	No
NB I-710	WB Slauson Ave off-ramp	N/A	Yes	Yes	Yes
NB I-710	EB Slauson Ave off-ramp	N/A	N/A	N/A	N/A
SB I-710	WB Slauson Ave off-ramp	N/A	N/A	N/A	N/A
SB I-710	EB Slauson Ave off-ramp	N/A	Yes	Yes	Yes
Alternatives 6A, 6B, and 6C – Design Option 2					
WB Slauson Ave	NB I-710 on-ramp	N/A	Yes	Yes	Yes
WB Slauson Ave	SB I-710 on-ramp	N/A	Yes	Yes	No
EB Slauson Ave	NB I-710 on-ramp	N/A	Yes	Yes	Yes
EB Slauson Ave	SB I-710 on-ramp	N/A	No	No	No
NB I-710	WB Slauson Ave off-ramp	N/A	Yes	Yes	Yes
NB I-710	EB Slauson Ave off-ramp	N/A	N/A	N/A	N/A
SB I-710	WB Slauson Ave off-ramp	N/A	N/A	N/A	N/A
SB I-710	EB Slauson Ave off-ramp	N/A	Yes	Yes	Yes
Alternatives 6B – Design Option 3					
WB Slauson Ave	NB I-710 on-ramp	N/A	N/A	Yes	N/A
WB Slauson Ave	SB I-710 on-ramp	N/A	N/A	Yes	N/A
EB Slauson Ave	NB I-710 on-ramp	N/A	N/A	Yes	N/A
EB Slauson Ave	SB I-710 on-ramp	N/A	N/A	No	N/A
NB I-710	WB Slauson Ave off-ramp	N/A	N/A	Yes	N/A
NB I-710	EB Slauson Ave off-ramp	N/A	N/A	N/A	N/A
SB I-710	WB Slauson Ave off-ramp	N/A	N/A	N/A	N/A
SB I-710	EB Slauson Ave off-ramp	N/A	N/A	Yes	N/A
Atlantic Blvd / Bandini Blvd at I-710					
Alternative 5A					
NB Atlantic Blvd (L)	Atlantic Blvd/Bandini Blvd Int.	Yes	(See Design Options below)		
SB Atlantic Blvd (L)	Atlantic Blvd/Bandini Blvd Int.	Yes			
WB Bandini Blvd (L)	NB 710 on-ramp	No			
WB Bandini Blvd (L)	Atlantic Blvd/Bandini Blvd Int.	Yes			
WB Bandini Blvd (R)	Atlantic Blvd/Bandini Blvd Int.	Yes			
EB Bandini Blvd (L)	Atlantic Blvd/Bandini Blvd Int.	Yes			
EB Bandini Blvd (L)	26th St/Bandini Blvd Int.	Yes			
NB I-710	WB Bandini Blvd off-ramp	Yes			
NB I-710	EB Bandini Blvd off-ramp	Yes			
SB I-710	WB Bandini Blvd off-ramp	Yes			
SB I-710	EB Bandini Blvd off-ramp	Yes			
Alternatives 6A, 6B, and 6C – Design Options 1 & 2					
NB Atlantic Blvd (L)	Atlantic Blvd/Bandini Blvd Int.	N/A	Yes	Yes	Yes
SB Atlantic Blvd (L)	Atlantic Blvd/Bandini Blvd Int.	N/A	Yes	Yes	Yes
WB Bandini Blvd (L)	NB 710 on-ramp	N/A	Yes	Yes	Yes

