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ARBOR CAR WASH
TRAFFIC IMPACT ANALYSIS
RANCHO CUCAMONGA, CALIFORNIA

SEPTEMBER 24, 2018

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TRAMES SOLUTIONS INC.

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EXECUTIVE SUMMARY

The purpose of this traffic impact analysis (TIA) is to evaluate the traffic impacts of the proposed Arbor Car Wash development. The project is proposed to be developed by 2019 with an automated car wash facility with a 140 foot long tunnel. The site is located north of Arrow Route and east of Archibald Avenue in the City of Rancho Cucamonga.

The amount of vehicular trips generated by a project is typically determined from the trip rates included in the ITE **Trip Generation** manual. The latest version (10th edition) only provides the PM peak hour rate for one observation. Therefore, due to the small data set collected by ITE for an automated car wash, empirical count data has been collected at a Fast 5 Xpress car wash in the City of Murrieta (Murrieta Hot Springs Road at Jackson Ave.) to determine the amount of peak hour and daily vehicles that occur at this facility. Trip generation rates for the proposed development are driven by the amount of cars that can be washed during the peak hour. It is our understanding that a higher number of cars can be washed as the length of the service tunnel is increased. Therefore, the peak hour and daily trip rates shown in Table 1 were based on tunnel length.

The daily and peak hour trip generations for the proposed project are shown on Table 2. The proposed development is projected to generate a total of approximately 710 new trip-ends per day with 37 new vehicle trips per hour during the AM peak hour and 66 new vehicle trips per hour during the PM peak hour. It should be noted that a pass by reduction (AM-37%, PM-35%) and a 5% internal trip reduction was assumed. The pass-by reduction percentages were based on a survey conducted at the Lighting Express Car Wash (17111 Hawthorne Blvd., Lawndale, CA).

TABLE 1
PROJECT TRIP GENERATION RATES

LAND USE	SOURCE	QUANTITY	PEAK HOUR TRIP RATES[1]						DAILY
			AM			PM			
			IN	OUT	TOTAL	IN	OUT	TOTAL	
Automated Car Wash	Empirical Data	140 Feet	025	0.21	0.46	0.38	0.41	0.79	8.45

[1] Source: Fast 5 Xpress car wash in the City of Murrieta (Murrieta Hot Springs Road at Jackson Ave.)

TABLE 2
PROJECT TRIP GENERATION SUMMARY

LAND USE	QUANTITY	PEAK HOUR						DAILY
		AM			PM			
		IN	OUT	TOTAL	IN	OUT	TOTAL	
Arbor Car Wash	140 Feet	35	29	64	53	57	111	1183
Pass-by Reduction (AM–37%:PM–35%)[1]		-13	-11	-24	-19	-20	-39	-414
Internal Trip Reduction (5%)		-2	-1	-3	-3	-3	-6	-59
TOTAL PROJECT TRIPS		**20**	**17**	**37**	**31**	**34**	**66**	**710**

[1] Pass-by reduction percentages were based on surveys at Lightning Express Car Wash, 17111 Hawthorne Blvd, Lawndale, CA

The traffic study has been conducted in accordance with the City of Rancho Cucamonga traffic study guidelines. These guidelines include the following conditions:

- **Existing (2018) Traffic**
- **Opening Day + Ambient Traffic + Cumulative (ODAC 2019)**
- **Opening Day + Ambient + Cumulative + Project (ODACP 2019)**
- **Horizon Year (2040) Without Project Conditions**
- **Horizon Year (2040) With Project Conditions**

Based on the analysis conducted for the proposed project, no study area intersections were determined to have a direct significant impact due to the proposed project.

Project recommendations include:

- Provide stop sign control at the project driveways.
- On-site traffic signing and striping should be implemented in conjunction with detailed construction plans for the project.
- Verify that minimum sight distance is provided at the project driveways.

1.0 INTRODUCTION

A. Purpose of the TIA and Study Objectives

The purpose of this traffic impact analysis (TIA) is to evaluate the traffic impacts of the proposed Arbor Car Wash development. The project is proposed to be developed with an automated car wash facility with a 140 foot long tunnel. The site is located north of Arrow Route and east of Archibald Avenue in the City of Rancho Cucamonga. The traffic study will be based on the San Bernardino Association of Governments (SANBAG) Congestion Management Program and Traffic Impact Analysis Guidelines criteria.

Study objectives include the following:

Existing (2018) Traffic. Existing traffic will be counted to determine current conditions. This constitutes the environmental setting for a CEQA analysis at the time that the hearing body reviews the project. Traffic count data shall be new or recent. In some cases, data up to one year old may be acceptable with the approval of the City of Rancho Cucamonga Engineering Department. Any exception to this must be requested prior to approval of the scoping agreement

Opening Day + Ambient + Cumulative (ODAC 2019). Traffic conditions prior to the time that the proposed development is completed will be estimated by increasing the existing traffic counts by an appropriate growth rate to be provided by City of Rancho Cucamonga Engineering Department staff, projected to the year that the project is estimated to be completed. Traffic generated by other cumulative projects will then be added, and the impacts on the circulation system will be analyzed. This will be the basis for determining “no-project” conditions.

Opening Day + Ambient + Cumulative + Project (ODACP 2019). Traffic generated by the project will be added to the “No Project” conditions identified in Scenario 2. This scenario will identify the potential project impacts to the circulation system.

Horizon Year (2040) Without Project. The Horizon Year forecasts has been developed based on applying a 2% per year growth rate (44% total growth) to the existing traffic volumes and traffic generated by other cumulative projects.

Horizon Year (2040) With Project. The project traffic has been added to the Horizon Year traffic volumes to determine the potential long range impacts due to the project traffic.

