



ATTACHMENT D

MITIGATED NEGATIVE DECLARATION

APPENDIX G1 - LOCAL TRANSPORTATION ANALYSIS

Appendix G

Local Transportation Analysis

**SAN MARCOS COSTCO
BUSINESS CENTER FUEL
FACILITY ADDITION
LOCAL TRANSPORTATION
ANALYSIS**
San Marcos, CA

December 19, 2024



San Marcos Costco Business Center Fuel Facility Addition Local Transportation Analysis San Marcos, CA

Prepared for:
Costco Wholesale
730 Lake Drive
Issaquah, WA 98027

Prepared by:
Kittelson & Associates, Inc.
851 SW 6th Avenue, Suite 600
Portland, OR 97204
503.228.5230

Project Manager:
Kristine Connolly
Associate Engineer

Project Principal:
Mychal Loomis PE, PTOE, TE, RSP
Associate Engineer

Project Analysts:
Rebecca Hoffman
Billy Swort

Project Number 27900

December 19, 2024



CONTENTS

1. Executive Summary	2
2. Introduction	6
Project Description.....	6
Scope of the Report	9
3. Methodologies and Criteria.....	11
Intersection Level of Service.....	11
Roadway Level of Service and Capacity	12
City of San Marcos LOS Standards	13
Caltrans Performance Standards.....	13
Performance Standard Summary	14
Traffic Analysis Methodology	16
4. Project Traffic	19
Trip Generation	19
Trip Distribution & Assignment.....	26
5. Existing Conditions.....	42
Existing Roadways.....	42
Existing Transit Facilities	43
Pedestrian & Bicycle Facilities	44
Crash History Review	44
Existing Traffic Operations	46
6. Traffic Impact Analysis.....	53
Year 2025 Near-Term Without Project Conditions	53
Year 2025 Near-Term With Project Conditions	61
Site Access Evaluation	74
On-Site Parking	79
Fuel Facility Circulation	79
Fuel Facility Queuing.....	80
7. Horizon Year 2050 Traffic Conditions.....	88
Horizon Year 2050 Without Project Conditions	88
Horizon Year 2050 With Project Conditions	94

8. VMT Analysis	102
9. Findings and Recommendations	104
Findings	104
Recommendations	106
10. References	109
Trip Generation Forecast Regression Graphs	113
Queue Forecast Regression Graphs	115

LIST OF FIGURES

Figure 1. Site Vicinity Map	7
Figure 2. Fuel Addition Site Plan	8
Figure 3A. Trip Assignment: Pass-By Trips – Weekday AM Peak Hour	29
Figure 3B. Trip Assignment: Pass-By Trips – Weekday PM Peak Hour	30
Figure 3C. Trip Assignment: Pass-By Trips – Saturday Midday Peak Hour	31
Figure 4A. Trip Assignment: Diverted Trips – Weekday AM Peak Hour	32
Figure 4B. Trip Assignment: Diverted Trips – Weekday PM Peak Hour	33
Figure 4C. Trip Assignment: Diverted Trips – Saturday Midday Peak Hour	34
Figure 5A. Trip Assignment: Primary Trips – Weekday AM Peak Hour	35
Figure 5B. Trip Assignment: Primary Trips – Weekday PM Peak Hour	36
Figure 5C. Trip Assignment: Primary Trips – Saturday Midday Peak Hour	37
Figure 6A. Trip Assignment: Total External Trips – Weekday AM Peak Hour	38
Figure 6B. Trip Assignment: Total External Trips – Weekday PM Peak Hour	39
Figure 6C. Trip Assignment: Total External Trips – Saturday Midday Peak Hour	40
Figure 7. Year 2023 Existing Lane Configurations and Traffic Control Devices	47
Figure 8A. Year 2023 Existing Traffic Volumes – Weekday AM Peak Hour	48
Figure 8B. Year 2023 Existing Traffic Volumes – Weekday PM Peak Hour	49
Figure 8C. Year 2023 Existing Traffic Volumes – Saturday Midday Peak Hour	50
Figure 9A. Year 2025 Near-Term Without Project Traffic Volumes – Weekday AM Peak Hour	56
Figure 9B. Year 2025 Near-Term Without Project Traffic Volumes – Weekday PM Peak Hour	57
Figure 9C. Year 2025 Near-Term Without Project Traffic Volumes – Saturday Midday Peak Hour	58
Figure 10A. Year 2025 Near-Term With Project Traffic Volumes – Weekday AM Peak Hour	62
Figure 10B. Year 2025 Near-Term With Project Traffic Volumes – Weekday PM Peak Hour	63
Figure 10C. Year 2025 Near-Term With Project Traffic Volumes – Saturday Midday Peak Hour	64
Figure 11A. Forecast Fuel Facility Queues – Weekday AM Peak Hour	84
Figure 11B. Forecast Fuel Facility Queues – Weekday PM Peak Hour	85
Figure 11C. Forecast Fuel Facility Queues – Saturday Midday Peak Hour	86
Figure 12A. Horizon Year 2050 Without Project Traffic Volumes – Weekday AM Peak Hour	90
Figure 12B. Horizon Year 2050 Without Project Traffic Volumes – Weekday PM Peak Hour	91
Figure 12C. Horizon Year 2050 Without Project Traffic Volumes – Saturday Midday Peak Hour	92
Figure 13A. Horizon Year 2050 With Project Traffic Volumes – Weekday AM Peak Hour	95
Figure 13B. Horizon Year 2050 With Project Traffic Volumes – Weekday PM Peak Hour	96
Figure 13C. Horizon Year 2050 With Project Traffic Volumes – Saturday Midday Peak Hour	97

LIST OF TABLES

Table 1. Study Intersections LOS Operations Summary	3
Table 2. General Level of Service Definitions	11
Table 3. Intersection Level of Service Definitions	12
Table 4. Roadway Classifications, Capacity, and LOS.....	12
Table 5. Study Intersection Performance Standards	15
Table 6. Study Roadway Segment Performance Standards	16
Table 7. San Diego North County Costco Fuel Facility Trip Generation	19
Table 8. San Diego North County Fuel Facility Trip Generation - Adjusted to 30 Fueling Positions	20
Table 9. California Costco Business Center & Warehouse Fuel Facility Trip Generation Comparison	21
Table 10. Trip Generation Comparison Between 30 and 36 Fueling Positions Based on Regression Analysis	22
Table 11. California Costco Business Center with Fuel Facility Internal Trip Characteristics	23
Table 12. San Diego North County Costco Fuel Facility Shifted Trips Characteristics	24
Table 13. Trip Characteristics for Costco Fuel Facility Addition	25
Table 14. San Marcos Costco Business Center Fuel Facility Addition Trip Generation Estimate	26
Table 15. Existing Roadway Network Characteristics.....	43
Table 16. Study Intersection Crash Type and Severity Summary, 2018-2022	45
Table 17. Year 2023 Existing Intersection Operations	46
Table 18. Year 2023 Existing Weekday Roadway Segment Operations	51
Table 19. Cumulative In-Process Development Trip Generation Summary	55
Table 20. Year 2025 Near-Term Without Project Intersection Operations.....	59
Table 21. Year 2025 Near-Term Without Project Weekday Roadway Segment Operations.....	60
Table 22. Year 2025 Near-Term With Project Intersection Operations.....	61
Table 23. Year 2025 Near-Term With Project Improved Intersection Operations – Intersection 2	67
Table 24. Year 2025 Near-Term With Project Improved Intersection Operations – Intersection 3	69
Table 25. Year 2025 Near-Term With Project Improved Intersection Operations – Intersection 4	70
Table 26. Year 2025 Near-Term With Project Weekday Roadway Segment Operations.....	72
Table 27. Year 2025 Near-Term With Project Conditions 95th Percentile Queuing Analysis	75
Table 28. SimTraffic 95 th Percentile Queue - Southbound Shared Through-Right.....	78
Table 29. San Diego North County Costco Fuel Facility Queues.....	80
Table 30. San Diego North County Costco Fuel Facility Queues – Adjusted to 30 Fueling Positions	81
Table 31. California Costco Business Center & Warehouse Fuel Facility Queue Comparison.....	81
Table 32. Maximum and 95th Percentile Queue Comparison Between 30 and 36 Fueling Positions Based on Regression Analysis	82
Table 33. Forecasted Maximum and 95th Percentile Queues for 36 Fueling Position Facility	82
Table 34. Horizon Year 2050 Without Project Intersection Operations.....	89
Table 35. Horizon Year 2050 Without Project Weekday Roadway Segment Operations.....	93
Table 36. Horizon Year 2050 With Project Intersection Operations	94
Table 37. Year 2050 Horizon Year With Project Improved Intersection Operations – Intersection 4.....	99
Table 38. Horizon Year 2050 With Project Weekday Roadway Segment Operations	100

APPENDICES

Appendix A.	Scope of Work & Confirmation Emails
Appendix B.	Signal Timing Data
Appendix C.	Regression Analysis
Appendix D.	San Marcos Costco Business Center Fuel Addition Traffic Reassignment
Appendix E.	Crash Data
Appendix F.	Year 2023 Existing Traffic Counts
Appendix G.	Year 2023 Existing Conditions Operations Worksheets
Appendix H.	In-Process Development Trip Assignments
Appendix I.	Year 2025 Near-Term Without Project Operations Worksheets
Appendix J.	Year 2025 Near-Term With Project Operations Worksheets
Appendix K.	Side-By-Side Operations Comparison
Appendix L.	Year 2025 Near-Term With Project Improved Operations Worksheets
Appendix M.	SANDAG TFIC Model Volumes
Appendix N.	Horizon Year 2050 Without Project Operations Worksheets
Appendix O.	Horizon Year 2050 With Project Operations Worksheets
Appendix P.	Horizon Year 2050 With Project Improved Operations Worksheets



Section 1

Executive Summary

Executive Summary

Kittelson & Associates, Inc. (Kittelson) has prepared a Local Transportation Analysis (LTA) for the San Marcos Costco Business Center Fuel Facility Addition. Costco Wholesale (Costco) proposes to add a fuel facility to the existing Costco Business Center located at 150 S Bent Avenue in San Marcos, California. The proposed fuel facility is to be located in the northeast corner of the site, southwest of the Bent Avenue / Grand Avenue intersection. The existing Costco site contains a 144,013 square-foot business center warehouse. The Project proposes to add a fuel facility with eighteen (18) fuel dispensers for a total of thirty-six (36) vehicle fueling positions. The anticipated build out year for the fuel facility is 2025.

The fuel facility will operate from approximately 6:00 AM to 8:00 PM Monday through Friday, 6:00 AM to 7:00 PM on Saturday, and from 7:00 AM to 6:00 PM on Sunday.

Access to the new fuel facility is planned via relocation of the site's existing northern Costco driveway to the south approximately 150 feet, and through the existing middle and southern Costco driveways. For conservative purposes, the analysis presented in this report assumes all traffic generated by the fuel facility addition will access the site from the northern Costco driveway.

To best evaluate the anticipated transportation characteristics of the San Marcos Costco Business Center fuel facility addition, Kittelson's consistently maintained Costco database was used in conjunction with San Diego North County-specific Costco data to develop the trip generation estimate since it provides use-specific data that most accurately represents the anticipated traffic characteristics of the unique development type. The new San Marcos Costco Business Center fuel facility is estimated to generate 2,409 weekday daily net new trip ends. Of these, 145 are estimated to occur in the weekday AM peak hour (73 inbound / 72 outbound), 202 are estimated to occur in the weekday PM peak hour (101 inbound / 101 outbound). Additionally, the fuel facility addition is estimated to generate 239 net new trip ends during the Saturday midday peak hour (119 inbound / 120 outbound).

Table 1 summarizes traffic operations conditions for the study intersection under year 2023 existing conditions, near-term 2025 without project conditions, near-term 2025 with project conditions, as well as horizon year 2050 without project and horizon year 2050 with project conditions. Existing traffic volumes were developed from traffic counts collected in November 2023. Near-term year 2025 traffic volumes were forecast by adding trips from in-process developments to existing volumes. Horizon year 2050 traffic volumes were forecast by applying segment-based annual growth identified in travel demand model (TDM) information provided by the SANDAG Transportation Forecast Information Center (TFIC) to existing volumes. With Project traffic volumes were forecast by adding the estimated trip generation for the San Marcos Costco Business Center fuel facility to the year 2025 and year 2050 Without Project traffic volumes.

Given that Caltrans no longer sets a minimum acceptable LOS for its facilities and focuses on adverse effects to 95th percentile queue lengths, City of San Marcos LOS D operation threshold was applied to all study intersections, except for study intersections along W San Marcos Boulevard, where the City of San Marcos identifies LOS E as the operational threshold.

Table 1. Study Intersections LOS Operations Summary

Intersection	Jurisdiction	Year 2023 Existing (AM / PM / SAT)	Year 2025 Near Term Without Project (AM / PM / SAT)	Year 2025 Near Term With Project (AM / PM / SAT)	Horizon Year 2050 Without Project (AM / PM / SAT)	Horizon Year 2050 With Project (AM / PM / SAT)
Las Posas Rd & SR-78 WB Ramps	Caltrans	D / C / C	D / C / C	E / C / D	D / C / C	E / C / D
S Las Posas Rd & Grand Ave	City of San Marcos	D / E / D	E / F / D	E / F / D	D ¹ / F / D	E / F / D
Via Vera Cruz & Grand Ave	Caltrans	D / E / D	D / E / D	D / F / E	E / F / D	E / F / E
Linda Vista Dr & Grand Ave	City of San Marcos	B / D / B	B / E / C	C / F / C	B / F / B	B / F / C
S Bent Ave & Grand Ave	City of San Marcos	B / B / B	B / B / B	B / C / C	B / C / B	B / D / C
S Bent Ave & Northern Costco Dwy	City of San Marcos	B / B / B	B / B / B	C / F / F	B / B / B	C / F / F
S Bent Ave & Industrial Dwy	City of San Marcos	B / A / B	B / A / B	B / B / B	B / B / B	B / B / B
S Bent Ave & Middle Costco Dwy	City of San Marcos	B / B / B	B / B / B	B / C / C	B / B / B	B / C / C
S Bent Ave & Southern Costco Dwy	City of San Marcos	C / C / C	B / C / C	D / F / F	C / C / D	D / F / F
Via Vera Cruz & W San Marcos Blvd	City of San Marcos	C / C / D	C / C / D	C / C / D	C / C / D	C / C / C ¹
S Bent Ave & W San Marcos Blvd	City of San Marcos	C / C / D	D / C / D	D / E / E	D / D / D	D / E / E
Grand Ave & W San Marcos Blvd	City of San Marcos	D / F / E	D / F / E	D / F / E	D / F / F	D / F / F
SR-78 EB Ramps & W San Marcos Blvd	Caltrans	A / A / B	A / A / B	A / A / B	A / A / B	A / A / B
Knoll Rd & W San Marcos Blvd	Caltrans	C / C / C	C / C / C	C / C / C	C / C / C	C / C / C

Bold corresponds to substandard LOS operations.

¹ Some minor improvements in operations were observed in horizon year 2050 due to a shift in future traffic patterns occurring as a result of future roadway network improvements, including the new connection of Grand Avenue from W San Marcos Boulevard to Discovery Boulevard.

As shown in Table 1, several intersections operate at LOS E or F during at least one scenario. The following intersections were evaluated for potential improvements:

- **S Las Posas Road / SR-78 WB Ramp**
 - o Given the right-of-way constraints limiting the potential for widening and that the Project does not add vehicles or queue to the westbound off-ramp, no improvements are recommended.
- **S Las Posas Road / Grand Avenue**

- o Under near-term year 2025 conditions, signal timing adjustments will restore operations to pre-project conditions. Costco Wholesale will fund the retiming of the traffic signal.
- **Grand Avenue / Via Vera Cruz / SR-78 EB Ramp**
 - o Under near-term year 2025 conditions, signal timing adjustments will restore operations to pre-project conditions. Costco Wholesale will fund the retiming of the traffic signal.
 - o At the request of City of San Marcos staff, the provision of a separate southbound right-turn lane was evaluated at this location, consistent with other recently approved developments. Costco Wholesale will contribute a fair share contribution of 31.1% of the cost to construct this improvement.
- **Linda Vista Drive / Grand Avenue**
 - o Under near-term year 2025 conditions, the provision of separate northbound left-turn and right-turn lanes (to allow a right-turning vehicle to get around a vehicle waiting to make a left-turn) will restore operations to pre-project conditions. Costco Wholesale will restripe Linda Vista Drive to provide two 10-foot lanes with 25 feet of storage approaching Grand Avenue, with a 6-foot hatched painted median to accommodate heavy vehicle turns without encroaching on opposing traffic.
 - o At the request of City of San Marcos staff, a traffic signal was evaluated at this location under Horizon Year 2050 conditions. Costco Wholesale will contribute a fair share contribution of 41.2% of the cost to construct this improvement.
- **S Bent Avenue / N Costco Driveway**
 - o Given that conditions modeled for the purpose of this analysis are conservative, that members may reroute appropriately within the site, and that there may be gaps in traffic in addition to those reflected in the intersection analysis presented, no improvements are recommended.
- **S Bent Avenue / S Costco Driveway**
 - o Given that there may be gaps in traffic in addition to those reflected in the intersection analysis presented and that the critical intersection operations are not driven by Costco member traffic, no improvements are recommended.
- **W San Marcos Boulevard / Grand Avenue**
 - o Given that the addition of Project traffic is forecasted to improve intersection average delay, no improvements are recommended.

The results of the intersection analysis indicate that the fuel facility will add delays to some intersections that are currently operating near or over capacity, but operational improvements are not recommended for the reasons noted above. The Project would have some adverse effects to delay at these locations, but overall daily operations of the network are anticipated to be adequate.

With the construction of the Project, Costco will construct a Class I bike path along Grand Avenue between Linda Vista Drive and S Bent Avenue along the northern boundary of the site as an alternative improvement, given the right-of-way constraints limiting the potential for other intersection improvements.

Based on the report's analyses and evaluation of findings, the addition of traffic generated by the Project does not adversely affect roadway segment capacity, therefore no roadway segment improvements are recommended for the proposed fuel facility at the existing Costco Business Center.



Section 2

Introduction

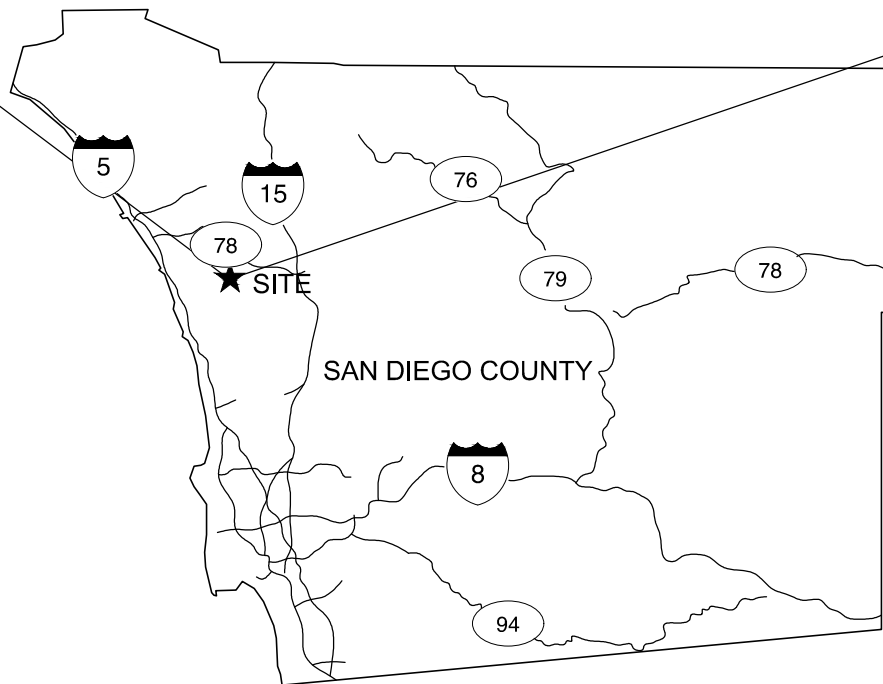
Introduction

Kittelson & Associates, Inc. (Kittelson) has prepared a Local Transportation Analysis (LTA) for the proposed fuel facility addition at the existing San Marcos Costco Business Center Warehouse located in San Marcos, California.

PROJECT DESCRIPTION

Costco plans to construct a new fuel facility at the existing San Marcos Costco Business Center warehouse located at 150 S Bent Avenue in San Marcos, California. The fuel facility will replace existing parking in the northeast corner of the existing site, southwest of the Bent Avenue / Grand Avenue intersection, south of SR-78, as shown in **Figure 1**. The Project will also include relocation of the northern most existing Costco driveway to the south to provide additional queue storage for the fuel facility. The existing Costco Business Center currently contains a 144,013 square-foot warehouse. Costco plans to construct a fuel facility with eighteen (18) fuel dispensers for a total of thirty-six (36) vehicle fueling positions. **Figure 2** illustrates the overall site plan, including the existing Costco Warehouse and planned fuel facility.

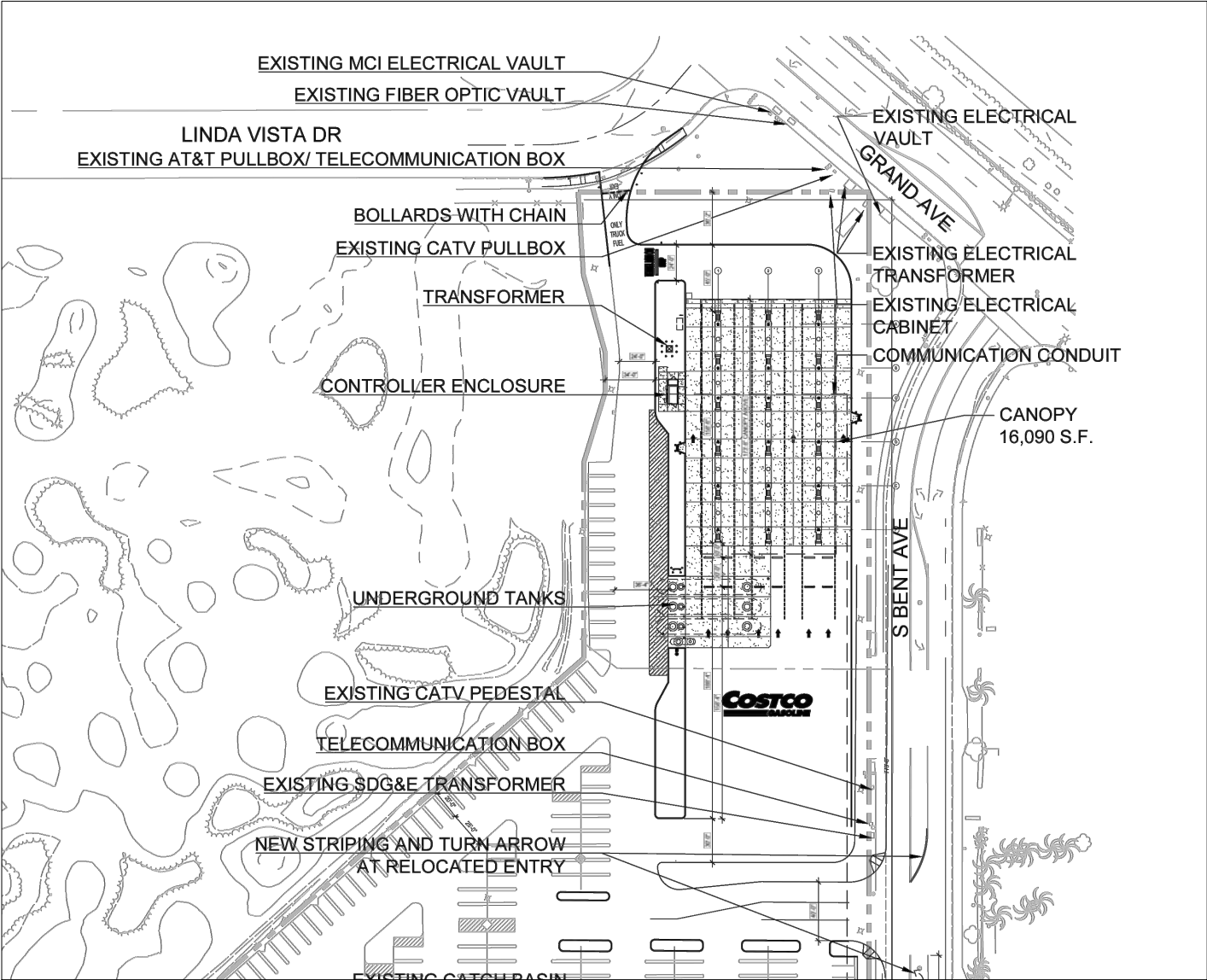
The Project is anticipated to be constructed and operational in 2025. The fuel facility will maintain operating hours between 6:00 AM and 8:00 PM Monday through Friday, 6:00 AM and 7:00 PM on Saturday, and 7:00 AM and 6:00 PM on Sunday.



- - Study Intersection
- - Site Access Intersection

Site Vicinity Map
San Marcos, CA

Figure
1



PROJECT DATA

CLIENT: COSTCO WHOLESALE
999 LAKE DRIVE
ISSAQUAH, WA 98027

PROJECT ADDRESS: 150 S BENT AVENUE
SAN MARCOS, CA 92078

SITE DATA:

TOTAL SITE AREA: 14.30 ACRES (619,691 SF)

JURISDICTION: CITY OF SAN MARCOS

ZONING: COMMERCIAL (C)

C ZONE SETBACKS: REQUIRED FRONT: 10 FT ACTUAL FRONT: 11'-11"
(LANDSCAPED) SIDE: 10 FT SIDE: 36'-2"
(LANDSCAPED) REAR: 10 FT REAR: 34'-0"

CANOPY SETBACKS: REQUIRED FRONT: 20 FT ACTUAL FRONT: 22'-5"
SIDE: 20 FT SIDE: 73'-7"
REAR: 15 FT REAR: 66'-0"

PUMP ISLAND SETBACKS: REQUIRED FRONT: 10 FT ACTUAL FRONT: 34'-5"
SIDE: 10 FT SIDE: 81'-2"
REAR: 10 FT REAR: 78'-0"

BOUNDARIES INFORMATION: THIS PLAN WAS DEVELOPED AND REVIEWED BY MG2 FOR COMPLIANCE WITH COSTCO STANDARDS AND REQUIREMENTS ONLY.

BUILDING DATA:

TOTAL BUILDING FOOTPRINT AREA: 204,919 SF

INCLUDES:

EXISTING WAREHOUSE AREA	142,962 NET SF
FUEL FACILITY AREA	144,000 GROSS SF
MECHANICAL ROOM	60,906 SF
PROPOSED CANOPY	271 SF
	12,477 SF

PARKING DATA:

EXISTING PARKING: 794 STALLS

INCLUDES:

EXISTING PARKING PROVIDED:	
9' X 15' STALLS	214 STALLS
9' X 20' STALLS	520 STALLS
10' X 18' STALLS	45 STALLS
ACCESSIBLE STALLS (2 PER 100)	15 STALLS
(1 IN 6 VAN REQ)	(4 OF 15)

PROPOSED PARKING: 583 STALLS

CITY PARKING STANDARDS REQUIRE A MINIMUM OF ONE (1) PARKING STALL FOR EVERY 250 SQUARE FEET OF THE GFA RETAIL USE IN ADDITION TO ONE (1) PARKING STALL FOR EVERY 1,000 SQUARE FEET.

RETAIL SPACE: (122,962 SQUARE FEET/250 = 492 STALLS)
CANOPY: (12,477 SF/1,000 = 13)

FUELING POSITIONS: 30 STALLS

TOTAL REQUIRED PARKING: 505

THE PROJECT WILL REMOVE 211 PARKING SPACES, FOR AN OVERALL TOTAL OF 583 PARKING STALLS FOR THE SITE

RECEIVED FROM COSTCO WHOLESALE : April 2024

Fuel Addition Site Plan
San Marcos, CA

Figure
2

SCOPE OF THE REPORT

This study was prepared in consultation with City of San Marcos (City) staff in accordance with City of San Marcos's Transportation Impact Analysis Guidelines (Reference 1). The City of San Marcos reviewed, provided comments, and generally agreed with the scope and key assumptions within this LTA in October 2023. *Appendix A includes the Local Transportation Analysis Assumptions and Methodology memorandum and coordination emails from the City of San Marcos related to project scoping.*

This study evaluates the impacts to the transportation system associated with the Project and includes:

- Existing land use and transportation system conditions, including intersections within the site vicinity for the typical weekday AM, weekday PM, and Saturday midday peak hours;
- Trip generation and distribution estimates for the Project;
- Intersection and roadway segment analysis under future 2025 traffic conditions with the addition of identified in-process developments without the addition of Project traffic (near-term without project) during the weekday AM, weekday PM, and Saturday midday peak hours;
- Intersection and roadway segment analysis under future 2025 traffic conditions with the addition of identified in-process developments and the addition of Project traffic (near-term with project) during the weekday AM, weekday PM, and Saturday midday peak hours;
- Intersection and roadway segment analysis under future 2050 traffic conditions with the addition of annual compounded growth applied to existing conditions without the addition of Project traffic (horizon year without project) during the weekday AM, weekday PM, and Saturday midday peak hours;
- Intersection and roadway segment analysis under future 2050 traffic conditions with the addition of annual compounded growth applied to existing conditions and the addition of Project traffic (horizon year with project) during the weekday AM, weekday PM, and Saturday midday peak hours;
- Identification and feasibility review of transportation improvements at the study intersections under all scenarios including Project traffic;
- Evaluation of site access intersections, on-site parking and circulation;
- Summary of findings and recommendations.



Section 3

Methodologies and Criteria

Methodologies and Criteria

This section outlines an overview of the methodology for the transportation analysis related to roadway capacity. The following discusses the performance standards and evaluation criteria as well as the analysis software approach for the level of service analysis.

INTERSECTION LEVEL OF SERVICE

Operations at the study intersections were assessed to determine both level-of-service (LOS) and average delay in seconds. The City of San Marcos uses performance measures based on LOS, which describes the operating conditions experienced by users of a facility. Level of service (LOS) is a qualitative measure of the effect of several factors, including speed, travel time, traffic interruptions, freedom to maneuver, driving comfort, and convenience. Levels of service are designated "A" through "F," from best to worst, which cover an entire range of traffic operations that might occur. LOS A through E generally represent traffic volumes at less than roadway capacity while LOS F represents over capacity or forced flow conditions. In general, LOS C and D are considered acceptable while LOS E and LOS F are not. These conditions are generally described in **Table 2**.

Table 2. General Level of Service Definitions

LOS	Description
A	Free Flow or Insignificant Delays: Vehicles are completely unimpeded in their ability to maneuver within the traffic stream. Control delay at signalized intersections is minimal.
B	Stable Operation or Minimal Delays: The ability to maneuver within the traffic stream is only slightly restricted, and control delay at signalized intersections is not significant.
C	Stable Operation or Acceptable Delays: The ability to maneuver and change lanes is somewhat restricted, and average travel speeds may be about 5% of the free flow speed.
D	Approaching Unstable or Tolerable Delays: Small increases in flow may cause substantial increases in delay and decreases in travel speed.
E	Unstable Operation or Significant Delays: Significant delays may occur, and average travel speeds may be 33% or less of free flow speed.
F	Forced Flow or Excessive Delays: Congestion, high delays, and extensive queuing occur at critical signalized intersections with urban street flow at extremely low speeds.

Source: *Highway Capacity Manual, Transportation Research Board, Washington DC, 2016*

In conformance with the City's requirements, existing weekday AM and PM peak hour and Saturday midday peak hour operating conditions for the study intersections were evaluated using Highway Capacity Manual 6th Edition (HCM, Reference 2) methodologies.

Intersection analysis was conducted using the operational methodology outlined in the HCM at all signalized and unsignalized intersections. The HCM calculates a weighted average stop delay in seconds per vehicle at signalized and unsignalized intersections and assigns a level of service designation based on the delay. At two-way stop-controlled intersections, LOS is defined for each minor-street movement and the major-street left turns, as opposed to the overall intersection (given that major-street through vehicles are assumed to experience zero delay). **Table 3** presents the relationship of average delay to level of service for signalized intersection and unsignalized (two-way stop-controlled (TWSC) and all-way stop-controlled

(AWSC)) intersections. As shown, the thresholds are different at unsignalized intersections compared to traffic signals, because user perceptions differ among transportation facility types and “unsignalized intersections are also associated with more uncertainty for users, as delays are less predictable than they are at signals” (Reference 2.)

Table 3. Intersection Level of Service Definitions

LOS	Average Delay Per Vehicle (seconds)	
	Traffic Signal	TWSC / AWSC (Unsignalized)
A	≤10.0	≤10.0
B	>10.0 and ≤20.0	>10.0 and ≤15.0
C	>20.0 and ≤35.0	>15.0 and ≤25.0
D	>35.0 and ≤55.0	>25.0 and ≤35.0
E	>55.0 and ≤80.0	>35.0 and ≤50.0
F	>80.0	>50.0

Source: *Highway Capacity Manual*, Transportation Research Board, Washington DC, 2016

ROADWAY LEVEL OF SERVICE AND CAPACITY

Roadway segment LOS and volume-to-capacity (v/c) evaluation conducts analysis of roadway segment performance based on several factors including average daily traffic (ADT), functional classification, capacity, and geometrics. **Table 4** provides the roadway segment capacity thresholds outlined in the City of San Marcos Transportation Impact Analysis Guidelines (Reference 1).

Table 4. Roadway Classifications, Capacity, and LOS

Street Classification	Lanes	LOS A	LOS B	LOS C	LOS D	LOS E (Capacity)
Expressway	6	30,000	42,000	60,000	70,000	80,000
Prime Arterial	6	25,000	35,000	50,000	55,000	60,000
Major Arterial	6	20,000	28,000	40,000	45,000	50,000
Major Arterial	4	15,000	21,000	30,000	35,000	40,000
Major Arterial (One-Way)	3	12,500	16,500	22,500	25,000	27,500
Major Arterial (One-Way)	2	10,000	13,000	17,500	20,000	22,500
Secondary Arterial / Collector	4	10,000	14,000	20,000	25,000	30,000
Collector (No Center Lane)	4	5,000	7,000	10,000	13,000	15,000
Collector (Continuous Left-Turn Lane)	2	5,000	7,000	10,000	13,000	15,000
Collector (No Fronting Property)	2	4,000	5,500	7,500	9,000	10,000
Collector (Commercial-Industrial Fronting)	2	2,500	3,500	5,000	6,500	8,000
	2	2,500	3,500	5,000	6,500	
Collector (One-Way)	3	11,000	14,000	19,000	22,500	26,000
	2	7,500	9,500	12,500	15,000	
Collector (One-Way)	1	2,500	3,500	5,000	6,500	7,500
Sub-Collector (Single-Family)	2	-	-	2,200	-	-

Source: *City of San Marcos Traffic Impact Analysis Guidelines* (Reference 1)

The capacity thresholds outlined in Table 4 are identified for planning purposes to determine roadway functional classifications. A roadway segment's actual capacity may vary due to geometric attributes and may be influenced by the operations of intersections along the roadway corridor.

CITY OF SAN MARCOS LOS STANDARDS

The City of San Marcos General Plan (Mobility, Reference 3) provides guidance for maintaining intersection LOS standards as noted below:

- **Policy M-1.4:** *LOS D or better for Vehicles as prioritized mode – Generally provides facilities that have minimum vehicle congestion during peak periods. Most motorists are delayed less than 55 seconds at a signal (or less than one signalized cycle).*
- Additional guidance is provided for intersections along identified roadways, including a LOS E vehicular operational threshold for intersections along San Marcos Boulevard between Discovery Street and Grand Avenue.

Per the LOS standard identified for intersections and roadway segments in Policy M-1.4, the City of San Marcos Transportation Impact Analysis (TIA) Guidelines (Reference 1) provide the following thresholds to determine if a project will be required to provide improvements for study facilities:

- For study intersections:
 - *Triggers an intersection operating at acceptable LOS to operate at unacceptable LOS and increases the average delay per vehicle by more than 2.0 seconds.*
 - *Increases the average delay per vehicle for a study intersection that is already operating at unacceptable LOS by more than 2.0 seconds.*
- For study segments:
 - *Triggers a roadway segment operating at acceptable LOS to operate at unacceptable LOS and increases the volume/capacity (v/c) ratio by more than 0.02.*
 - *Increases the v/c ratio for a study roadway segment that is already operating at unacceptable LOS by more than 0.02.*

Any identified improvements should increase intersection or roadway segment performance to acceptable or pre-project conditions.

CALTRANS PERFORMANCE STANDARDS

Intersections associated with freeway on- and off-ramps fall under Caltrans jurisdiction. Caltrans updated its guidance in 2020 to include metrics to evaluate transportation impacts based on vehicle miles traveled (VMT) and no longer sets a minimum acceptable LOS for its facilities.

Caltrans has prepared the Transportation Analysis Framework (TAF) and Transportation Analysis under CEQA (TAC) documents to guide implementation of SB 743. The TAF and TAC establish Caltrans guidance on how to analyze induced travel associated with transportation projects and how to determine impact significance under CEQA, respectively. These documents guide transportation impact analysis for projects on the State Highway System (SHS). For land use projects and plans affecting the SHS, Caltrans's Vehicle Miles Traveled-Focused Transportation Impact Study Guide (Reference 4) provides guidance to assess the

potential for impacts related to land development projects. Caltrans transitioned away from LOS performance standards and instead focused on VMT to identify significant CEQA impacts.

"For land use projects and plans, automobile delay is no longer considered a significant impact on the environment under CEQA (SB 743, 2013). Caltrans review of land use projects and plans is focused on a VMT metric, consistent with changes to the CEQA Guidelines (California Code of Regulations Section 15064.3(b)(1)). This VMT-focused TISG provides a foundation for review of how lead agencies apply the VMT metric to CEQA project analysis. "

Caltrans published in July 2020 an interim Land Development and Intergovernmental Review (LDIGR) Safety Review Practitioners Guidance to provide immediate direction about the safety review while final guidance is being developed. Caltrans's LDIGR provides guidance that applies to proposed land use projects that may affect the highway system. It does consider land development projects influence on safety such as queuing at freeway off-ramps resulting in slow or stopped traffic on the mainline or speed differentials between adjacent lanes and queuing exceeding turn pocket length that impedes through-traffic.

Caltrans identifies the following occurrences as adverse effects:

- If trips generated by the Project cause the 95th percentile queue lengths at Caltrans off-ramp intersections to exceed the available capacity at intersection turn lane pockets.