Table 10-17
I-710 Intersection Queuing Analysis

Direction	Location	ALT 5A	ALT 6A	Alt 6B	Alt 6C
WB Bandini Blvd (L)	Atlantic Blvd/Bandini Blvd Int.	N/A	Yes	Yes	Yes
WB Bandini Blvd (R)	Atlantic Blvd/Bandini Blvd Int.	N/A	Yes	Yes	Yes
EB Bandini Blvd (L)	Atlantic Blvd/Bandini Blvd Int.	N/A	Yes	Yes	Yes
EB Bandini Blvd (L)	26th St/Bandini Blvd Int.	N/A	Yes	Yes	Yes
NB I-710	WB Bandini Blvd off-ramp	N/A	Yes	Yes	Yes
NB I-710	EB Bandini Blvd off-ramp	N/A	Yes	Yes	Yes
SB I-710	WB Bandini Blvd off-ramp	N/A	Yes	Yes	Yes
SB I-710	EB Bandini Blvd off-ramp	N/A	Yes	Yes	Yes
Alternative 6B – Design Option 3					
NB Atlantic Blvd (L)	Atlantic Blvd/Bandini Blvd Int.	N/A	N/A	Yes	N/A
SB Atlantic Blvd (L)	Atlantic Blvd/Bandini Blvd Int.	N/A	N/A	No	N/A
WB Bandini Blvd (L)	NB 710 on-ramp	N/A	N/A	No	N/A
WB Bandini Blvd (L)	Atlantic Blvd/Bandini Blvd Int.	N/A	N/A	Yes	N/A
WB Bandini Blvd (R)	Atlantic Blvd/Bandini Blvd Int.	N/A	N/A	No	N/A
WB Bandini Blvd (L)	SB 710 on-ramp	N/A	N/A	Yes	N/A
EB Bandini Blvd (L)	Atlantic Blvd/Bandini Blvd Int.	N/A	N/A	Yes	N/A
EB Bandini Blvd (L)	26th St/Bandini Blvd Int.	N/A	N/A	Yes	N/A
NB I-710	WB Bandini Blvd off-ramp	N/A	N/A	Yes	N/A
NB I-710	EB Bandini Blvd off-ramp	N/A	N/A	Yes	N/A
SB I-710	WB Bandini Blvd off-ramp	N/A	N/A	Yes	N/A
SB I-710	EB Bandini Blvd off-ramp	N/A	N/A	Yes	N/A
Washington Blvd at I-710					
Alternative 5A					
WB Washington Blvd (R)	NB 710 on-ramp	Yes	(See Design Options below)		
WB Washington Blvd (R)	SB 710 on-ramp	No			
EB Washington Blvd (L)	SB 710 on-ramp	No			
EB Washington Blvd (L)	NB 710 on-ramp	No			
NB I-710	WB Washington Blvd off-ramp	Yes			
NB I-710	EB Washington Blvd off-ramp	Yes			
SB I-710	WB Washington Blvd off-ramp	Yes			
SB I-710	EB Washington Blvd off-ramp	Yes			
Alternatives 6A, 6B, and 6C – Design Option 1					
WB Washington Blvd	NB 710 on-ramp	N/A	Yes	Yes	Yes
WB Washington Blvd (R)	SB 710 on-ramp	N/A	Yes	Yes	Yes
EB Washington Blvd (L)	SB 710 on-ramp	N/A	Yes	Yes	Yes
EB Washington Blvd	NB 710 on-ramp	N/A	Yes	Yes	Yes
NB I-710	WB Washington Blvd off-ramp	N/A	Yes	Yes	Yes
NB I-710	EB Washington Blvd off-ramp	N/A	Yes	Yes	Yes
SB I-710	WB Washington Blvd off-ramp	N/A	Yes	Yes	Yes
SB I-710	EB Washington Blvd off-ramp	N/A	Yes	Yes	Yes
Alternatives 6A, 6B, and 6C – Design Option 2					
WB Washington Blvd	NB 710 on-ramp	N/A	No	No	No
WB Washington Blvd (R)	SB 710 on-ramp	N/A	Yes	Yes	Yes