B. Site Location and Study Area

The site is located north of Arrow Route and east of Archibald Avenue in the City of Rancho Cucamonga. Figure 1-A illustrates the site location and the traffic analysis study area.

In general, the study area shall include any intersection of Collector or higher classification street with another Collector roadway or higher classification street, at which the proposed project will add 50 or more peak hour trips. Per discussion with City Staff, the study area includes the following intersections:

STUDY AREA INTERSECTIONS	
1.	Archibald Ave./Arrow Route.
2.	Malven Ave./Arrow Route
3.	Hermosa Ave./Arrow Route.
4.	Project Dwy. / Arrow Route.

C. Development Project Identification

1. Project Size and Description

The Arbor Car Wash site is proposed to be developed by 2019. The following uses are proposed as indicated below:

- An automated car wash facility with a 140 foot long tunnel

2. Existing Land Use

The project site is currently vacant. Adjacent uses include the following:

- North –Residential
- South –Commercial
- East –Residential
- West – Vacant/Gas Station

3. Proposed Land Use

Proposed Land Use: Car Wash

4. Site Plan of Proposed Project

Figure 1-B illustrates the conceptual land use plan. As shown in Figure 1-B, the project is proposed to have a full access driveway along Arrow Route and a reciprocal access with the adjacent gas station.

FIGURE 1-A
STUDY AREA

LEGEND:

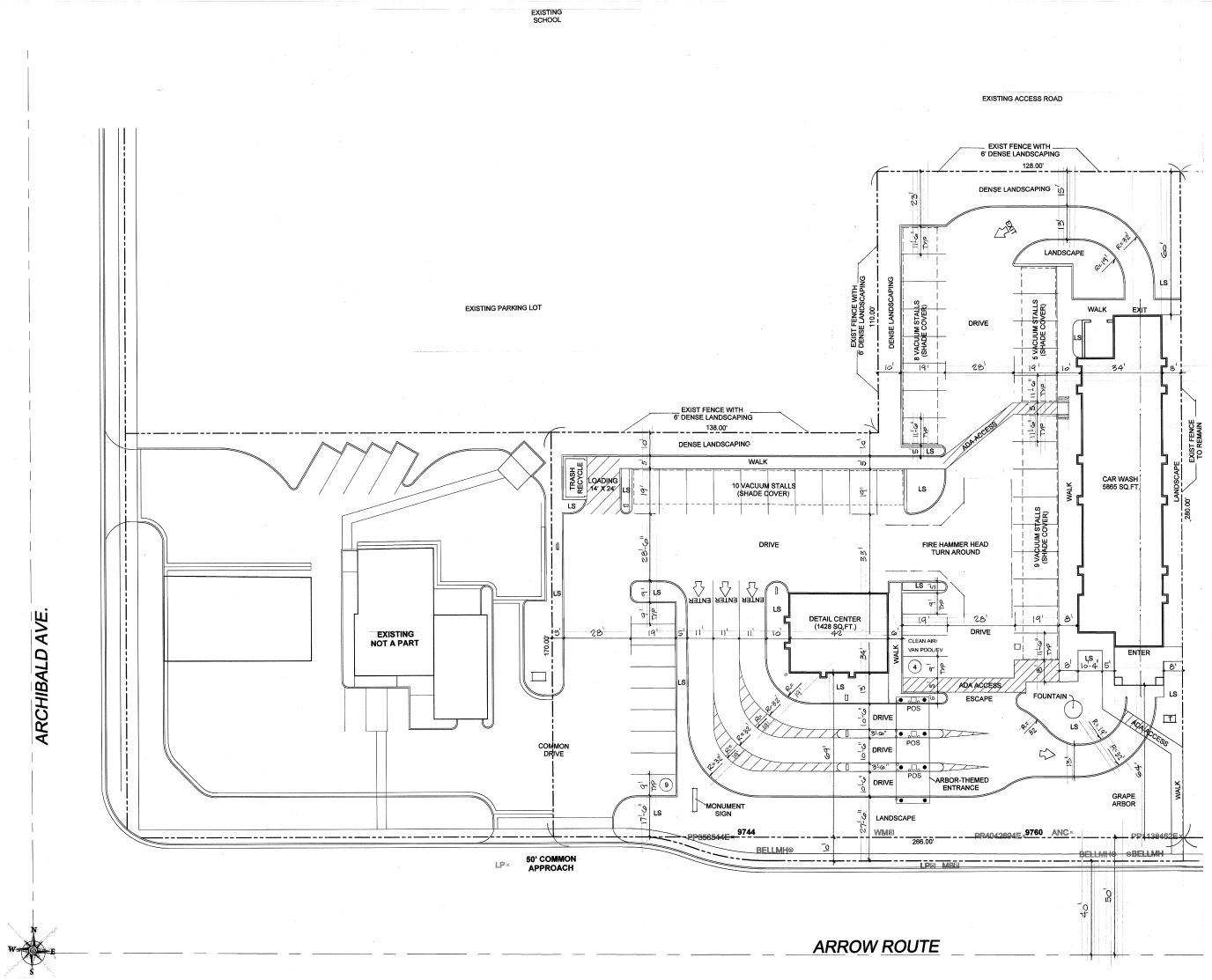
3 = EXISTING INTERSECTION ANALYSIS LOCATION

1 = FUTURE INTERSECTION ANALYSIS LOCATION

= FUTURE DRIVEWAY

N

FIGURE 1-B
SITE PLAN



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5. Proposed Project Opening Year

The proposed project is anticipated to be completed by 2019. Future traffic analysis has been based on a background (ambient) growth of 2% per year, along with traffic generated by other future developments in the surrounding area.

6. Proposed Project Phasing

The project is expected to be completed in a single phase. Therefore, all traffic recommendations included in this report have been assumed to be completed by 2019.