In instances where trips generated by the Project cause 95th percentile queue lengths at Caltrans off-ramp intersections to exceed the available storage to create an adverse effect, improvement would be required through coordination with Caltrans.

PERFORMANCE STANDARD SUMMARY

The following study intersections were identified during the scoping process to experience 50 or more Project trips during any peak hour and are included in the analysis herein:

1. S Las Posas Road / SR-78 Westbound Ramp
2. S Las Posas Road / Grand Avenue
3. Grand Avenue / Via Vera Cruz / SR-78 Eastbound Ramp
4. Grand Avenue / Linda Vista Drive
5. Grand Avenue / S Bent Avenue
 - A. S Bent Avenue / North Costco Driveway
 - B. S Bent Avenue / Industrial Driveway
 - C. S Bent Avenue / Middle Costco Driveway
 - D. S Bent Avenue / South Costco Driveway
6. W San Marcos Boulevard / Via Vera Cruz
7. W San Marcos Boulevard / S Bent Avenue
8. W San Marcos Boulevard / Grand Avenue
9. W San Marcos Boulevard / SR-78 Eastbound Ramp
10. W San Marcos Boulevard / Knoll Road / SR-78 Westbound Ramp

The jurisdiction, traffic control, and performance standard for each study intersection are provided in **Table 5**.

Table 5. Study Intersection Performance Standards

Study Intersection	Jurisdiction	Traffic Control	Performance Standard ¹
1. S Las Posas Road / SR-78 WB Ramp	Caltrans	Signal	LOS D
2. S Las Posas Road / Grand Avenue	San Marcos	Signal	LOS D
3. Grand Avenue / Via Vera Cruz / SR-78 EB Ramp	Caltrans	Signal	LOS D
4. Grand Avenue / Linda Vista Drive	San Marcos	TWSC	LOS D
5. Grand Avenue / S Bent Avenue	San Marcos	Signal	LOS D
A. S Bent Avenue / North Costco Driveway	San Marcos	TWSC	LOS D
B. S Bent Avenue / Industrial Driveway	San Marcos	TWSC	LOS D
C. S Bent Avenue / Middle Costco Driveway	San Marcos	TWSC	LOS D
D. S Bent Avenue / South Costco Driveway	San Marcos	TWSC	LOS D
6. W San Marcos Boulevard / Via Vera Cruz	San Marcos	Signal	LOS E
7. W San Marcos Boulevard / S Bent Avenue	San Marcos	Signal	LOS E
8. W San Marcos Boulevard / Grand Avenue	San Marcos	Signal	LOS E
9. W San Marcos Boulevard / SR-78 EB Ramp	Caltrans	Signal	LOS D
10. W San Marcos Boulevard / Knoll Road / SR-78 WB Ramp	Caltrans	Signal	LOS D

¹ As Caltrans has moved away from LOS criteria, LOS standards according to the City of San Marcos standards for intersections 1, 3, 9, and 10 have been applied.

The following roadway segments were identified through the scoping process to be included in the analysis herein:

1. S Las Posas Road, between SR-78 Westbound Ramp and Grand Avenue
2. Grand Avenue, between S Las Posas Road and Via Vera Cruz
3. Grand Avenue, between Via Vera Cruz and Linda Vista Drive
4. Grand Avenue, between Linda Vista Drive and S Bent Avenue
5. Grand Avenue, between S Bent Avenue and W San Marcos Boulevard
6. S Bent Avenue, between Grand Avenue and W San Marcos Boulevard
7. W San Marcos Boulevard, between Via Vera Cruz and S Bent Avenue
8. W San Marcos Boulevard, between S Bent Avenue and Grand Avenue
9. W San Marcos Boulevard, between Grand Avenue and SR-78 Eastbound Ramp
10. W San Marcos Boulevard, between SR-78 Eastbound Ramp and Knoll Road

All roadway segments identified for analysis in this report are within City of San Marcos jurisdiction and are therefore subject to San Marcos operational standards. **Table 6** outlines the performance standard for each study roadway segment.

Table 6. Study Roadway Segment Performance Standards

Roadway Segment	Performance Measure
S Las Posas Road, between SR-78 Westbound Ramp and Grand Avenue	LOS D
Grand Avenue, between S Las Posas Road and Via Vera Cruz	LOS D
Grand Avenue, between Via Vera Cruz and Linda Vista Drive	LOS D
Grand Avenue, between Linda Vista Drive and S Bent Avenue	LOS D
Grand Avenue, between S Bent Avenue and W San Marcos Boulevard	LOS D
S Bent Avenue, between Grand Avenue and W San Marcos Boulevard	LOS D
W San Marcos Boulevard, between Via Vera Cruz and S Bent Avenue	LOS D
W San Marcos Boulevard, between S Bent Avenue and Grand Avenue	LOS D
W San Marcos Boulevard, between Grand Avenue and SR-78 Eastbound Ramp	LOS D
W San Marcos Boulevard, between SR-78 Eastbound Ramp and Knoll Road	LOS D
S Las Posas Road, between SR-78 Westbound Ramp and Grand Avenue	LOS D
Grand Avenue, between S Las Posas Road and Via Vera Cruz	LOS D

TRAFFIC ANALYSIS METHODOLOGY

The signalized and unsignalized intersection operations analyses described in this report were performed in accordance with the procedures stated in the Highway Capacity Manual 6th Edition (HCM, Reference 2) using Synchro 11 software. Synchro 11 is unable to implement the HCM 6th edition methodology at signalized intersections with custom or non-NEMA phasing, unique ring barrier structures, pedestrian split times that exceed maximum split times, or U-turns. Due to these limitations, the signalized intersection at Grand Avenue and Via Vera Cruz and SR-78 was analyzed using the HCM 2000 methodology in Synchro.

Peak 15-minute flow rates were used in the evaluation of all intersection levels of service to provide analyses based on a reasonable worst-case scenario. The peak hours were identified as the four consecutive 15-minute periods with the highest volumes during the weekday AM (7:00 AM – 9:00 AM), weekday PM (4:00 PM – 6:00 PM), and Saturday midday (11:00 AM – 2:00 PM) peak periods. These represent critical time periods for evaluation based on peak demand on the surrounding transportation system and the peak demand associated with the Project.

Therefore, the analyses reflect conditions that are only likely to occur for 15 minutes out of each average peak hour. During all other periods, the transportation system will likely operate under conditions better than the conditions described in this report.

The analyses presented in this report made the following assumptions:

- Saturation flow rate of 1,900 passenger cars per hour per lane.
- Speeds based on posted speed limits.
- Turn bay lengths based on striped storage lengths measured from aerial images.
- Existing pedestrian and bicycle volumes assumed across all analysis periods.

- Peak Hour Factor (PHF) – Existing PHF as calculated from traffic counts was applied to existing scenarios. Future year 2025 and 2050 conditions assumed a 0.95 PHF at all study intersections except those exceeding 0.95 under existing conditions.

Signal timing split and cycle length optimization was assumed under future year 2025 and 2050 scenarios at signalized study intersections that are not part of a coordinated signal system. If part of a coordinated system, the signal timing remained the same as existing conditions. *Appendix B includes existing signal timing data.*



Section 4

Project Traffic

Project Traffic

This section discusses the development of the trip generation and distribution pattern for the proposed fuel facility addition.

TRIP GENERATION

Costco Trip Generation Database

For more than 20 years, Kittelson has maintained a database of traffic data and travel characteristics for Costco Wholesale, including data about Business Center fuel facilities. The database contains transportation information such as trip rates, trip type percentages, and parking demand for Costco locations throughout the United States as well as Canada and Mexico. The database is updated periodically each time new Costco traffic counts or other information becomes available to Kittelson.

To best evaluate the anticipated transportation characteristics of the San Marcos Costco Business Center fuel facility addition, the Costco database was used to develop the trip generation estimate since it provides use-specific data that most accurately represents the anticipated traffic characteristics of the unique development type. Costco has invested significant time and effort into developing this use-specific trip generation database for its Warehouses, Business Centers and its fuel facilities. Because of the members-only access requirement and the nature of Costco sales, Costco members have unique travel characteristics and patterns, which are different from customers of other retail facilities or more traditional gas stations or convenience stores. These unique characteristics and patterns exist in the trip generation for Costco Warehouses/Business Centers, Costco Gasoline fuel facilities, and the interaction of trips between the two.

The Costco-specific trip generation data presented herein follows nationally accepted practices for trip generation data collection as recommended by the Institute of Transportation Engineers (ITE) and presents a robust dataset upon which to confidently and accurately predict the trip generation of the San Marcos Costco Business Center fuel facility.

Costco Fueling Position Adjustment Factors

Based on coordination with the City of San Marcos, new and historical trip generation data was collected at surrounding local Costco fuel facilities at standard Costco Warehouses in San Diego North County. There are currently no Costco Business Centers with fuel facilities in the North County area. **Table 7** provides a summary of the trip generation at each North County site.

Table 7. San Diego North County Costco Fuel Facility Trip Generation

Site	Existing Fueling Positions	Data Collection	Weekday Daily	Weekday AM Peak Hour	Weekday PM Peak Hour	Saturday Midday Peak Hour
Vista, CA	16	March 2019	5,207	386	397	467
Carmel Mountain, CA	22	June 2023	9,284	518	660	704
Carlsbad, CA	22	March 2022	8,868	612	594	598
San Marcos, CA	24	June 2023	8,970	420	672	820

Source: Kittelson & Associates, Inc., 2024

These North County sites have 16-24 fueling positions, whereas the Project will have 36 positions. While there are Costco fuel facilities larger than 30 or 32 fueling positions that have been approved, they are not yet open for data collection and the largest Costco fuel facilities in the database are currently 30-32 fueling positions. An adjustment factor for each time period was calculated based on the data available in the trip generation database and applied to the trip generations of the North County sites shown in Table 7 to reflect the expected trip generation of a 30-position Costco fuel facility in North County¹. **Table 8** presents the adjustment factors and corresponding adjusted trip generation for each local site and summarizes the average adjusted trip generation estimate for the Project. The adjustment factors presented in Table 8 were calculated by dividing the average trip generation for Costco fuel facilities with 30-32 fueling positions by the average trip generation for Costco fuel facilities with 16 and 22-24 fueling positions (based on data collected at other Costco Warehouse fuel facilities in California).

Table 8. San Diego North County Fuel Facility Trip Generation - Adjusted to 30 Fueling Positions

Site	Existing Fueling Positions	Weekday Daily	Weekday AM Peak Hour	Weekday PM Peak Hour	Saturday Midday Peak Hour
Average 30/32 FP Trip Generation		9,932	518	818	913
Average 16 FP Trip Generation		6,055	412	471	494
Adjustment Factor (16 FP – 30/32 FP)		1.64	1.26	1.74	1.85
Vista, CA	16	8,541	486	689	863
Average 30/32 FP Trip Generation		9,932	518	818	913
Average 22/24 FP Trip Generation		7,351	464	589	668
Adjustment Factor (22/24 FP – 30/32 FP)		1.35	1.12	1.39	1.37
Carmel Mountain, CA	22	12,544	579	916	962
Carlsbad, CA	22	11,972	684	825	818
San Marcos, CA	24	12,120	470	933	1,121
Average		11,294	555	841	941

Source: Kittelson & Associates, Inc., 2024

Costco Business Center Adjustment Factors

Fuel facilities at Costco Business Centers generate fewer (or similar) trips compared to typical Costco Warehouse fuel facilities, with the exception of the weekday AM peak hour. During the weekday AM peak hour, the Business Center locations generate more traffic than a standard Warehouse, likely because the Business Center is open during the AM peak hour while a standard Warehouse is not.

Table 9 compares the average trip generation for fuel facilities at Costco Business Centers in California with the average trip generation for fuel facilities at standard Costco Warehouses in California (with the same number of fueling positions) based on the data available in the trip generation database.

¹ The volumes for the local San Diego North County sites were normalized to 30 fueling position fuel facilities to be consistent with the *Costco Traffic Impact Analysis Assumptions and Methodology* Memorandum prepared by Kittelson & Associates, Inc and dated August 2023. Note that the use of both 30 and 32 fueling position facilities for this normalization result in a conservative trip generation estimate for a 30-position fuel facility.

Table 9. California Costco Business Center & Warehouse Fuel Facility Trip Generation Comparison

Site Type	Weekday Daily	Weekday AM	Weekday PM	Saturday Midday
Business Center Trips	6049	482	520	536
Warehouse Average Trips	6372	416	502	549
% Difference WH to BC	-5.1%	16.0%	3.6%	-2.3%

Source: Kittelson & Associates, Inc., 2024

Note: There are currently no existing Costco Business Center fuel facilities with more than 24 fueling positions (the Project will have 36 fueling positions). Data summarized in the table reflects Costco Business Center and Costco Warehouse locations in California with 16-24 fueling positions.

Comparing the trip generation data collected for Costco Warehouse fuel facilities and Costco Business Center fuel facilities in California, the fuel facilities at Business Centers generate fewer daily trips, but with a greater concentration of trips during the weekday AM and weekday PM peak hours. More specifically, the fuel facilities at Business Centers generate 5.1% less traffic on a weekday than a Costco Warehouse, 16.0% more traffic during the AM peak hour, 3.6% more traffic during the PM peak hour and 2.3% less traffic during the Saturday midday peak hour.

Based on these results, an adjustment was applied to the Project trip generation in Table 8 to reflect the ancillary use being to a Costco Business Center, rather than a standard Costco Warehouse. These results are presented in Table 14 later in this report.

Costco Fueling Position Forecast

As previously indicated, there are currently no Costco fueling facilities with more than 30 or 32 fueling positions open for data collection. The largest Costco Gasoline sites contained within Kittelson's Costco database are currently 32 fueling positions. As such, a conservative extrapolation approach was used to take the existing data for sites in the database and project in a conservative manner to estimate a trip generation for a fuel facility with 36 fueling positions. The following discussion presents the trend observed from trip generation studies at Costco Gasoline facilities in California, which shows that trip generation does not have a linear relationship to the number of fueling positions at a facility.

The industry standard ITE Trip Generation Manual currently reports trip generation rates for fuel stations based on the independent variable of pumps. Specific data for the Costco Gasoline facilities show that the correlation between trips and number of pumps isn't a linear relationship and therefore requires more careful consideration. In particular for Costco Gasoline facilities, membership base (since they are member-only facilities), market area, and adjacent warehouse activity appear to have a much greater influence on the activity levels of the associated fuel facilities than whether the facility is 12, 16, 18, 20, 24, 30, 32, or 36 fueling positions.

To further investigate the correlation between trip generation and pumps, an analysis was conducted comparing the average trip generation determined by counts at the various sized California Costco fuel facilities to the key variable of number of fueling positions.

REGRESSION ANALYSIS

Both a linear and logarithmic regression analysis were conducted on the trip generation data with the logarithmic trendline being a better fit to the dataset, as reflected by the resulting R^2 values. The R^2 value is

a statistical value (referred to as the coefficient of determination) that is used by the ITE *Trip Generation Manual* in the context of statistical models whose main purpose is to predict future outcomes based on other related information. It is the proportion of variability in a data set that is accounted for by the statistical model and provides a measure of how well future outcomes are likely to be predicted by a model. An R^2 value of 1.00 indicates that the regression line (or model) perfectly fits the data and an R^2 value of 0.00 indicates there is no relationship between the data and a given independent variable. The R^2 of 0.70 may be interpreted as indicating that the model fits 70% of the data and that for 70% of situations the model will predict the future outcome. The remaining 30% can be explained by unknown or inherent variability. The ITE *Trip Generation Manual* also presents liner and logarithmic regression analysis for the trip generation data it contains. A typical guideline when applying the ITE *Trip Generation Manual* is that data does not show a strong or reasonably predictive correlation or trend where the R^2 value is less than 0.75. In other words, if at least 75% of the data does not fit the statistical model, then the relationship between trip generation and the given variable should not be used for predicting future outcomes for trip generation. *Appendix C includes graphs illustrating the comparison of average trip generation versus number of fueling positions for the weekday AM, weekday PM, and Saturday midday peak hours as well as weekday daily conditions.*

As shown in Appendix C, the R^2 values for the logarithmic regression analysis for trip generation against fueling positions was greater than 0.75 for each time period analyzed. Therefore, the trendline fits the data set well and the projection to 36 fueling positions can be inferred from this data set. **Table 10** compares the expected trip generation for a 36-position Costco fuel facility to that of a 30-position Costco fuel facility in California.

Table 10. Trip Generation Comparison Between 30 and 36 Fueling Positions Based on Regression Analysis

Number of Fueling Positions	Weekday Daily	Weekday AM Peak Hour	Weekday PM Peak Hour	Saturday Midday Peak Hour
30	9,330	519	762	852
36	10,293	553	842	947
Percent Difference	10.3%	6.5%	10.6%	11.3%

Source: Kittelson & Associates, Inc., 2024

As summarized in Table 10, a 36-position fuel facility is forecast to generate 10.3% more traffic on a weekday than a 30-position fuel facility, 6.5% more traffic during the AM peak hour, 10.6% more traffic during the PM peak hour, and 11.3% more traffic during the Saturday midday peak hour.

Based on these results, an adjustment was applied to the Project trip generation in Table 8 to reflect the forecasted increase in trips associated with a 36-position fuel facility. These results are presented in Table 14 later in this report.

Costco Fuel Facility Trip Characteristics

The trip characteristics described below for internal trip capture between Costco Business Centers and their associated fuel facilities are based on data collected at existing Costco Business Centers with fuel facilities in California. The trip characteristics described below for pass-by and diverted trip capture from the surrounding street system are based on studies of customer surveys at existing Costco Gasoline fuel facilities

in California. The unique nature of Costco's members-only operations results in different trip characteristics than those observed at typical gas/service stations summarized in SANDAG's (Not So) Brief Guide of Vehicular Traffic Generation Rates or the *Trip Generation Manual*, published by the Institute of Transportation Engineers (ITE). The percentages of pass-by or diverted trips at Costco fuel facilities are considerably lower than those documented by SANDAG and in the ITE *Trip Generation Manual* for typical gas/service stations. In addition, the members-only access requirement also has a significant effect on trip internalization (or sharing of trips) between the warehouse and the fuel facility. Fewer people exclusively visit a Costco fuel facility (in comparison to a typical standalone gas/service station) because they have another primary purpose for visiting the site (that being a trip to the Warehouse/Business Center).

INTERNAL TRIPS

Internal capture trips account for those members who patronize both the Warehouse/Business Center and the fuel facility during a single visit to the Costco site. As such, although they account for a trip to both the Warehouse/Business Center and the fuel facility, they only account for one overall vehicle trip to the site and on the surrounding transportation system. **Table 11** outlines the percentage of internalized trips (trips frequenting both the Business Center and fuel facility) for each time period at three existing California Costco Business Center locations with fuel facilities². Appendix A includes a description about how Costco member transaction data was used to calculate the internalization percentages.

Table 11. California Costco Business Center with Fuel Facility Internal Trip Characteristics

Site	Weekday Daily	Weekday AM Peak Hour	Weekday PM Peak Hour	Saturday Midday Peak Hour
Hawthorne, CA	14.2%	11.4%	12.6%	17.5%
Hayward, CA	20.5%	16.2%	16.5%	24.5%
Commerce, CA	21.0%	16.0%	17.9%	29.4%
Average	18.5%	14.5%	15.7%	23.8%

Source: Kittelson & Associates, Inc., 2024

SHIFTED TRIPS

Construction of a fuel facility does not increase the general demand for gasoline within a given geographic area. With construction of the San Marcos Business Center Costco fuel facility, it is expected that a portion of the trips generated by the Project will shift from visiting the previously identified existing local Costco fuel facilities to visit the new location instead because it is closer or more convenient. The number of trips expected to shift from nearby Costco fuel facilities was calculated using proprietary member transaction data provided by Costco and assumes only primary trips to other Costco fuel facilities will shift to the new location. The member transaction data includes:

- Approximate home locations of Costco members who shopped at the four previously identified existing North County Costco Warehouses with fuel facilities³ in the Project area during May and June 2023, grouped into 1-square-mile zones.

² There are no existing Costco Business Centers in the North County area that have a fuel facility. Therefore, the three identified existing Business Centers with fuel facilities in California were determined to be the most comparable sites.

³ The four identified North County Costco Warehouse locations used for comparison were selected at the request of City staff as the most comparable sites.

- Number of visits to the four existing North County Costco Warehouses in May and June 2023 by members in each 1-square-mile zone.
- Market areas of the four existing North County Costco Warehouses and the existing San Marcos Costco Business Center.

Table 12 includes the calculated percent of shifted trips from each of the identified North County Costco sites.

Table 12. San Diego North County Costco Fuel Facility Shifted Trips Characteristics

Site	Percent Shifted	Weekday Daily		Weekday AM Peak Hour		Weekday PM Peak Hour		Saturday Midday Peak Hour	
		Existing Primary Trip Generation	Shifted Trips	Existing Primary Trip Generation	Shifted Trips	Existing Primary Trip Generation	Shifted Trips	Existing Primary Trip Generation	Shifted Trips
Vista, CA	15%	1,017	153	76	11	78	12	92	14
Carmel Mountain, CA	3%	1,701	476	80	22	128	36	156	44
Carlsbad, CA	23%	1,733	52	97	3	123	4	132	4
San Marcos, CA	28%	1,597	367	110	25	107	25	108	25
Total Shifted Trips		-	1,048	-	61	-	77	-	87

Source: Kittelson & Associates, Inc., 2024

The remaining trips generated by the Project are expected to shift from non-Costco gas/service stations in the Project vicinity, as the construction of a fuel facility does not increase the general demand for gasoline within a given geographic area.

Given that the trip generation estimate is conservatively based on trip generation data collected at the four local North County Costco fuel facilities, the trip generation estimate presented in this report has not been adjusted to take credit for trips that will shift from an existing site to the new fuel facility. These trips, while already on the network to frequent a different fuel facility, will be considered net new trips at intersections and driveways in the immediate vicinity of the Project.

PASS-BY TRIPS

Pass-by trips represent members (and trips) that are currently traveling on the surrounding street network for some other primary purpose (such as a trip from work to home) and stop into the site enroute during their normal travel. As such, pass-by trips do not result in a net increase in traffic on the surrounding transportation system and their only effect occurs at the immediate intersections and site access driveways where they become turning movements.

Based on studies of customer surveys at existing Costco Gasoline fuel facilities in California, on average 34.3% of trips during the weekday PM and 33.7% during the Saturday midday peak hours can be classified as pass-by trip capture from the surrounding street system.

Within the Kittelson Costco database for sites in California there is no daily pass-by trip information and only one data point is available for the weekday AM peak hour pass-by trip characteristic. Therefore, weekday PM peak hour pass-by percentages are applied to the weekday AM peak hour and weekday daily

calculations. These averages are lower than the average pass-by rate quoted in the ITE *Trip Generation Manual* for typical gas/service stations (63% AM, 57% PM and 49% Saturday midday) and SANDAG's Trip Generation (50%). This lower pass-by rate is attributable to the unique travel characteristics that result from Costco's membership requirements.

DIVERTED TRIPS

Diverted trips are similar to pass-by trips in that they represent members (and trips) that are currently traveling on the surrounding street network for some other primary purpose and stop into the site enroute during their travel. However, as the name indicates, diverted trips divert from the normal roadways they would be traveling on to go to the Costco site.

Based on studies of customer surveys at existing Costco Gasoline fuel facilities in California, on average 40.7% of trips during the weekday PM and 35.7% of the during the Saturday midday peak hours can be classified as diverted trip capture from the surrounding street system.

Within the Kittelson Costco database for sites in California there is no daily diverted trip information and only one data point is available for the weekday AM peak hour diverted trip characteristic. Therefore, weekday PM peak hour diverted percentages are applied to the weekday AM peak hour and weekday daily calculations. These averages are higher than the average diverted rate quoted in the ITE *Trip Generation* manual for typical gas/service stations (21% AM and 31% PM) and is attributable to the unique travel characteristics that result from Costco's membership requirements.

San Marcos Business Center Fuel Facility Trip Generation Estimate

The trip characteristics and adjustment factors presented above have been summarized in **Table 13**. The adjustment factors shown are applied to the estimated Project trip generation in Table 8 which was established based on local North County sites selected in consultation with the City.

Table 13. Trip Characteristics for Costco Fuel Facility Addition

Land Use / Trip Type	Weekday Daily	Weekday AM Peak Hour	Weekday PM Peak Hour	Saturday Midday Peak Hour
Warehouse to Business Center Adjustment	-5.1%	16.0%	3.6%	-2.3%
Percent Difference – Forecast to 36 FP	10.3%	6.5%	10.6%	11.3%
Internal Capture	18.5%	14.5%	15.7%	23.8%
Pass-By Trips	34.3%	34.3%	34.3%	33.7%
Diverted Trips	40.7%	40.7%	40.7%	35.7%

Source: Kittelson & Associates, Inc., 2024

Based on the trip generation adjustment factors and trip characteristics outlined above, a trip generation estimate for the San Marcos Costco Business Center fuel facility is summarized in **Table 14**.

Table 14. San Marcos Costco Business Center Fuel Facility Addition Trip Generation Estimate

Land Use / Trip Type	Weekday Daily Trips	Weekday AM Peak Hour			Weekday PM Peak Hour			Saturday Midday Peak Hour		
		Total	In	Out	Total	In	Out	Total	In	Out
Total Trips – Normalized to 30 FP	11,294	555	277	278	841	420	421	941	471	470
Total Trips – BC Adjustment	10,718	643	322	321	871	436	435	919	460	459
Total Trips – Forecast to 36 FP	11,825	685	343	342	963	482	481	1,022	511	511
<i>Internal Capture</i>	(2,192)	(100)	(50)	(50)	(151)	(76)	(75)	(243)	(122)	(121)
Total External Trips – BC	9,633	585	293	292	812	406	406	779	389	390
<i>New Trips Previously Visiting Non-Costco Gas/Service Stations</i>	8,585	524	262	262	735	367	368	692	345	347
<i>Shifted Trips from Local Costco Fuel Facilities</i>	1,048	61	31	30	77	39	38	87	44	43
Total External Trips – BC	9,633	585	293	292	812	406	406	779	389	390
<i>Pass-By Trips</i>	(3,307)	(202)	(101)	(101)	(280)	(140)	(140)	(262)	(131)	(131)
<i>Diverted Trips</i>	(3,917)	(238)	(119)	(119)	(330)	(165)	(165)	(278)	(139)	(139)
Net New Trips	2,409	145	73	72	202	101	101	239	119	120

BC = Business Center

Source: Kittelson & Associates, Inc., 2024

As shown in Table 14, the San Marcos Costco Business Center fuel facility is estimated to generate 2,409 weekday daily net new trip ends. Of these, 145 are estimated to occur in the weekday AM peak hour (73 inbound / 72 outbound), 202 are estimated to occur in the weekday PM peak hour (101 inbound / 101 outbound). Additionally, the fuel facility addition is estimated to generate 239 net new trip ends during the Saturday midday peak hour (119 inbound / 120 outbound).

TRIP DISTRIBUTION & ASSIGNMENT

The Project is located within the northern parking area of the existing Costco Business Center in San Marcos at the northwest corner of the W San Marcos Boulevard / S Bent Avenue intersection. The San Marcos Costco Business Center has an existing market area in the greater San Diego North County area, which the fuel facility will serve as an ancillary use. Market study data provided by Costco Wholesale for the existing Business Center was reviewed to develop a trip distribution estimate for fuel facility trips. Additionally, the Project team reviewed site driveway locations and the surrounding land uses in the San Marcos area to identify trip distribution patterns.

Trip Distribution

A trip distribution for each trip type was prepared based upon existing traffic volume patterns in the Project vicinity and a market study conducted by Costco.

Pass-by trips to the site occur on Grand Avenue and W San Marcos Boulevard. While treated as new trips at the site accesses, pass-by trips do not result in additional trips to the overall network or have the same

environmental impacts compared to new trips to the system since these trips are already present on the adjacent arterial streets. Historical counts along Grand Avenue and W San Marcos Boulevard were used to determine the following peak hour directional distribution of pass-by trips (Saturday midday distribution is assumed to be an even split).

Grand Avenue:

- 10% eastbound and 10% westbound during the weekday AM peak hour
- 15% eastbound and 5% westbound during the weekday PM peak hour
- 10% eastbound and 10% westbound during the Saturday midday peak hour

W San Marcos Boulevard:

- 34% eastbound and 46% westbound during the weekday AM peak hour
- 44% eastbound and 36% westbound during the weekday PM peak hour
- 40% eastbound and 40% westbound during the Saturday midday peak hour

Diverted trips to the site originate from State Route 78 (SR-78). While treated as new trips between the interchange ramps and site access points, diverted trips result in fewer system capacity and environmental impacts as compared to new trips to the system because these trips generally have no impact once traced back onto the system they divert from. In this scenario, trips exiting from their respective interchange will return onto the system through the interchange that is further downstream. For example, a trip heading eastbound on SR-78 will exit at the intersection of Via Vera Cruz and Grand Avenue and reenter the interchange from W San Marcos Boulevard. Caltrans produces a Peak Hour Report (Reference 5) where data from control stations 985 and 986 on milepost 10.606 was utilized for the following peak hour directional distribution for diverted trips (Saturday midday distribution is assumed to be an even split):

- 50% eastbound and 50% westbound during the weekday AM peak hour
- 45% eastbound and 55% westbound during the weekday PM peak hour
- 50% eastbound and 50% westbound during the Saturday midday peak hour

Primary trip distribution to the site is based on a market study prepared by Costco, a review of driveway counts for the existing Costco Business Center, and an analysis of established gas/service stations in the surrounding area. The driveway counts can be found in Attachment B. Based on this assessment: primary site trips were distributed to the study intersections accordingly:

- 20% to/from Grand Avenue, west of S Las Posas Road
- 15% to/from SR-78, west of S Las Posas Road
- 10% to/from Las Posas Road, north of SR-78
- 2% to/from Linda Vista Drive, west of S Las Posas Road
- 22% to/from W San Marcos Boulevard, west of S Las Posas Road
- 3% to/from Discovery Street, south of W San Marcos Boulevard
- 3% to/from Via Vera Cruz, south of W San Marcos Boulevard
- 5% to/from S Bent Avenue, south of W San Marcos Boulevard
- 5% to/from SR-78, east of W San Marcos Boulevard
- 15% to/from W San Marcos Boulevard, east of SR-78

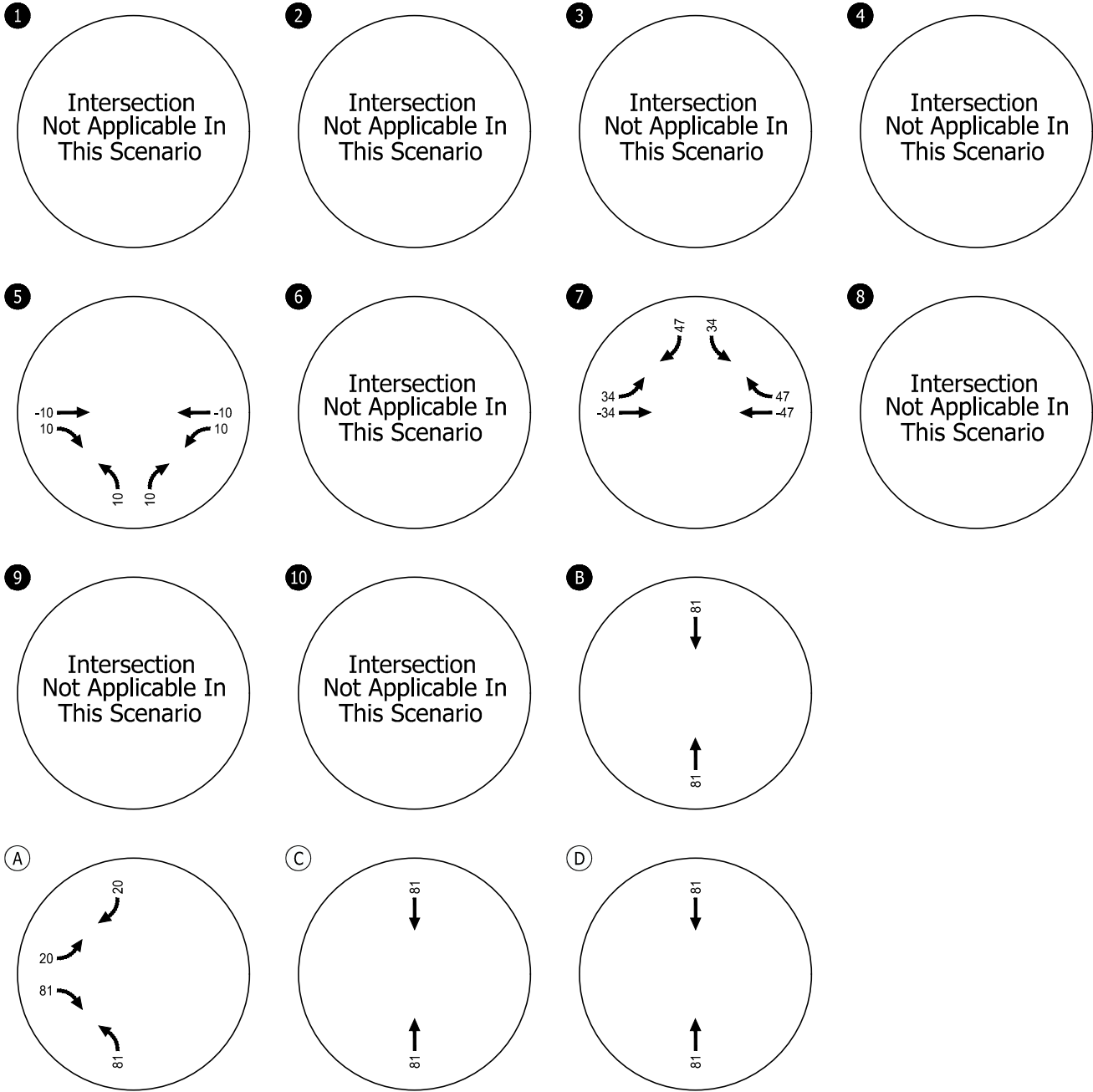
Trip Assignment

Pass-by, diverted, and primary site trips were assigned to the study area according to the distribution assumptions outlined above. **Figure 3** depicts the pass-by trip assignment for the weekday AM, weekday PM, and Saturday midday peak hours, respectively. **Figure 4** depicts the diverted trip assignment for the weekday AM, weekday PM, and Saturday midday peak hours, respectively. **Figure 5** depicts the primary trip assignment for the weekday AM, weekday PM, and Saturday midday peak hours, respectively.

Conservatively, all external trips associated with the Costco fuel facility addition are assigned to the northernmost Costco driveway. **Figure 6** depicts the total external (pass-by + diverted + primary) trip assignment for the weekday AM, weekday PM, and Saturday midday peak hours.