Table 10-17
I-710 Intersection Queuing Analysis

Direction	Location	ALT 5A	ALT 6A	Alt 6B	Alt 6C
EB Washington Blvd (L)	SB 710 on-ramp	N/A	Yes	Yes	Yes
EB Washington Blvd	NB 710 on-ramp	N/A	Yes	Yes	Yes
NB I-710	WB Washington Blvd off-ramp	N/A	Yes	Yes	Yes
NB I-710	EB Washington Blvd off-ramp	N/A	Yes	Yes	Yes
SB I-710	WB Washington Blvd off-ramp	N/A	Yes	Yes	Yes
SB I-710	EB Washington Blvd off-ramp	N/A	Yes	Yes	Yes
Interchanges North of Washington Blvd					
NB I-710	Olympic Blvd off-ramp	No	No	No	No
SB I-710	Humphreys Ave/Floral off-ramp	Yes	Yes	Yes	Yes

Notes:

NA – Not Applicable

Shaded and bold cells indicate insufficient storage.

Table 10-18 provides a summary of the ramp queuing analysis for the on-ramps along the I-710 and the highways intersecting with I-710. The following summarizes the on-ramp queuing analysis results with the combination of the recommended geometric enhancements along the freeway, ramps, and interchange reconfiguration changes:

- All of the ramps are adequate to serve future vehicle queuing with the designed ramp meter rates during the AM, PM and MD periods under the 2035 Build conditions except for the following two locations:
 - o Pico Avenue to Northbound I-710 (Alt 5A only);
 - o Bandini Boulevard to I-710 Southbound (Alt 6B Design option 3);

As discussed in **Section 9**, at the freeway on-ramps, it is recommended to increase the meter rates to accommodate the required projected maximum queue. However, at locations where the required storage is not provided and the maximum meter rate is utilized, it is concluded that there are no feasible improvement recommendations. This is generally a result of physical and design constraints that limits additional storage. Note that a higher meter rate allows more throughput, but would generally cause turbulence at the merge area and increase congestion to the mainline freeway.

Table 10-18
I-710 Ramp Queuing Analysis

Direction	Location	ALT 5A	ALT 6A	Alt 6B	Alt 6C
Pico Ave at I-710					
NB I-710	Pico Ave on-ramp	No	Yes	Yes	Yes
Anaheim St at I-710					
NB I-710	Anaheim St on-ramp	Yes	Yes	Yes	Yes
SB I-710	Anaheim St on-ramp	Yes	Yes	Yes	Yes
Pacific Coast Highway (PCH) at I-710					
NB I-710	PCH on-ramp	Yes	Yes	Yes	Yes
SB I-710	PCH on-ramp	Yes	Yes	Yes	Yes
Willow St at I-710					
NB 710	Willow St on-ramp	Yes	Yes	Yes	Yes
SB 710	Willow St on-ramp	Yes	Yes	Yes	Yes
Del Amo Blvd at I-710					
NB I-710	Del Amo on-ramp	Yes	Yes	Yes	Yes
SB I-710	Del Amo Blvd on-ramp	Yes	Yes	Yes	Yes
Long Beach Blvd at I-710					
NB I-710	Long Beach Blvd on-ramp	Yes	Yes	Yes	Yes
SB I-710	Long Beach Blvd on-ramp	Yes	Yes	Yes	Yes
Artesia Blvd at I-710					
SB I-710	Artesia Blvd on-ramp	Yes	Yes	Yes	Yes
Alondra Blvd at I-710					
NB I-710	Alondra Blvd on-ramp	Yes	Yes	Yes	Yes
SB I-710	Alondra Blvd on-ramp	Yes	Yes	Yes	Yes
Rosecrans Ave at I-710					
NB I-710	Rosecrans Ave on-ramp	Yes	Yes	Yes	Yes
SB I-710	WB Rosecrans Ave on-ramp	Yes	Yes	Yes	Yes
SB I-710	EB Rosecrans Ave on-ramp	Yes	Yes	Yes	Yes
Imperial Hwy at I-710					
NB I-710	Imperial Hwy on-ramp	Yes	Yes	Yes	Yes
SB I-710	Imperial Hwy on-ramp	Yes	Yes	Yes	Yes
Firestone Blvd at I-710					
NB I-710	WB Firestone Blvd on-ramp	Yes	Yes	Yes	Yes
NB I-710	EB Firestone Blvd on-ramp	Yes	Yes	Yes	Yes
SB I-710	WB Firestone Blvd on-ramp	Yes	Yes	Yes	Yes
SB I-710	EB Firestone Blvd on-ramp	Yes	Yes	Yes	Yes
Florence Ave at I-710					
NB I-710	Florence Ave on-ramp	Yes	Yes	Yes	Yes
SB I-710	Florence Ave on-ramp	Yes	Yes	Yes	Yes
Slauson Ave at I-710					
Alternative 5A					
NB I-710	Slauson Ave on-ramp	Yes	N/A	N/A	N/A
SB I-710	Slauson Ave on-ramp	Yes	N/A	N/A	N/A
Alternatives 6A, 6B, and 6C – Option 1					
NB I-710	Slauson Ave on-ramp	N/A	Yes	Yes	Yes