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2.0 TRAFFIC ANALYSIS METHODOLOGIES

Traffic operations are quantified through the determination of "Level of Service" (LOS). Level of Service is a qualitative measure of traffic operating conditions, whereby a letter grade "A" through "F" is assigned to an infrastructure facility (intersection) representing progressively worsening traffic conditions. This section presents the LOS definition, LOS criteria and methodologies for the Intersection Operations.

A. Level of Service Definition

The definitions of Level of Service for uninterrupted flow (flow unrestrained by the existence of traffic control devices) are:

- LOS "A": Completely free-flow conditions. The operation of vehicles is virtually unaffected by the presence of other vehicles, and operations are constrained only by the geometric features of the highway and by driver preferences. Maneuverability within the traffic stream is good. Minor disruptions to flow are easily absorbed without a change in travel speed.

- LOS "B": Free flow conditions, although the presence of other vehicles becomes noticeable. Average travel speeds are the same as in LOS "A", but drivers have slightly less freedom to maneuver. Minor disruptions are still easily absorbed, although local deterioration in LOS will be more obvious.

- LOS "C": The influence of traffic density on operations becomes marked. The ability to maneuver within the traffic stream is clearly affected by other vehicles. Minor disruptions can cause serious local deterioration in service, and queues will form behind any significant traffic disruption.

- LOS "D": The ability to maneuver is restricted due to traffic congestion. Travel speed is reduced by the increasing volume. Only minor disruptions can be absorbed without extensive queues forming and the service deteriorating.

- LOS "E": Operations at or near capacity, an unstable level. Vehicles are operating with the minimum spacing for maintaining uniform flow.

- LOS "F": Forced or breakdown flow. It occurs either when vehicles arrive at a rate greater than the rate at which they are discharged or when the forecast demand exceeds the computed capacity of a planned facility. Although operations at these points – and on sections immediately downstream – appear to be at capacity, queues form behind these breakdowns. Operations within queues are highly unstable, with vehicles experiencing brief periods of movement followed by stoppages.

B. City of Rancho Cucamonga Level of Service Criteria

The City of Rancho Cucamonga General Plan has established Level of Service (LOS) "D" as the target along all City maintained intersections, roads and conventional state highways. Therefore, LOS "E" or "F" is considered unacceptable and requires improvements measures if the project causes significant impacts.

C. Intersection Operations Analysis Methodology

The City of Rancho Cucamonga requires the use of the Transportation Research Board - Highway Capacity Manual (HCM), 2016 Update, or most recent release. The HCM defines level of service as a qualitative measure, which describes operational conditions within a traffic stream, generally in terms of such factors as speed and travel time, freedom to maneuver, traffic interruptions, comfort and convenience, and safety. The criteria used to evaluate Level of Service (LOS) conditions vary based on the type of roadway and whether the traffic flow is considered interrupted or uninterrupted. The HCM methodology expresses the level of service at an intersection in terms of delay time for the various intersection approaches. The HCM uses different procedures depending on the type of intersection control.

The level of service is typically dependent on the quality of traffic flow at the intersections along a roadway. The HCM methodology expresses the level of service at an intersection in terms of delay time for the various intersection approaches. The HCM uses different procedures depending on the type of intersection control. The Levels of Service results in this study are determined using the HCM methodology.

For signalized intersections, average total delay per vehicle for the overall intersection is used to determine level of service.

The study area intersections which are stop sign controlled with stop control on the minor street only have been analyzed using the unsignalized intersection methodology of the HCM. For these intersections, the calculation of level of service is dependent on the occurrence of gaps occurring in the traffic flow of the main street. Using data collected describing the intersection configuration and traffic volumes at the study area locations; the level of service has been calculated. The level of service criteria for this type of intersection analysis is based on average total delay per vehicle for the worst minor street movement(s).

For all way stop (AWS) controlled intersections, the ability of vehicles to enter the intersection is not controlled by the occurrence of gaps in the flow of the main street. The AWS controlled intersections have been evaluated using the HCM methodology for this type of multi-way stop controlled intersection configuration. The level of service criteria for this type of intersection analysis is based on average total delay per vehicle.

The levels of service are defined for the various analysis methodologies as follows:

LEVEL OF SERVICE	AVERAGE TOTAL DELAY PER VEHICLE (SECONDS)	
	SIGNALIZED	UNSIGNALIZED
A	0 to 10.00	0 to 10.00
B	10.01 to 20.00	10.01 to 15.00
C	20.01 to 35.00	15.01 to 25.00
D	35.01 to 55.00	25.01 to 35.00
E	55.01 to 80.00	35.01 to 50.00
F	80.01 and up	50.01 and up

Peak hour factors (PHF), where known from existing traffic counts, have been used to assess intersection operations.

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3.0 AREA CONDITIONS

A. Study Area Intersections

In general, the minimum area to be studied shall include any intersection of "Collector" or higher classification street, with "Collector" or higher classification streets, at which the proposed project could have a significant impact. The City of Rancho Cucamonga Engineering Department may require deviation from these requirements based on area conditions. Pursuant to the attached scoping agreement (see Appendix 3.1), and discussions with City of Rancho Cucamonga staff, the study area include the following intersections (shown previously on Figure 1-A):

STUDY AREA INTERSECTIONS	
1.	Archibald Ave./Arrow Route.
2.	Malven Ave./Arrow Route
3.	Hermosa Ave./Arrow Route.
4.	Project Dwy. / Arrow Route.

B. Area Roadway System

Figure 3-A identifies the existing roadway conditions for study area roadways. The existing intersection traffic controls and geometrics are identified.

C. Existing (2018) Traffic Volumes

Existing intersection level of service calculations are based upon manual AM and PM peak hour turning movement counts made for Trames Solutions, Inc. in June 2018 while school was in session. Existing (2018) AM and PM peak hour intersection turning movement volumes are shown on Figure 3-B. The traffic count worksheets are included in Appendix 3.2.