Some internally captured trips (visiting the existing Business Center today) have been reassigned from the southern driveways to the northernmost driveway to reflect a shift in travel patterns to get gas before visiting the Business Center. *Appendix D details these reassignment assumptions.*

C:\Users\hoffman\appdata\local\temp\AcPublish_30168127900_San Marcos Report Figures_36.dwg Dec 19, 2024 - 2:58pm - hoffman Layout Tab: 3A TA PB AM

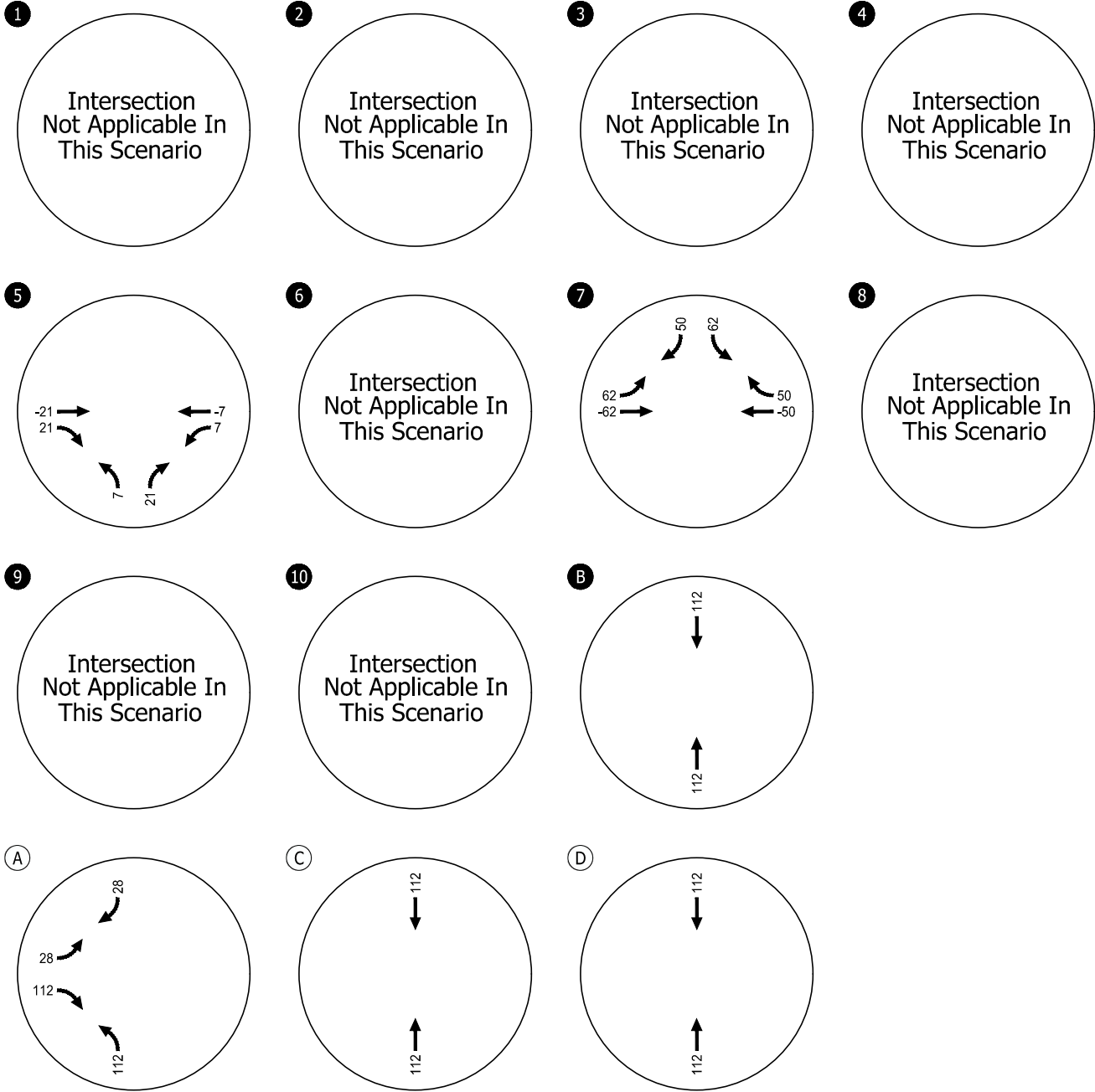


- # - Study Intersection
- # - Site Access Intersection
- XX% - Trip Distribution Assumption

Trip Assignment: Pass-By Trips
Weekday AM Peak Hour
San Marcos, CA

Figure
3A

C:\Users\hoffman\appdata\local\temp\AcPublish_30168\27900_San Marcos Report Figures_36.dwg Dec 19, 2024 - 2:58pm - hoffman Layout Tab: 3B TA PB PM

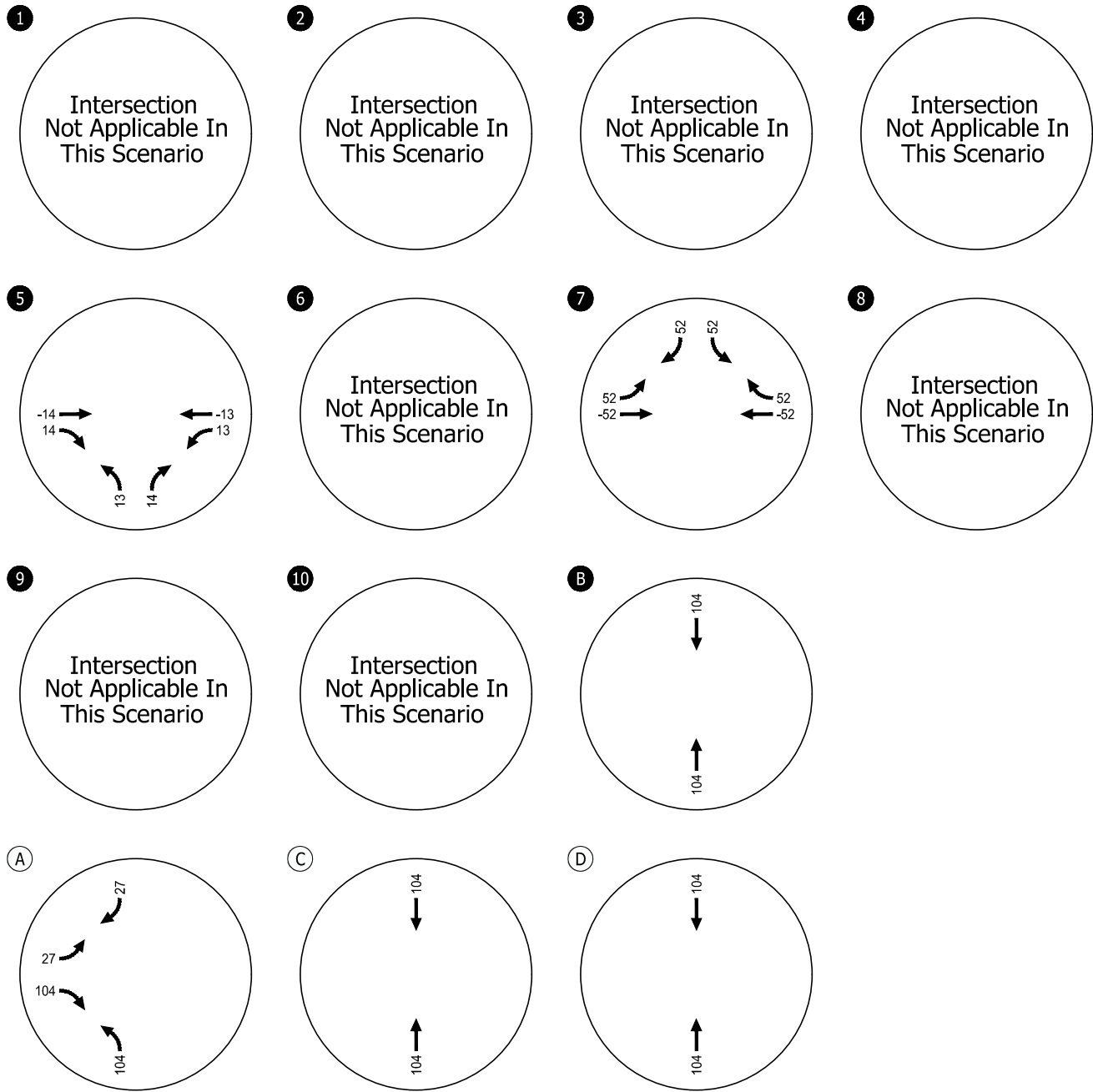


- # - Study Intersection
- # - Site Access Intersection
- XX% - Trip Distribution Assumption

Trip Assignment: Pass-By Trips
Weekday PM Peak Hour
San Marcos, CA

Figure
3B

C:\Users\hoffman\appdata\local\temp\AcPublish_30168127900_San Marcos Report Figures_36.dwg Dec 19, 2024 - 2:58pm - hoffman Layout Tab: 3C TA PB SAT

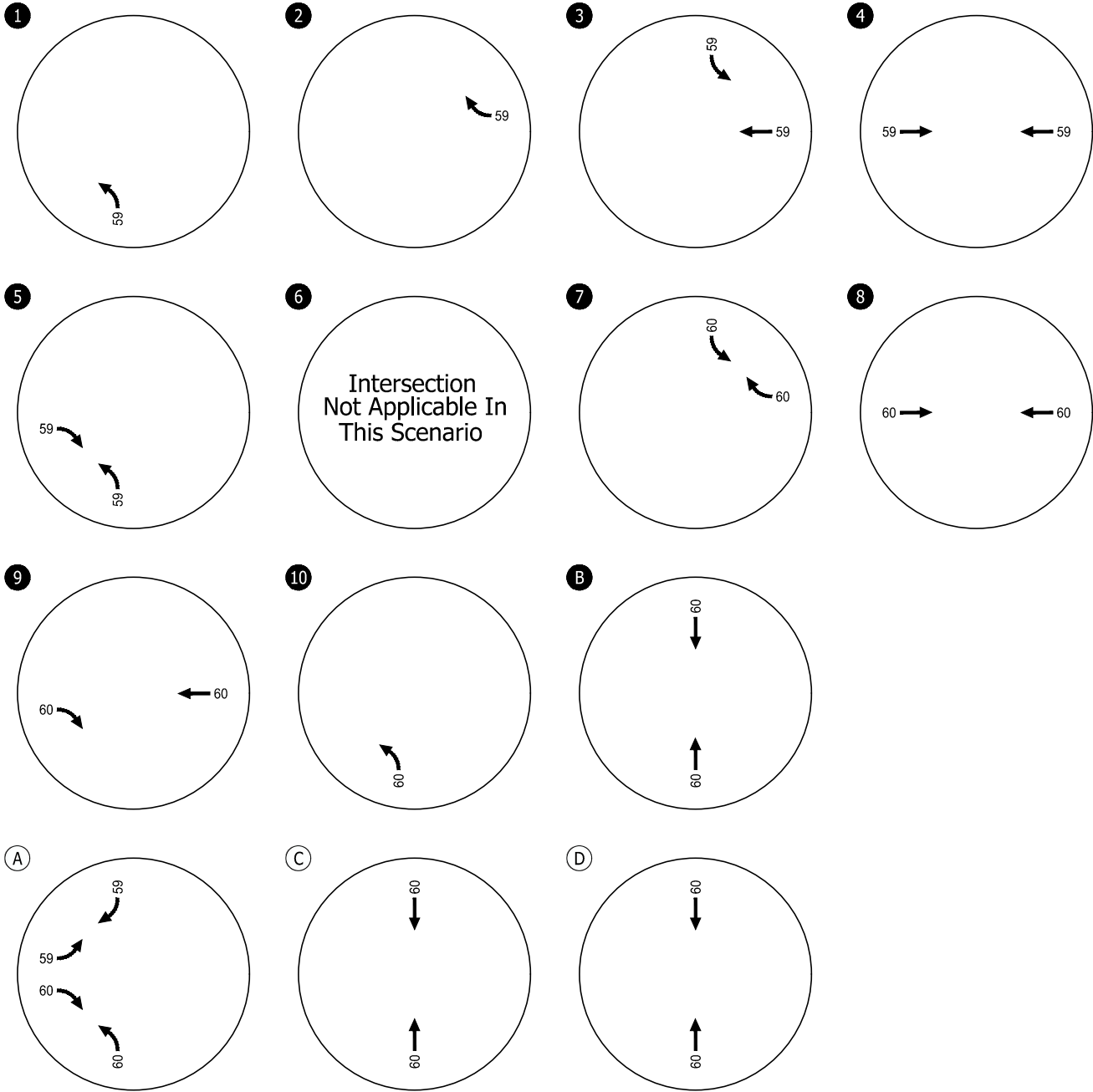


- # - Study Intersection
- # - Site Access Intersection
- XX% - Trip Distribution Assumption

Trip Assignment: Pass-By Trips
Saturday Midday Peak Hour
San Marcos, CA

Figure
3C

C:\Users\hoffman\appdata\local\temp\AcPublish_30168\27900_San Marcos Report Figures_36.dwg Dec 19, 2024 - 2:58pm - hoffman Layout Tab: 4A, TA D AM

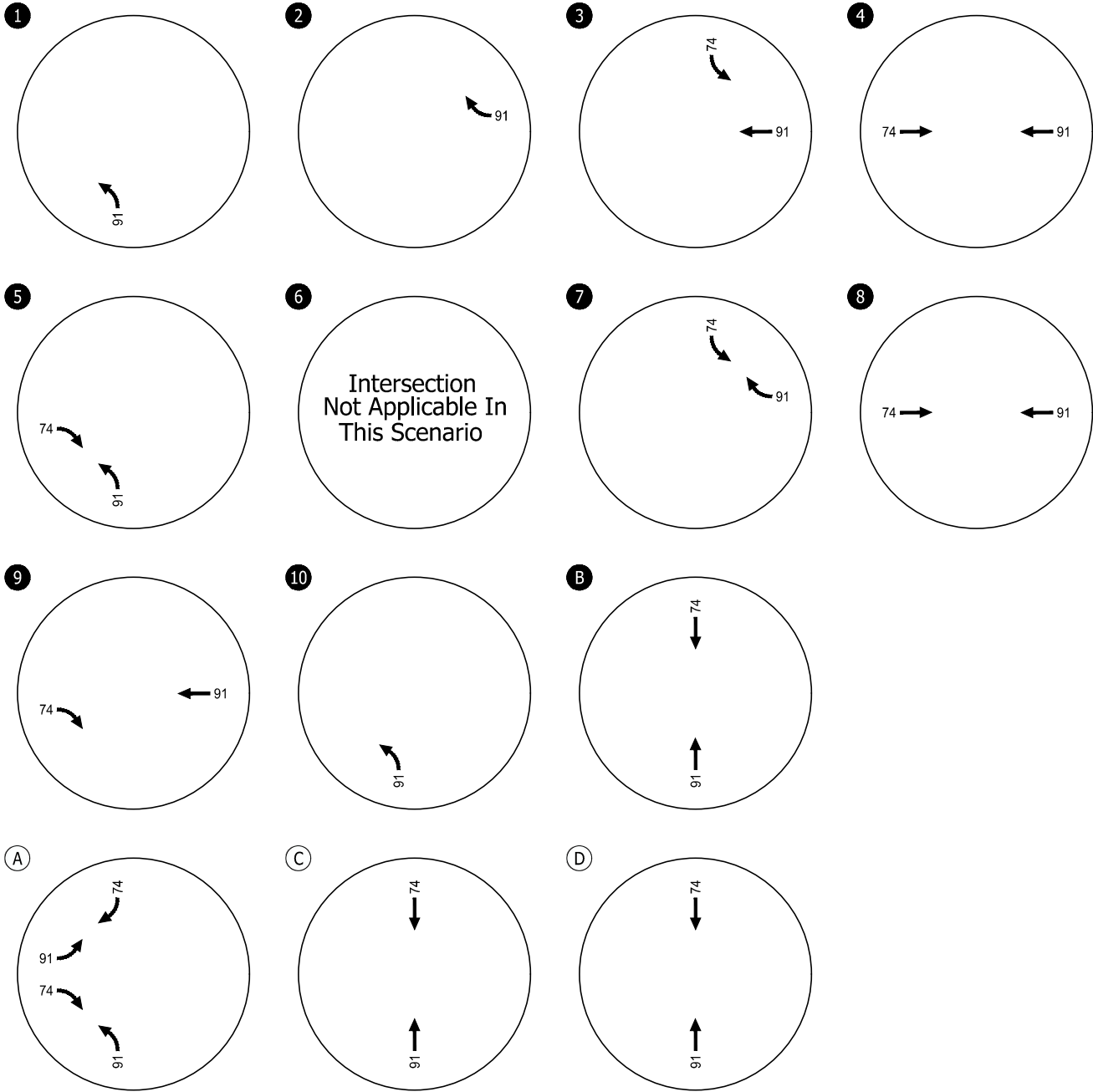


- # - Study Intersection
- # - Site Access Intersection
- XX% - Trip Distribution Assumption

Trip Assignment: Diverted Trips
Weekday AM Peak Hour
San Marcos, CA

Figure
4A

C:\Users\hoffman\appdata\local\temp\AcPublish_30168\27900_San Marcos Report Figures_36.dwg Dec 19, 2024 - 2:58pm - hoffman Layout Tab: 4B, TA D PM

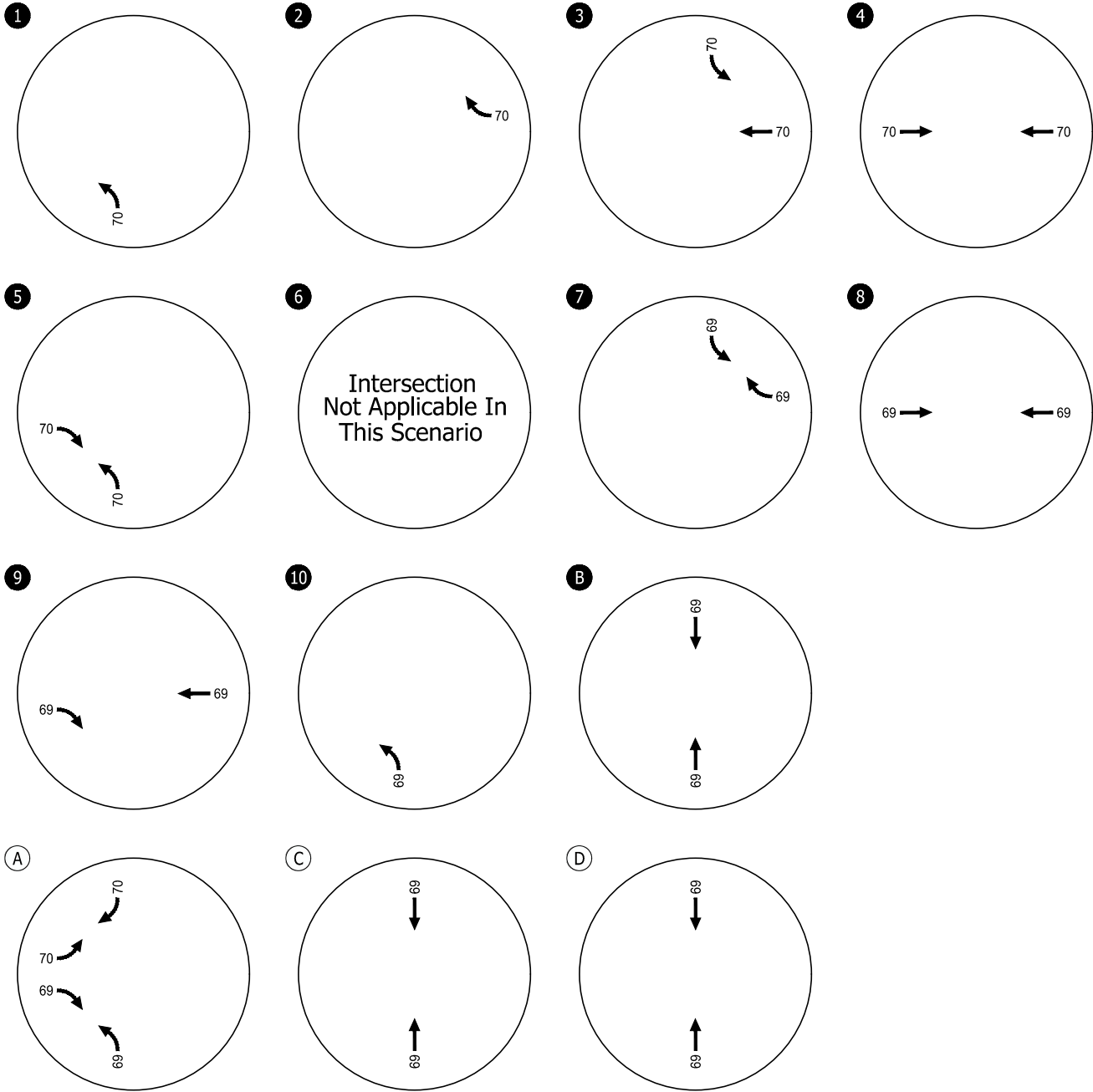


- # - Study Intersection
- # - Site Access Intersection
- XX% - Trip Distribution Assumption

Trip Assignment: Diverted Trips
Weekday PM Peak Hour
San Marcos, CA

Figure
4B

C:\Users\hoffman\appdata\local\temp\AcPublish_30168\27900_San Marcos Report Figures_36.dwg Dec 19, 2024 - 2:58pm - hoffman Layout Tab: 4C TA D SAT

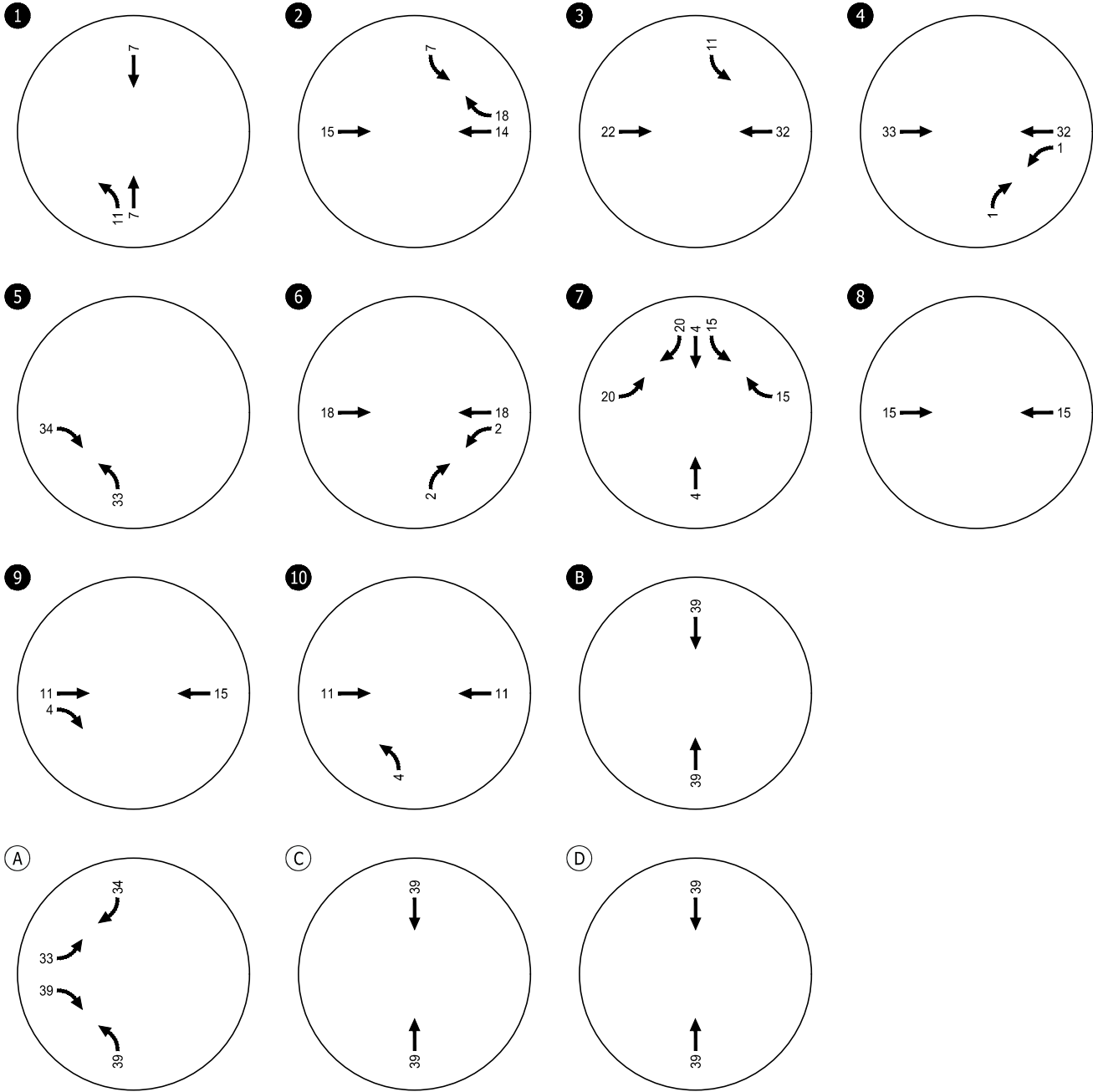
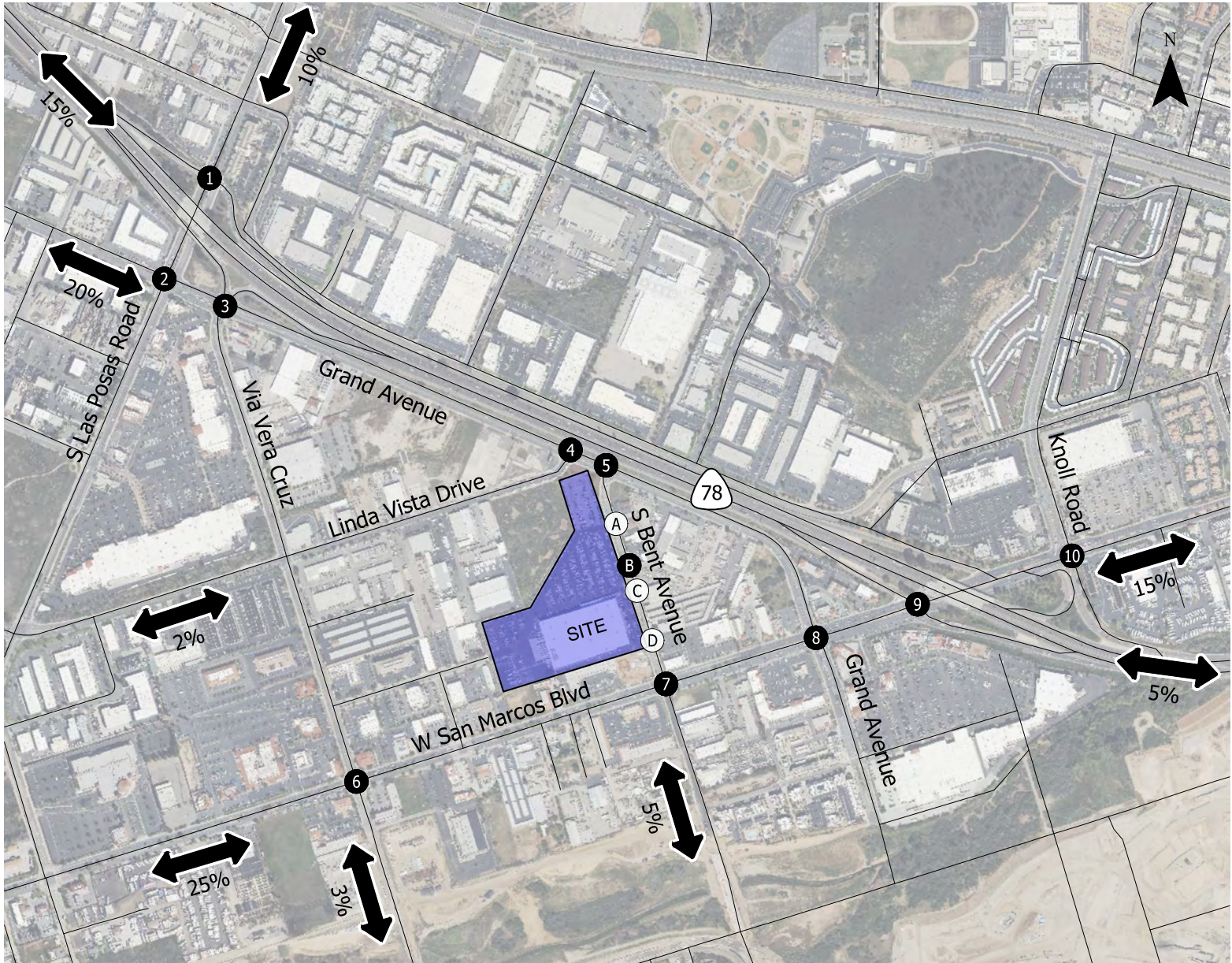


- # - Study Intersection
- # - Site Access Intersection
- XX% - Trip Distribution Assumption

Trip Assignment: Diverted Trips
Saturday Midday Peak Hour
San Marcos, CA

Figure
4C

C:\Users\hoffman\appdata\local\temp\AcPublish_30168\27900_San Marcos Report Figures_36.dwg Dec 19, 2024 - 2:58pm - hoffman Layout Tab: 5A TA P AM

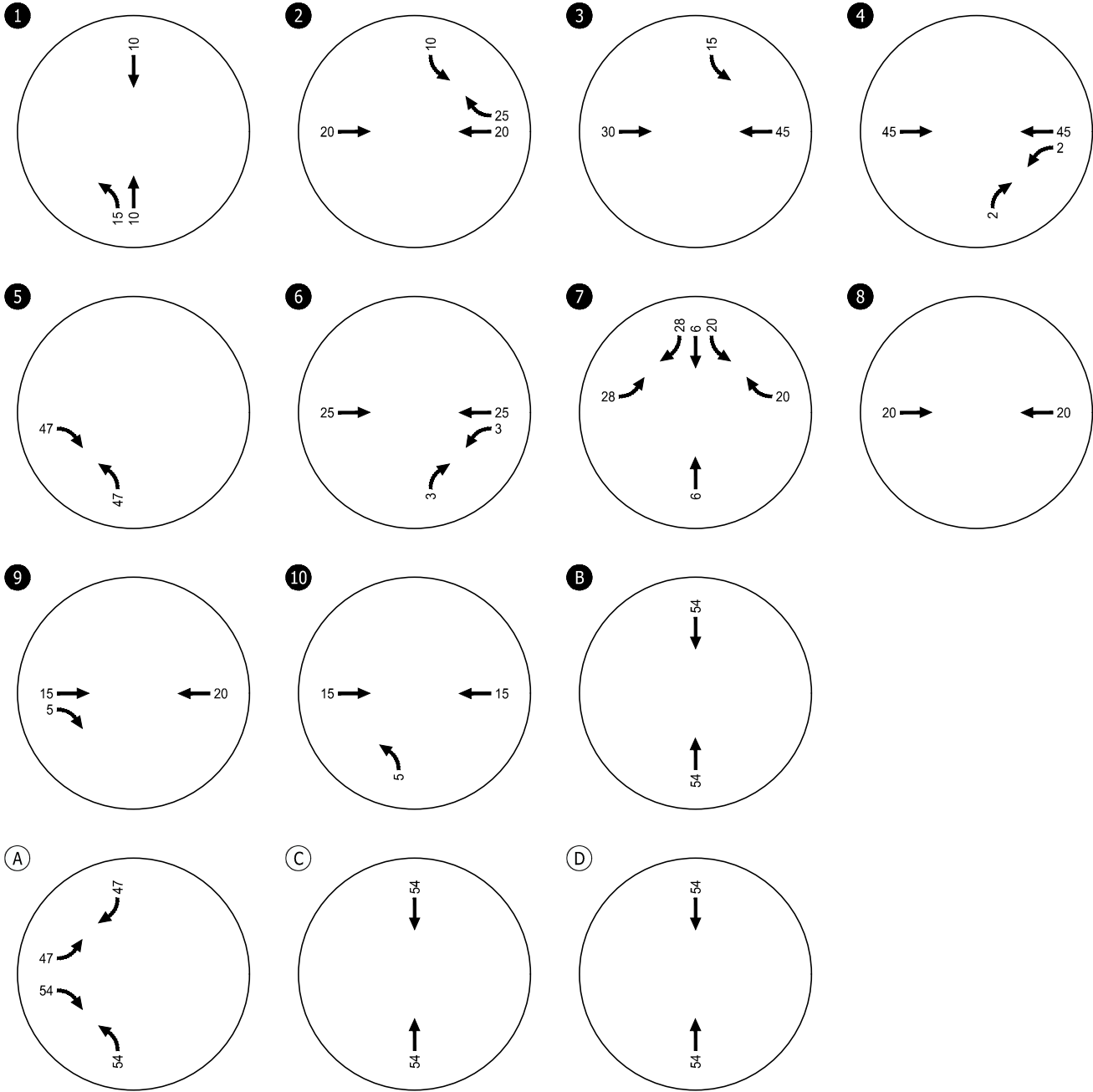
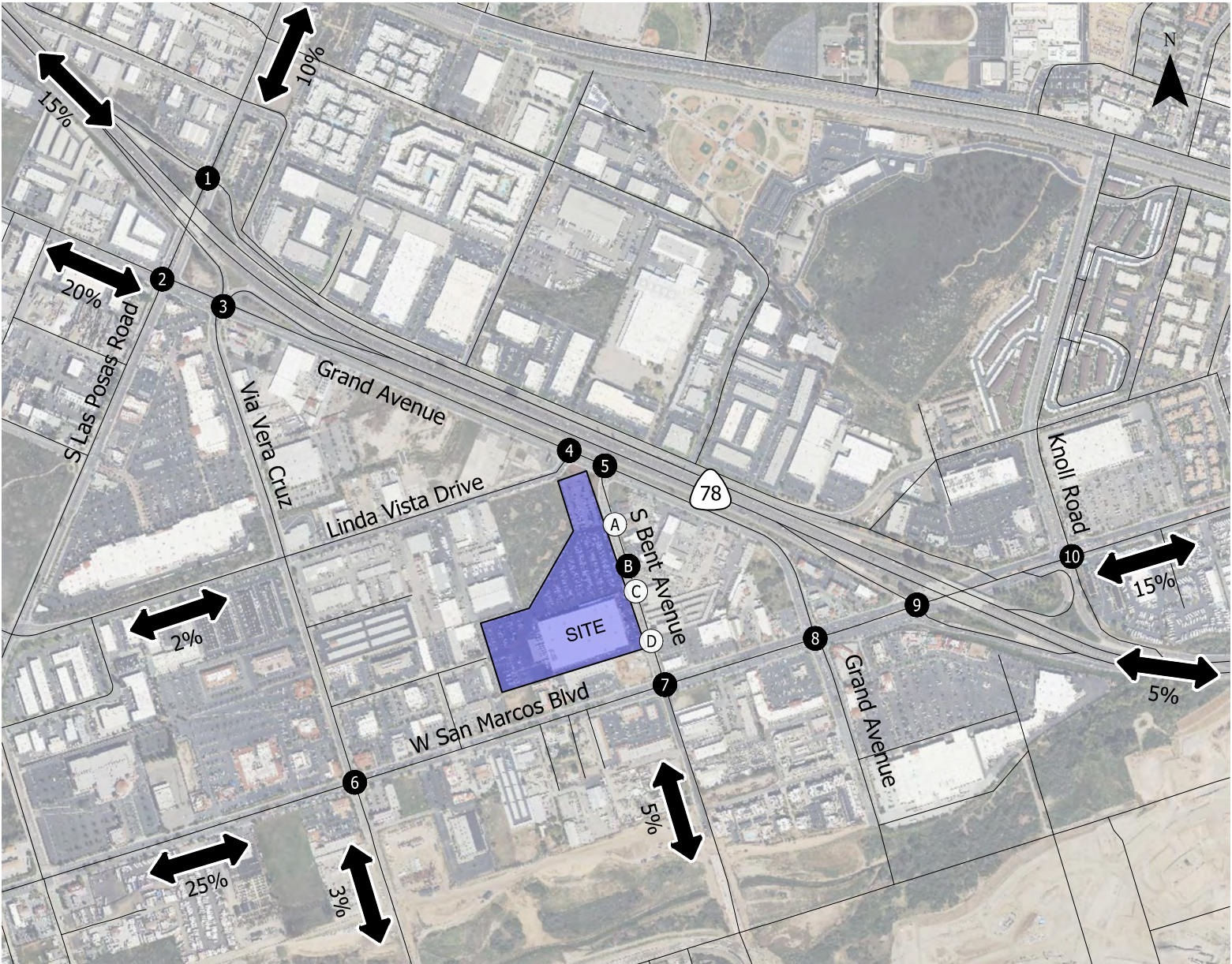


- Study Intersection
- Site Access Intersection
XX% - Trip Distribution Assumption

Trip Assignment: Primary Trips
Weekday AM Peak Hour
San Marcos, CA

Figure
5A

C:\Users\hoffman\appdata\local\temp\AcPublish_30168\27900_San Marcos Report Figures_36.dwg Dec 19, 2024 - 2:58pm - hoffman Layout Tab: 5B: TA P.M

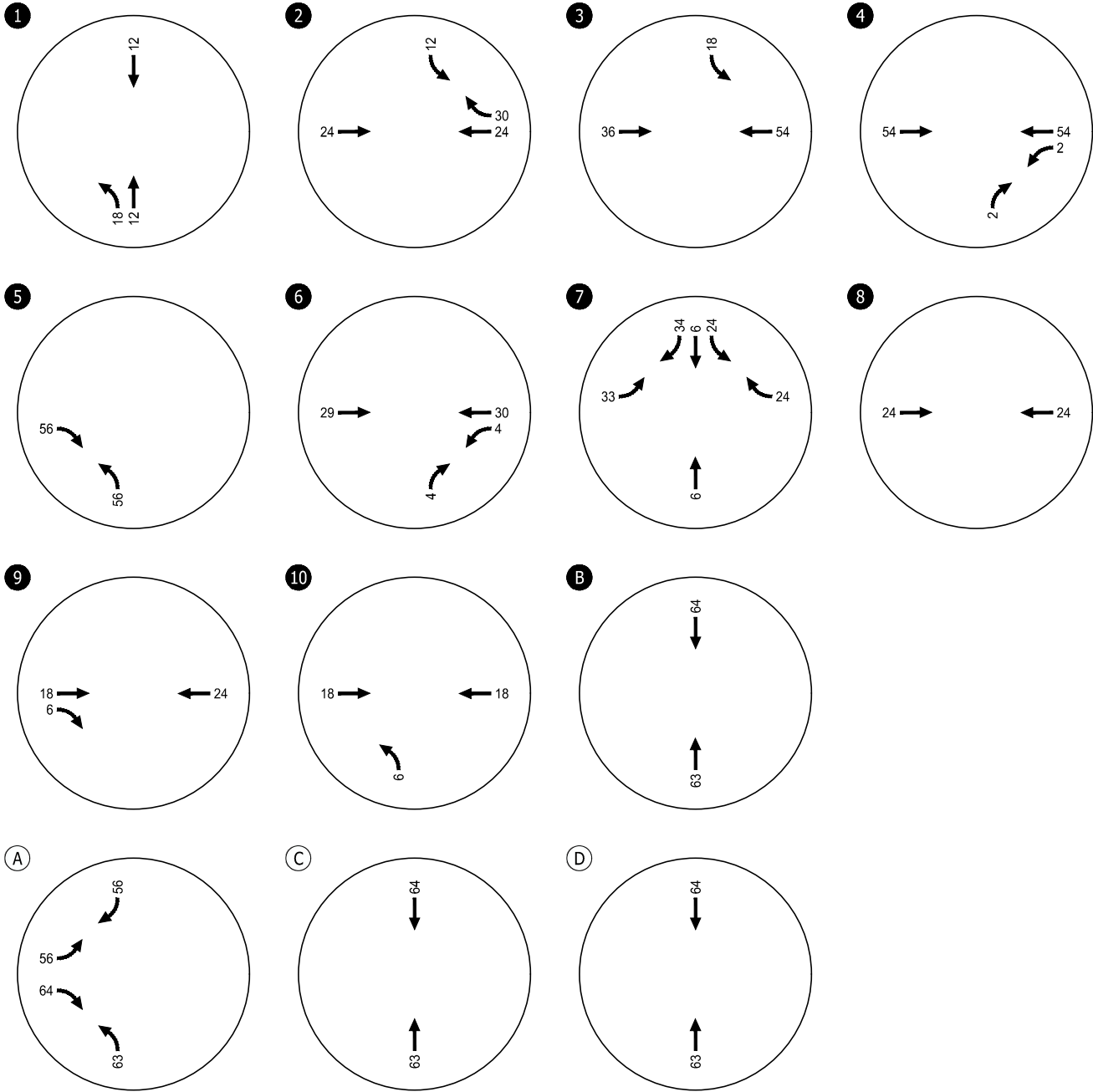
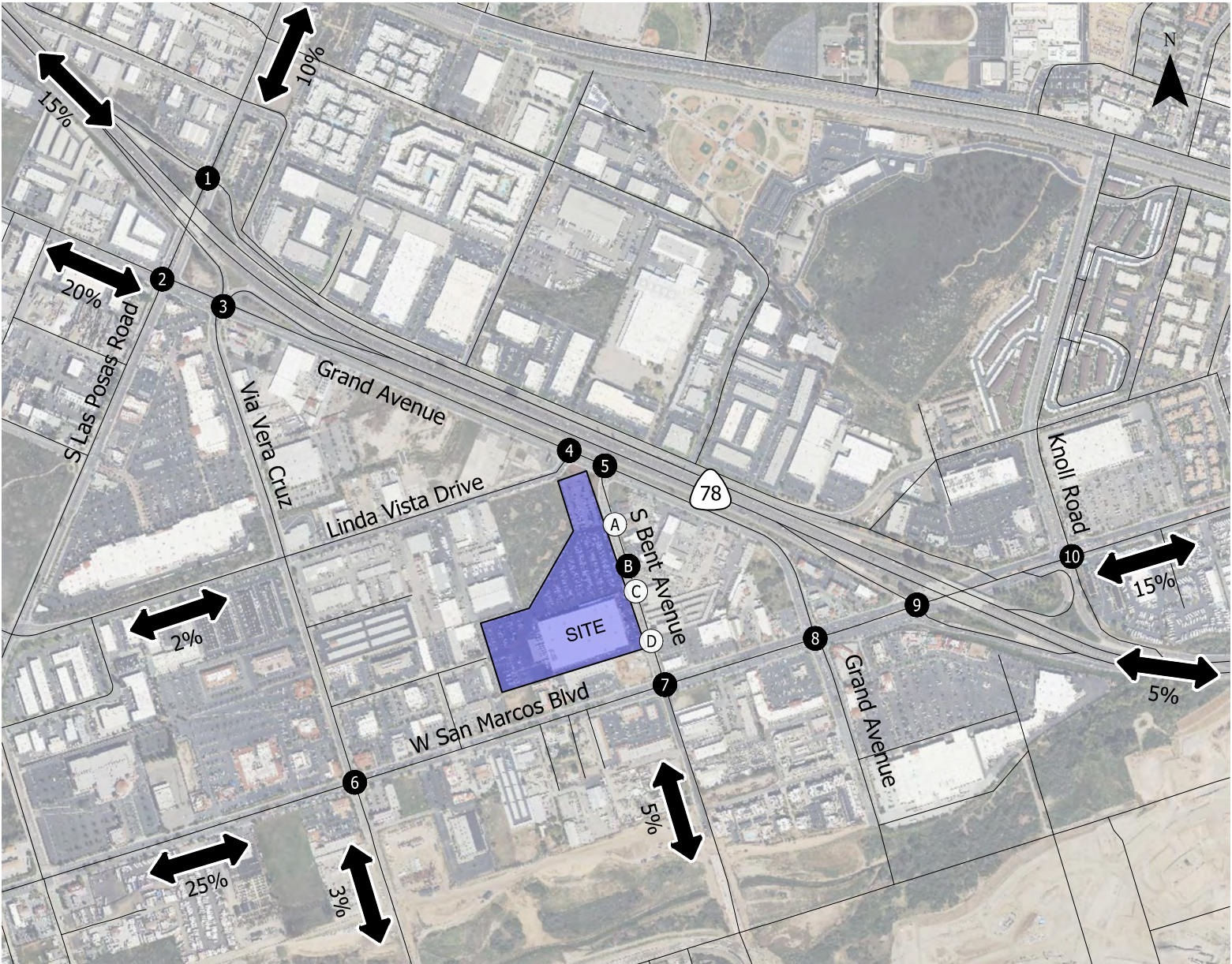