**Table 10-18
I-710 Ramp Queuing Analysis**

Direction	Location	ALT 5A	ALT 6A	Alt 6B	Alt 6C
SB I-710	Slauson Ave on-ramp	N/A	Yes	Yes	Yes
Alternatives 6A, 6B, and 6C – Option 1					
NB I-710	Slauson Ave on-ramp	N/A	Yes	Yes	Yes
SB I-710	Slauson Ave on-ramp	N/A	Yes	Yes	Yes
Alternatives 6A, 6B, and 6C – Option 1					
NB I-710	Slauson Ave on-ramp	N/A	N/A	Yes	N/A
SB I-710	Slauson Ave on-ramp	N/A	N/A	Yes	N/A
Bandini Blvd at I-710					
Alternative 5A					
SB I-710	Atlantic Blvd on-ramp	Yes	N/A	N/A	N/A
NB I-710	Bandini Blvd on-ramp	Yes	N/A	N/A	N/A
Alternatives 6A, 6B, and 6C – Option 1					
SB I-710	Atlantic Blvd on-ramp	N/A	Yes	Yes	Yes
NB I-710	Bandini Blvd on-ramp	N/A	Yes	Yes	Yes
Alternatives 6A, 6B, and 6C – Option 2					
SB I-710	Atlantic Blvd on-ramp	N/A	Yes	Yes	Yes
NB I-710	Bandini Blvd on-ramp	N/A	Yes	Yes	Yes
Alternative 6B – Option 3					
SB I-710	Atlantic Blvd on-ramp	N/A	N/A	Yes	N/A
NB I-710	Bandini Blvd on-ramp	N/A	N/A	Yes	N/A
SB I-710	Bandini Blvd on-ramp	N/A	N/A	No	N/A
Washington Blvd at I-710					
Alternative 5A					
NB I-710	Washington Blvd on-ramp	Yes	N/A	N/A	N/A
SB I-710	Washington Blvd on-ramp	Yes	N/A	N/A	N/A
Alternatives 6A, 6B, and 6C – Option 1					
NB I-710	Washington Blvd on-ramp	N/A	Yes	Yes	Yes
SB I-710	Washington Blvd on-ramp	N/A	Yes	Yes	Yes
Alternatives 6A, 6B, and 6C – Option 2					
NB I-710	Washington Blvd on-ramp	N/A	Yes	Yes	Yes
SB I-710	Washington Blvd on-ramp	N/A	Yes	Yes	Yes
Alternatives 6B – Option 3					
NB I-710	Washington Blvd on-ramp	N/A	N/A	Yes	N/A
SB I-710	Washington Blvd on-ramp	N/A	N/A	Yes	N/A
Olympic Blvd at I-710					
NB I-710	Olympic Blvd on-ramp	Yes	Yes	Yes	Yes
Eastern Ave at I-710					
SB I-710	SB Eastern Ave on-ramp	Yes	Yes	Yes	Yes

10.4 CONCLUSIONS

Continuing population and employment growth along with ongoing Port expansion along I-710 Corridor is expected to result in significant growth in travel demand throughout the I-710 corridor study area. With no improvements to I-710, traffic volume growth on I-710 will be capacity constrained, resulting in lengthening of peak periods, increases in travel delays, and diversion of long distance trips to the local road network.