Existing average daily traffic (ADT) volumes (see Figure 3-B) for the roadway are estimated based on the following formula: PM Peak Hour Link Volume (Approach + Exit) x 12 = ADT Leg Volume.

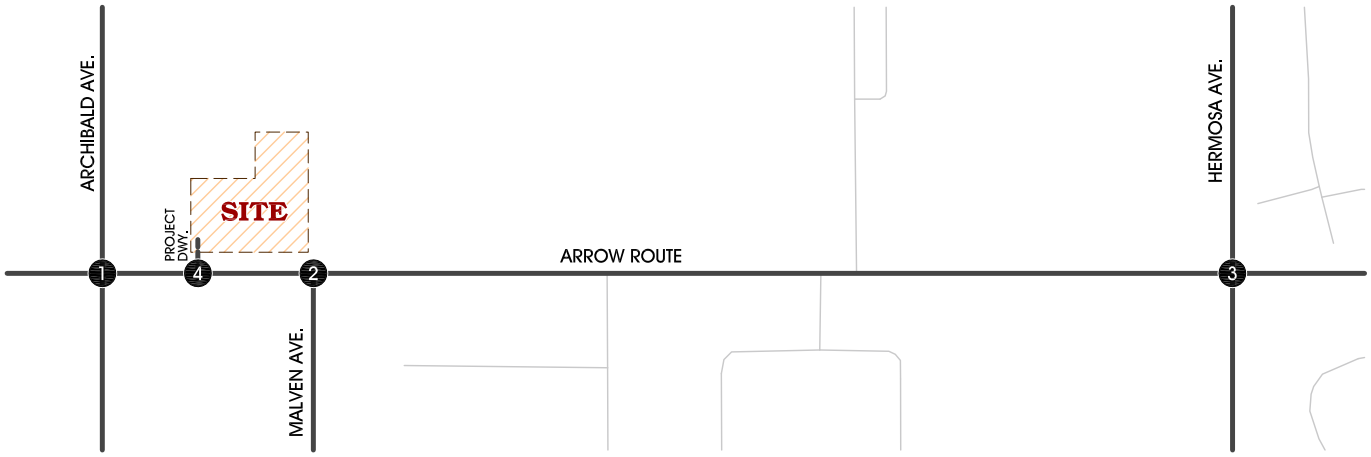
D. Existing (2018) Delay and Level of Service

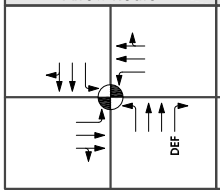
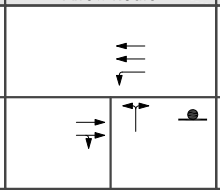
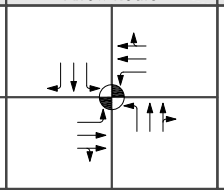
The City of Rancho Cucamonga has established Level of Service (LOS) "D" as the maximum allowable threshold for the intersection operations. Therefore, LOS "E" or "F" is considered unacceptable and requires improvements measures.

The results of the existing conditions intersection analysis are summarized in Table 3-1. The existing condition operations analysis worksheets are provided in Appendix "3.3". As shown on Table 3-1, the intersection of Archibald Avenue / Arrow Route is currently operating at unacceptable level of service (LOS "E" or worse) during the AM peak hour with the existing geometry and traffic controls.

FIGURE 3-A

EXISTING TRAFFIC CONTROLS AND INTERSECTION GEOMETRICS



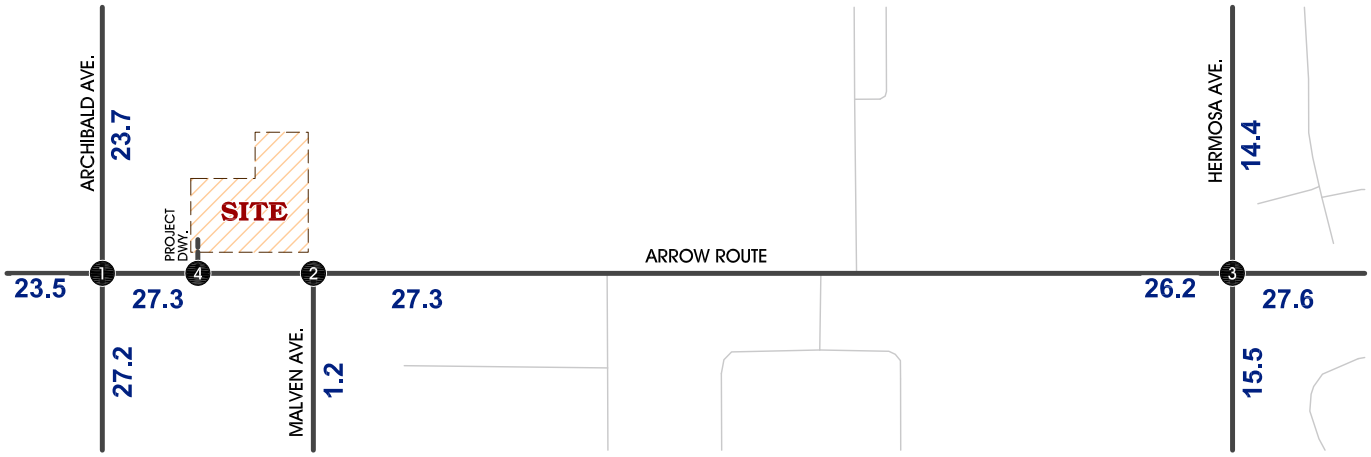
1. Archibald Ave. / Arrow Route	2. Malven Ave. / Arrow Route	3. Hermosa Ave. / Arrow Route	4. Project Dwy. / Arrow Route
			FUTURE INTERSECTION