- # - Study Intersection
- # - Site Access Intersection
- XX% - Trip Distribution Assumption

Trip Assignment: Primary Trips
Weekday PM Peak Hour
San Marcos, CA

Figure
5B

C:\Users\hoffman\appdata\local\temp\AcPublish_30168\27900_San Marcos Report Figures_36.dwg Dec 19, 2024 - 2:58pm - hoffman Layout Tab: SC TA P SAT

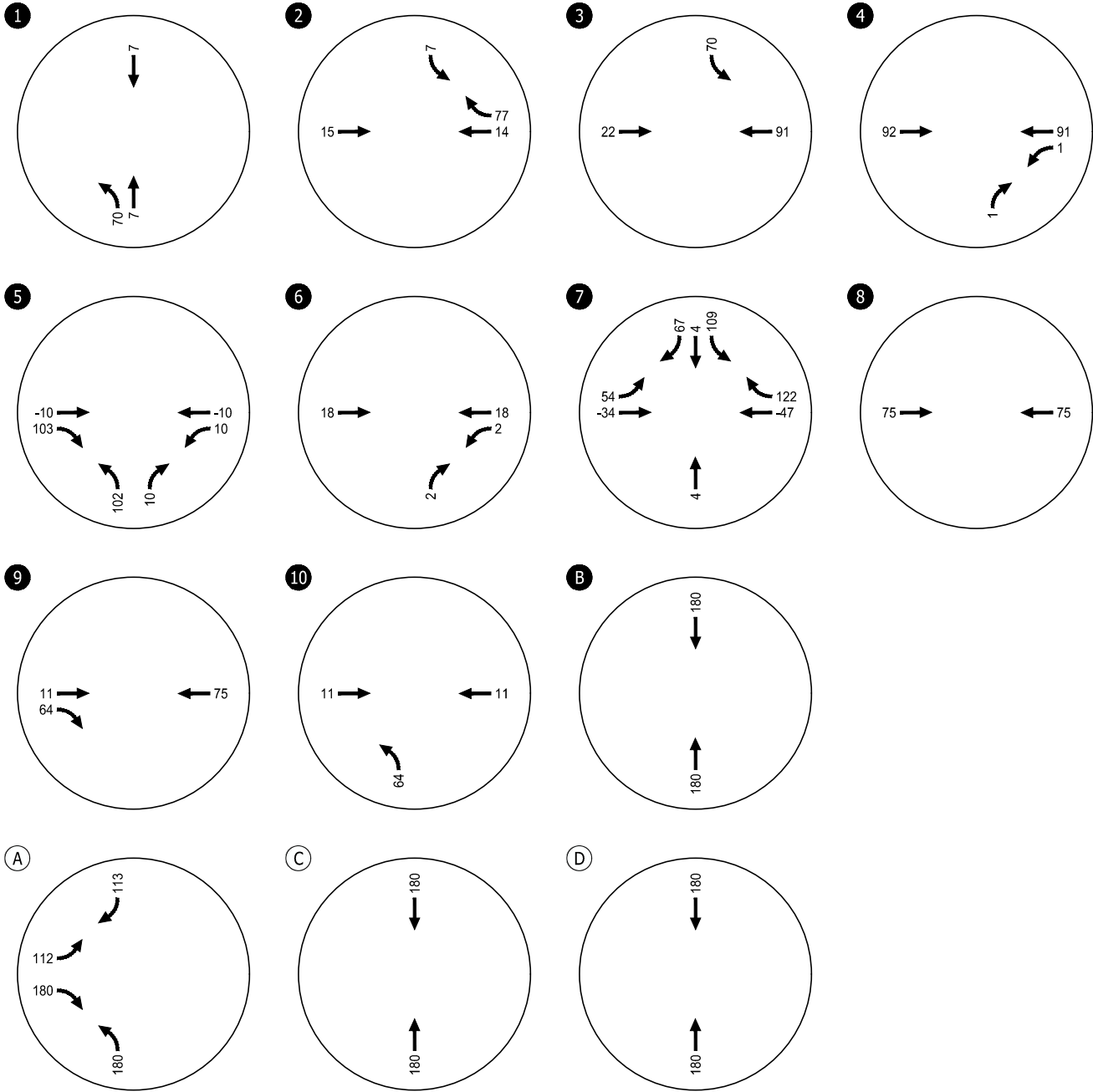


- Study Intersection
- Site Access Intersection
XX% - Trip Distribution Assumption

Trip Assignment: Primary Trips
Saturday Midday Peak Hour
San Marcos, CA

Figure
5C

C:\Users\hoffman\appdata\local\temp\AcPublish_30168\27900_San Marcos Report Figures_36.dwg Dec 19, 2024 - 2:58pm - hoffman Layout Tab: 6A TA TE AM

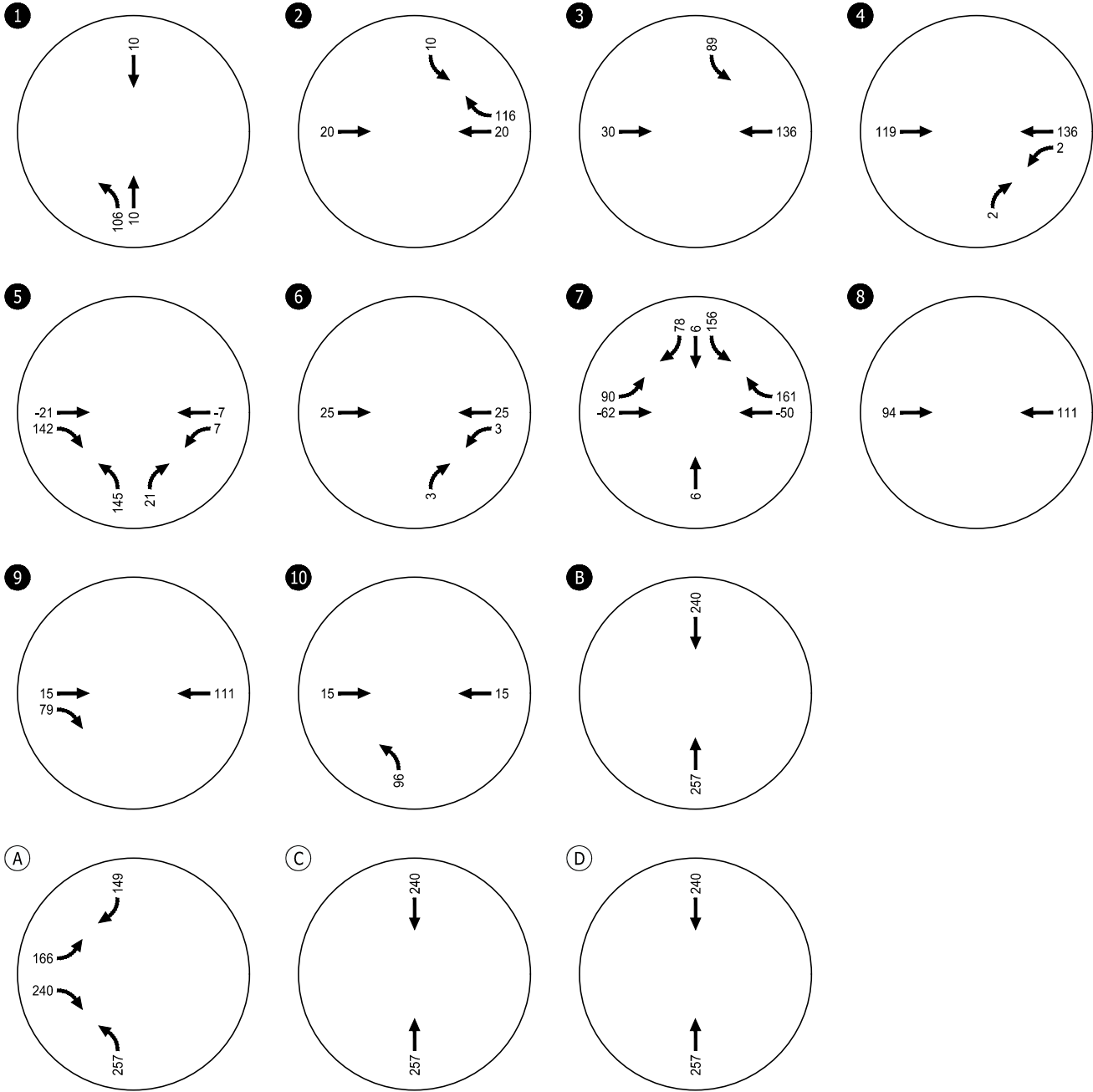


- Study Intersection
- Site Access Intersection

Trip Assignment: Total External Trips
Weekday AM Peak Hour
San Marcos, CA

Figure
6A

C:\Users\hoffman\appdata\local\temp\AcPublish_30168\27900_San Marcos Report Figures_36.dwg Dec 19, 2024 - 2:58pm - hoffman Layout Tab: 6B TA TE PM

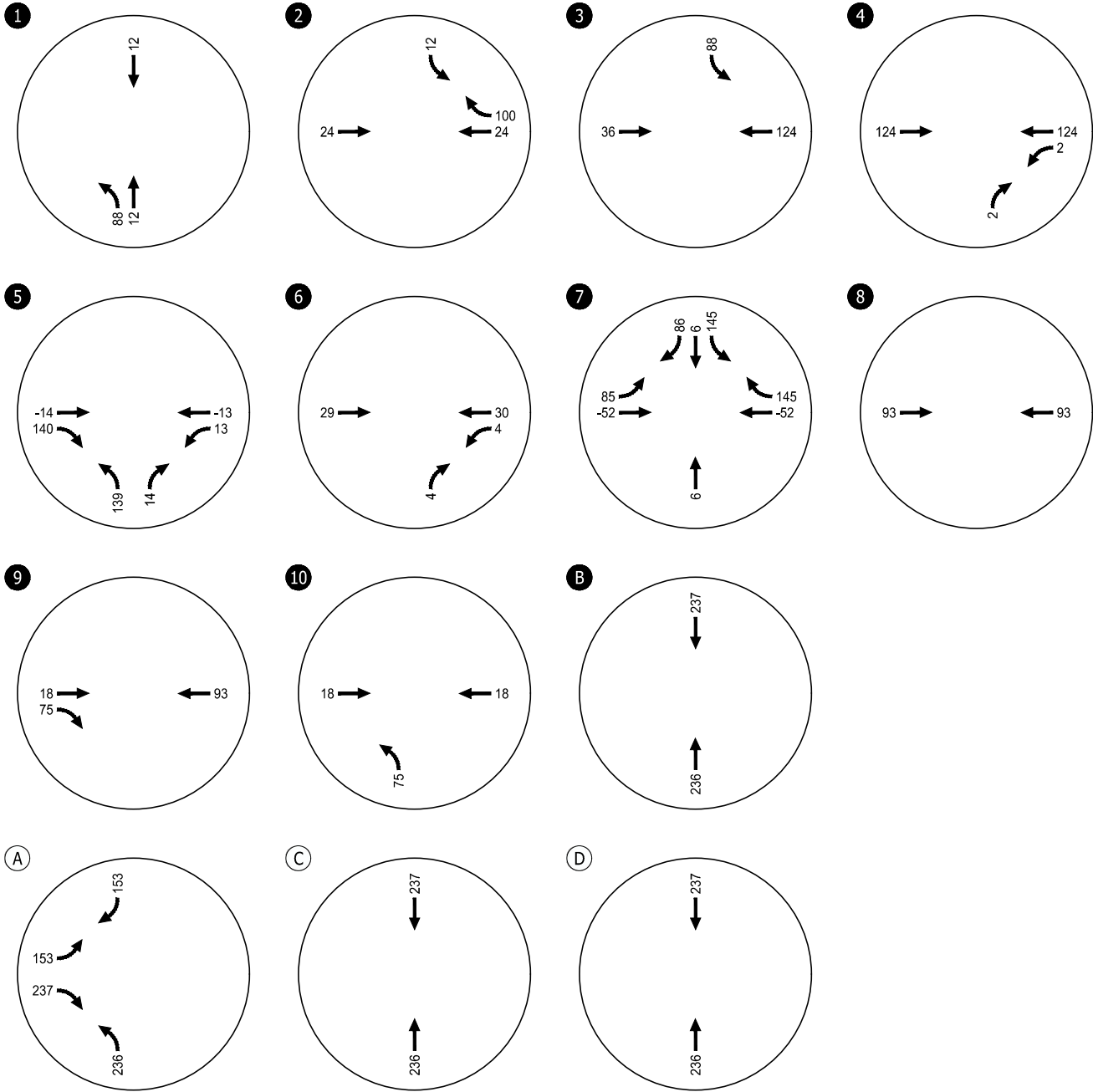


- Study Intersection
- Site Access Intersection

Trip Assignment: Total External Trips
Weekday PM Peak Hour
San Marcos, CA

Figure
6B

C:\Users\hoffman\appdata\local\temp\AcPublish_30168\27900_San Marcos Report Figures_36.dwg Dec 19, 2024 - 2:58pm - hoffman Layout Tab: 6C TA TE SAT



- # - Study Intersection
- # - Site Access Intersection

Trip Assignment: Total External Trips
Saturday Midday Peak Hour
San Marcos, CA

Figure
6C



Section 5

Year 2023 Existing Conditions

Existing Conditions

The existing conditions analysis identifies the site conditions and current operational and geometric characteristics of the roadways within the study area. Information regarding site conditions, adjacent land uses, existing traffic operations, and transportation facilities in the study area was collected between November 2023 and January 2024. The site of the fuel facility addition currently also contains the existing Costco Business Center Warehouse with three existing site access locations along S Bent Avenue. The following section summarizes the existing transportation facilities in the vicinity of the Costco Business Center Warehouse.

EXISTING ROADWAYS

The City of San Marcos is served by various transportation facilities, including one regional freeway, one freight commuter rail line, an extensive roadway network and several bus transit lines.

The following describes the major roads in the vicinity of the Project site that will be included in the LTA. The roadway system in the study area consists of several roadway functional classification categories as categorized in the City of San Marcos General Plan Mobility Element (Reference 3). The existing regional and local roadway network in San Marcos is a system of highways and local streets identified by their number of lanes developed to provide regional traffic movement and local access. The roadway classifications in the City of San Marcos General Plan are listed. **Table 15** presents the existing roadway network characteristics.

Table 15. Existing Roadway Network Characteristics

Roadway	Segment	Classification	Number of Lanes	Median Type	Posted Speed Limit	Sidewalk	Bicycle Lanes	Transit Route
S Las Posas Road	SR-78 WB Ramp to Grand Avenue	6-Lane Major Arterial	3 NB / 3 SB	Raised Median	45	Contiguous	SB: Class II	445 / 645
Via Vera Cruz	Grand Avenue to Linda Vista Drive	4-Lane Secondary Arterial/Collector	2 NB / 2 SB	TWLTL / Raised Median	40	Contiguous	Class II	None
Grand Avenue	S Las Posas Road to Via Vera Cruz	4-Lane Secondary Arterial/Collector	2 EB / 2 WB	Striped	45	North Side: None South Side: Contiguous	None	None
Grand Avenue	Via Vera Cruz to Linda Vista Drive	4-Lane Secondary Arterial/Collector	2 EB / 2 WB	TWLTL	45	North Side: None South Side: Contiguous	None	None
Grand Avenue	Linda Vista Drive to S Bent Avenue	4-Lane Secondary Arterial/Connector	2 EB / 2 WB	TWLTL	45	North Side: None South Side: Contiguous	None	None
Grand Avenue	S Bent Avenue to W San Marcos Blvd	4-Lane Secondary Arterial/Connector	2 EB / 2 WB	TWLTL	45	North Side: None South Side: Contiguous	None	None
S Bent Avenue	Grand Avenue to W San Marcos Blvd	2-Lane Collector (Continuous Left-Turn Lane)	1 NB / 1 SB	TWLTL	35	Contiguous	Class II	None
Linda Vista Drive	Via Vera Cruz to Grand Avenue	2-Lane Collector	1 EB / 1 WB	None	40	Intermittently Contiguous	None	None
W San Marcos Blvd	Via Vera Cruz to S Bent Avenue	4-Lane Major Arterial	2 EB / 2 WB	Raised Median	40	Contiguous	Class II	347
W San Marcos Blvd	S Bent Avenue to Grand Avenue	5-Lane Major Arterial	3 EB / 2 WB	Raised Median	40	Contiguous	Class II	347
W San Marcos Blvd	Grand Avenue to SR-78 EB Ramp	6-Lane Major Arterial	3 EB / 3 WB	Raised Median	40	North Side: Contiguous South Side: None	None	347
W San Marcos Blvd	SR-78 EB Ramp to Knoll Road	6-Lane Major Arterial	3 EB / 3 WB	Raised Median	40	North Side: Contiguous South Side: None	None	347

TWLTL = Two-Way Center Left-Turn

EXISTING TRANSIT FACILITIES

Transit service near the Project site is provided by the North County Transit District. In the Project vicinity bus service is provided along the following routes:

- 347 – Cal State San Marcos to Palomar College along W San Marcos Boulevard.
- 445 – Carlsbad Poinsettia COASTER Connection to Palomar College along S Las Posas Road.
- 645 – Palomar College to San Marcos High School along S Las Posas Road.

PEDESTRIAN & BICYCLE FACILITIES

Pedestrian Facilities

The study area offers several types of facilities and amenities to support walking. The availability and quality of pedestrian facilities can be analyzed using several key factors as detailed below:

- **Sidewalk Availability:** The abutting streets to the site contain sidewalks on both sides.
- **Crosswalk Availability and Type:** Within the study area, marked crosswalks are consistently provided at signalized intersections. SR-78 on and off ramp intersections typically provide crossings perpendicular to ramp activities but not across major roads they intersect with.
- **Flat Grade:** The study area is generally flat except for mild inclines/declines at freeway underpasses and overpasses.
- **Pedestrian Amenities:** Pedestrian amenities such as street furniture are lacking along roadways in the study area, except for some bus stops that include covered benches and trash cans.

Bicycle Facilities

Bicycle facilities are categorized into four types, as described below:

- **Class I Bikeway (Bike Path):** Also known as a shared path or multi-use path, a bike path is a paved right-of-way for bicycle traffic that is completely separated from any street or highway.
- **Class II Bikeway (Bike Lane):** A striped and stenciled lane for one-way bicycle travel on a street or highway. This facility could include a buffered space between the bike lane and vehicle lane and the bike lane could be adjacent to on-street parking.
- **Class III Bikeway (Bike Route):** A signed route along a street where the bicyclist shares the right-of-way with motor vehicles. This facility can also be designated used a shared-lane marking (sharrow).
- **Class IV Bikeway (Separated Bike Lane):** A bikeway for the exclusive use of bicycles including a separation required between the separated bikeway and the through vehicular traffic. The separation may include, but is not limited to, grade separation, flexible posts, inflexible physical barriers, or on-street parking.

Within the site vicinity bike facilities are provided along major roads as identified in Table 15 and are typically Class II facilities. As part of completion of the Project, Costco will be constructing Class I bike lanes along the northern boundary of the site along Bent Avenue, between Linda Vista Drive and Bent Avenue.

CRASH HISTORY REVIEW

Crash data for the study intersections was obtained through for the previous five (5) years on record (2018-2022) from the University of California, Berkeley Transportation Injury Mapping System (TIMS, Reference 6) and the California Highway Patrol Statewide Integrated Traffic Records System (SWITRS, Reference 7). This data was used to evaluate and document any potential crash trends occurring at study intersections. *Appendix E contains the crash data reports.*

Table 16 presents the number of crashes, by crash type and severity, at each study intersection.

Table 16. Study Intersection Crash Type and Severity Summary, 2018-2022

Intersection	Crash Type								Total	Severity		
	Broad side	Head On	Fixed Object	Over turn	Rear End	Side swipe	Ped/ Bike	Other		PDO ¹	Injury ²	Severe / Fatal ³
S Las Posas Road / SR-78 WB Ramp	2	-	17	1	36	28	-	-	84	77	6	1
S Las Posas Road / Grand Avenue	4	-	1	-	10	4	-	1	20	15	5	-
Grand Avenue / Via Vera Cruz / SR-78 EB Ramp	5	-	2	-	-	2	-	-	9	6	3	-
Grand Avenue / Linda Vista Drive	-	-	1	-	-	-	-	-	1	-	1	-
Grand Avenue / S Bent Avenue	2	-	-	-	2	1	-	-	5	2	3	-
W San Marcos Blvd / Via Vera Cruz	6	-	4	-	13	7	-	-	30	16	13	1
W San Marcos Blvd / S Bent Avenue	4	1	3	-	15	6	-	-	29	18	11	-
W San Marcos Blvd / Grand Avenue	17	1	5	-	9	10	-	1	43	28	13	2
W San Marcos Blvd / SR-78 EB Ramp	-	1	12	1	24	19	1	-	58	48	7	3
W San Marcos Blvd / Knoll Road / SR-78 WB Ramp	7	-	3	-	8	3	-	-	21	13	8	0
Total	47	3	48	2	117	80	1	2	300	223	70	7

¹ Property Damage Only.

² Includes complaint of pain and suspected injury classifications.

³ Includes severe injury and fatality classifications

As shown in Table 16, rear-end crashes were the most frequent occurrence followed by sideswipes. The least frequent occurrence of crashes were ped/bike crashes followed by over-turn and head on crashes. Property damage only crashes were the most common type of crash severity.

Based on this review of crash data, no specific safety-based improvement needs are identified as part of the proposed fuel facility addition.

EXISTING TRAFFIC OPERATIONS

Peak hour turning movement counts were collected on November 2 and November 4, 2023 during the weekday AM (7:00 AM – 9:00 AM), weekday PM (4:00 PM – 6:00 PM), and Saturday midday (11:00 AM – 2:00 PM) peak periods. The peak hour intersection counts include total vehicle volumes by movement, and pedestrian and bicycle volumes recorded in 15-minute intervals. *Appendix F includes the traffic counts collected at each study intersection and along each roadway segment.*

At the time of data collection, the south leg of the Via Vera Cruz and W San Marcos Boulevard intersection was closed and under construction to widen and improve the connection of Via Vera Cruz between W San Marcos Boulevard and Discovery Street. Historical counts collected from the Artist's Village transportation analysis were reviewed and applied to develop turning movements onto and off of the southern leg of the intersection.

Existing Intersection Operations Analysis

Existing peak hour traffic operations were analyzed for a typical mid-weekday AM and PM peak periods, in accordance with City of San Marcos TIA Guidelines (Reference 1), as well as during a typical Saturday midday peak period given the Project team's historical context of Saturday operations at Costco locations. For a conservative analysis, individual intersection peak hour volumes were used rather than a network peak hour.

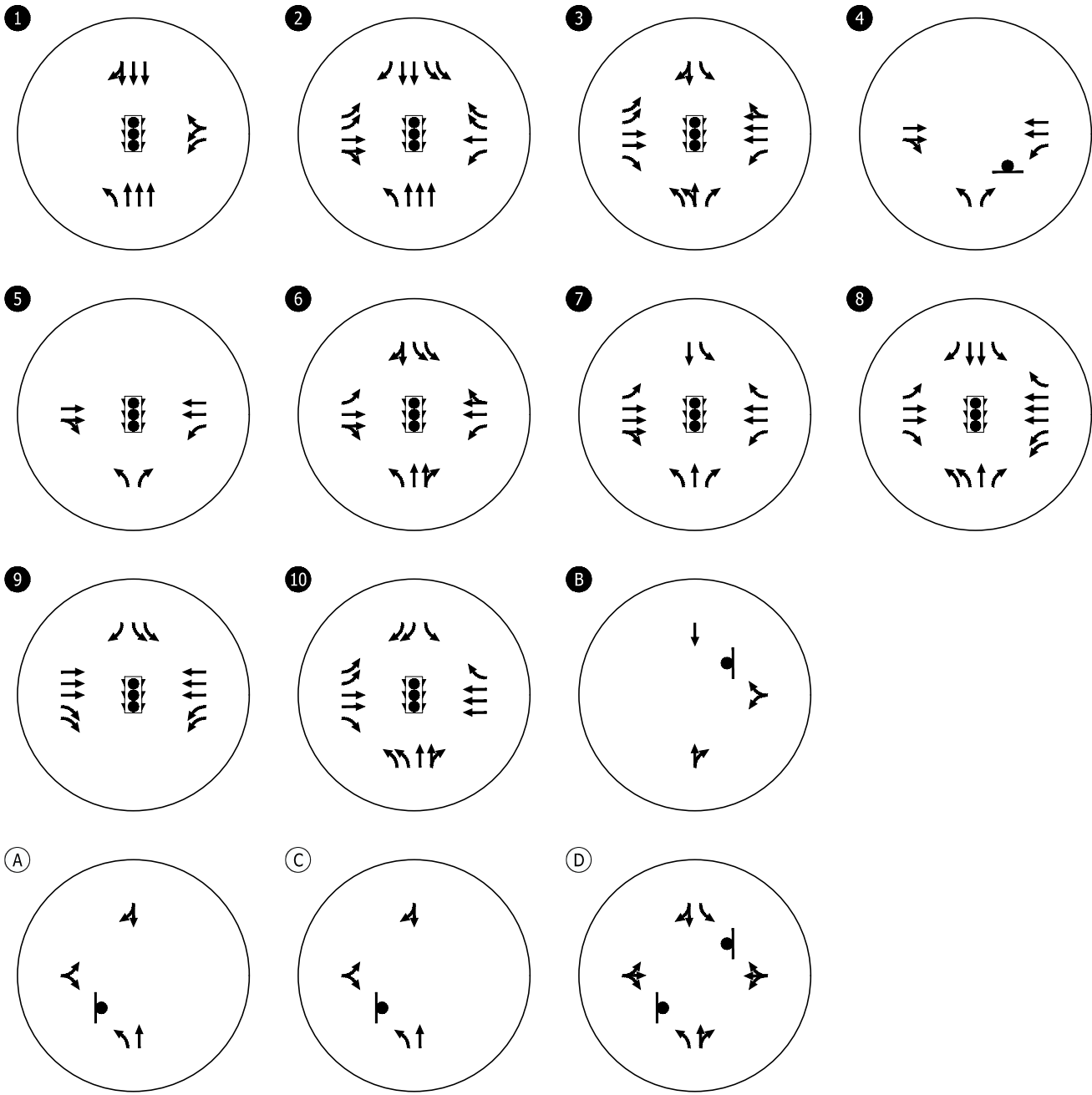
Figure 7 presents the existing lane configuration and traffic control devices. **Figure 8** presents the weekday AM, weekday PM, and Saturday midday peak hour traffic volumes at each study intersection. **Table 17** presents the traffic operation results for each overall intersection under year 2023 existing conditions during the weekday AM and PM, and Saturday midday peak hours. *Appendix G contains the year 2023 existing conditions synchro operations worksheets.*

Table 17. Year 2023 Existing Intersection Operations

#	Intersection	Weekday AM		Weekday PM		Saturday Midday	
		LOS	Delay	LOS	Delay	LOS	Delay
1	S Las Posas Road / SR-78 WB Ramp	D	42.7	C	26.1	C	31.3
2	S Las Posas Road / Grand Avenue	D	41.3	E	76.5	D	36.2
3	Grand Avenue / Via Vera Cruz / SR-78 EB Ramp	D	46.2	E	63.4	D	41.1
4	Grand Avenue / Linda Vista Drive	B	12.1	D	28.2	B	12.7
5	Grand Avenue / S Bent Avenue	B	10.3	B	17.9	B	13.7
A	S Bent Avenue / N Costco Driveway	B	11.3	B	13.6	B	13.8
B	S Bent Avenue / Industrial Driveway	B	10.6	A	9.9	B	10.1
C	S Bent Avenue / Middle Costco Driveway	B	10.8	B	12.3	B	12.3
D	S Bent Avenue / S Costco Driveway	C	15.2	C	18.7	C	22.1
6	W San Marcos Blvd / Via Vera Cruz	C	28	C	28.9	D	37.1
7	W San Marcos Blvd / S Bent Avenue	C	34.3	C	28.8	D	39.6
8	W San Marcos Blvd / Grand Avenue	D	45.6	F	116.0	E	68.5
9	W San Marcos Blvd / SR-78 EB Ramp	A	9.6	A	9.6	B	14.9
10	W San Marcos Blvd / Knoll Road	C	24.6	C	25.0	C	23.1

Bold corresponds to substandard LOS operations.

C:\Users\hoffman\appdata\local\temp\AcPublish_30168\27900_San Marcos Report Figures_36.dwg Dec 19, 2024 - 2:58pm - hoffman Layout Tab: 7, existing LCTD

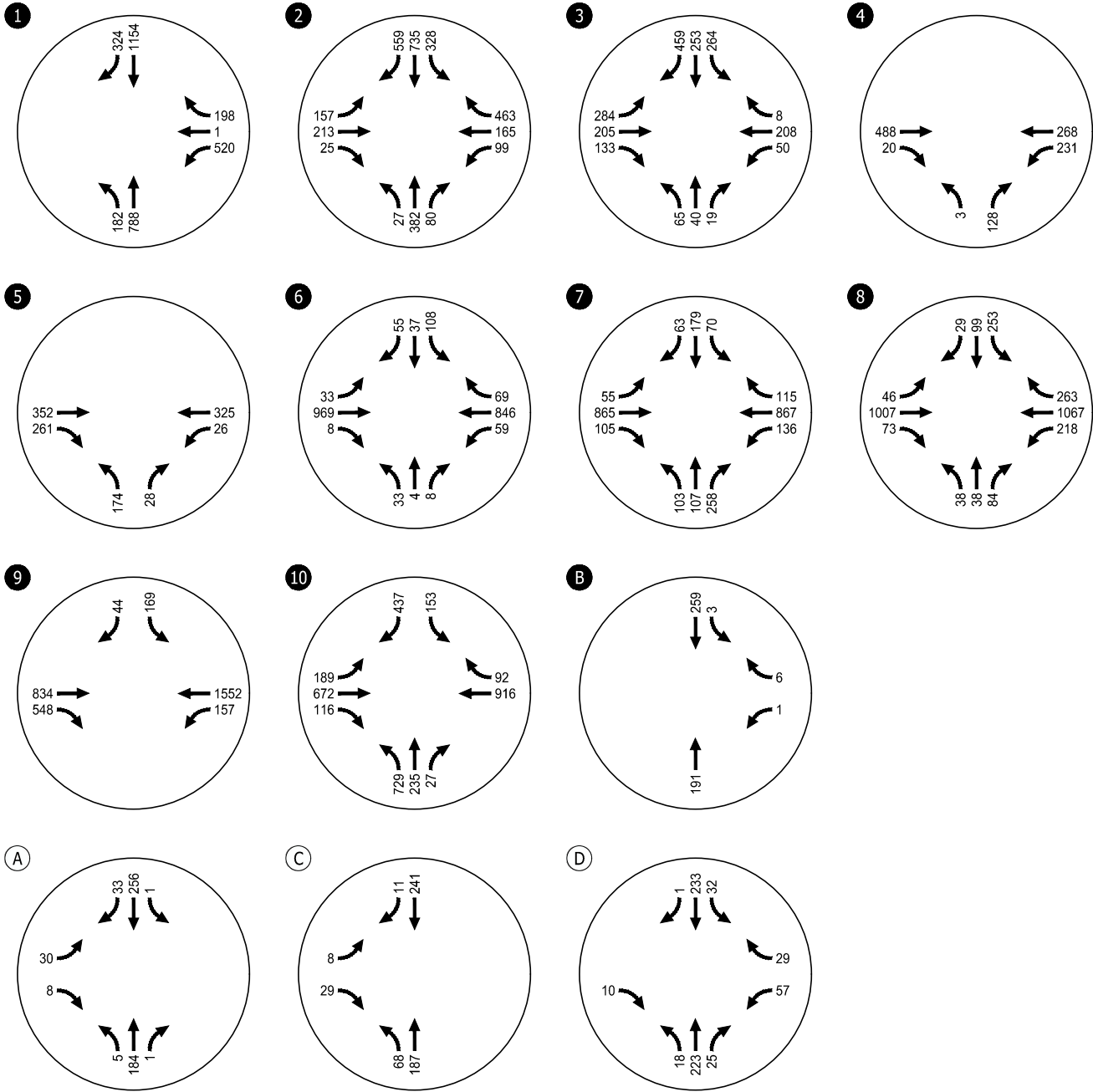


- # - Study Intersection
- # - Site Access Intersection
- Stop Sign
- Traffic Signal

Year 2023 Existing Lane Configurations and Traffic Control Devices
San Marcos, CA

Figure
7

C:\Users\hoffman\appdata\local\temp\AcPublish_30168\27900_San Marcos Report Figures_36.dwg Dec 19, 2024 2:58pm - hoffman Layout Tab: 8A, existing AM

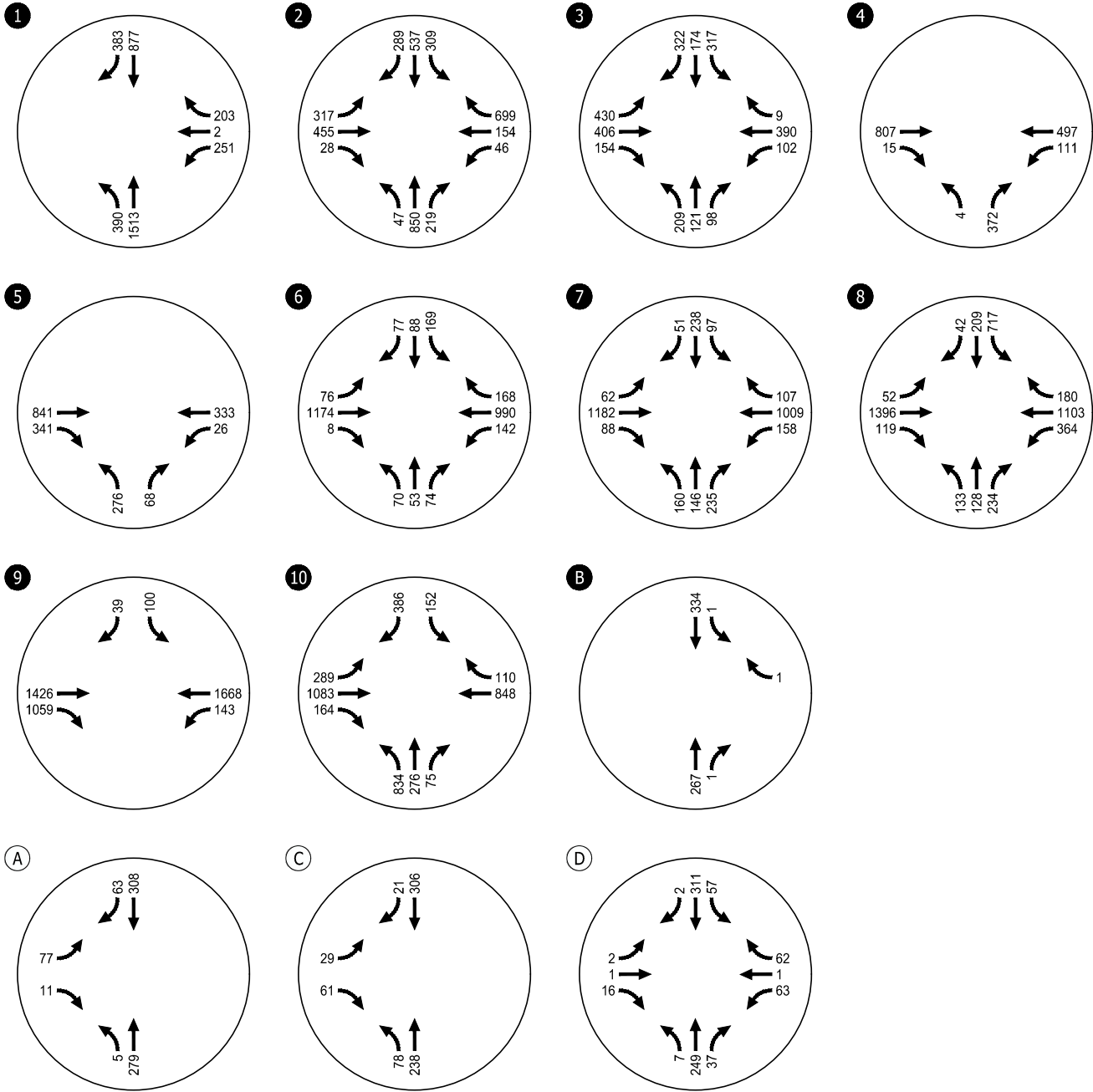


- # - Study Intersection
- # - Site Access Intersection

Year 2023 Existing Traffic Volumes
Weekday AM Peak Hour
San Marcos, CA

Figure
8A

C:\Users\hoffman\appdata\local\temp\AcPublish_30168\27900_San Marcos Report Figures_36.dwg Dec 19, 2024 - 2:58pm - hoffman Layout Tab: 8B, existing PM

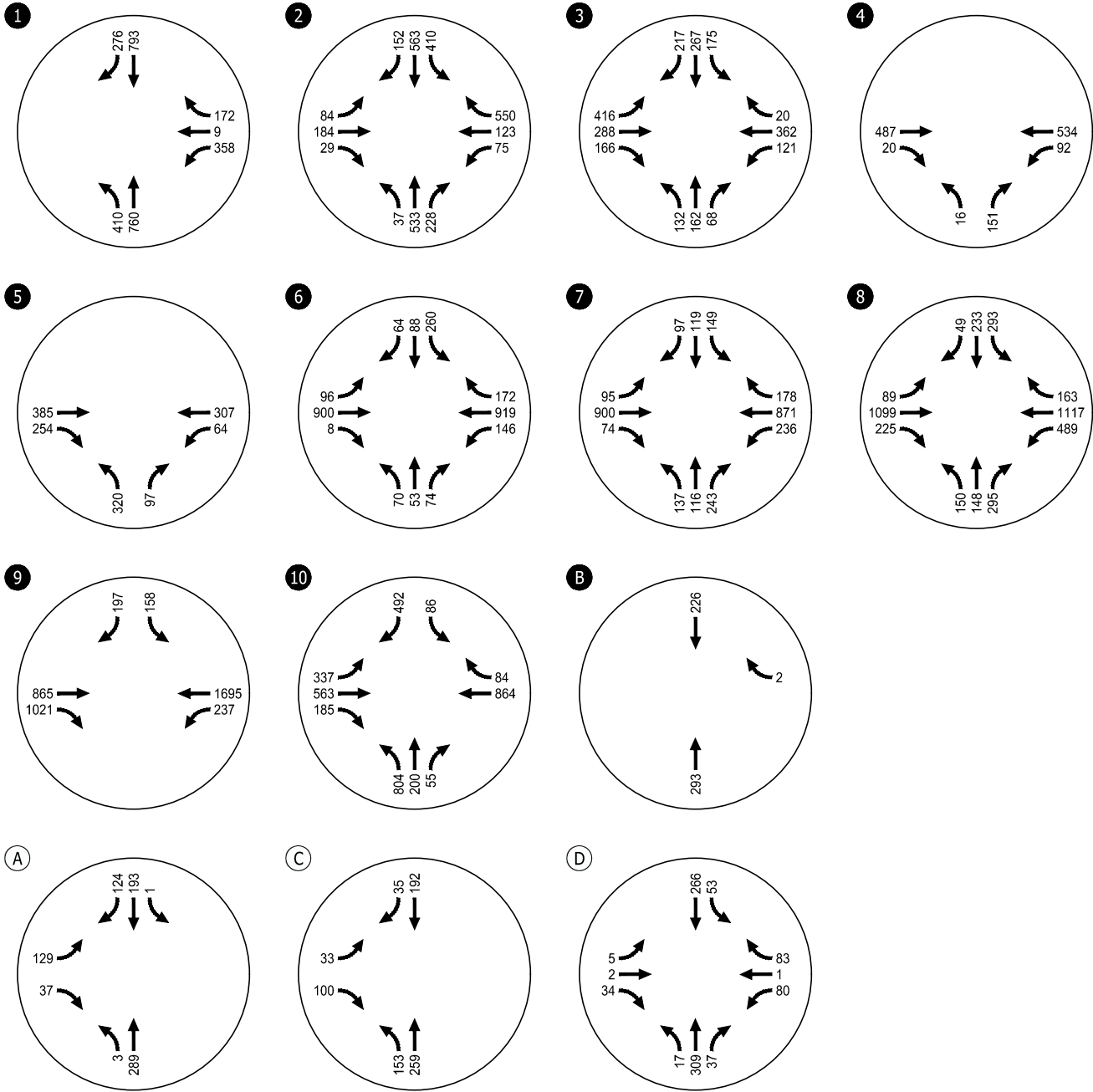


- Study Intersection
- Site Access Intersection

Year 2023 Existing Traffic Volumes
Weekday PM Peak Hour
San Marcos, CA

Figure
8B

C:\Users\hoffman\appdata\local\temp\AcPublish_30168\27900_San Marcos Report Figures_36.dwg Dec 19, 2024 - 2:58pm - hoffman Layout Tab: 8C: existing SAT



- Study Intersection
- Site Access Intersection

Year 2023 Existing Traffic Volumes
Saturday Midday Peak Hour
San Marcos, CA

Figure
8C

As shown in Table 17, under year 2023 existing conditions all study intersections operate with an acceptable LOS during the weekday AM, weekday PM, and Saturday midday peak hours, except for:

- S Las Posas Road / Grand Avenue (PM Peak Hour, LOS E)
- Grand Avenue / Via Vera Cruz / SR-78 EB Ramp (PM Peak Hour, LOS E)
- W San Marcos Boulevard / Grand Avenue (PM Peak Hour, LOS F)

Existing Roadway Segment Operations Analysis

Roadway segment operational analysis was conducted on study roadway segments in accordance with City of San Marcos TIA Guidelines (Reference 1). **Table 18** presents roadway segment operational results for each study roadway segment under year 2023 existing weekday conditions.