The existing conditions analyses show many of the I-710 freeway operations are currently operating under unacceptable LOS and experiencing significant delays. High accident rates exceeding state averages exist along both directions of I-710 freeway mainline and ramp junctions. The most common factor identified as contributing to the collision history in the locations with above average accident rates was recurring congestion due to high heavy vehicle volumes. Without any improvements, operating conditions are expected to deteriorate.

As summarized in the previous section under Alternative 1 (2035 No Build) operating conditions, it is expected that the I-710 freeway corridor will continue to experience severe delay, congestion, and high accident rates. Similar to existing conditions, the poor operating conditions under 2035 Alternative 1 are expected to deteriorate further without any improvements.

Analysis of Alternative 5A operating conditions show that traffic operations along I-710 will improve considerably (reducing delays and congestion) compared to No Build conditions. As summarized in the previous sections, the traffic operations analysis indicates that acceptable operations could be restored throughout most of the study area, and maintained through 2035, by undertaking basic lane widening, addition of continuous auxiliary lanes at specific locations, reconfiguring existing interchanges and widening of ramps, as defined under Alternative 5A.

In addition to these cumulative improvements, under Alternatives 6A, 6B and 6C, the addition of various FC options would further alleviate congestion along the I-710 by diverting the majority of truck traffic from the general purpose lanes to the proposed freight corridor. This results in significant improvement to traffic operations along I-710 as compared to Alternative 1. However, at the northern and southern termini as well as intermediate connections along the I-710, congestion still occurs along the freeway and some FC segments and ramp termini as a result of truck traffic entering/exiting at these connections. The overall freeway, FC and ramps operations as well as local arterial circulation are improved and LOS maintained along the I-710 corridor as compared to Alternative 1.

Overall, the traffic operations analysis summaries confirm that based on the performance measures analyzed, the proposed project alternatives will maintain or improve future traffic operations on the I-710 Corridor when compared to Alternative 1 conditions. While the results at specific segment, weaving, or intersection analysis locations may vary between Alternatives, the net change in all cases maintains or improves conditions over Alternative 1 conditions. All of those aforementioned metrics that were either maintained or exceeded through improved operational performance are positive indicators that the project is meeting its stated objectives and purpose and need.

This page intentionally left blank.

11.0 REFERENCES

Southern California Association of Governments' (SCAG) 2008 Regional Transportation Plan (RTP)

Southern California Association of Governments' (SCAG) 2008 Regional Transportation Improvement Program (RTIP)

I-5 EIR/EIS, 2010 (CALTRANS/LSA)

I-710 Major Corridor Study, March 2005

Technical Memorandum – I-710 Corridor Project EIR/EIS Travel Demand Modeling Methodology, WBS ID: 165.10.08, August 11, 2009 (URS/Cambridge Systematics)

I-710 Corridor Project Traffic Impact Analysis Report, (URS/Iteris/LSA)

I-710 Initial Geometric Plans, WBS ID: 160.10.15.30 (URS)

Caltrans' Traffic Accident Surveillance and Analysis System (TASAS)

Freeway Performance Measurement System (PeMS), University of California, Berkeley

Highway Capacity Manual 2000, Transportation Research Board (TRB)

Highway Capacity Software (HCS+) Version 5.2, McTrans

Synchro and SimTraffic 6, Trafficware

VISSIM 5.2, PTV America

This page intentionally left blank.