LEGEND:

- 4 = INTERSECTION ID
- = TRAFFIC SIGNAL
- = STOP SIGN
- DEF = DEFACTO RIGHT TURN LANE
- = PROJECT DRIVEWAY

N

FIGURE 3-B
EXISTING (2018) TRAFFIC VOLUMES



AM PEAK HOUR

1. Archibald Ave. / Arrow Route		2. Malven Ave. / Arrow Route		3. Hermosa Ave. / Arrow Route		4. Project Dwy. / Arrow Route
117 875 140	92 792 235	1109 49		115 446 94	78 880 126	FUTURE INTERSECTION
64 583 106	133 483 218	925 17	25 23	82 736 144	50 253 95	

PM PEAK HOUR

1. Archibald Ave. / Arrow Route		2. Malven Ave. / Arrow Route		3. Hermosa Ave. / Arrow Route		4. Project Dwy. / Arrow Route
68 590 108	138 723 186	1013 37		60 265 63	94 883 118	FUTURE INTERSECTION
117 819 82	151 957 304	1194 16	22 27	118 979 61	84 597 165	

LEGEND:

4 = INTERSECTION ID

10.0 = VEHICLES PER DAY (1000's)

N

TABLE 3-1

INTERSECTION ANALYSIS FOR EXISTING (2018) CONDITIONS

ID	Intersection	Traffic Control [1]	Intersection Approach Lanes [2]												Delay [3] (secs.)		Level of Service [3]	
			Northbound			Southbound			Eastbound			Westbound						
			L	T	R	L	T	R	L	T	R	L	T	R	AM	PM	AM	PM
1	Archibald Ave./ Arrow Route	TS	1	2	d	1	2	0	1	2	0	1	2	0	**64.9**	47.5	**E**	D
2	Malven Ave./ Arrow Route	CSS	0	1	0	0	0	0	0	2	0	1	2	0	28.0	24.3	D	C
3	Hermosa Ave./ Arrow Route	TS	1	2	0	1	1	1	1	2	0	1	2	0	39.6	37.2	D	D
4	Project Driveway / Arrow Route	-	Future Intersection												**-**	**-**	-	-

[1] TS = Traffic Signal; CSS = Cross Street Stop

[2] When a right turn is designated, the lane can either be striped or unstriped. To function as a right turn lane there must be sufficient width for right turning vehicles to travel outside the through lanes.
L = Left; T = Through; R = Right; d = Defacto right turn lane

[3] Delay and level of service calculated using the following analysis software: Synchro 10 HCM6
BOLD = Unacceptable level of service

4.0 PROJECTED FUTURE TRAFFIC

This section of the report quantifies the number of trips generated by the proposed project and other known developments in the area.

A. Project Traffic

1. Ambient Growth Rate

Some traffic volume increases on roadways can be attributed to vehicles originating outside of the study area. These types of trips either end up within the study area or pass-through onto an outside destination. Therefore, to account for these trips (termed "ambient growth"), a growth rate can be applied to existing traffic volumes.

A 2% ambient growth rate that has been used in this study to account for traffic not attributed to the project or other planned developments within the study area. The City of Rancho Cucamonga Transportation Department staff has previously reviewed and approved this rate.

2. Project Trip Generation

Trip generation represents the amount of traffic which is attracted and produced by a development. The trip generation for the project is based upon the specific land use which has been planned for this development. For the purpose of this analysis, the following land use assumption is evaluated:

- An automated car wash facility with a 140 foot long tunnel

The amount of vehicular trips generated by a project is typically determined from the trip rates included in the ITE **Trip Generation** manual. The latest version (10th edition) only provides the PM peak hour rate for one observation. Therefore, due to the small data set collected by ITE for an automated car wash, empirical count data has been collected at a Fast 5 Xpress car wash in the City of Murrieta (Murrieta Hot Springs Road at Jackson Ave.) to determine the amount of peak hour and daily vehicles that occur at this facility. Trip generation rates for the proposed development are driven by the amount of cars that can be washed during the peak hour. It is our understanding that a higher number of cars can be washed as the length of the service tunnel is increased. Therefore, the peak hour and daily trip rates shown in Table 4-1 were based on tunnel length.

The daily and peak hour trip generations for the proposed project are shown on Table 4-2. The proposed development is projected to generate a total of approximately 710 new trip-ends per day with 37 new vehicle trips per hour during the AM peak hour and 66 new vehicle trips per hour during the PM peak hour. It should be noted that a pass by reduction (AM-37%, PM-35%) and a 5% internal trip

reduction was assumed. The pass-by reduction percentages were based on a survey conducted at the Lighting Express Car Wash (17111 Hawthorne Blvd., Lawndale, CA).

TABLE 4-1

PROJECT TRIP GENERATION RATES

LAND USE	SOURCE	QUANTITY	PEAK HOUR TRIP RATES[1]						DAILY
			AM			PM			
			IN	OUT	TOTAL	IN	OUT	TOTAL	
Automated Car Wash	Empirical Data	140 Feet	0.25	0.21	0.46	0.38	0.41	0.79	8.45

[1] Source: Fast 5 Xpress car wash in the City of Murrieta (Murrieta Hot Springs Road at Jackson Ave.)