Table 18. Year 2023 Existing Weekday Roadway Segment Operations

Roadway	Segment	Functional Classification	Roadway Capacity	ADT	v/c	LOS
S Las Posas Road	SR-78 WB Ramp to Grand Avenue	6-Lane Major Arterial	50,000	26,671	0.533	B
Grand Avenue	S Las Posas Road to Via Vera Cruz	4 Lane Secondary Arterial/Collector	30,000	22,505	0.750	D
Grand Avenue	Via Vera Cruz to Linda Vista Drive	4-Lane Secondary Arterial/Collector	30,000	12,085	0.403	B
Grand Avenue	Linda Vista Drive to S Bent Avenue	4-Lane Secondary Arterial/Connector	30,000	16,970	0.566	C
Grand Avenue	S Bent Avenue to W San Marcos Blvd	4-Lane Secondary Arterial/Connector	30,000	11,710	0.390	B
S Bent Avenue	Grand Avenue to W San Marcos Blvd	2-Lane Collector (Continuous Left-Turn Lane)	15,000	6,894	0.460	B
W San Marcos Blvd	Via Vera Cruz to S Bent Avenue	4-Lane Major Arterial	40,000	45,270	1.132	F
W San Marcos Blvd	S Bent Avenue to Grand Avenue	5-Lane Major Arterial	45,000	51,538	1.145	F
W San Marcos Blvd	Grand Avenue to SR-78 EB Ramp	6-Lane Major Arterial	50,000	51,472	1.029	F
W San Marcos Blvd	SR-78 EB Ramp to Knoll Road	6-Lane Major Arterial	50,000	48,136	0.963	E

Bold corresponds to LOS E and F operations.

As shown in Table 18, all roadway segments operate acceptably under year 2023 existing conditions, except for:

- **W San Marcos Boulevard between Via Vera Cruz and S Bent Avenue:** The average daily traffic bi-directional traffic volume along this segment exceeds the roadway capacity standard of 40,000 for a 4-Lane Major Arterial, resulting in overcapacity and LOS F operations.
- **W San Marcos Boulevard between S Bent Avenue and Grand Avenue:** The average daily traffic bi-directional traffic volume along this segment exceeds the roadway capacity standard of 45,000 for a 5-Lane Major Arterial, resulting in overcapacity and LOS F operations.
- **W San Marcos Boulevard between Grand Avenue and SR-78 EB Ramp:** The average daily traffic bi-directional traffic volume along this segment exceeds the roadway capacity standard of 50,000 for a 6-Lane Major Arterial, resulting in overcapacity and LOS F operations.
- **W San Marcos Boulevard between SR-78 EB Ramp and Knoll Road:** The average daily traffic bi-directional traffic volume along this segment exceeds the roadway capacity standard of 50,000 for a 6-Lane Major Arterial, resulting in undercapacity but LOS E operations.



Section 6

Year 2025 Near-Term Conditions

Traffic Impact Analysis

The traffic impact analysis identifies how the study area's transportation system will operate in the year the Project is expected to be fully built, year 2025. An evaluation of the impact of traffic generated by the Project during the typical weekday AM, weekday PM, and Saturday midday peak hours as follows:

- In-process developments planned in the site vicinity expected to be completed prior to Project completion were identified and added to year 2023 existing traffic volumes to develop near-term without Project 2025 traffic volumes.
- Near-term without Project weekday AM, weekday PM, and Saturday midday peak hour traffic conditions for build-out year 2025 were analyzed at each of the study intersections and roadway segments.
- Site-generated trips under each time period were estimated for the build-out of the Project.
- The build-out year 2025 volumes for near-term with Project conditions were developed by adding near-term without Project 2025 traffic volumes to site generated traffic volumes and were analyzed at each study intersection and roadway segment.
- On-site circulation and site-access operations were evaluated.

YEAR 2025 NEAR-TERM WITHOUT PROJECT CONDITIONS

The year 2025 near-term without Project traffic analysis identifies how the study area's transportation system will operate in the future year without traffic generated by the Project. This analysis includes traffic attributed to planned developments within the study area but does not include traffic from the Project.

Cumulative In-Process Developments

The following developments were identified in coordination with City staff in the study area as cumulative in-process developments and are expected to be completed prior to the completion of the Project. *Appendix H includes trip assignment assumptions for each identified in-process development during the weekday AM, weekday PM, and Saturday midday peak hours.*

PACIFIC COMMERCIAL

This project is located in the northeast corner of the Grand Avenue and Pacific Street intersection. The project proposes to construct a hotel with 122 rooms.

MACDONALD GROUP

This project is located at the former Sears site along San Marcos Boulevard, between S Las Posas Road and Via Vera Cruz. The project proposes to construct 82 apartments and 5,000 square feet of commercial space. A pass-by trip rate of 10 percent was applied to the trips generated by the commercial space.

JUMP BALL LLC

This project is located in the northwest corner of the W San Marcos Boulevard and S Bent Avenue intersection. The project proposes to construct a 3,500 square-foot Panera Bread fast food restaurant with a drive-through window.

PACIFIC GRAND VENTURES, LP

This project is located east of Pacific Street and north of Grand Avenue. The project proposes to construct 262,000 square feet of industrial park space.

GRAN VISTA

This project is located in the northwest corner of the W Mission Road and S Las Posas Road intersection. The project proposes to construct 120 multi-family residential units.

ARCO

This project is located in the southwest corner of the Las Posas Road and W Mission Road intersection. The project proposes to construct a 9-pump gas station, a 3,000 square-foot car wash, and a 5,000 square-foot mart/mini attached restaurant with a drive-through window.

ARTISTS VILLAGE

This project is located in the northwest corner of the Linda Vista Road and Grand Avenue intersection. The project proposes to construct 102 multi-family dwelling units, 7 live/work units, 7,658 square feet of office space, and 49,266 square feet of specialty retail space.

IN-PROCESS DEVELOPMENT TRIP GENERATION SUMMARY

The traffic studies prepared for the in-process developments did not include trip generation or assignment for the Saturday midday peak hour. To develop Saturday midday peak hour in-process trip estimates for this analysis, the PM peak hour trip assignment for each in-process development was multiplied by a factor based on the general land use of each development. These factors were calculated by comparing PM peak hour and Saturday peak hour trip generation rates from the ITE *Trip Generation Manual, 11th Edition* (Reference 8). Where trip generations and assignments were not provided by a previously completed LTA, they were estimated based on the known land use, SANDAG trip generation rates, and existing knowledge of traffic patterns in the Project area.

Table 19 presents the weekday AM, weekday PM, and Saturday midday peak hour trip generation for each identified in-process development.

Table 19. Cumulative In-Process Development Trip Generation Summary

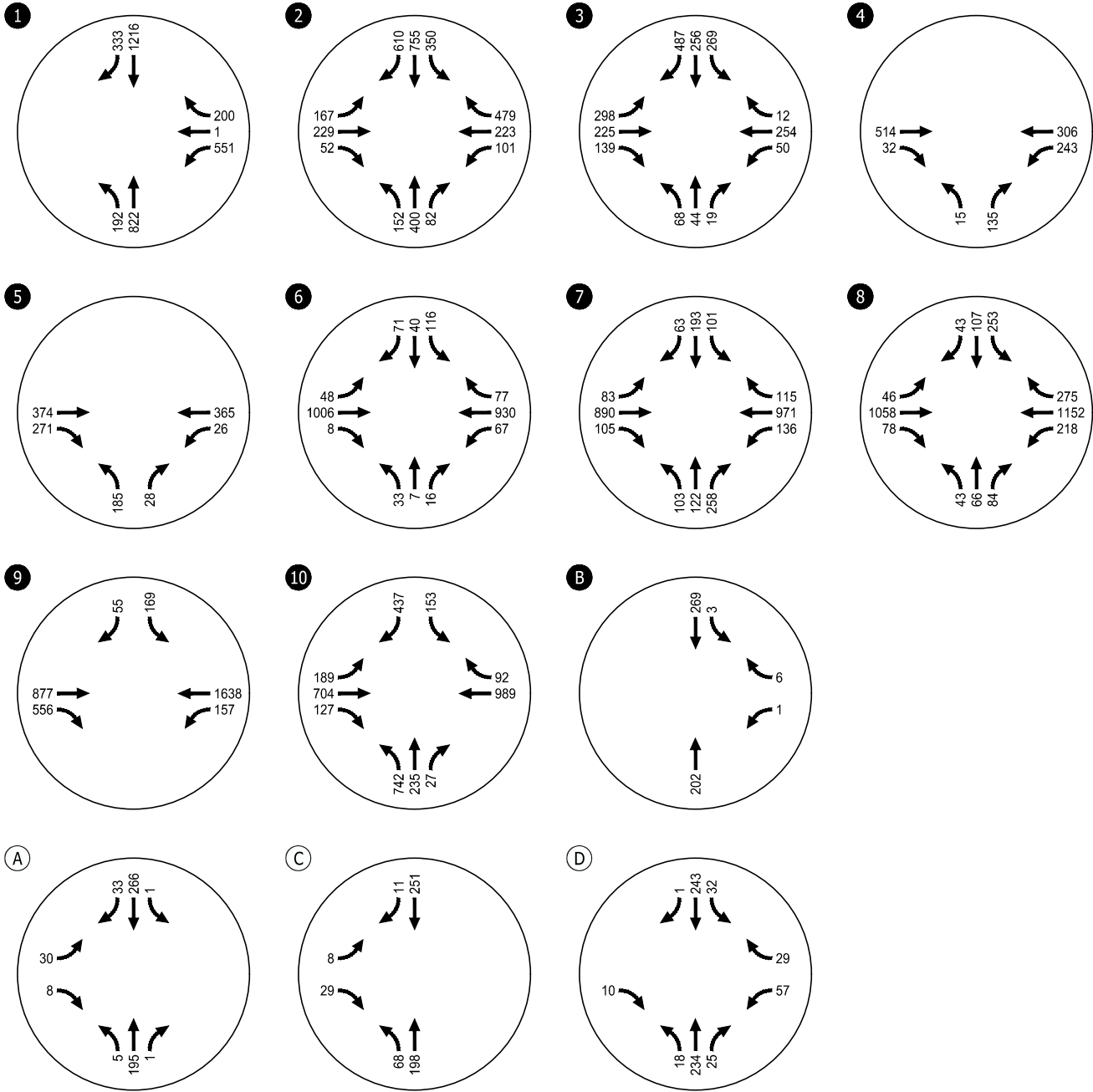
Project	Land Use	Size	Weekday AM Peak			Weekday PM Peak			Saturday Midday		
			Total	In	Out	Total	In	Out	Total	In	Out
Pacific Commercial	Hotel (w/ convention facilities / restaurant)	122 rooms	73	44	29	98	59	39	118	66	52
MacDonald Group	Apartment (multi-family > 20 DU / acre) & Specialty Rate / Strip Commercial	82 units / 5,000 SF com.	43	15	28	69	40	29	46	26	20
Jump Ball LLC	Drive-thru Restaurant	3,500 SF	159	80	79	159	80	79	172	88	84
Pacific Grand Ventures, LP	Industrial Park	252 KSF	230	207	23	251	50	201	276	88	188
Gran Vista	Multi-family (6-20 DU/acre)	120 rooms	77	15	62	96	67	29	69	43	26
Arco	Car Wash & Convenience Store & Commercial Drive-thru & Gas Station Fuel Pump	3,000 SF CW / 5,000 SF C-store / 18 FP gas	134	67	67	150	76	74	134	67	67
Artist's Village	Multi-family (> 20 DU/acre) & Single Tenant Office & Specialty Retail / Strip Commercial	109 units / 7,658 SF office / 49,266 SF com.	126	60	62	189	101	89	219	114	105

Bold indicates scenario volumes calculated using the methodologies described above.

Year 2025 Near-Term Without Project Traffic Volumes

Year 2025 near-term without Project traffic volumes reflect the addition of in-process trips to year 2023 existing traffic volumes. **Figure 9** presents the 2025 near-term without Project traffic volumes used for analysis for the weekday AM, weekday PM, and Saturday midday peak hours.

C:\Users\hoffman\appdata\local\temp\AcPublish_30168\27900_San Marcos Report Figures_36.dwg Dec 19, 2024 - 2:58pm - hoffman Layout Tab: 9A, background AM

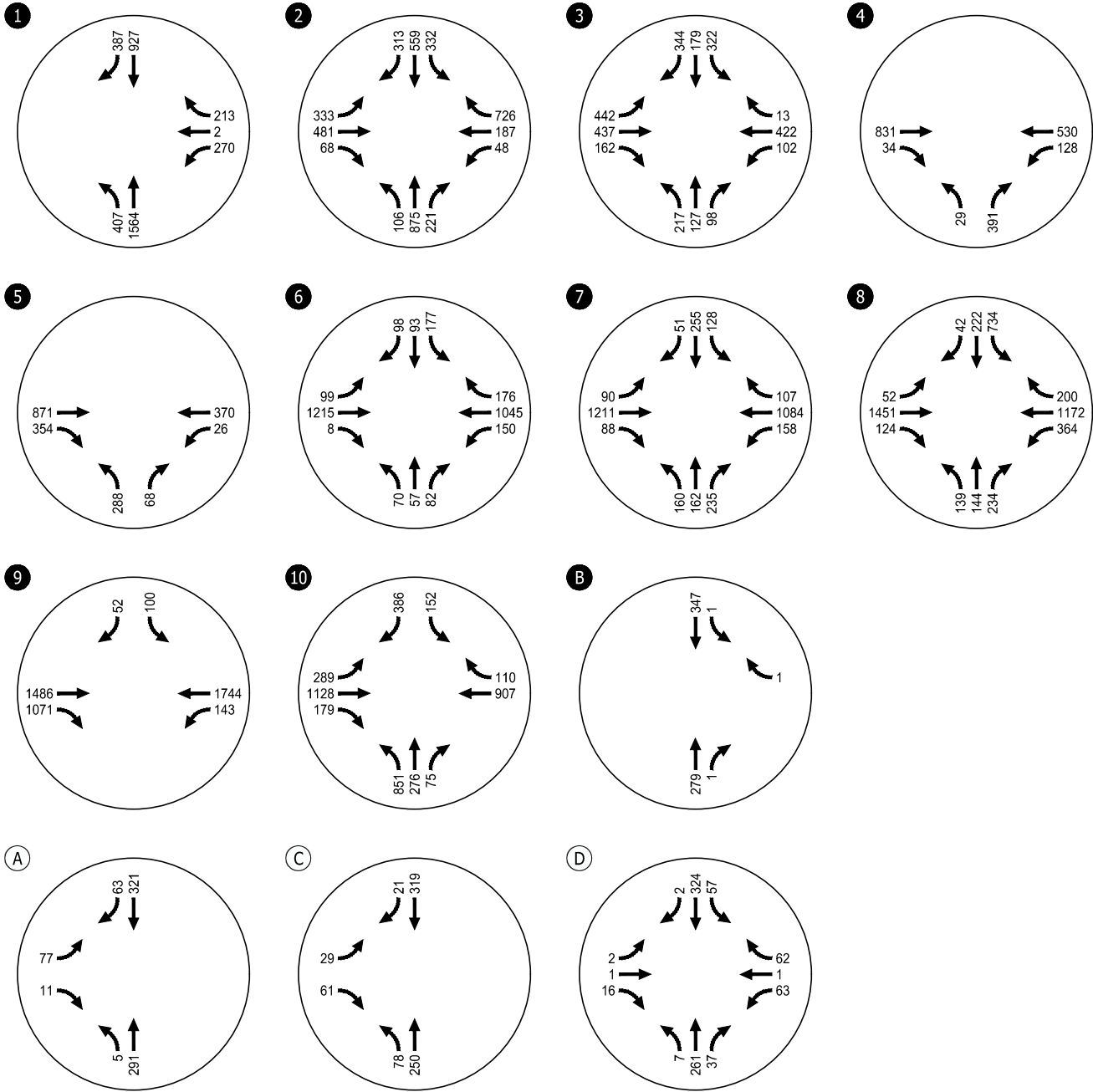


- Study Intersection
- Site Access Intersection

Year 2025 Near-Term Without Project Traffic Volumes
Weekday AM Peak Hour
San Marcos, CA

Figure
9A

C:\Users\hoffman\appdata\local\temp\AcPublish_30168\27900_San Marcos Report Figures_36.dwg Dec 19, 2024 - 2:58pm - hoffman Layout Tab: 9B, background PM

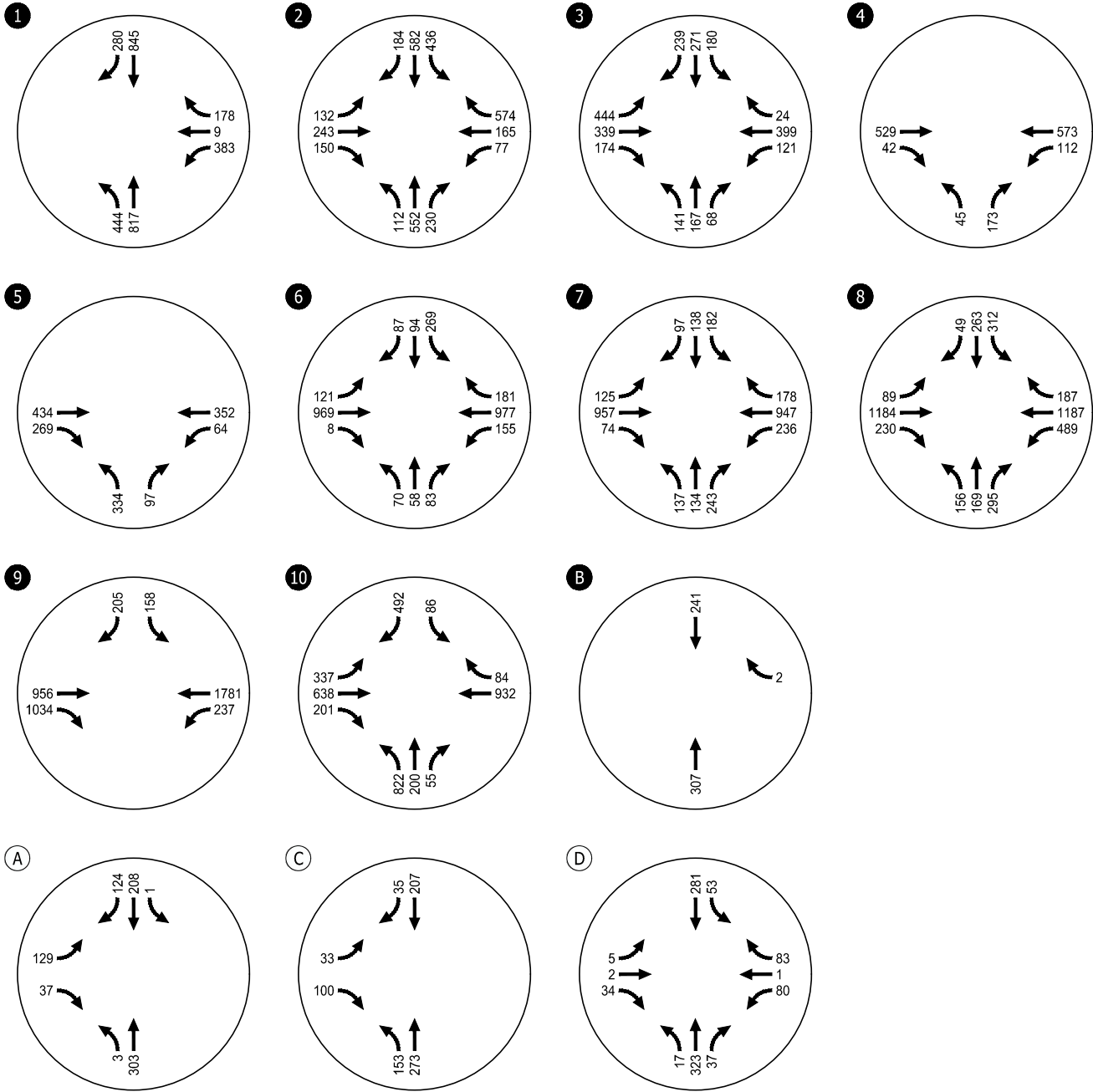


- Study Intersection
- Site Access Intersection

Year 2025 Near-Term Without Project Traffic Volumes
Weekday PM Peak Hour
San Marcos, CA

Figure
9B

C:\Users\hoffman\appdata\local\temp\AcPublish_30168\27900_San Marcos Report Figures_36.dwg Dec 19, 2024 - 2:58pm - hoffman Layout Tab: 9C background SAT



- Study Intersection
- Site Access Intersection

Year 2025 Near-Term Without Project Traffic Volumes
Saturday Midday Peak Hour
San Marcos, CA

Figure
9C

Year 2025 Near-Term Without Project Intersection Operations Analysis

Following discussions with City of San Marcos staff, the previously identified Artists Village Development has been conditioned with relocating the roadway centerline of Linda Vista Drive further east to better accommodate heavy vehicle right turns from Grand Avenue onto Linda Vista Drive. This shift in the roadway centerline, assumed as a background roadway network improvement, results in an adjusted lane configuration for the northbound approach of the Grand Avenue / Linda Vista Drive intersection. Where there is currently enough roadway width for two vehicles to stop at the northbound stop bar, operating effectively as a dedicated left-turn and dedicated right-turn movement, the relocation means these independently operating movements will be contained in one shared left-right approach. This change in lane configuration has been reflected in all future year analysis.

Table 20 presents the traffic operation results for each overall intersection under year 2025 near-term without Project conditions during the weekday AM and PM, and Saturday midday peak hours. *Appendix I contains the year 2025 near-term without Project conditions synchro operations worksheets.*

Table 20. Year 2025 Near-Term Without Project Intersection Operations

#	Intersection	Weekday AM		Weekday PM		Saturday Midday	
		LOS	Delay	LOS	Delay	LOS	Delay
1	S Las Posas Road / SR-78 WB Ramp	D	44.8	C	27.8	C	34.0
2	S Las Posas Road / Grand Avenue	E	60.2	F	82.1	D	38.4
3	Grand Avenue / Via Vera Cruz / SR-78 EB Ramp	D	51.4	E	71.3	D	44.2
4	Grand Avenue / Linda Vista Drive	B	13.9	E	45.3	C	16.0
5	Grand Avenue / S Bent Avenue	B	10.0	B	16.2	B	14.0
A	S Bent Avenue / N Costco Driveway	B	11.1	B	12.9	B	13.0
B	S Bent Avenue / Industrial Driveway	B	10.4	A	9.8	B	10.0
C	S Bent Avenue / Middle Costco Driveway	B	10.5	B	12.1	B	12.0
D	S Bent Avenue / S Costco Driveway	B	14.8	C	17.7	C	21.9
6	W San Marcos Blvd / Via Vera Cruz	C	26.2	C	30.3	D	39.3
7	W San Marcos Blvd / S Bent Avenue	D	39.8	C	31.8	D	42.2
8	W San Marcos Blvd / Grand Avenue	D	42.0	F	116.7	E	66.6
9	W San Marcos Blvd / SR-78 EB Ramp	A	9.6	A	8.6	B	15.5
10	W San Marcos Blvd / Knoll Road	C	24.7	C	24.9	C	23.0

Bold corresponds to substandard LOS operations.

Some minor improvements in operations were observed in year 2025 compared to existing conditions due to peak hour factor adjustments.

As shown in Table 20, under year 2025 near-term without Project conditions all study intersections operate with an acceptable LOS during the weekday AM, weekday PM, and Saturday midday peak hours, except for:

- S Las Posas Road / Grand Avenue (AM Peak Hour, LOS E and PM Peak Hour, LOS F)
- Grand Avenue / Via Vera Cruz / SR-78 EB Ramp (PM Peak Hour, LOS E)
- Grand Avenue / Linda Vista Drive (PM Peak Hour, LOS E)
- W San Marcos Boulevard / Grand Avenue (PM Peak Hour, LOS F)

Year 2025 Near-Term Without Project Roadway Segment Operations Analysis

Table 21 presents roadway segment operational results for each study roadway segment under year 2025 near-term without Project weekday conditions.

Table 21. Year 2025 Near-Term Without Project Weekday Roadway Segment Operations

Roadway	Segment	Functional Classification	Roadway Capacity	ADT	v/c	LOS
S Las Posas Road	SR-78 WB Ramp to Grand Avenue	6-Lane Major Arterial	50,000	27,853	0.557	B
Grand Avenue	S Las Posas Road to Via Vera Cruz	4 Lane Secondary Arterial/Collector	30,000	23,263	0.775	D
Grand Avenue	Via Vera Cruz to Linda Vista Drive	4-Lane Secondary Arterial/Collector	30,000	12,534	0.418	B
Grand Avenue	Linda Vista Drive to S Bent Avenue	4-Lane Secondary Arterial/Connector	30,000	17,440	0.581	C
Grand Avenue	S Bent Avenue to W San Marcos Blvd	4-Lane Secondary Arterial/Connector	30,000	11,964	0.399	B
S Bent Avenue	Grand Avenue to W San Marcos Blvd	2-Lane Collector (Continuous Left-Turn Lane)	15,000	7,972	0.531	C
W San Marcos Blvd	Via Vera Cruz to S Bent Avenue	4-Lane Major Arterial	40,000	46,688	1.167	F
W San Marcos Blvd	S Bent Avenue to Grand Avenue	5-Lane Major Arterial	45,000	53,046	1.179	F
W San Marcos Blvd	Grand Avenue to SR-78 EB Ramp	6-Lane Major Arterial	50,000	52,888	1.058	F
W San Marcos Blvd	SR-78 EB Ramp to Knoll Road	6-Lane Major Arterial	50,000	49,337	0.987	E

Bold corresponds to LOS E and F operations.

As shown in Table 21, all roadway segments are forecast to operate acceptably under year 2025 near-term without Project conditions, except for:

- **W San Marcos Boulevard between Via Vera Cruz and S Bent Avenue:** The average daily traffic bi-directional traffic volume along this segment exceeds the roadway capacity standard of 40,000 for a 4-Lane Major Arterial, resulting in overcapacity and LOS F operations.
- **W San Marcos Boulevard between S Bent Avenue and Grand Avenue:** The average daily traffic bi-directional traffic volume along this segment exceeds the roadway capacity standard of 45,000 for a 5-Lane Major Arterial, resulting in overcapacity and LOS F operations.
- **W San Marcos Boulevard between Grand Avenue and SR-78 EB Ramp:** The average daily traffic bi-directional traffic volume along this segment exceeds the roadway capacity standard of 50,000 for a 6-Lane Major Arterial, resulting in overcapacity and LOS F operations.
- **W San Marcos Boulevard between SR-78 EB Ramp and Knoll Road:** The average daily traffic bi-directional traffic volume along this segment exceeds the roadway capacity standard of 50,000 for a 6-Lane Major Arterial, resulting in undercapacity but LOS E operations.

YEAR 2025 NEAR-TERM WITH PROJECT CONDITIONS

The year 2025 near-term with Project traffic analysis identifies how the study area's transportation system will operate in the future year with traffic generated by the Project. This analysis includes traffic attributed to planned developments within the study area and traffic from the Project.

Year 2025 Near-Term With Project Traffic Volumes

Year 2025 near-term with Project traffic volumes reflect the addition of in-process trips previously identified with year 2023 existing traffic volumes and site generated traffic. **Figure 10** presents the 2025 near-term with Project traffic volumes used for analysis for the weekday AM, weekday PM, and Saturday midday peak hours.

Year 2025 Near-Term With Project Intersection Operations Analysis

Table 22 presents the traffic operation results for each overall intersection under year 2025 near-term with Project conditions during the weekday AM and PM, and Saturday midday peak hours and identifies the change in average delay at each intersection as a result of the addition of Project traffic. *Appendix J contains the year 2025 near-term with Project conditions synchro operations worksheets. Appendix K includes a detailed side-by-side comparison of all intersection and roadway segment operations across all scenarios.*

Table 22. Year 2025 Near-Term With Project Intersection Operations

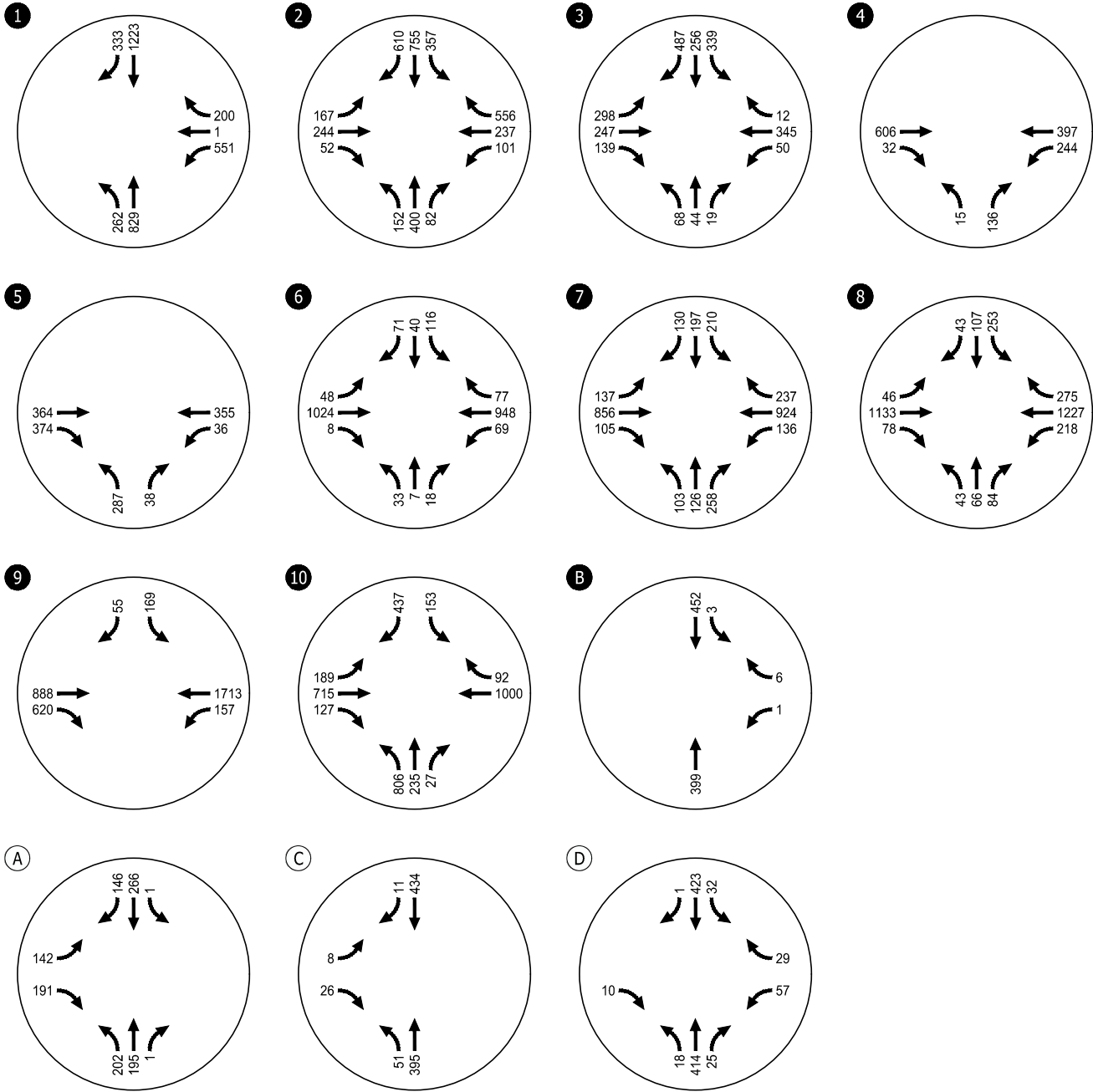
#	Intersection	Weekday AM			Weekday PM			Saturday Midday		
		LOS	Delay	Δ^1 Delay	LOS	Delay	Δ^1 Delay	LOS	Delay	Δ^1 Delay
1	S Las Posas Road / SR-78 WB Ramp	E	55.9	11.1	C	31.3	3.5	D	45.2	11.2
2	S Las Posas Road / Grand Avenue	E	64.5	4.3	F	107.4	25.3	D	40.3	1.9
3	Grand Avenue / Via Vera Cruz / SR-78 EB Ramp	D	52.1	0.7	F	96.2	24.9	E	60.0	15.8
4	Grand Avenue / Linda Vista Drive	C	15.1	1.2	F	68.6	23.3	C	18.8	2.8
5	Grand Avenue / S Bent Avenue	B	13	3.0	C	33.0	16.8	C	21.2	7.2
A	S Bent Avenue / N Costco Driveway	C	16.6	5.5	F	62.3	49.4	F	72.9	59.9
B	S Bent Avenue / Industrial Driveway	B	12.3	1.9	B	12.0	2.2	B	12.3	2.3
C	S Bent Avenue / Middle Costco Driveway	B	12.3	1.8	C	16.1	4	C	15.9	3.9
D	S Bent Avenue / S Costco Driveway	D	25.2	10.4	F	52.1	34.4	F	92.4	70.5
6	W San Marcos Blvd / Via Vera Cruz	C	26.2	0.0	C	30.2	-0.1	D	39.2	-0.1
7	W San Marcos Blvd / S Bent Avenue	D	49.6	9.8	E	77.3	45.5	E	64.6	22.4
8	W San Marcos Blvd / Grand Avenue	D	40.8	-1.2	F	112.6	-4.1	E	64.6	-2.0
9	W San Marcos Blvd / SR-78 EB Ramp	A	9.6	0.0	A	8.8	0.2	B	16.0	0.5
10	W San Marcos Blvd / Knoll Road	C	24.6	-0.1	C	24.8	-0.1	C	22.9	-0.1

¹ Difference calculated between 2025 Near-Term With and Without Project

Bold corresponds to substandard LOS operations.