TABLE 4-2

PROJECT TRIP GENERATION SUMMARY

LAND USE	QUANTITY	PEAK HOUR						DAILY
		AM			PM			
		IN	OUT	TOTAL	IN	OUT	TOTAL	
Arbor Car Wash	140 Feet	35	29	64	53	57	111	1,183
Pass-by Reduction (AM–37%:PM–35%)[1]		*-13*	*-11*	*-24*	*-19*	*-20*	*-39*	*-414*
Internal Trip Reduction (5%)		*-2*	*-1*	*-3*	*-3*	*-3*	*-6*	*-59*
TOTAL PROJECT TRIPS		**20**	**17**	**37**	**31**	**34**	**66**	**710**

[1] Pass-by reduction percentages were based on surveys at Lightning Express Car Wash, 17111 Hawthorne Blvd, Lawndale, CA

3. Project Trip Distribution and Assignment

Trip distribution represents the directional orientation of traffic to and from the project site. The project's trip distribution patterns are based on the proximity of the project to the proposed driveway locations, the surrounding trip attractors, and the regional freeway interchanges. The trip distribution pattern for the project is illustrated on Figure 4-A.

4. Other Trip Generation Factors

The project land use is comprised of primary, pass-by and internal traffic. Primary traffic refers to trips that are intending to go to the project as their primary destination. Pass-by traffic consists of vehicles that stop at the site on their way to a primary destination. Internal traffic consists of trips that are anticipated to occur between the future gas station and those that go to the project. A 5% reduction in traffic has been assumed for these trips.

FIGURE 4-A
PROJECT TRIP DISTRIBUTION

LEGEND:

3 = INTERSECTION ID

= FUTURE DRIVEWAY

10% = PERCENT TO/FROM PROJECT

N

Pass-by reductions have been based on the surveys conducted at the Lightning Express Car Wash, 17111 Hawthorne Blvd, Lawndale, CA during the AM and PM peak hours. Based on the surveys, a pass-by rate of 37% and 35% were observed for the AM and PM peak hours, respectively. Appendix 3.1 contains the survey sheets.

5. Project Peak Hour Turning Movement Traffic

The assignment of traffic from the site to the adjoining roadway system has been based upon the site's trip generation, trip distribution, proposed arterial highway and local street systems, which would be in place by the time of initial occupancy of the site. Based on the identified project traffic generation and distribution, Project traffic volumes are shown on Figure 4-B.

B. Cumulative Traffic (Background)

4. Method of Projection

To assess Opening Day Plus ambient plus cumulative plus project traffic conditions, project traffic is combined with existing traffic, area-wide growth and other future developments which are approved or being processed concurrently in the study area. Developments which are being processed concurrently in the study area have been provided by the City of Rancho Cucamonga staff.

2. Other Approved or Proposed Development Projects

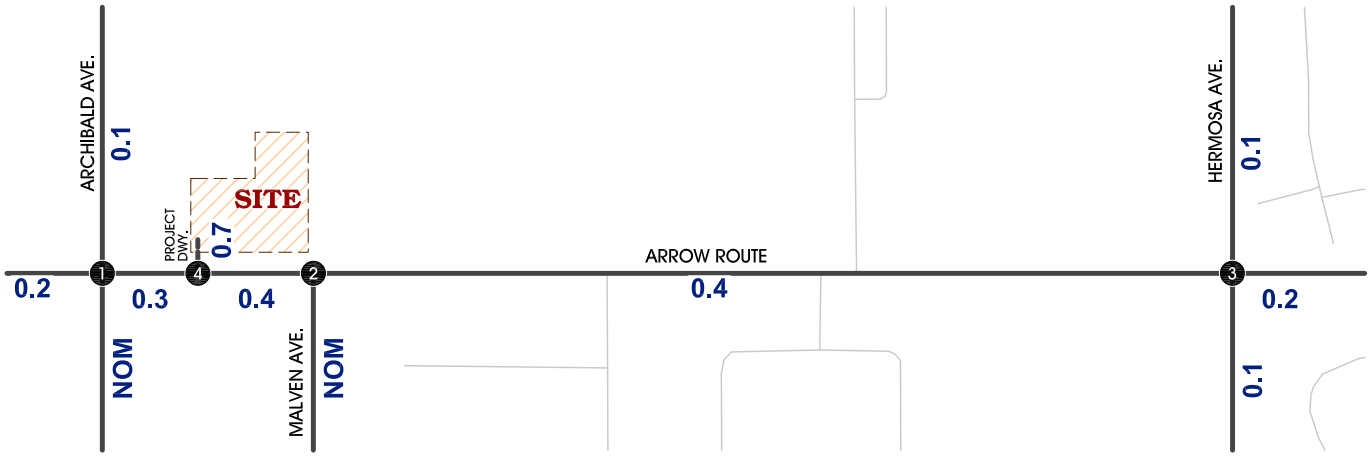
The locations of the cumulative projects provided by the City are shown on Figure 4-C and include the following projects:

- DRC 20118-000119 (9000 Hellman Ave.) – 174,745 sf Industrial Warehouse
- DRC 2013-00565 (NE of Archibald/7th) – 171,941 General Industrial
- DRC 2017-00654 (SW of Haven/26th) – 207 MFDU/14,300 sf Retail
- DRC 2016-00695 (8th/Industrial) – 150,003 sf General Industrial

3. Other Approved Projects Trip Generation

Table 4-3 presents the cumulative development trip generation rates and anticipated cumulative traffic volumes. Table 4-4 indicates that the cumulative developments are projected to generate a total of approximately 4,822 trips per day with 465 trip ends per hour during the AM peak hour and 504 trip ends per hour during the PM peak hour.