Some minor improvements in operations were observed under 2025 near-term with project traffic conditions due to the addition of project trips to lower-delay movements, decreasing the weighted average vehicle delay at the intersection.

C:\Users\hoffman\appdata\local\temp\AcPublish_30168\27900_San Marcos Report Figures_36.dwg Dec 19, 2024 - 2:58pm - hoffman Layout Tab: 10A, total AM

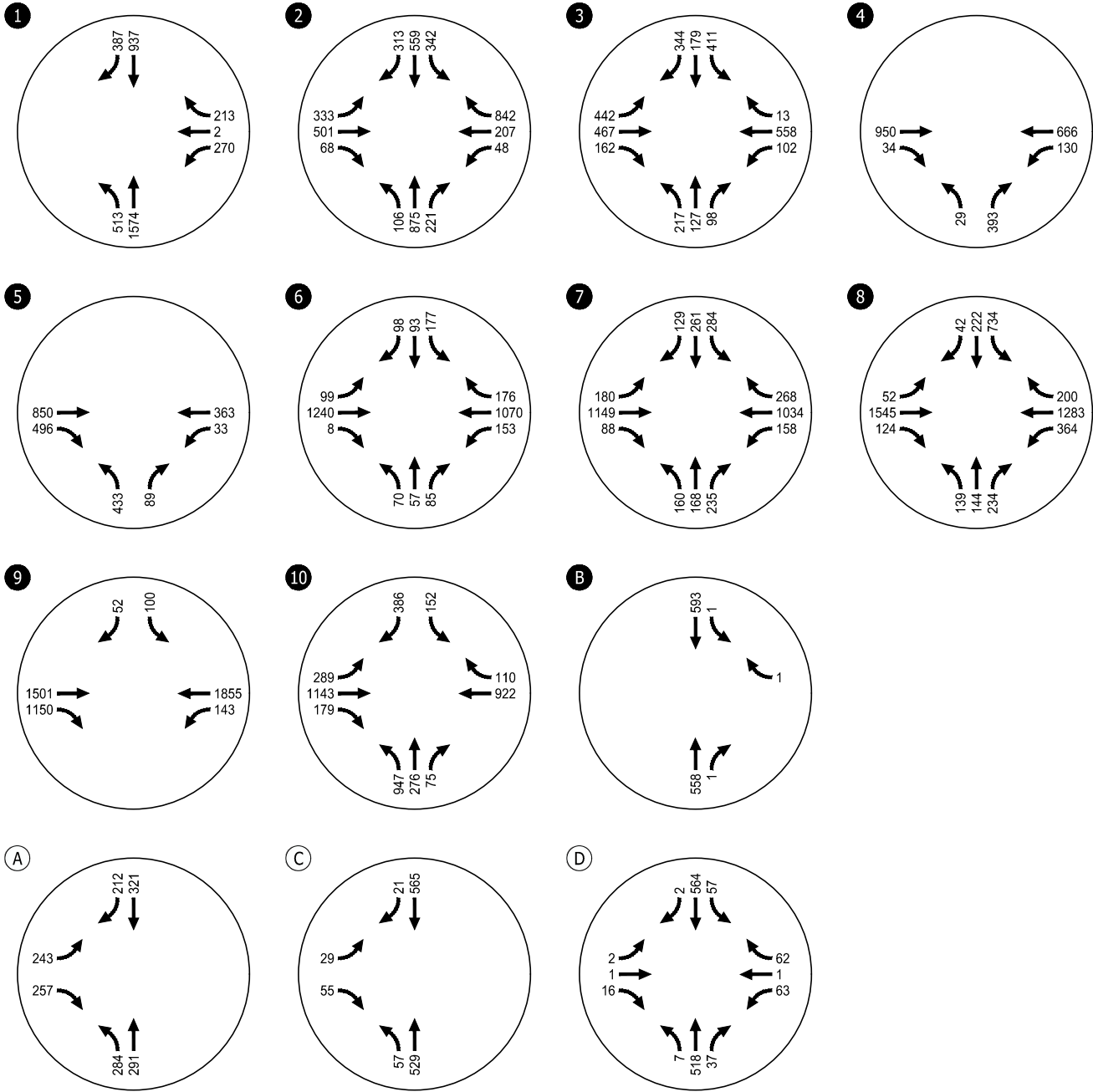


- Study Intersection
- Site Access Intersection

Year 2025 Near-Term With Project Traffic Volumes
Weekday AM Peak Hour
San Marcos, CA

Figure
10A

C:\Users\hoffman\appdata\local\temp\AcPublish_30168\27900_San Marcos Report Figures_36.dwg Dec 19, 2024 - 2:58pm - hoffman Layout Tab: 10B, total PM

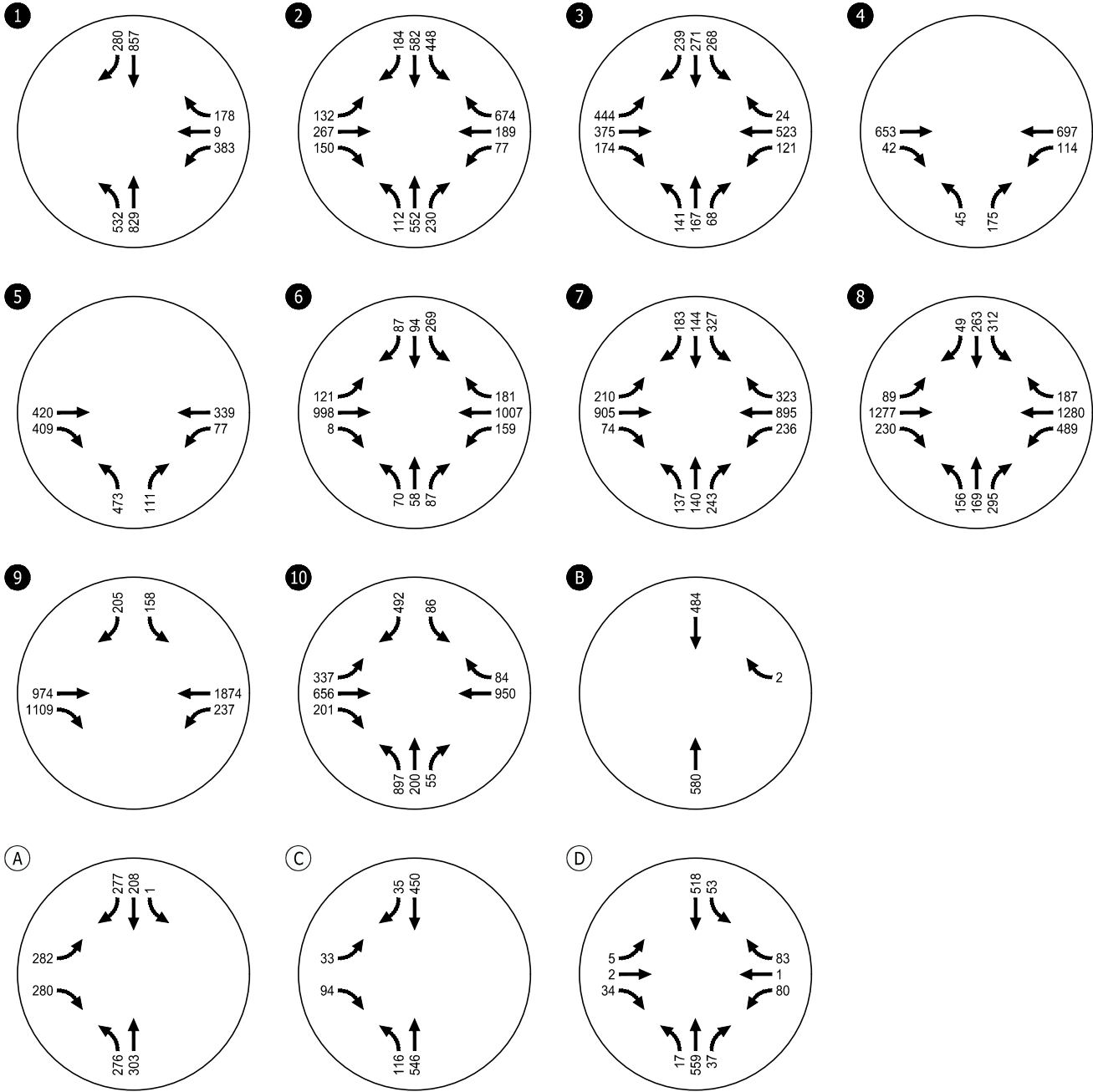


- Study Intersection
- Site Access Intersection

Year 2025 Near-Term With Project Traffic Volumes
Weekday PM Peak Hour
San Marcos, CA

Figure
10B

C:\Users\hoffman\appdata\local\temp\AcPublish_30168\27900_San Marcos Report Figures_36.dwg Dec 19, 2024 - 2:58pm - hoffman Layout Tab: 10C, total SAT



- # - Study Intersection
- # - Site Access Intersection

Year 2025 Near-Term With Project Traffic Volumes
Saturday Midday Peak Hour
San Marcos, CA

Figure
10C

As shown in Table 22, under year 2025 near-term with Project conditions all off-site study intersections operate with an acceptable LOS during the weekday AM, weekday PM, and Saturday midday peak hours, except for:

- S Las Posas Road / SR-78 WB Ramp (AM Peak Hour, LOS E)
- S Las Posas Road / Grand Avenue (AM Peak Hour, LOS E and PM Peak Hour, LOS F)
- Grand Avenue / Via Vera Cruz / SR-78 EB Ramp (PM Peak Hour, LOS F and Saturday Midday Peak Hour, LOS E)
- Grand Avenue / Linda Vista Drive (PM Peak Hour, LOS F)
- W San Marcos Boulevard / Grand Avenue (PM Peak Hour, LOS F)

Site access study intersection operations will be discussed later in this section.

YEAR 2025 NEAR-TERM WITH PROJECT INTERSECTION IMPROVEMENT EVALUATION

This section discusses the potential improvements needed to address each of the intersections not meeting traffic operation standards in year 2025 near-term with Project conditions as a result of Project implementation. *Appendix L includes all operational worksheets for the evaluated near-term improvements.*

S LAS POSAS ROAD & SR-78 WB RAMPS

Under year 2025 near-term with Project conditions, during the weekday AM peak hour the addition of traffic generated by the Project degrades intersection operations from LOS D to LOS E and adds 11.1 seconds of average delay. While the intersection of S Las Posas Road and SR-78 WB Ramps is forecast to operate 0.9 seconds over the LOS D threshold, exceeding City of San Marcos LOS standards during the weekday AM peak hour, the intersection is maintained by Caltrans. Caltrans performance standards require improvements when the addition of Project traffic extends ramp intersection queues to beyond the available storage.

Similar to year 2025 near-term without Project conditions, during the weekday AM peak hour the westbound off-ramp 95th percentile queues for both the left-turn and shared through-right movements at the intersection of S Las Posas Road and SR-78 WB Ramps are forecast to exceed the available storage, while the average queues are forecast to be maintained within the available storage. The Project is not forecast to add any traffic volumes or queue to the westbound off-ramp.

Given that the intersection of S Las Posas Road and SR-78 WB Ramp appears to be fully built out within the available right-of-way, and that the Project does not add any trips to the westbound off-ramp at this intersection therefore not contributing to the queues, no improvements are recommended.

S LAS POSAS ROAD & GRAND AVENUE

Under year 2025 near-term with Project conditions, during the weekday AM and PM peak hours the addition of traffic generated by the Project maintains substandard intersection LOS operations from year 2025 near-term without Project, but adds 4.3 and 25.3 seconds of average delay, respectively. During the weekday AM peak hour the westbound right-turn movement, northbound left-turn movement, and southbound left-turn movements operate at LOS F. During the weekday PM peak hour the eastbound left-turn movement, westbound right-turn movement, and northbound left-turn movement operate at LOS E or worse.

The only turning movements impacted by the traffic generated by the Project are the southbound left-turn and westbound right-turn movements. To improve intersection operations for movements impacted by the addition of Project traffic, the Project team reviewed the addition of another dedicated southbound left-turn lane and the addition of another dedicated westbound right-turn lane.

The addition of another westbound right-turn lane would require roadway widening to the north of Grand Avenue, east of S Las Posas Road. Based on the locations of existing poles and utilities in the northeast corner of the intersection the construction of a westbound right-turn lane would likely require right-of-way acquisition and utility relocation. Given these constraints, construction of another westbound right-turn lane is considered infeasible.

Similarly, the addition of another southbound left-turn lane would require roadway widening. Based on the location of existing fencing surrounding the property in the northwest corner of the intersection, widening in this direction would require right-of-way acquisition. Widening to the east may allow for use of the existing raised median space but would also require right-of-way and utility impacts. Given the location of the existing fire hydrant and other utilities in the northeast corner of the intersection along S Las Posas Road, construction of another southbound left-turn lane is considered infeasible.

To improve intersection operations under Year 2025 Near-Term With Project conditions back to Year 2025 Near-Term Without Project conditions, signal timing adjustments were explored. During the AM peak hour signal timing adjustments include shifting two (2) seconds of green time from the westbound left turn (phase 3) to the southbound left turn (phase 1), shifting two (2) seconds of green time from the eastbound left turn (phase 7) to the southbound approach (phase 6), and shifting seven (7) seconds of green time from the northbound approach (phase 2) to the southbound left turn (phase 1). This adjustment in green time maintains the existing 100-second cycle length, preserving the coordinated signal system along Las Posas Road. During the PM peak hour signal timing adjustments include shifting four (4) seconds of green time from the northbound and southbound through movements (phase 2 and phase 6) to the westbound left-turn and westbound through movements (phase 3 and phase 8). This adjustment in green time maintains the existing 110-second cycle length, preserving the coordinated signal system along Las Posas Road. All signal timing adjustments maintain the existing traffic signal timing assumptions related to minimum green time, yellow time, and red time.

Table 23 summarizes the intersection operations with the identified traffic signal timing adjustments in place during the weekday AM and weekday PM peak hours. Given that no signal timing adjustments were evaluated for the Saturday midday peak hour as the intersection is forecast to operate acceptably, no improved intersection operations for this time period are included in Table 23. As shown, implementation of signal timing adjustments while maintaining the existing cycle lengths, preserving the coordinated signal system on Las Posas Road, improves intersection operations by minimizing impacts associated with Project generated traffic. Signal timing adjustments during the weekday PM peak hour improve intersection operations to better than forecasted under Year 2025 Near-Term Without Project conditions.

Table 23. Year 2025 Near-Term With Project Improved Intersection Operations – Intersection 2

#	Intersection	Evaluated Improvement	Weekday AM		Weekday PM	
			LOS	Delay	LOS	Delay
2	S Las Posas Road / Grand Avenue	Year 2025 Near-Term Without Project	E	60.2	F	82.1
		Year 2025 Near-Term With Project	E	64.5	F	107.4
		Signal Timing Adjustments	E	59.4	F	81.9

As the intersection delay impacts resulting from the addition of Project generated traffic can be mitigated with the implementation of traffic signal timing adjustments, signal adjustments are the recommended improvement for the intersection of S Las Posas Road and Grand Avenue.

GRAND AVENUE & VIA VERA CRUZ & SR-78 EB RAMP

Under year 2025 near-term with Project conditions, during the weekday PM peak hour the addition of traffic generated by the Project maintains substandard LOS but degrades intersection operations from LOS E to LOS F and adds 24.9 seconds of average delay. During the Saturday midday peak hour the addition of Project traffic degrades intersection operations from LOS D to LOS E and adds 15.8 seconds of average delay. During the weekday PM peak hour the westbound shared through-right movement and southbound approach movements operate at LOS F and overcapacity, and the northbound left and through movements operate at LOS E.

While the intersection of Grand Avenue and Via Vera Cruz and the SR-78 EB Ramp operations are forecast to exceed City of San Marcos operational standards, the intersection is maintained by Caltrans. Caltrans performance standards require improvements when the addition of Project traffic extends ramp intersection queues to beyond the available storage.

During the weekday PM peak hour, when the intersection operations exceed City of San Marcos standards, the southbound 95th percentile queues exceed the available striped storage on the SR-78 EB off-ramp, as they do under year 2025 near-term without Project conditions. The addition of traffic generated by the Project adds 55 feet, 152 feet, and 67 feet of 95th percentile queue to the weekday AM, weekday PM, and Saturday midday southbound left-turn queues, respectively.

In addition to adding trips to the southbound left-turn movement the addition of traffic generated by the Project is forecast to add trips to the eastbound and westbound through movements. The addition of an additional southbound left-turn lane, westbound right-turn lane, or northbound left-turn lane would improve capacity for these movements, and subsequently improve intersection operations. However, while the addition of Project traffic adversely affects operations, the intersection of Grand Avenue and Via Vera Cruz and SR-78 EB Ramp appears to be built out within the existing right-of-way.

At the request of City of San Marcos staff, to improve intersection operations under Year 2025 Near-Term With Project conditions back to Year 2025 Near-Term Without Project conditions, signal timing adjustments were explored. During the weekday PM peak hour these signal timing adjustments include lowering the existing green time allocated to the northbound approach (phase 8) by 2.1 seconds, increasing the existing green time allocated to the southbound approach (phase 7) by 10.9 seconds. Timing adjustments also include lowering the existing green time allocated to the westbound left-turn (phase 1) by 3.9 seconds,

lowering the existing green time allocated to the eastbound approach (phase 2) by 4.9 seconds, lowering the existing green time allocated to the eastbound left-turn (phase 5) by 16.7 seconds, and increasing the existing green time allocated to the westbound approach (phase 6) by 7.9 seconds. These timing adjustments maintain the existing cycle length at this intersection, preserving the coordinated traffic signal system.

During the Saturday midday peak hour, the signal timing adjustments include lowering the existing green time allocated to the northbound approach (phase 8) by 2.1 seconds, lowering the existing green time allocated to the southbound approach (phase 7) by 1.1 seconds. Timing adjustments also include lowering the existing green time allocated to the westbound left-turn (phase 1) by 3.9 seconds, increasing the existing green time allocated to the eastbound approach (phase 2) by 7.1 seconds, lowering the existing green time allocated to the eastbound left-turn (phase 5) by 2.7 seconds, and increasing the existing green time allocated to the westbound approach (phase 6) by 5.9 seconds. These timing adjustments maintain the existing cycle length at this intersection, preserving the coordinated traffic signal system. All signal timing adjustments maintain the existing traffic signal timing assumptions related to minimum green time, yellow time, and red time.

Table 24 summarizes the intersection operations with the identified traffic signal timing adjustments in place during the weekday PM and Saturday midday peak hours, and provides the identified unimproved results to the Year 2025 Near-Term Without and With Project conditions for comparison. Given that no signal timing adjustments were evaluated for the weekday AM peak hour as the intersection is forecast to operate acceptably, no improved intersection operations for this time period are included in Table 24. As shown, implementation of signal timing adjustments while maintaining the existing cycle lengths, preserving the coordinated signal system, improves intersection operations to better than forecasted under Year 2025 Near-Term Without Project conditions.

In addition to the evaluated signal timing adjustments, City staff have identified that other developments in the area (including the Pacific Specific Plan) have evaluated the addition of a dedicated southbound right-turn off of SR-78 onto Grand Avenue. Per the request of City staff, the project team evaluated intersection operations with the addition of a dedicated southbound right-turn lane, assuming 200 feet of right-turn storage. Table 24 summarizes the intersection operations with the addition of a dedicated southbound right-turn lane, assuming traffic signal split optimization (providing additional time to the eastbound and westbound approaches), maintaining the existing cycle length. As shown, the dedicated southbound right-turn lane improves intersection operations during the weekday AM peak hour, weekday PM, and Saturday midday peak hours.

Table 24. Year 2025 Near-Term With Project Improved Intersection Operations – Intersection 3

#	Intersection	Evaluated Improvement	Weekday AM		Weekday PM		Saturday Midday	
			LOS	Delay	LOS	Delay	LOS	Delay
3	Grand Avenue / Via Vera Cruz / SR-78 EB Ramp	Unimproved Year 2025 Near-Term Without Project	D	51.4	E	71.3	D	44.2
		Unimproved Year 2025 Near-Term With Project	D	52.1	F	96.2	D	60.0
		Signal Timing Adjustments	-	-	D	47.6	D	42.7
		Dedicated SBR Turn Lane	C	34.4	D	42.5	D	36.7

The addition of a dedicated southbound right-turn lane and signal timing adjustments at the intersection of Grand Avenue / Via Vera Cruz / SR-78 EB Ramp improves intersection operations. While trips generated by the Project do not add to the southbound right-turn movement, adding a dedicated right-turn lane will separate right-turning vehicles from the shared through-right lane, reducing the volume of vehicles in that lane and shortening its queue. With less congestion in the shared through-right lane, left-turning vehicles will have a clearer path to enter the left-turn lane more efficiently. This improvement allows left-turning vehicles to move into their lane faster, enhancing the overall capacity and reducing delays for the left-turn movement.

Utilizing the Caltrans fair share calculation consistent with what was presented in the February 2023 Pacific Specific Plan LTA, the Project is forecast to contribute an average of 31.1% of traffic to the intersection.

Following the intersection improvement evaluation, signal adjustments are the recommended improvement for the intersection of Grand Avenue / Via Vera Cruz / SR-78 EB Ramp.

GRAND AVENUE & LINDA VISTA DRIVE

Under near-term 2025 with Project conditions, during the weekday PM peak hour the addition of traffic generated by the Project degrades intersection operations from LOS E to LOS F and adds 23.3 seconds of average delay. The two-way stop-control LOS and delay for the intersection of Linda Vista Drive and Grand Avenue are driven by the critical northbound right-turn movement and difficulty finding gaps in eastbound traffic along Grand Avenue to complete the right-turn. This movement exceeds LOS D standards and operates under capacity with a v/c ratio of 0.98 during the weekday PM peak hour.

To improve intersection operations under Year 2025 Near-Term With Project conditions back to Year 2025 Near-Term Without Project conditions, the lane configuration of Linda Vista Drive was evaluated. Restriping Linda Vista Drive to provide separate northbound left-turn and right-turn lanes (to allow a right-turning vehicle to get around a vehicle waiting to make a left-turn) will restore operations to pre-project conditions.

Table 25 summarizes intersection operations with dedicated northbound left-turn and right-turn lanes. Given that the adjustment to the lane configuration would impact all peak hours, the operational results for the weekday AM, weekday PM, and Saturday midday peak hours are shown.

Table 25. Year 2025 Near-Term With Project Improved Intersection Operations – Intersection 4

#	Intersection	Evaluated Improvement	Weekday AM		Weekday PM		Saturday Midday	
			LOS	Delay	LOS	Delay	LOS	Delay
4	Grand Avenue / Linda Vista Drive	Unimproved Year 2025 Near-Term Without Project	B	13.9	E	45.3	C	16.0
		Unimproved Year 2025 Near-Term With Project	C	15.1	F	68.6	C	18.8
		Provision of Dedicated NBL and NBR Turn Lanes	B	13.6	E	36.9	B	14.8

As demonstrated in Table 25, providing separate northbound left-turn and right-turn lanes improves intersection operations under Year 2025 Near-Term With Project conditions back to Year 2025 Near-Term Without Project conditions. Through coordination between the project team, City of San Marcos staff, and the Artists Village Development, truck turning movements and curb lines were examined to arrive at a striping plan with two 10-foot lanes with 25 feet of storage approaching Grand Avenue, and a 6-foot hatched painted median to accommodate heavy vehicle turns without encroaching on opposing traffic.

Exhibit A demonstrates that a Costco fuel truck can safely complete a right-turn maneuver out of the site while a WB-50 (the design vehicle for the Artists Village Development) simultaneously makes a right-turn maneuver onto Linda Vista Drive.

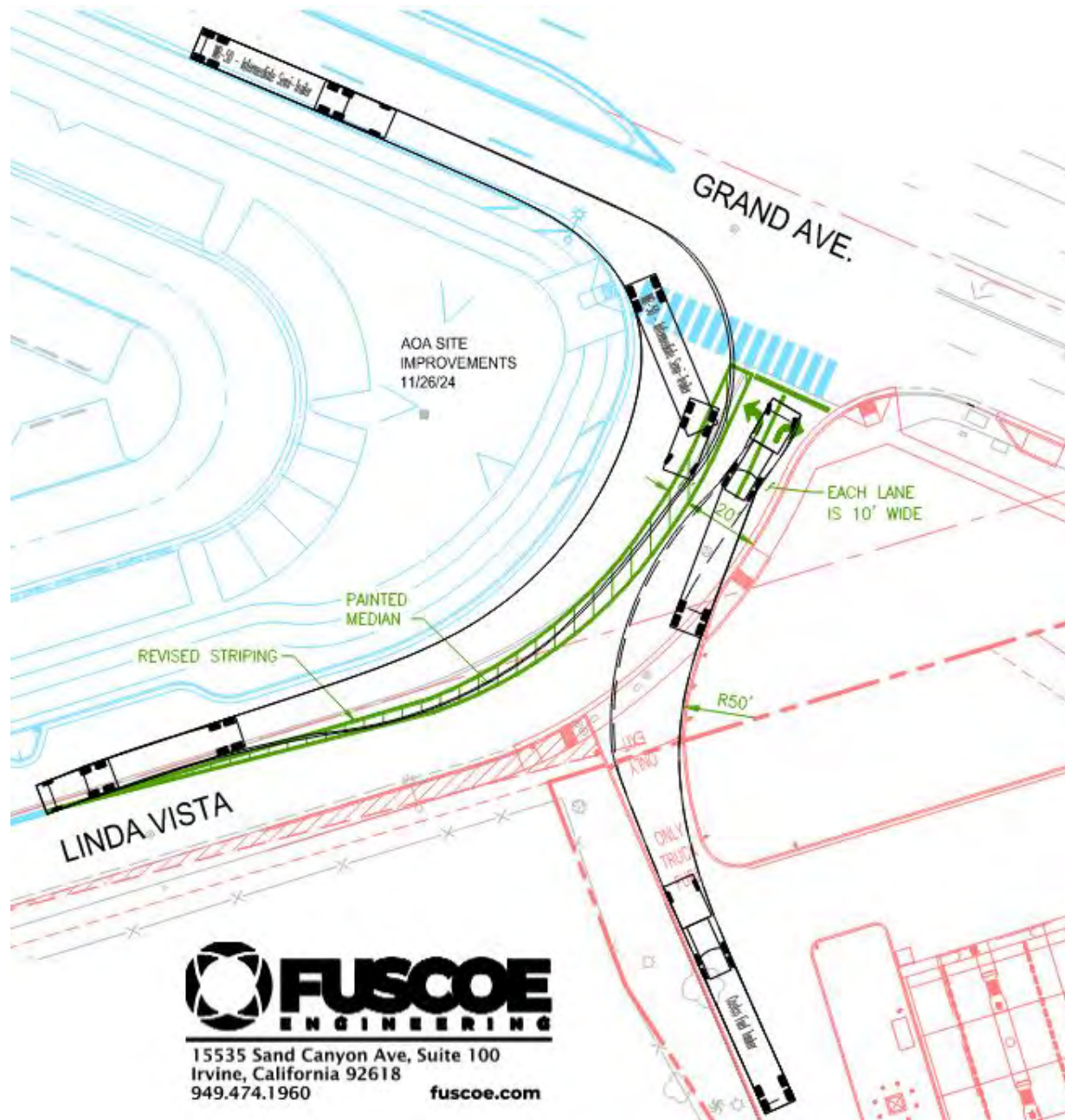


Exhibit A. Truck Turn and Roadway Centerline Evaluation at Linda Vista Drive / Grand Avenue

Restriping Linda Vista Drive to provide separate northbound left-turn and right-turn movements is the recommended improvement for the intersection of Grand Avenue / Linda Vista Drive.

W SAN MARCOS BOULEVARD & GRAND AVENUE

Under near-term 2025 with Project conditions, during the weekday PM peak hour the addition of traffic generated by the Project maintains the substandard LOS F operations. The addition of Project traffic reduces the average intersection delay by 4.1 seconds.

Traffic generated by the Project is only anticipated to add volume to the eastbound and westbound through movements at the intersection of W San Marcos Boulevard and Grand Avenue. The addition of Project traffic to movements experiencing the lowest delay in a traffic signal system coordinated in the eastbound and westbound directions results in a more efficient balancing of traffic volumes at the intersection, and results in a lower average delay. Given that the addition of Project traffic is forecast to improve intersection average delay, no improvements are recommended.

Year 2025 Near-Term With Project Roadway Segment Operations Analysis

Table 26 presents roadway segment operational results for each study roadway segment under year 2025 near-term with Project weekday conditions and identifies the change in v/c on each roadway segment as a result of the addition of Project traffic. *Appendix K includes a detailed side-by-side comparison of all intersection and roadway segment operations across all scenarios.*

Table 26. Year 2025 Near-Term With Project Weekday Roadway Segment Operations

Roadway	Segment	Functional Classification	Roadway Capacity	ADT	v/c	Δ^1 v/c	LOS
S Las Posas Road	SR-78 WB Ramp to Grand Avenue	6-Lane Major Arterial	50,000	27,968	0.560	0.003	B
Grand Avenue	S Las Posas Road to Via Vera Cruz	4 Lane Secondary Arterial/Collector	30,000	23,414	0.781	0.006	D
Grand Avenue	Via Vera Cruz to Linda Vista Drive	4-Lane Secondary Arterial/Collector	30,000	12,766	0.426	0.008	B
Grand Avenue	Linda Vista Drive to S Bent Avenue	4-Lane Secondary Arterial/Connector	30,000	17,616	0.590	0.009	C
Grand Avenue	S Bent Avenue to W San Marcos Blvd	4-Lane Secondary Arterial/Connector	30,000	11,964	0.399	0.000	B
S Bent Avenue	Grand Avenue to W San Marcos Blvd	2-Lane Collector (Continuous Left-Turn Lane)	15,000	8,421	0.565	0.033	C
W San Marcos Blvd	Via Vera Cruz to S Bent Avenue	4-Lane Major Arterial	40,000	46,740	1.169	0.001	F
W San Marcos Blvd	S Bent Avenue to Grand Avenue	5-Lane Major Arterial	45,000	53,233	1.183	0.004	F
W San Marcos Blvd	Grand Avenue to SR-78 EB Ramp	6-Lane Major Arterial	50,000	53,075	1.062	0.004	F
W San Marcos Blvd	SR-78 EB Ramp to Knoll Road	6-Lane Major Arterial	50,000	49,453	0.989	0.002	E

¹ Difference calculated between 2025 Near-Term With and Without Project

Bold corresponds to LOS E and F operations.

As shown in Table 26, all roadway segments are forecast to operate acceptably under year 2025 near-term with Project conditions, except for:

- **W San Marcos Boulevard between Via Vera Cruz and S Bent Avenue:** The average daily traffic bi-directional traffic volume along this segment exceeds the roadway capacity standard of 40,000 for a 4-Lane Major Arterial, resulting in overcapacity and LOS F operations.
- **W San Marcos Boulevard between S Bent Avenue and Grand Avenue:** The average daily traffic bi-directional traffic volume along this segment exceeds the roadway capacity standard of 45,000 for a 5-Lane Major Arterial, resulting in overcapacity and LOS F operations.

- **W San Marcos Boulevard between Grand Avenue and SR-78 EB Ramp:** The average daily traffic bi-directional traffic volume along this segment exceeds the roadway capacity standard of 50,000 for a 6-Lane Major Arterial, resulting in overcapacity and LOS F operations.
- **W San Marcos Boulevard between SR-78 EB Ramp and Knoll Road:** The average daily traffic bi-directional traffic volume along this segment exceeds the roadway capacity standard of 50,000 for a 6-Lane Major Arterial, resulting in LOS E operations.

As shown, no study roadway segments are expected to degrade to an unacceptable LOS and increase v/c by more than 0.02 as a result of Project implementation. Additionally, no study segments forecast to operate at a substandard LOS under near-term without Project conditions experience more than a 0.02 increase to v/c as a result of the Project. Therefore, no study roadway segment improvements are required.

SITE ACCESS EVALUATION

This section evaluates intersection sight distance, queuing and on-site circulation. All analyses and evaluation in this section is based on year 2025 near-term build out of the site.

Site Access Locations

Site accesses were reviewed for spacing standards as per the City of San Marcos Intersection Sight Distance Guidelines (Reference 9) which outlines sight distance requirements.

S BENT AVENUE / NORTHERN COSTCO DRIVEWAY

This new site access to S Bent Avenue is along the site's eastern boundary and will be a relocation of the existing site access location, to be located approximately 460 feet south of the existing S Bent Avenue and Grand Avenue intersection and 230 feet north of the existing Middle Costco Driveway intersection. This driveway is stop-controlled.

S BENT AVENUE / MIDDLE COSTCO DRIVEWAY

This existing site access to S Bent Avenue is along the site's eastern boundary and is located approximately 230 feet south of the new Northern Costco Driveway intersection and approximately 350 feet north of the existing Southern Costco Driveway intersection. This driveway is stop-controlled.

S BENT AVENUE / SOUTHERN COSTCO DRIVEWAY

This existing site access to S Bent Avenue is along the site's eastern boundary and is located approximately 350 feet south of the existing Middle Costco Driveway intersection and approximately 270 feet north of the existing S Bent Avenue and W San Marcos Boulevard intersection. This driveway is two-way stop-controlled with the Costco access being stop-controlled.

LINDA VISTA AVENUE TRUCK ONLY EGRESS DRIVEWAY

This new site access to Linda Vista Avenue is along the sites' northwestern boundary and is located approximately 82 feet south of the northbound stop bar at the existing Grand Avenue / Linda Vista intersection. This access will provide egress exclusively for fuel facility trucks. Previously presented Exhibit A provides a detailed depiction of the Egress Access onto Linda Vista Avenue and additional information related to truck turning movements.

Intersection Sight Distance

Sight distance was evaluated at the three site access locations along S Bent Avenue. Per City of San Marcos guidelines for vehicles making a right-turn from stop onto a 35-mph roadway 335 feet of intersection sight distance is required, vehicles making a left-turn from stop onto a 35-mph roadway require 390 feet of intersection sight distance.

Sight distance was also evaluated for the fuel truck egress on Linda Vista Drive, which is restricted to exclusively a right-out movement. Per City of San Marcos guidelines for vehicles making a right-turn from stop onto a 40-mph roadway 380 feet of sight distance is required. Per guidance provided in the AASHTO

Greenbook, for trucks making a right-turn from stop, assuming an eye height of 7.6 feet, onto a 40-mph roadway 620 feet of sight distance is required.

Adequate intersection sight distance appears to be available at all four site access locations. Project civil plans will show intersection visibility.

Queuing

The 95th percentile queuing at the site access intersections were evaluated. **Exhibit B** illustrates the assumed lane configurations for the site access intersections along S Bent Avenue. **Table 27** shows the projected queues under year 2025 near-term with Project conditions. *Appendix J provides year 2025 near-term with Project conditions queues with the appropriate analysis worksheets.*

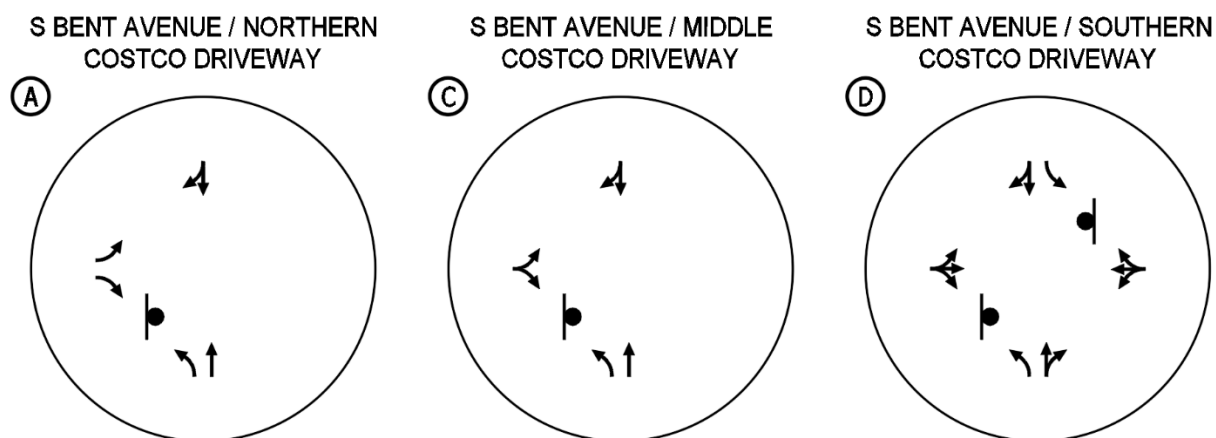


Exhibit B. Build-Out Site Access Lane Configurations

Table 27. Year 2025 Near-Term With Project Conditions 95th Percentile Queue Analysis at Driveways

No.	Intersection	Lane Group	Storage Available (ft)	95 th Queue ¹ (ft) AM / PM / SAT	Fits within Storage
A	S Bent Avenue / Northern Costco Driveway	EBL	150 ²	50 / 275 / 325	Yes ²
		EBR	150 ²	50 / 75 / 75	Yes ²
		NBL	150	25 / 50 / 50	Yes
		NBT	-	- / - / -	Yes
		SBTR	-	- / - / -	Yes
C	S Bent Avenue / Middle Costco Driveway	EBLR	100	25 / 25 / 50	Yes
		NBL	150	25 / 25 / 25	Yes
		NBT	-	- / - / -	Yes
		SBTR	-	- / - / -	Yes
D	S Bent Avenue / Southern Costco Driveway	EBLTR	100	25 / 25 / 25	Yes
		WBLTR	100 ³	50 / 100 / 175	Yes ³
		NBL	50	25 / 25 / 25	Yes
		NBTR	-	- / - / -	Yes
		SBL	100	25 / 25 / 25	Yes
		SBTR	-	- / - / -	Yes

¹ Reported queues rounded to nearest vehicle length assuming 25 feet per vehicle.