FIGURE 4-B
PROJECT ONLY TRAFFIC VOLUMES



AM PEAK HOUR

1. Archibald Ave. / Arrow Route	2. Malven Ave. / Arrow Route	3. Hermosa Ave. / Arrow Route	4. Project Dwy. / Arrow Route
0 0 2 / 2 5 1	11 / 0	2 0 0 / 0 6 0	7 9 / 12 0
0 6 0 / 0 0 1	8 1 / 1 0	2 5 2 / 2 0 0	9 0

AM PEAK HOUR PASS-BY

4. Project Dwy. / Arrow Route
5 7 / 5 -5
7 -7

PM PEAK HOUR

1. Archibald Ave. / Arrow Route	2. Malven Ave. / Arrow Route	3. Hermosa Ave. / Arrow Route	4. Project Dwy. / Arrow Route
0 0 3 / 4 11 2	15 / 0	3 0 0 / 0 9 0	16 19 / 17 0
0 9 0 / 0 0 2	18 2 / 2 0	4 11 4 / 3 0 0	14 0

PM PEAK HOUR PASS-BY

4. Project Dwy. / Arrow Route
9 11 / 9 -9
11 -11

LEGEND:

4 = INTERSECTION ID

10.0 = VEHICLES PER DAY (1000's)

NOM = NOMINAL, LESS THAN 50 VEHICLES PER DAY

N

FIGURE 4-C
CUMULATIVE DEVELOPMENTS LOCATION MAP

LEGEND:

4 = INTERSECTION ID

= FUTURE ROADWAY / PROJECT DRIVEWAY

5 = CUMULATIVE DEVELOPMENT ID
(SEE TABLE 4-4 FOR REFERENCE)

N

TABLE 4-3
CUMULATIVE TRIP GENERATION RATES

LAND USE	ITE CODE	QUANTITY[2]	PEAK HOUR TRIP RATES[1]						DAILY
			AM			PM			
			IN	OUT	TOTAL	IN	OUT	TOTAL	
General Light Industrial	110	Varies TSF	0.62	0.08	0.70	0.08	0.55	0.63	4.96
Multifamily (Low Rise)	220	207 DU	0.11	0.35	0.46	0.35	0.21	0.56	7.32
General Office Bldg.	710	1.625 TSF	1.36	0.19	1.55	0.25	1.24	1.49	11.03
Shopping Center	820	Varies TSF	0.61	0.39	1.00	1.83	1.90	3.73	42.94

[1] Source: ITE (Institute of Transportation Engineers) Trip Generation Manual, 10th Edition, 2017.

[2] TSF = Thousand Square Feet; DU = Dwelling Units

TABLE 4-4
CUMULATIVE TRIP GENERATION SUMMARY

MAP ID	PROJECT NAME	LAND USE	QUANTITY [1]	PEAK HOUR						DAILY
				AM			PM			
				IN	OUT	TOTAL	IN	OUT	TOTAL	
1	Overton Moore Properties (DRC 2018-00119)	Gen. Lt. Industrial	174.745 TSF	108	14	122	14	96	110	867
2	SCHEU Management Corp (DRC 2013-00565)	Gen. Lt. Industrial	171.941 TSF	107	14	121	14	95	109	853
3	Charles Joseph Assoc. (DRC 2017-00654)	Multifamily Housing Shopping Center *Pass-by (25% Retail)*	207 DU 14.3 TSF	23 9 *-2*	72 6 *-2*	95 15 *-4*	72 26 *-7*	43 27 *-6*	115 53 *-13*	1,515 614 *-154*
	Subtotal			30	76	106	91	64	155	1,975
4	Rancho Cucamonga Prop. (DRC 2016-00695)	Gen. Lt. Industrial	150.003 TSF	93	12	105	12	83	95	744
5	Neighboring Property (east of project site)	Gen. Office Bldg. Shopping Center	1.625 TSF 8.5 TSF	2 5	1 3	3 8	1 16	2 16	3 32	18 365
	Subtotal			7	4	11	17	18	35	383
Total Cumulative Projects Trip Generation				**345**	**120**	**465**	**148**	**356**	**504**	**4,822**

[1] TSF = Thousand Square Feet; DU = Dwelling Units

4. Other Approved Development Trip Distribution and Assignments

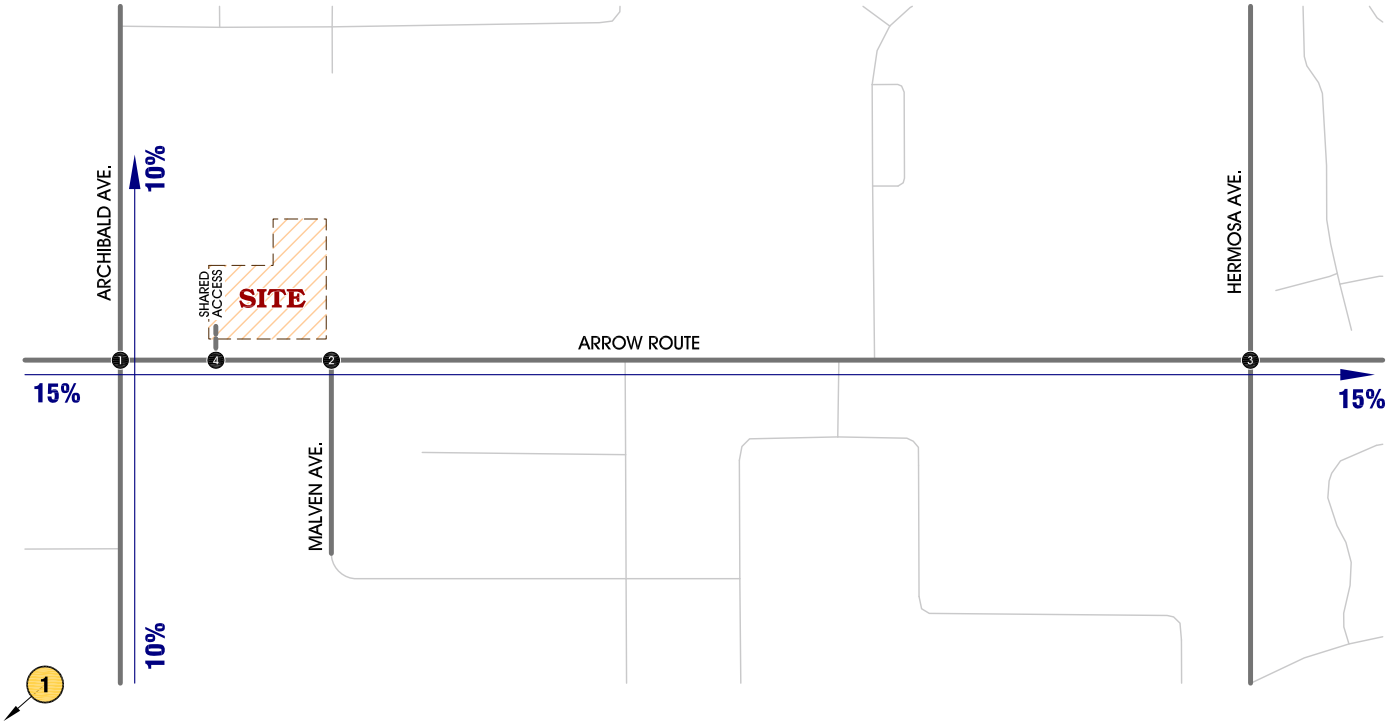
Figures 4-D through 4-H contains the directional distribution and assignment of the cumulative development traffic.