² Available storage extends beyond 150 feet into the site up to 580 feet.

³ Available storage extends beyond 100 feet further into the site.

As demonstrated in Table 27, under year 2025 near-term with Project conditions all site access queues are forecast to be maintained within the available storage lengths during the weekday AM, weekday PM, and Saturday midday peak hours.

At the new intersection location of the S Bent Avenue and North Costco Driveway intersection the existing two-way center left-turn lane provides adequate turn lane storage for vehicles making northbound left-turns without impeding intersection operations at the Middle Costco Driveway.

S BENT AVENUE & NORTHERN COSTCO DRIVEWAY

Under near-term 2025 with Project conditions, as presented in Table 22, during the weekday PM peak hour the addition of traffic generated by the Project degrades intersection operations from LOS B to LOS F and adds 49.4 seconds of average delay. During the Saturday midday peak hour, the addition of Project traffic degrades intersection operations from LOS B to LOS F and adds 59.9 seconds of average delay.

The two-way stop-control LOS and delay for the intersection are driven by the critical eastbound left-turning movement during both the weekday PM and Saturday midday peak hours as vehicles leaving the Costco site have difficulty finding gaps in traffic along S Bent Avenue.

During the weekday PM and Saturday Midday peak hours the eastbound left-turn lane is forecast to experience vehicle queues of 275 feet and 325 feet into the site, respectfully. The driveway provides approximately 150 feet of depth into the site for queue storage directly behind the exit. Vehicles queuing beyond this storage are anticipated to queue back into the site, wrapping north past the fuel facility entrance. Including the space adjacent to the eastern boundary of the fuel facility, there is approximately 580 feet of vehicle storage. The outbound queue from the fuel facility would not impede member access to the fuel facility entrance or member drive aisle circulation as they will still be able to access the entrance from the northern driveway. **Exhibit C** demonstrates the potential queue storage available within the site for vehicles exiting the fuel facility.



Exhibit C. Northern Costco Driveway Fuel Facility Queuing Route

The distribution and assignment of Costco fuel facility trips presented in this report conservatively assumes that 100 percent of traffic generated by the new fuel facility will utilize the Northern Costco Driveway as the primary access. In the event that intersection delay experienced by members waiting to exit the Costco site exceeds member expectations, it is likely that members will reroute within the site to utilize a different driveway to exit. Further, given that S Bent Avenue along the Costco Business Center frontage is bound upstream and downstream by traffic signal-controlled intersections at Grand Avenue and W San Marcos Boulevard there may be additional more frequent gaps available for eastbound members leaving the site to utilize as vehicles are platooned in both the north and south directions by the traffic signals.

Given that conditions modeled for the purpose of this analysis represent conservative assumptions about members accessing the fuel facility exclusively from the northern driveway access, that members may reroute appropriately within the site, and that delays and queues would be internal to the Costco site and not influence public road operations, no improvements are recommended.

Following conversations with City staff, Kittelson also evaluated the queues at the Northern Costco Driveway intersection with S Bent Avenue using SimTraffic. The SimTraffic queuing analysis was conducted on the

entire roadway network to evaluate how vehicles slowing to make the southbound right-turn into the Costco parking lot would impact traffic flow.

Table 28 summarizes the 95th percentile southbound queues for the shared southbound through-right movement at the intersection of the Northern Costco Driveway / S Bent Avenue during the weekday AM, weekday PM, and Saturday midday peak hours.

Table 28. SimTraffic 95th Percentile Queue - Southbound Shared Through-Right

#	Intersection	Available Storage (feet)	Weekday AM Peak Hour Queue (feet)	Weekday PM Peak Hour Queue (feet)	Saturday Midday Peak Hour Queue (feet)
11	Northern Costco Driveway / S Bent Avenue	400	203	375	356

As shown in Table 28, the queues generated by the southbound vehicles turning into the site are contained within the available storage on S Bent Avenue, and do not impact Grand Avenue or Linda Vista Drive.

S BENT AVENUE & SOUTHERN COSTCO DRIVEWAY

Under near-term 2025 with Project conditions, as presented in Table 22, during the weekday PM peak hour the addition of traffic generated by the Project degrades intersection operations from LOS C to LOS F and adds 34.4 seconds of average delay. During the Saturday midday peak hour the addition of Project traffic degrades intersection operations from LOS C to LOS F and adds 70.5 seconds of average delay.

The two-way stop-control LOS and delay for the intersection are driven by the critical westbound left-turning movement during both the weekday PM and Saturday midday peak hours as vehicles have difficulty finding gaps in traffic along S Bent Avenue. While the westbound left-turn operates at LOS F during the weekday PM and Saturday midday peak hours, the movement operates under capacity during all peak hours.

The westbound approach provides access to and from a shopping center facility onto S Bent Avenue. Access to this shopping center is also provided at two driveways along W San Marcos Boulevard. Vehicles making the westbound left-turn to ultimately access the S Bent Avenue intersection with W San Marcos Boulevard may reroute within the shopping center site to access W San Marcos directly from another driveway.

Given that S Bent Avenue along the Costco Business Center frontage is bound upstream and downstream by traffic signal-controlled intersections at Grand Avenue and W San Marcos Boulevard there may be additional more frequent gaps available for eastbound members leaving the site to utilize as vehicles are platooned in both the north and south directions by the traffic signals.

While the addition of traffic generated by the Project does not add to the critical westbound movement, it does add to the northbound and southbound through movements, resulting in fewer gaps. Given that westbound drivers exiting the shopping center have other driveway options, travel behaviors at the intersection of S Bent Avenue and the Southern Costco Driveway will likely change according to time of day and traffic gap variations. Additionally, the adjacent traffic signal at S Bent Avenue and W San Marcos Boulevard may create additional gaps in traffic than those reflected in the intersection analysis presented,

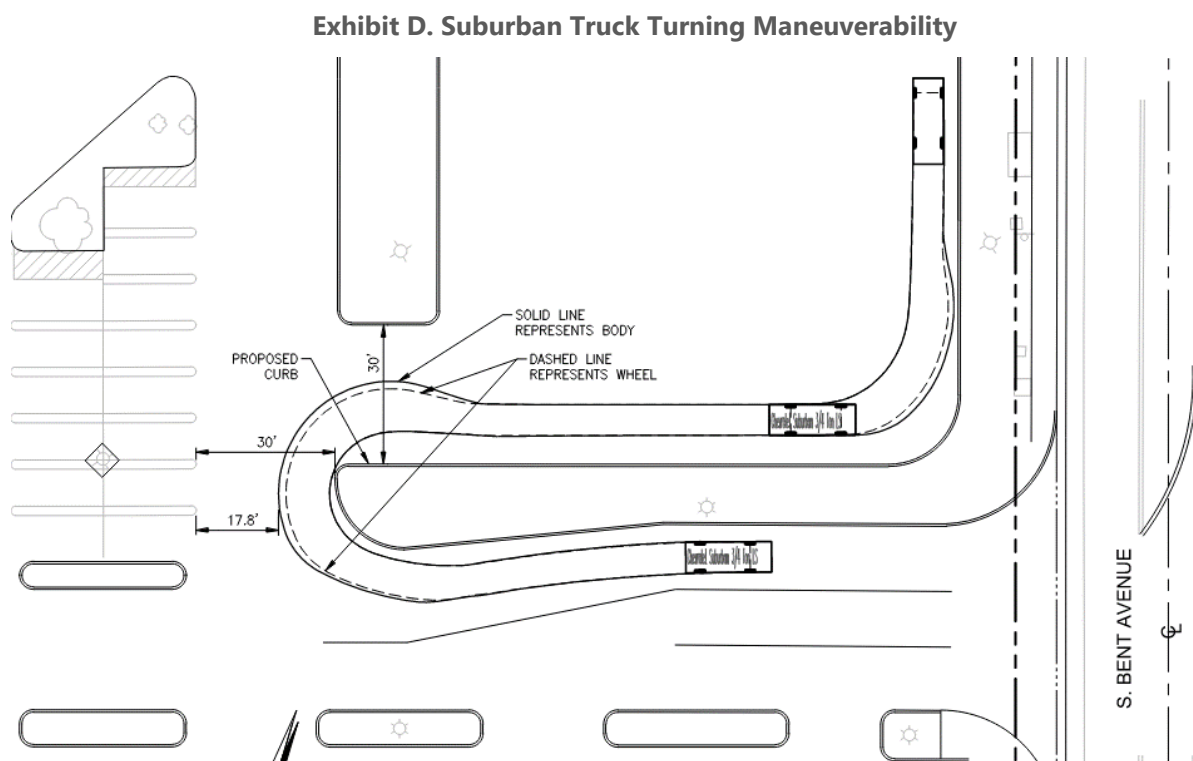
allowing for westbound right-turns and two-stage left-turns to occur. As such, no improvements are recommended.

ON-SITE PARKING

The existing San Marcos Costco Business Center site currently provides 794 parking stalls. Following the addition of the fuel facility, the site will provide 583 parking stalls resulting in a loss of 211 parking stalls. However, the proposed number of provided stalls still exceeds the minimum number of stalls required per City of San Marcos parking standards (505 parking stalls).

FUEL FACILITY CIRCULATION

Per the request of the City, a large SUV (Chevrolet Suburban) truck, assumed 20 feet in length, turning movement was evaluated entering the fuel facility. This evaluation focused on the potential for passenger vehicles to enter the fuel facility from the Northern Costco driveway and join an existing queue of vehicles without encroaching on opposing traffic movements. **Exhibit D** demonstrates the turning maneuverability of a large SUV.



As demonstrated in Exhibit D, a large SUV will be able to fully access the fuel facility queue area without encroaching on the opposing lane of traffic.

FUEL FACILITY QUEUING

Similar to the trip generation estimate, anticipated queues at the San Marcos Business Center fuel facility were estimated based on new and historical data collected at surrounding local Costco fuel facilities in San Diego North County. Measured queues include vehicles stopped behind the fuel pumps as well as vehicles approaching the end of the queue at slow speeds. **Table 29** provides a summary of the maximum and 95th percentile queues at each North County site. Maximum queues represent the longest queue length recorded during the peak hour, and 95th percentile queues represent a queue length in number of vehicles that has a five percent likelihood of being exceeded during the peak hour.

Table 29. San Diego North County Costco Fuel Facility Queues

Site	Fueling Positions	Data Collection	Weekday AM Peak Hour		Weekday PM Peak Hour		Saturday Midday Peak Hour	
			Max	95 th	Max	95 th	Max	95 th
Vista, CA	16	March 2019	21	19	39	38	40	36
Carmel Mountain, CA	22	June 2023	5	2	44	39	42	38
Carlsbad, CA	22	March 2022	26	22	53	47	43	38
San Marcos, CA	24	June 2023	5	1	10	8	39	34

Source: Kittelson & Associates, Inc., 2024

These North County sites have 16-24 fueling positions, whereas the Project will have 36 positions. While there are Costco fuel facilities larger than 30 or 32 fueling positions that have been approved, they are not yet open for data collection and the largest Costco fuel facilities in the database are currently 30-32 fueling positions. An adjustment factor for each time period was calculated based on the data available in the trip generation database and applied to the queues of the North County sites shown in Table 30 to reflect the expected queuing of a 30-position Costco fuel facility in North County⁴. **Table 30** presents the adjustment factors and corresponding adjusted queue estimates for each local site and summarizes the average adjusted queue estimate for the Project. The adjustment factors presented in Table 30 were calculated by dividing the average queues for Costco fuel facilities with 30-32 fueling positions by the average queues for Costco fuel facilities with 16 and 22-24 fueling positions (based on data collected at other Costco Warehouse fuel facilities in California).

⁴ The volumes for the local San Diego North County sites were normalized to 30 fueling position fuel facilities to be consistent with the *Costco Traffic Impact Analysis Assumptions and Methodology* Memorandum prepared by Kittelson & Associates, Inc and dated August 2023. Note that the use of both 30 and 32 fueling position facilities for this normalization result in a conservative trip generation estimate for a 30-position fuel facility.

Table 30. San Diego North County Costco Fuel Facility Queues – Adjusted to 30 Fueling Positions

Site	Fueling Positions	Weekday AM Peak Hour		Weekday PM Peak Hour		Saturday Midday Peak Hour	
		Max	95 th	Max	95 th	Max	95 th
Average 30/32 FP Queues		3	1	19	16	30	27
Average 16 FP Queues		15	14	33	30	37	33
Adjustment Factor (16 FP – 30/32 FP)		0.20	0.10	0.56	0.53	0.81	0.79
	16	4	2	22	20	32	29
Average 30/32 FP Queues		3	1	19	16	30	27
Average 22/24 FP Queues		8	6	24	21	33	30
Adjustment Factor (22/24 FP – 30/32 FP)		0.36	0.24	0.77	0.76	0.90	0.89
	22	2	0	34	30	38	34
Carlsbad, CA	22	9	5	41	36	39	34
San Marcos, CA	24	2	0	8	6	35	30
Average		4	2	26	23	36	32

Source: Kittelson & Associates, Inc., 2024

Table 31 compares the average maximum and 95th percentile queues for fuel facilities at Costco Business Centers in California with the average maximum and 95th percentile queues for fuel facilities at standard Costco Warehouses in California (with the same number fueling positions) based on the data available in the trip generation database.

Table 31. California Costco Business Center & Warehouse Fuel Facility Queue Comparison

Site Type	Weekday AM Peak Hour		Weekday PM Peak Hour		Saturday Midday Peak Hour	
	Max	95 th	Max	95 th	Max	95 th
Business Center Average Queue	19	13	19	14	54	47
Warehouse Average Queue	9	7	28	26	35	32
% Difference WH to BC	108.9%	86.6%	-33.0%	-45.1%	53.8%	48.3%

Source: Kittelson & Associates, Inc., 2024

Note: There are currently no existing Costco Business Center fuel facilities with more than 24 fueling positions (the Project will have 36 fueling positions). Data summarized in the table reflects Costco Business Center and Costco Warehouse locations in California with 16-24 fueling positions.

Comparing the queue data collected for Costco Warehouse fuel facilities and Costco Business Center fuel facilities in California, the fuel facilities at Business Centers generate 108.9% and 86.6% more vehicles in the maximum and 95th percentile queues, respectively, during the weekday AM peak hour. The Costco Business Centers generate 33.0% and 45.1% fewer vehicles in the maximum and 95th percentile queues, respectively, during the weekday PM peak hour. During the Saturday midday peak hour, Costco Business Centers generate approximately 53.8% and 48.3% more vehicles in the maximum and 95th percentile queues, respectively.

Based on these results, an adjustment was applied to the Project queues in Table 30 to reflect the ancillary use being to a Costco Business Center, rather than a standard Costco Warehouse. These results are presented in Table 33 later in this report.

As previously indicated, there are currently no Costco fueling facilities with more than 30 or 32 fueling positions open for data collection. The largest Costco Gasoline sites contained within Kittelson's Costco database are currently 32 fueling positions. Similar to the trip generation estimate, a conservative extrapolation approach was used to take the existing data for sites in the database and project in a conservative manner to estimate the expected maximum and 95th percentile queues for a fuel facility with 36 fueling positions. *Appendix C includes graphs illustrating the comparison of maximum and 95th percentile queues versus number of fueling positions for the weekday AM, weekday PM, and Saturday midday peak hours.*

In general, as observed by the logarithmic trendline for each time period in Appendix C, larger fuel facilities typically have reduced queues as the additional fueling positions process peak period demand quicker, reducing queues, wait times, and vehicle idling. **Table 32** compares the expected maximum and 95th percentile queues for a 36-position Costco fuel facility to that of a 30-position Costco fuel facility in California.

Table 32. Maximum and 95th Percentile Queue Comparison Between 30 and 36 Fueling Positions Based on Regression Analysis

Number of Fueling Positions	Weekday AM Peak Hour		Weekday PM Peak Hour		Saturday Midday Peak Hour	
	Max	95 th	Max	95 th	Max	95 th
30	6	4	24	20	32	29
36	4	3	22	18	29	26
Percent Difference	-33.3%	-25.0%	-8.3%	-10.0%	-9.4%	-10.3%

Source: Kittelson & Associates, Inc., 2024

As summarized in Table 32, a 36-position fuel facility is forecast to generate 33.3% and 25.0% fewer vehicles in the maximum and 95th percentile queues, respectively, during the weekday AM peak hour. A 36-position facility is forecast to generate 8.3% and 10.0% fewer vehicles in the maximum and 95th percentile queues, respectively, during the weekday PM peak hour. During the Saturday midday peak hour, a 36-position facility is forecast to generate 9.4% and 10.3% fewer vehicles in the maximum and 95th percentile queues, respectively.

Based on these results, an adjustment was applied to the Project queues in Table 30 to reflect the forecasted decrease in queues associated with a 36-position fuel facility. These results are presented in Table 33 later in this report.

Based on the queue adjustment factors outlined above, a queue estimate for the San Marcos Costco Business Center fuel facility is summarized in **Table 33**.

Table 33. Forecasted Maximum and 95th Percentile Queues for 36 Fueling Position Facility

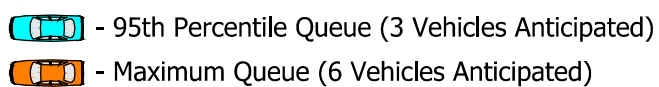
Site Type	Weekday AM Peak Hour		Weekday PM Peak Hour		Saturday Midday Peak Hour	
	Max	95 th	Max	95 th	Max	95 th
Adjusted 30 FP	4	2	26	23	36	32
<i>Warehouse to Business Center Adjustment</i>	<i>108.9%</i>	<i>86.6%</i>	<i>-33.0%</i>	<i>-45.1%</i>	<i>53.8%</i>	<i>48.3%</i>
<i>Percent Difference – Forecast to 36 FP</i>	<i>-33.3%</i>	<i>-25.0%</i>	<i>-8.3%</i>	<i>-10.0%</i>	<i>-9.4%</i>	<i>-10.3%</i>
Business Center 36 FP	6	3	16	11	50	43

Source: Kittelson & Associates, Inc., 2024

Figure 11 provides a visual representation of these identified queue lengths within the provided queue storage available behind the first row of dispensers. As shown, the fuel facility queue is expected to be contained within the available storage for the fuel facility for the weekday AM, weekday PM, and Saturday midday peak hours.

To promote and maintain efficient fuel facility processing for the new fuel facility, Costco has implemented the following features and practices at the new San Marcos Costco Business Center Fuel Facility:

- At least one fuel facility attendant will be on site during all hours the facility is open to support and direct members where needed;
- A wider by-pass lane has been provided between each island of fuel dispensers to make it easier for members to pull forward to access open fueling positions; and,
- A red light, green light system will indicate to members queued behind the fuel dispensers which positions are available for fueling.



Forecast Fuel Facility Queues
Weekday AM Peak Hour
San Marcos, CA

Figure
11A

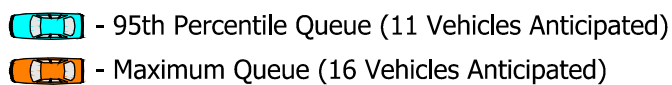
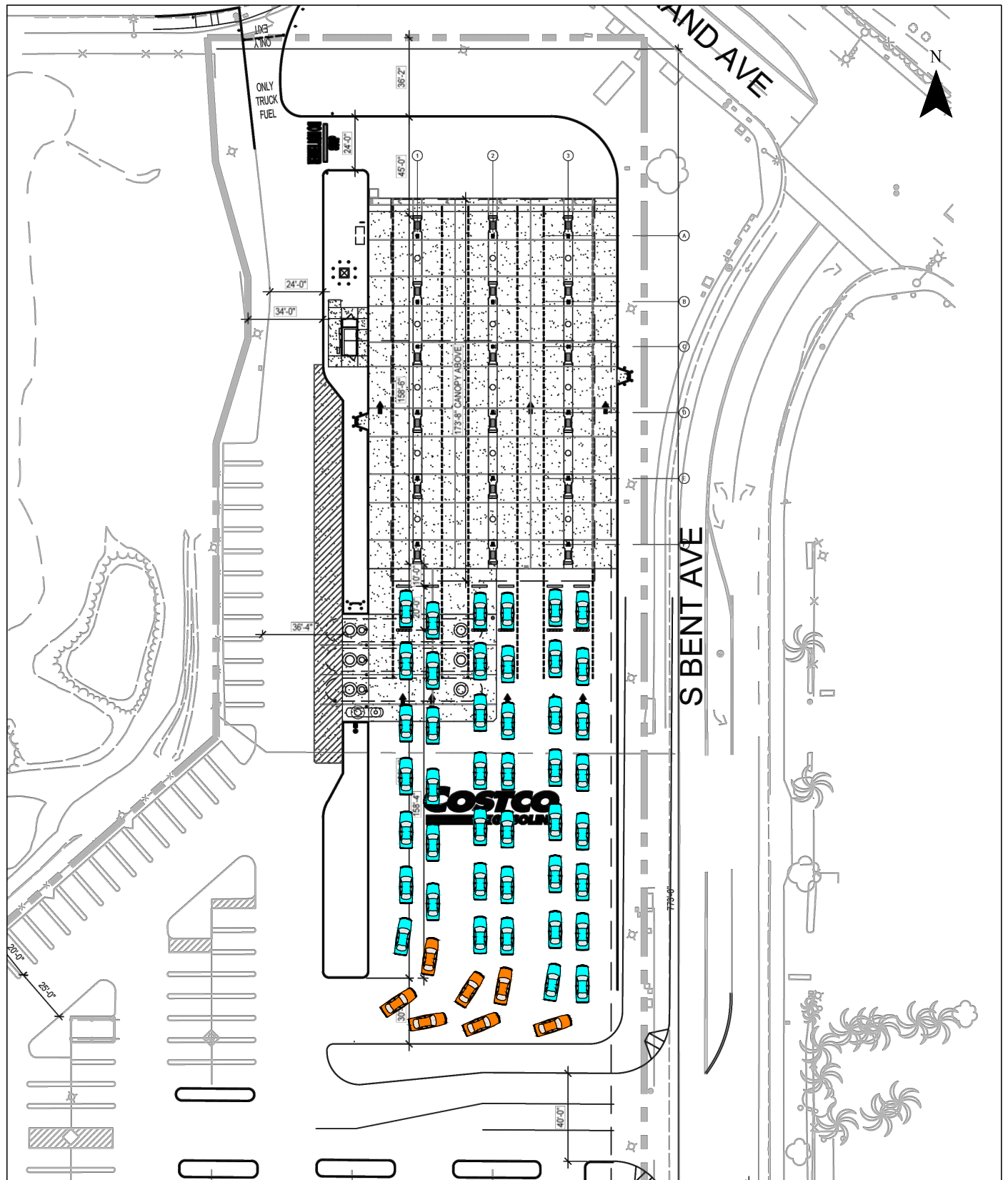


Figure
11B

C:\Users\rhoffman\appdata\local\temp\AcPublish_30168127900_San Marcos Report Figures_36.dwg Dec 19, 2024 - 2:58pm - rhoffman Layout Tab: 11C gas queue SAT



-  - 95th Percentile Queue (43 Vehicles Anticipated)
-  - Maximum Queue (50 Vehicles Anticipated)

Forecast Fuel Facility Queues
Saturday Midday Peak Hour
San Marcos, CA

Figure
11C



Section 7

Year 2050 Horizon Year Conditions

Horizon Year 2050 Traffic Conditions

This section provides analysis of Horizon Year 2050 traffic conditions with and without traffic generated from the Project.

HORIZON YEAR 2050 WITHOUT PROJECT CONDITIONS

The horizon year 2050 without Project traffic analysis identifies how the study area's transportation system will operate in the future year without traffic generated by the Project. This analysis includes traffic attributed to annual growth within the study area but does not include traffic from the Project.

Regional Growth

Horizon year 2050 intersection traffic volume projections were developed using travel demand model (TDM) information provided by the SANDAG Transportation Forecast Information Center (TFIC) Version ABM2+/2021 RP. The SANDAG TFIC provided weekday daily link volumes for the base year 2016 and future year 2050 conditions. The 2050 model projections assume improvements and inherently account for planned area developments, so no additional in-process development traffic was assumed. See Appendix M for the SANDAG TFIC past and future year network link volumes.

Existing 2023 daily segment traffic volumes, 2016 base year volumes, and 2050 future year volumes were post-processed using the National Cooperative Highway Research Program (NCHRP) Report 765: *Analytical Travel Forecasting Approaches for Project-Level Planning and Design* (NCHRP 765) methodology⁵ which has been updated from NCHRP Report 255: *Highway Traffic Data for Urbanized Area Project Planning and Design*. The following annual exponential growth rates were calculated between the existing 2023 ADT and the future 2050 ADT generated by the NCHRP methodology along the major links in the study area:

- S Las Posas Road – 0.20%
- Grand Avenue – 0.69%
- W San Marcos Boulevard – 0.22%
- S Bent Avenue – 0.69%

The selected link growth rates were applied to individual movements at each study intersections along the corresponding roadway segments. At intersections where different roadway segment growth rates intersect the roadway specific growth rates were applied to through movements, an average of the two growth rates was applied to turning movements.

⁵ This document sets forth procedures to refine computerized traffic volume forecasts by comparing base year and future year volumes to traffic count data. The ratio method (Existing * Future/Base) and difference method (Existing + Future – Base) are utilized as the primary approaches for post processing future year volumes. The average of the ratio and difference method was primarily used in this analysis.

Horizon Year 2050 Without Project Traffic Volumes

Horizon year 2050 without Project traffic volumes reflect the addition of identified annual growth to year 2023 existing traffic volumes. **Figure 12** presents the horizon year 2050 without Project traffic volumes used for analysis for the weekday AM, weekday PM, and Saturday midday peak hours.

Horizon Year 2050 Without Project Intersection Operations Analysis

Table 34 presents the traffic operation results for each overall intersection under horizon year 2050 without Project conditions during the weekday AM and PM, and Saturday midday peak hours. *Appendix N contains the horizon year 2050 without Project conditions synchro operations worksheets. Appendix K includes a detailed side-by-side comparison of all intersection and roadway segment operations across all scenarios.*

Table 34. Horizon Year 2050 Without Project Intersection Operations

#	Intersection	Weekday AM		Weekday PM		Saturday Midday	
		LOS	Delay	LOS	Delay	LOS	Delay
1	S Las Posas Road / SR-78 WB Ramp	D	45.3	C	27.5	C	33.1
2	S Las Posas Road / Grand Avenue	D	50.2	F	96.1	D	38.3
3	Grand Avenue / Via Vera Cruz / SR-78 EB Ramp	E	76.5	F	96.1	D	51.4
4	Grand Avenue / Linda Vista Drive	B	13.0	F	63.3	B	14.3
5	Grand Avenue / S Bent Avenue	B	11.0	C	20.5	B	15.7
A	S Bent Avenue / N Costco Driveway	B	11.5	B	13.8	B	13.5
B	S Bent Avenue / Industrial Driveway	B	10.6	B	10.1	B	10.3
C	S Bent Avenue / Middle Costco Driveway	B	10.9	B	12.8	B	12.4
D	S Bent Avenue / S Costco Driveway	C	16.2	C	20.8	D	26.4
6	W San Marcos Blvd / Via Vera Cruz	C	24.7	C	29.7	D	38.3
7	W San Marcos Blvd / S Bent Avenue	D	37.2	D	36.0	D	45.9
8	W San Marcos Blvd / Grand Avenue	D	54.9	F	148.0	F	86.3
9	W San Marcos Blvd / SR-78 EB Ramp	A	9.7	A	8.9	B	16.4
10	W San Marcos Blvd / Knoll Road	C	25.0	C	25.4	C	23.4

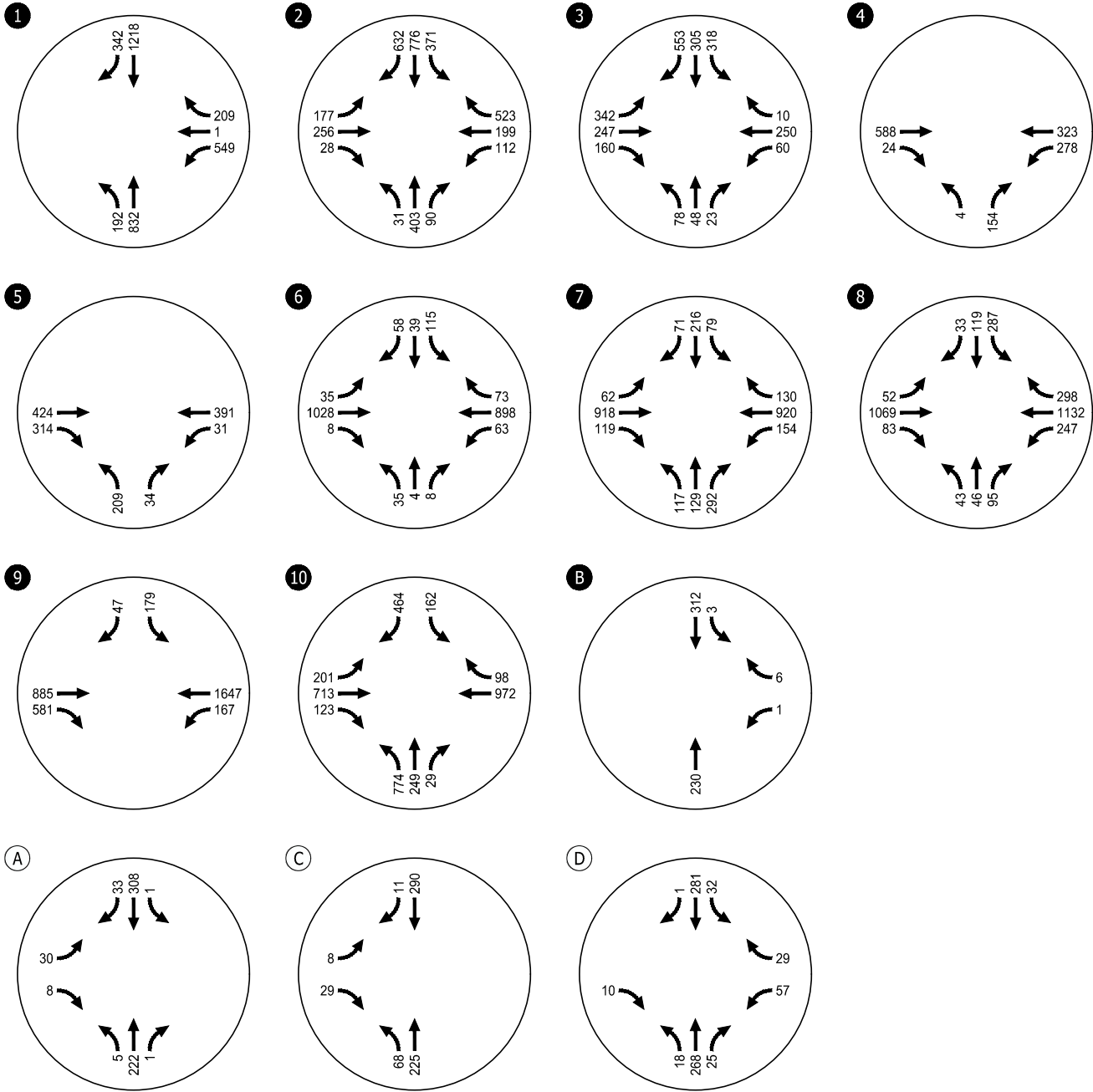
Bold corresponds to substandard LOS operations.

Some minor improvements in operations were observed in horizon year 2050 due to a shift in future traffic patterns occurring as a result of future roadway network improvements, including the new connection of Grand Avenue from W San Marcos Boulevard to Discovery Street.

As shown in Table 34, under horizon year 2050 without Project conditions all study intersections operate with an acceptable LOS during the weekday AM, weekday PM, and Saturday midday peak hours, except for:

- S Las Posas Road / Grand Avenue (PM Peak Hour, LOS F):
- Grand Avenue / Via Vera Cruz / SR-78 EB Ramp (AM Peak Hour, LOS E and PM Peak Hour, LOS F)
- Linda Vista Drive / Grand Avenue (PM Peak Hour, LOS F)
- W San Marcos Boulevard / Grand Avenue (PM Peak Hour, LOS F)

C:\Users\hoffman\appdata\local\temp\AcPublish_30168\27900_San Marcos Report Figures_36.dwg Dec 19, 2024 2:58pm - Hoffman - Hoffman Layout Tab: 12A, HY background AM

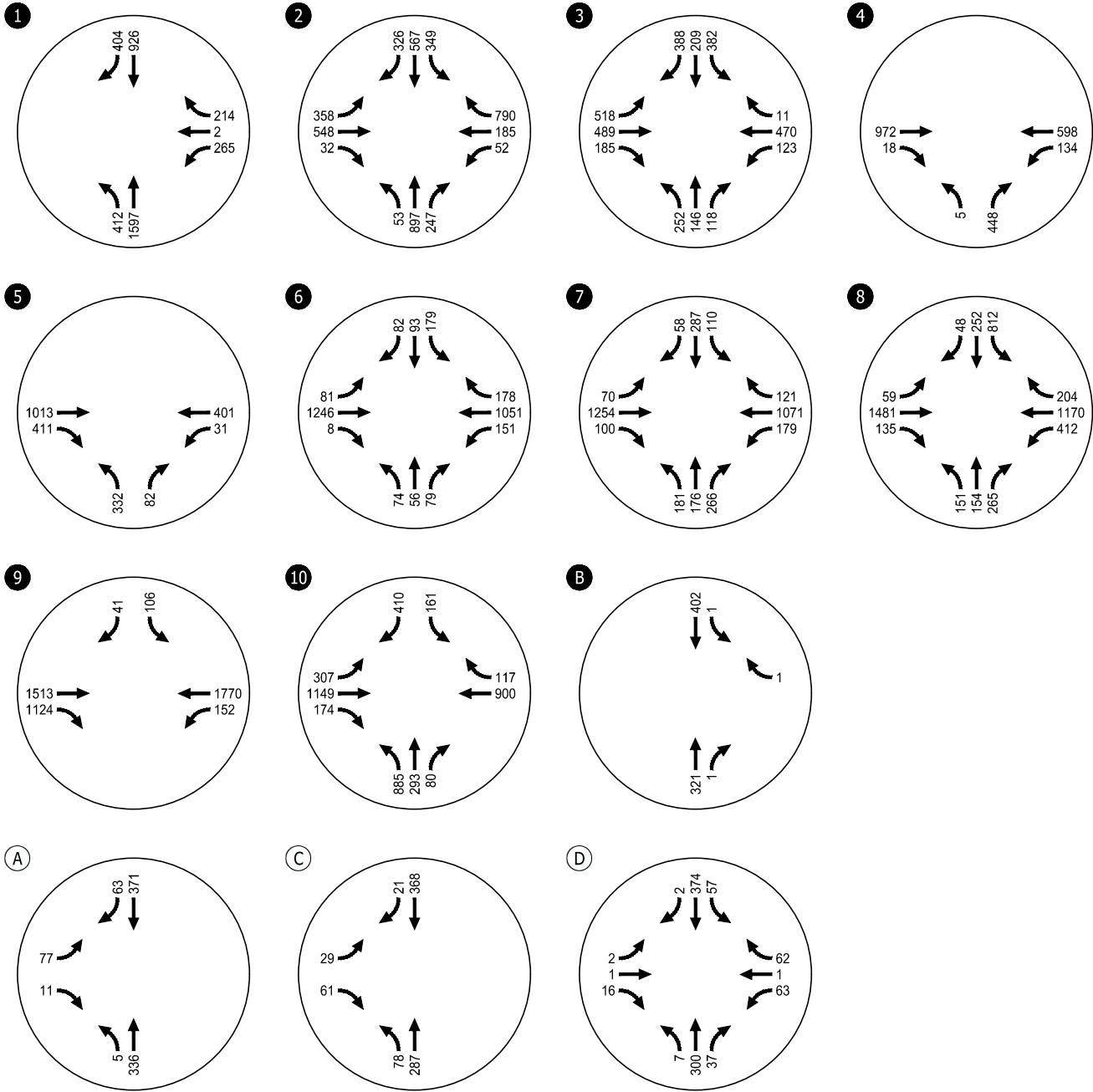


- Study Intersection
- Site Access Intersection

Horizon Year 2050 Without Project Traffic Volumes
Weekday AM Peak Hour
San Marcos, CA

Figure
12A

C:\Users\hoffman\appdata\local\temp\AcPublish_30168\27900_San Marcos Report Figures_36.dwg Dec 19, 2024 - 2:58pm - Hoffman - Hoffman Layout Tab: 12B, HY background PM

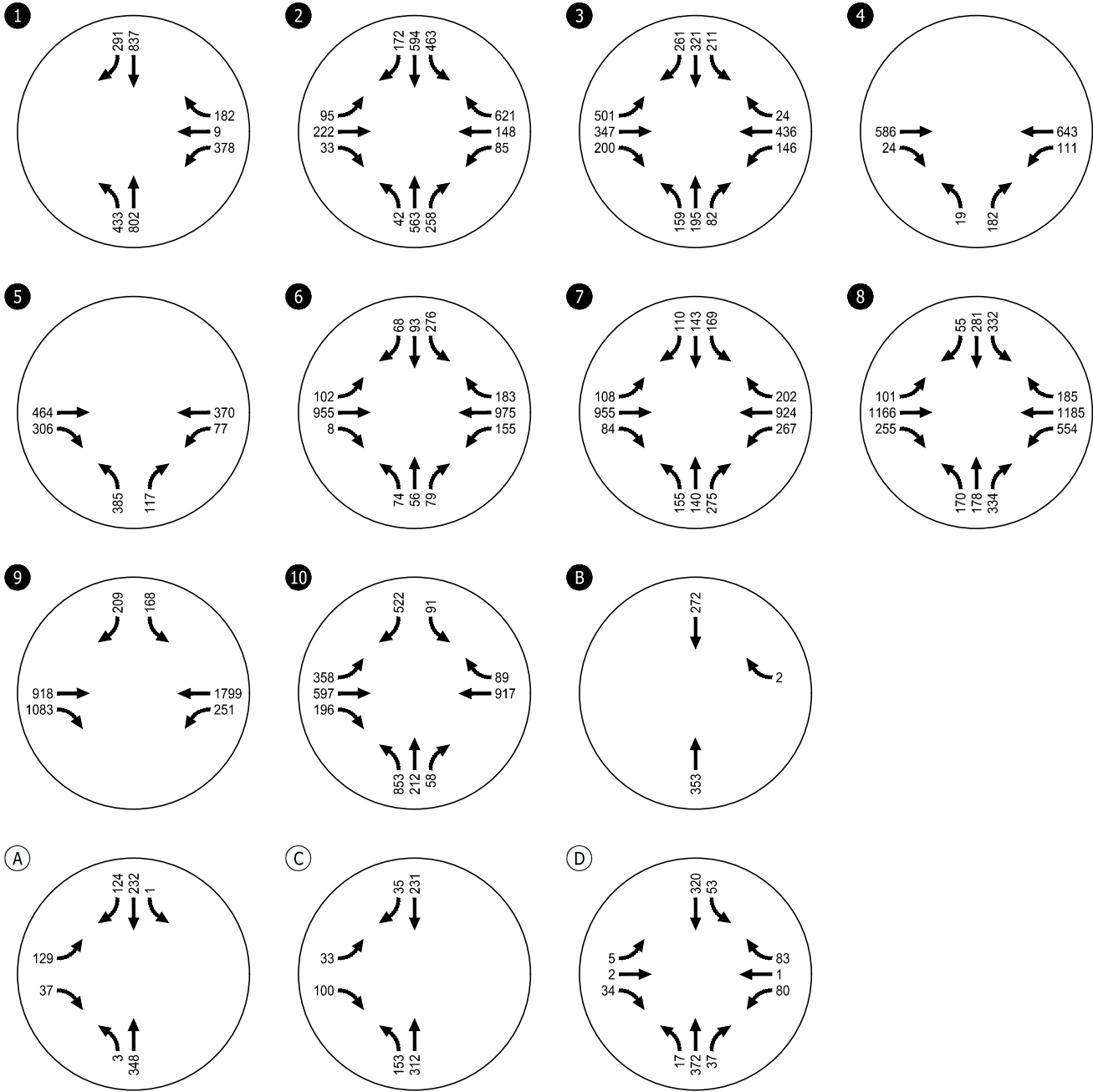


- Study Intersection
- Site Access Intersection

Horizon Year 2050 Without Project Traffic Volumes
Weekday PM Peak Hour
San Marcos, CA

Figure
12B

C:\Users\hoffman\appdata\local\temp\AcPublish_30168\27900_San Marcos Report Figures_36.dwg Dec 19, 2024 - 2:58pm - Hoffman - Hoffman Layout Tab: L2C, HY background SAT



- Study Intersection
- Site Access Intersection

Horizon Year 2050 Without Project Traffic Volumes
Saturday Midday Peak Hour
San Marcos, CA

Figure
12C

Horizon Year 2050 Without Project Roadway Segment Operations Analysis

Table 35 presents roadway segment operational results for each study roadway segment under horizon year 2050 without Project weekday conditions. *Appendix K includes a detailed side-by-side comparison of all intersection and roadway segment operations across all scenarios.*

Table 35. Horizon Year 2050 Without Project Weekday Roadway Segment Operations

Roadway	Segment	Functional Classification	Roadway Capacity	ADT	v/c	LOS
S Las Posas Road	SR-78 WB Ramp to Grand Avenue	6-Lane Major Arterial	50,000	28,149	0.563	C
Grand Avenue	S Las Posas Road to Via Vera Cruz	4 Lane Secondary Arterial/Collector	30,000	27,096	0.903	E
Grand Avenue	Via Vera Cruz to Linda Vista Drive	4-Lane Secondary Arterial/Collector	30,000	14,550	0.485	C
Grand Avenue	Linda Vista Drive to S Bent Avenue	4-Lane Secondary Arterial/Connector	30,000	20,432	0.681	D
Grand Avenue	S Bent Avenue to W San Marcos Blvd	4-Lane Secondary Arterial/Connector	30,000	14,099	0.470	C
S Bent Avenue	Grand Avenue to W San Marcos Blvd	2-Lane Collector (Continuous Left-Turn Lane)	15,000	8,300	0.553	C
W San Marcos Blvd	Via Vera Cruz to S Bent Avenue	4-Lane Major Arterial	40,000	48,037	1.201	F
W San Marcos Blvd	S Bent Avenue to Grand Avenue	5-Lane Major Arterial	45,000	54,689	1.215	F
W San Marcos Blvd	Grand Avenue to SR-78 EB Ramp	6-Lane Major Arterial	50,000	54,619	1.092	F
W San Marcos Blvd	SR-78 EB Ramp to Knoll Road	6-Lane Major Arterial	50,000	51,079	1.022	F

Bold corresponds to LOS E and F operations.

As shown in Table 35, all roadway segments are forecast to operate acceptably under horizon year 2050 near-term without Project conditions, except for:

- **W San Marcos Boulevard between Via Vera Cruz and S Bent Avenue:** The average daily traffic bi-directional traffic volume along this segment exceeds the roadway capacity standard of 40,000 for a 4-Lane Major Arterial, resulting in overcapacity and LOS F operations.
- **W San Marcos Boulevard between S Bent Avenue and Grand Avenue:** The average daily traffic bi-directional traffic volume along this segment exceeds the roadway capacity standard of 45,000 for a 5-Lane Major Arterial, resulting in overcapacity and LOS F operations.
- **W San Marcos Boulevard between Grand Avenue and SR-78 EB Ramp:** The average daily traffic bi-directional traffic volume along this segment exceeds the roadway capacity standard of 50,000 for a 6-Lane Major Arterial, resulting in overcapacity and LOS F operations.
- **W San Marcos Boulevard between SR-78 EB Ramp and Knoll Road:** The average daily traffic bi-directional traffic volume along this segment exceeds the roadway capacity standard of 50,000 for a 6-Lane Major Arterial, resulting in overcapacity and LOS F operations.

HORIZON YEAR 2050 WITH PROJECT CONDITIONS

The horizon year 2050 with Project traffic analysis identifies how the study area's transportation system will operate in the future year with traffic generated by the Project. This analysis includes traffic attributed to annual growth within the study area and traffic from the Project.

Horizon Year 2050 With Project Traffic Volumes

Horizon year 2050 with Project traffic volumes reflect the addition of identified annual growth to year 2023 existing traffic volumes and site generated traffic. **Figure 13** presents the horizon year 2050 with Project traffic volumes used for analysis for the weekday AM, weekday PM, and Saturday midday peak hours.

Horizon Year 2050 With Project Intersection Operations Analysis

Table 36 presents the traffic operation results for each overall intersection under horizon year 2050 with Project conditions during the weekday AM and PM, and Saturday midday peak hours and identifies the change in average delay at each intersection as a result of the addition of Project traffic. *Appendix O contains the horizon year 2050 with Project conditions synchro operations worksheets. Appendix K includes a detailed side-by-side comparison of all intersection and roadway segment operations across all scenarios.*

Table 36. Horizon Year 2050 With Project Intersection Operations

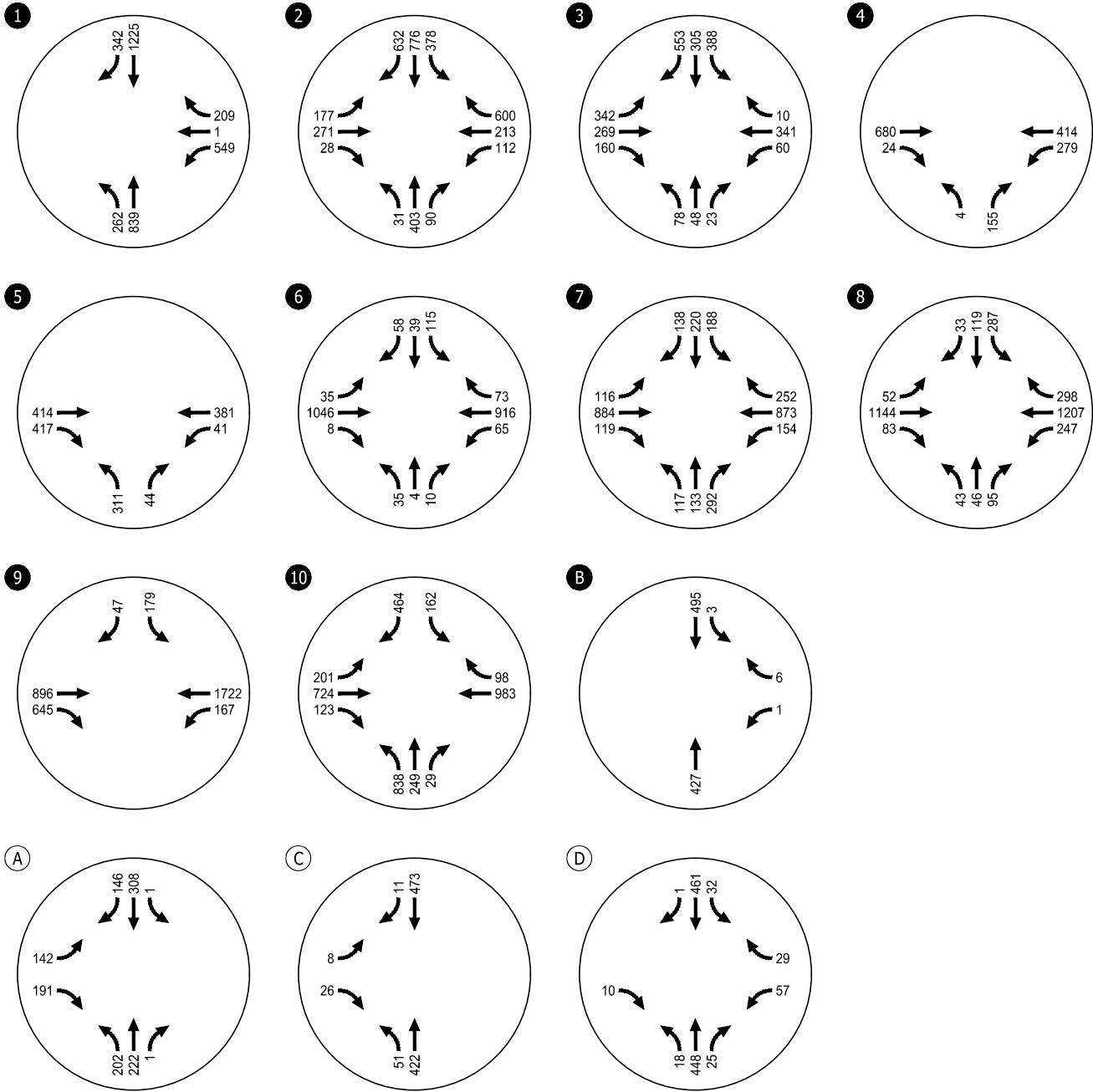
#	Intersection	Weekday AM			Weekday PM			Saturday Midday		
		LOS	Delay	Δ^1 Delay	LOS	Delay	Δ^1 Delay	LOS	Delay	Δ^1 Delay
1	S Las Posas Road / SR-78 WB Ramp	E	56.4	11.1	C	30.9	3.4	D	43.5	10.4
2	S Las Posas Road / Grand Avenue	E	55.7	5.5	F	123.6	27.5	D	45.8	7.5
3	Grand Avenue / Via Vera Cruz / SR-78 EB Ramp	E	75.4	-1.1	F	126.7	30.6	E	68.9	17.5
4	Grand Avenue / Linda Vista Drive	B	13.9	0.9	F	95.2	31.9	C	16.2	1.9
5	Grand Avenue / S Bent Avenue	B	14.7	3.7	D	43.8	23.3	C	26.9	11.2
A	S Bent Avenue / N Costco Driveway	C	17.8	6.3	F	78.4	64.6	F	86.1	72.6
B	S Bent Avenue / Industrial Driveway	B	12.6	2.0	B	12.5	2.4	B	12.7	2.4
C	S Bent Avenue / Middle Costco Driveway	B	12.8	1.9	C	17	4.2	C	16.6	4.2
D	S Bent Avenue / S Costco Driveway	D	29	12.8	F	70.1	49.3	F	139.1	112.7
6	W San Marcos Blvd / Via Vera Cruz	C	24.7	0.0	C	29.9	0.2	C	34.7	-3.6
7	W San Marcos Blvd / S Bent Avenue	D	49.7	12.5	E	75.7	39.7	E	65.9	20
8	W San Marcos Blvd / Grand Avenue	D	53.2	-1.7	F	143.1	-4.9	F	83.7	-2.6
9	W San Marcos Blvd / SR-78 EB Ramp	A	9.7	0.0	A	9.1	0.2	B	17	0.6
10	W San Marcos Blvd / Knoll Road	C	24.9	-0.1	C	25.3	-0.1	C	23.2	-0.2

¹ Difference calculated between Horizon Year 2050 With and Without Project

Bold corresponds to LOS E and F operations.

Some minor improvements in operations were observed under 2050 with project traffic conditions due to the addition of project volumes to lower-delay movements, decreasing the weighted average delay at the intersection.

C:\Users\hoffman\appdata\local\temp\AcPublish_30168\27900_San Marcos Report Figures_36.dwg Dec 19, 2024 2:58pm - hoffman Layout Tab: 13A, HY total AM

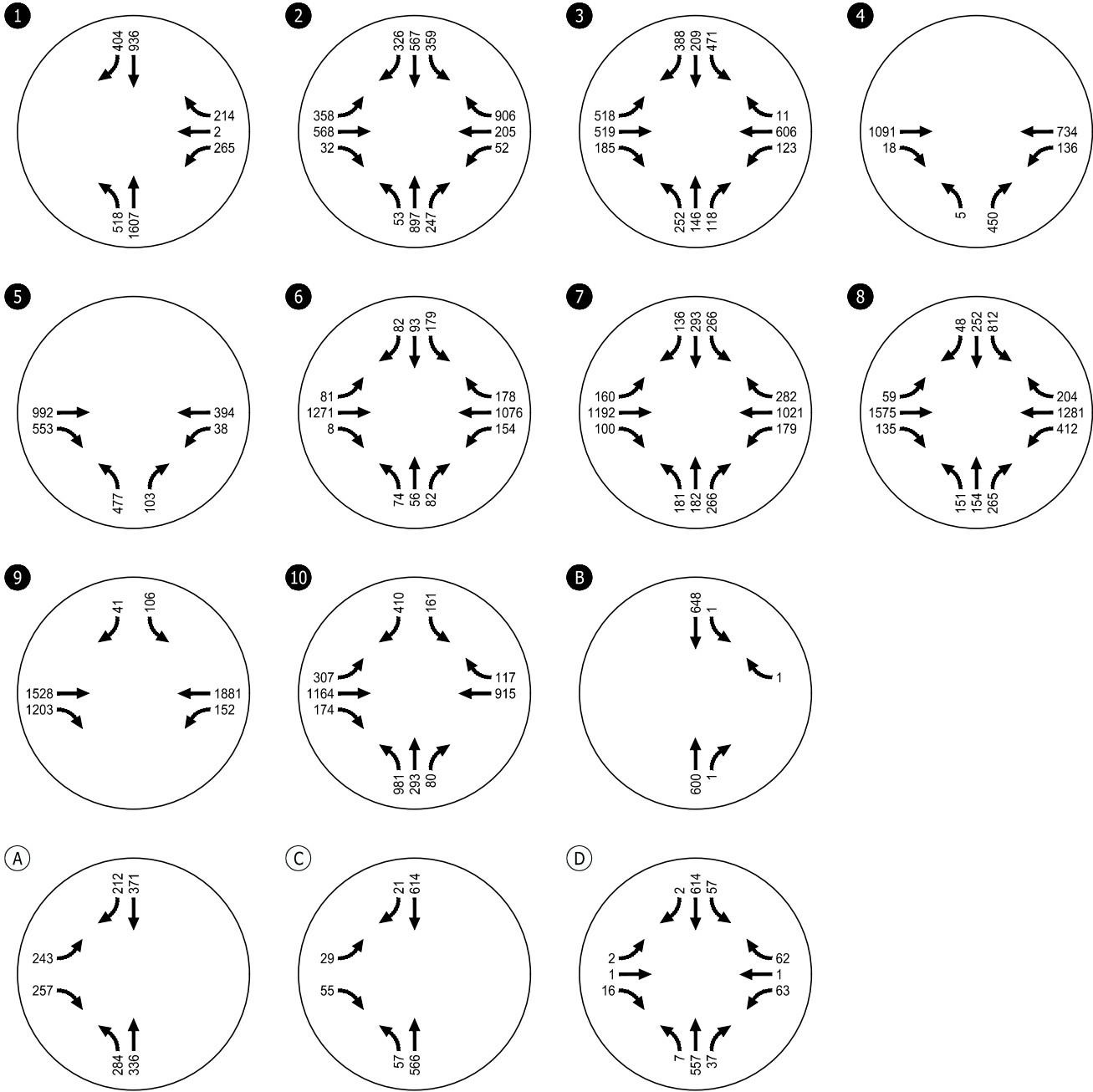


- Study Intersection
- Site Access Intersection

Horizon Year 2050 With Project Traffic Volumes
Weekday AM Peak Hour
San Marcos, CA

Figure
13A

C:\Users\hoffman\appdata\local\temp\AcPublish_30168\27900_San Marcos Report Figures_36.dwg Dec 19, 2024 - 2:59pm - hoffman Layout Tab: 13B, HY total PM

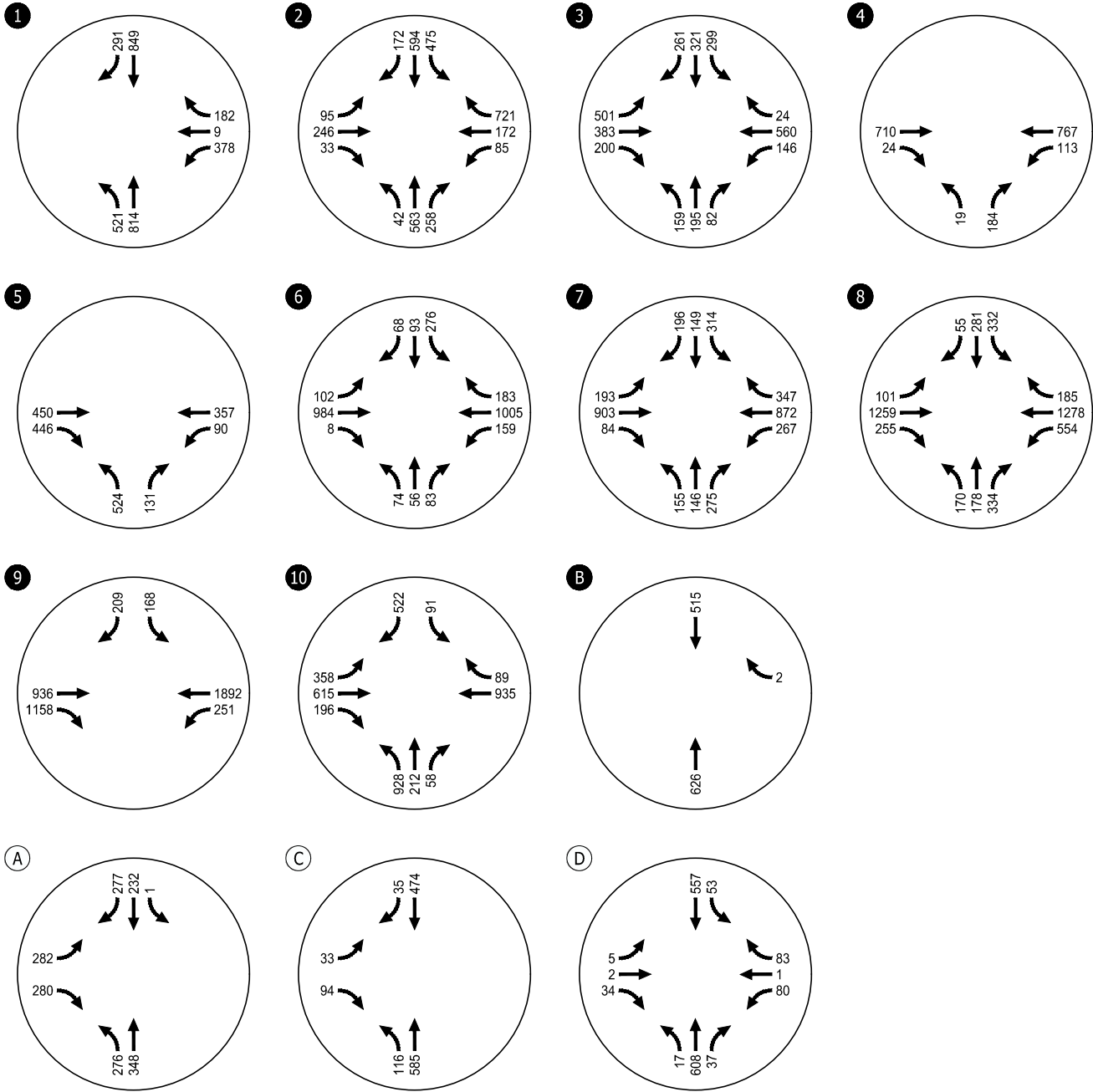


- Study Intersection
- Site Access Intersection

Horizon Year 2050 With Project Traffic Volumes
Weekday PM Peak Hour
San Marcos, CA

Figure
13B

C:\Users\hoffman\appdata\local\temp\AcPublish_30168\27900_San Marcos Report Figures_36.dwg Dec 19, 2024 - 2:59pm - hoffman Layout Tab: L3C HY total SAT



- # - Study Intersection
- # - Site Access Intersection

Horizon Year 2050 With Project Traffic Volumes
Saturday Midday Peak Hour
San Marcos, CA

Figure
13C

As shown in Table 36, under horizon year 2050 with Project conditions all study intersections operate with an acceptable LOS during the weekday AM, weekday PM, and Saturday midday peak hours, except for:

- S Las Posas Road / SR-78 WB Ramp (AM Peak Hour, LOS E)
- S Las Posas Road / Grand Avenue (AM Peak Hour, LOS E and PM Peak Hour, LOS F)
- Grand Avenue / Via Vera Cruz / SR-78 EB Ramp (PM Peak Hour, LOS F and Saturday Midday Peak Hour, LOS E)
- Grand Avenue / Linda Vista Drive (PM Peak Hour, LOS F)
- S Bent Avenue / N Costco Driveway (PM Peak Hour, LOS F and Saturday Midday Peak Hour, LOS F)
- S Bent Avenue / S Costco Driveway (PM Peak Hour, LOS F and Saturday Midday Peak Hour, LOS F)
- W San Marcos Boulevard / Grand Avenue (PM Peak Hour, LOS F)

HORIZON YEAR 2050 WITH PROJECT INTERSECTION IMPROVEMENT EVALUATION

All study intersection operational results for horizon year 2050 with Project conditions are consistent with year 2025 near-term with Project operational results. As such, no additional intersections have been identified for improvement evaluation. No additional intersection improvements other than those recommended under Year 2025 near-term with Project conditions have been evaluated, except for the intersection of Grand Avenue and Linda Vista Drive per the request of City of San Marcos staff.

Appendix P includes all operational worksheets for the evaluated Horizon Year improvements.

GRAND AVENUE & LINDA VISTA DRIVE

Under Horizon Year 2050 with Project conditions, during the weekday PM peak hour the addition of traffic generated by the Project degrades intersection operations from LOS E to LOS F and adds 31.9 seconds of average delay. The two-way stop-control LOS and delay for the intersection of Linda Vista Drive and Grand Avenue are driven by the critical northbound right-turn movement and difficulty finding gaps in eastbound traffic along Grand Avenue to complete the right-turn. This movement exceeds LOS D standards and operates overcapacity with a v/c ratio of 1.08 during the weekday PM peak hour.

At the request of City of San Marcos staff, the installation of a traffic signal at the Grand Avenue / Linda Vista Drive intersection was evaluated as a potential intersection improvement. Preliminary signal warrants were evaluated using peak hour traffic volumes collected in November 2023. The calculations showed that peak hour, four-hour, and eight-hour volume based MUTCD signal warrants are met at this intersection under Year 2023 existing conditions.

To review the impacts and feasibility of installing a traffic signal at this intersection, Kittelson reviewed intersection operations with a traffic signal in place assuming the dedicated left-turn and right-turn movements recommended under year 2025 near-term with Project conditions.

Additionally, intersection operations were evaluated assuming the traffic signals along Grand Avenue at Linda Vista Drive and S Bent Avenue operate as a cluster – where both traffic signals operate off a shared cabinet to maximize coordination. Signal timing assumes optimization of the cycle length and signal timing parameters. Given that Synchro 11 HCM 6th Edition cannot evaluate intersection operations at clustered intersections, HCM 2000 operations were reviewed.

Table 37 summarizes the forecasted intersection operations at the intersections of Grand Avenue / Linda Vista Drive and Grand Avenue / S Bent Avenue assuming a clustered traffic signal and provides the unimproved operations results for comparison. Given that the installation of a traffic signal would impact all peak hours, the operational results for the weekday AM, weekday PM, and Saturday midday peak hours are shown.

Table 37. Year 2050 Horizon Year With Project Improved Intersection Operations – Intersection 4

#	Intersection	Evaluated Improvement	Weekday AM		Weekday PM		Saturday Midday	
			LOS	Delay	LOS	Delay	LOS	Delay
4	Grand Avenue / Linda Vista Drive	Unimproved Horizon Year 2050 Without Project	B	13.0	F	63.3	B	14.3
5	Grand Avenue / S Bent Avenue		B	11.0	C	20.5	B	15.7
4	Grand Avenue / Linda Vista Drive	Unimproved Horizon Year 2050 With Project	B	13.9	F	95.2	C	16.2
5	Grand Avenue / S Bent Avenue		B	14.7	D	43.8	C	26.9
4	Grand Avenue / Linda Vista Drive	Clustered Traffic Signal – Optimized Timing	B	19.2	C	28.6	B	19.9
5	Grand Avenue / S Bent Avenue		B	13.9	D	41.1	C	22.0

As shown in Table 37, the installation of a traffic signal clustered with the existing traffic signal at Grand Avenue / S Bent Avenue would improve intersection operations to an acceptable LOS.

The Costco fair share percentage at the intersection of Grand Avenue / Linda Vista Drive is 41.2%.

Horizon Year 2050 With Project Roadway Segment Operations Analysis

Table 38 presents roadway segment operational results for each study roadway segment under horizon year 2050 with Project weekday conditions and identifies the change in v/c on each roadway segment as a result of the addition of Project traffic. *Appendix K includes a detailed side-by-side comparison of all intersection and roadway segment operations across all scenarios.*

Table 38. Horizon Year 2050 With Project Weekday Roadway Segment Operations

Roadway	Segment	Functional Classification	Roadway Capacity	ADT	v/c	Δ^1 v/c	LOS
S Las Posas Road	SR-78 WB Ramp to Grand Avenue	6-Lane Major Arterial	50,000	28,264	0.566	0.003	C
Grand Avenue	S Las Posas Road to Via Vera Cruz	4 Lane Secondary Arterial/Collector	30,000	27,247	0.909	0.006	E
Grand Avenue	Via Vera Cruz to Linda Vista Drive	4-Lane Secondary Arterial/Collector	30,000	14,782	0.494	0.009	C
Grand Avenue	Linda Vista Drive to S Bent Avenue	4-Lane Secondary Arterial/Connector	30,000	20,668	0.690	0.009	D
Grand Avenue	S Bent Avenue to W San Marcos Blvd	4-Lane Secondary Arterial/Connector	30,000	14,099	0.470	0.000	C
S Bent Avenue	Grand Avenue to W San Marcos Blvd	2-Lane Collector (Continuous Left-Turn Lane)	15,000	8,749	0.586	0.033	C
W San Marcos Blvd	Via Vera Cruz to S Bent Avenue	4-Lane Major Arterial	40,000	48,089	1.202	0.001	F
W San Marcos Blvd	S Bent Avenue to Grand Avenue	5-Lane Major Arterial	45,000	54,876	1.220	0.005	F
W San Marcos Blvd	Grand Avenue to SR-78 EB Ramp	6-Lane Major Arterial	50,000	54,806	1.096	0.004	F
W San Marcos Blvd	SR-78 EB Ramp to Knoll Road	6-Lane Major Arterial	50,000	51,195	1.024	0.002	F

¹ Difference calculated between 2025 Near-Term With and Without Project

Bold corresponds to LOS E and F operations.

As shown in Table 38, similar to year 2025 near-term with Project conditions, all roadway segments are forecast to operate acceptably under horizon year 2050 with Project conditions, except for:

- **W San Marcos Boulevard between Via Vera Cruz and S Bent Avenue:** The average daily traffic bi-directional traffic volume along this segment exceeds the roadway capacity standard of 40,000 for a 4-Lane Major Arterial, resulting in overcapacity and LOS F operations.
- **W San Marcos Boulevard between S Bent Avenue and Grand Avenue:** The average daily traffic bi-directional traffic volume along this segment exceeds the roadway capacity standard of 45,000 for a 5-Lane Major Arterial, resulting in overcapacity and LOS F operations.
- **W San Marcos Boulevard between Grand Avenue and SR-78 EB Ramp:** The average daily traffic bi-directional traffic volume along this segment exceeds the roadway capacity standard of 50,000 for a 6-Lane Major Arterial, resulting in overcapacity and LOS F operations.
- **W San Marcos Boulevard between SR-78 EB Ramp and Knoll Road:** The average daily traffic bi-directional traffic volume along this segment exceeds the roadway capacity standard of 50,000 for a 6-Lane Major Arterial, resulting in overcapacity and LOS F operations.

As shown, no study roadway segments are expected to degrade to an unacceptable LOS and increase v/c by more than 0.02 as a result of Project implementation. Additionally, no study segments forecast to operate at an substandard LOS under near-term without Project conditions experience more than a 0.02 increase to v/c as a result of the Project. Therefore, no study roadway segment improvements are required.



Section 8

VMT Analysis

VMT Analysis

Traffic operations are typically evaluated based on two key performance measures: level of service (LOS) and queuing. Additionally, the California Environmental Quality Act (CEQA) standards for evaluating traffic impacts were updated with the adoption of SB 743, which requires lead agencies in California to evaluate development projects for Vehicle Miles Traveled (VMT). In November 2020, the City of San Marcos updated their TIA Guidelines for VMT and LOS Assessment, which includes methodologies and criteria to evaluate land use and transportation products.

A separate VMT analysis has been conducted to determine if the proposed project results in a significant environmental impact under CEQA. That analysis is presented in the memorandum *San Marcos Costco Business Center – Fuel Facility Addition: Regional VMT Assessment*, completed by Kittelson & Associates and dated October 2024. As presented in the VMT analysis, the project is expected to result in a net decrease of 1,449 miles in total regional daily VMT thus having no significant impact.



Section 9

Findings and Recommendations

Findings and Recommendations

This LTA resulted in the following findings and recommendations:

FINDINGS

Year 2023 Existing Conditions

- All study intersections were found to operate acceptably during the 2023 existing weekday AM, weekday PM, and Saturday midday peak hours, except for:
 - S Las Posas Road / Grand Avenue
 - Grand Avenue / Via Vera Cruz / SR-78 EB Ramp
 - W San Marcos Boulevard / Grand Avenue
- All study roadway segments were found to operate acceptably under existing 2023 conditions, except for:
 - W San Marcos Boulevard between Via Vera Cruz and S Bent Avenue
 - W San Marcos Boulevard between S Bent Avenue and Grand Avenue
 - W San Marcos Boulevard between Grand Avenue and SR-78 EB Ramp
 - W San Marcos Boulevard between SR-78 EB Ramp and Knoll Road

Year 2025 Near-Term Without Project Conditions

- The following additional deficiencies at study intersections were identified under year 2025 near-term without Project conditions:
 - Grand Avenue / Linda Vista Drive
- No additional deficiencies at the study roadway segments beyond those identified under existing 2023 conditions were found under year 2025 near-term without Project conditions.

Trip Generation and Distribution

- The new thirty (36) vehicle fueling position fuel facility is estimated to generate 2,409 weekday daily net new trip ends. Of these, 145 are estimated to occur in the weekday AM peak hour (73 inbound / 72 outbound), 202 are estimated to occur in the weekday PM peak hour (101 inbound / 101 outbound). The fuel facility addition is estimated to generate 239 net new trip ends during the Saturday midday peak hour (119 inbound / 120 outbound).

Year 2025 Near-Term With Project Conditions

- The following additional deficiencies at study intersections were identified under year 2025 near-term with Project conditions:
 - S Las Posas Road / SR-78 WB Ramp
 - S Bent Avenue / N Costco Driveway
 - S Bent Avenue / S Costco Driveway

- No additional deficiencies at the study roadway segments beyond those identified under existing 2023 and year 2025 near-term without Project conditions were found under year 2025 near-term with Project conditions.

Horizon Year 2050 Without Project Conditions

- All study intersections were found to operate acceptably under horizon year 2050 without Project conditions during the weekday AM, weekday PM, and Saturday midday peak hours, except for:
 - o S Las Posas Road / Grand Avenue
 - o Grand Avenue / Via Vera Cruz / SR-78 EB Ramp
 - o Linda Vista Drive / Grand Avenue
 - o W San Marcos Boulevard / Grand Avenue
- All study roadway segments were found to operate acceptably under horizon year 2050 without Project conditions, except for:
 - o W San Marcos Boulevard between Via Vera Cruz and S Bent Avenue
 - o W San Marcos Boulevard between S Bent Avenue and Grand Avenue
 - o W San Marcos Boulevard between Grand Avenue and SR-78 EB Ramp
 - o W San Marcos Boulevard between SR-78 EB Ramp and Knoll Road

Horizon Year 2050 With Project Conditions

- The following additional deficiencies at study intersections were identified under horizon year 2050 with Project conditions:
 - o S Las Posas Road / SR-78 WB Ramp
 - o Grand Avenue / S Bent Avenue
 - o S Bent Avenue / N Costco Driveway
 - o S Bent Avenue / S Costco Driveway
- No additional deficiencies at the study roadway segments beyond those identified under horizon year 2050 without Project conditions were found under horizon year 2050 with Project conditions.

Site Access Evaluation

- The Project will relocate the northern Costco driveway to the south to provide access to the new fuel facility.
- Adequate on-site parking will be provided after the addition of the fuel facility, exceeding the number of stalls required by the City of San Marcos.
- Intersection sight distance will be further evaluated through development of the site civil plans.
- Under year 2025 near-term with Project conditions all site access queues are forecast to be maintained within the available storage lengths during the weekday AM, weekday PM, and Saturday midday peak hours.
- The new intersection location of the S Bent Avenue and North Costco Driveway intersection the existing two-way center left-turn lane provides adequate turn lane storage for vehicles making northbound left-turns without impeding intersection operations at the Middle Costco Driveway.

VMT Analysis

- A separate VMT analysis has been conducted to determine if the proposed project results in a significant environmental impact under CEQA. That analysis is presented in the memorandum *San Marcos Costco Business Center – Fuel Facility Addition: Regional VMT Assessment*, completed by Kittelson & Associates and dated October 2024. As presented in the VMT analysis, the project is expected to result in a net decrease of 1,449 miles in total regional daily VMT thus having no significant impact.

RECOMMENDATIONS

The following intersections were evaluated for potential improvements:

- **S Las Posas Road / SR-78 WB Ramp**
 - Given the right-of-way constraints limiting the potential for widening and that the Project does not add vehicles or queue to the westbound off-ramp, no improvements are recommended.
- **S Las Posas Road / Grand Avenue**
 - Under near-term year 2025 conditions, signal timing adjustments will restore operations to pre-project conditions. Costco Wholesale will fund the retiming of the traffic signal.
- **Grand Avenue / Via Vera Cruz / SR-78 EB Ramp**
 - Under near-term year 2025 conditions, signal timing adjustments will restore operations to pre-project conditions. Costco Wholesale will fund the retiming of the traffic signal.
 - At the request of City of San Marcos staff, the provision of a separate southbound right-turn lane was evaluated at this location, consistent with other recently approved developments. Costco Wholesale will contribute a fair share contribution of 31.1% of the cost to construct this improvement.
- **Linda Vista Drive / Grand Avenue**
 - Under near-term year 2025 conditions, the provision of separate northbound left-turn and right-turn lanes (to allow a right-turning vehicle to get around a vehicle waiting to make a left-turn) will restore operations to pre-project conditions. Costco Wholesale will restripe Linda Vista Drive to provide two 10-foot lanes with 25 feet of storage approaching Grand Avenue, with a 6-foot hatched painted median to accommodate heavy vehicle turns without encroaching on opposing traffic.
 - At the request of City of San Marcos staff, a traffic signal was evaluated at this location under Horizon Year 2050 conditions. Costco Wholesale will contribute a fair share contribution of 41.2% of the cost to construct this improvement.
- **S Bent Avenue / N Costco Driveway**
 - Given that conditions modeled for the purpose of this analysis are conservative, that members may reroute appropriately within the site, and there may be additional gaps in traffic than those reflected in the intersection analysis presented, no improvements are recommended.

- **S Bent Avenue / S Costco Driveway**
 - o Given that there may be additional gaps in traffic than those reflected in the intersection analysis presented and the critical intersection operations are not driven by Costco member traffic, no improvements are recommended.
- **W San Marcos Boulevard / Grand Avenue**
 - o Given that the addition of Project traffic is forecast to improve intersection average delay, no improvements are recommended.

The results of the intersection analysis indicate that the fuel facility will add delays to some intersections that are currently operating near or over capacity, but operational improvements are not recommended for the reasons noted above. The Project would have some adverse effects to delay at these locations, but overall daily operations of the network are anticipated to be adequate.

With the construction of the Project, Costco will construct a Class I bike path along Grand Avenue between Linda Vista Drive and S Bent Avenue along the northern boundary of the site as an alternative improvement, given the right-of-way constraints limiting the potential for other intersection improvements.

Based on the report's analyses and evaluation of findings, the addition of traffic generated by the Project does not adversely affect roadway segment capacity, therefore no roadway segment improvements are recommended for the proposed fuel facility at the existing Costco Business Center.



Section 10

References

References

1. City of San Marcos. *Transportation Impact Analysis Guidelines*. November 2020.
2. Transportation Research Board. *Highway Capacity Manual, 6th Edition*. April 2016
3. City of San Marcos. *General Plan, Mobility Element*. 2012.
4. California Department of Transportation. *Vehicle Miles Traveled-Focused Transportation Impact Study Guide*. May 2020.
5. California Department of Transportation. *Peak Hour Report*. 2021.
6. University of California Berkeley. *Transportation Injury Mapping System (TIMS)*.
7. California Highway Patrol. *Statewide Integrated Traffic Records System (SWITRS)*.
8. Institute of Transportation Engineers. *Trip Generation Manual, 11th Edition*. September 2021.
9. City of San Marcos. *Intersection Sight Distance Guidelines*. December 2020.