5. Total Background Peak Hour Turning Movement Volumes

Based on the identified trip distribution for the cumulative development on arterial highways throughout the study area, cumulative development traffic volumes are shown on Figure 4-I.

Opening Day plus Ambient plus Cumulative (ODAC 2019) traffic volumes are shown on Figure 4-J.

FIGURE 4-D
DRC 2018-00119 TRIP DISTRIBUTION



LEGEND:

4 = INTERSECTION ID

= FUTURE PROJECT DRIVEWAY

10% = PERCENT TO/FROM PROJECT

1 = DRC 2018-00119

N

FIGURE 4-E
DRC 2013-00565 TRIP DISTRIBUTION

LEGEND:

4 = INTERSECTION ID

= FUTURE PROJECT DRIVEWAY

10% = PERCENT TO/FROM PROJECT

2 = DRC 2013-00565

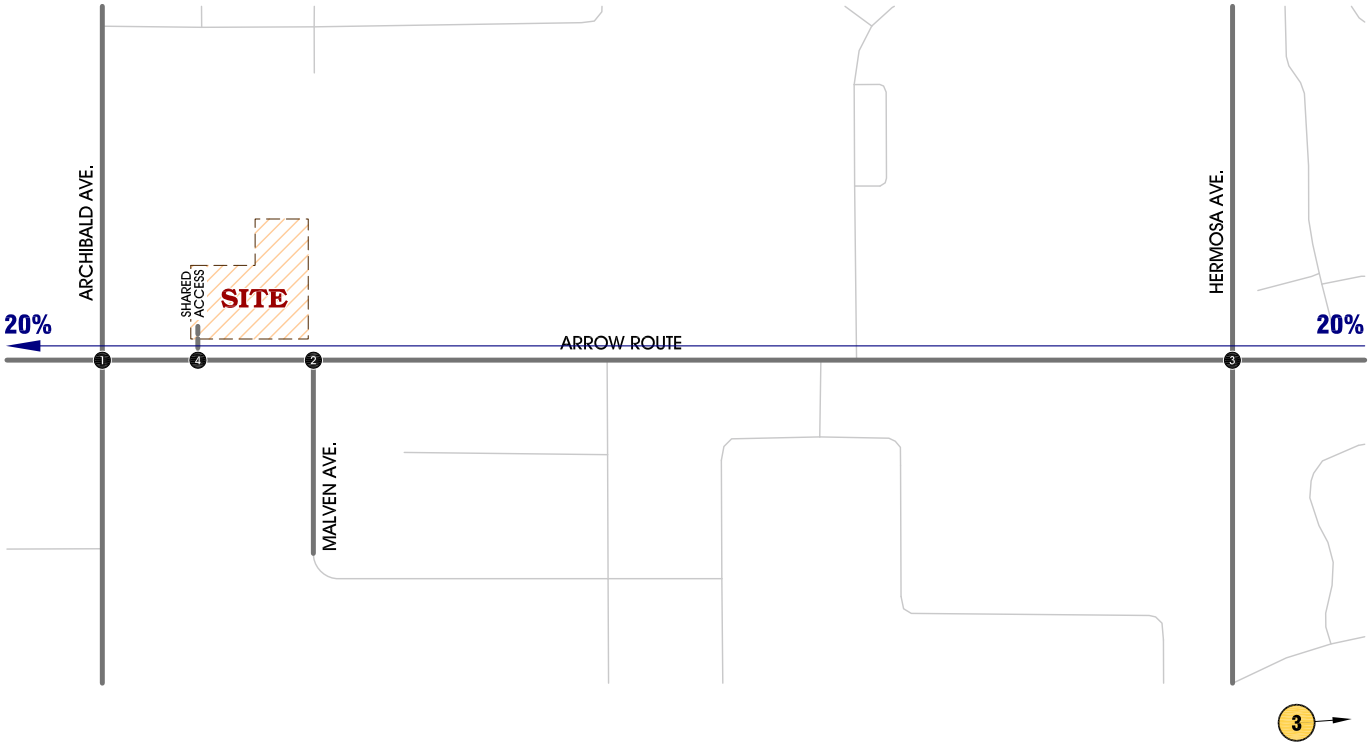
N

Arbor Car Wash Traffic Impact Analysis
Rancho Cucamonga, CA (0301-0001:02 - cm.dwg)

TRAMES SOLUTIONS INC.

FIGURE 4-F

DRC 2017-00654 TRIP DISTRIBUTION



LEGEND:

4 = INTERSECTION ID

= FUTURE PROJECT DRIVEWAY

10% = PERCENT TO/FROM PROJECT

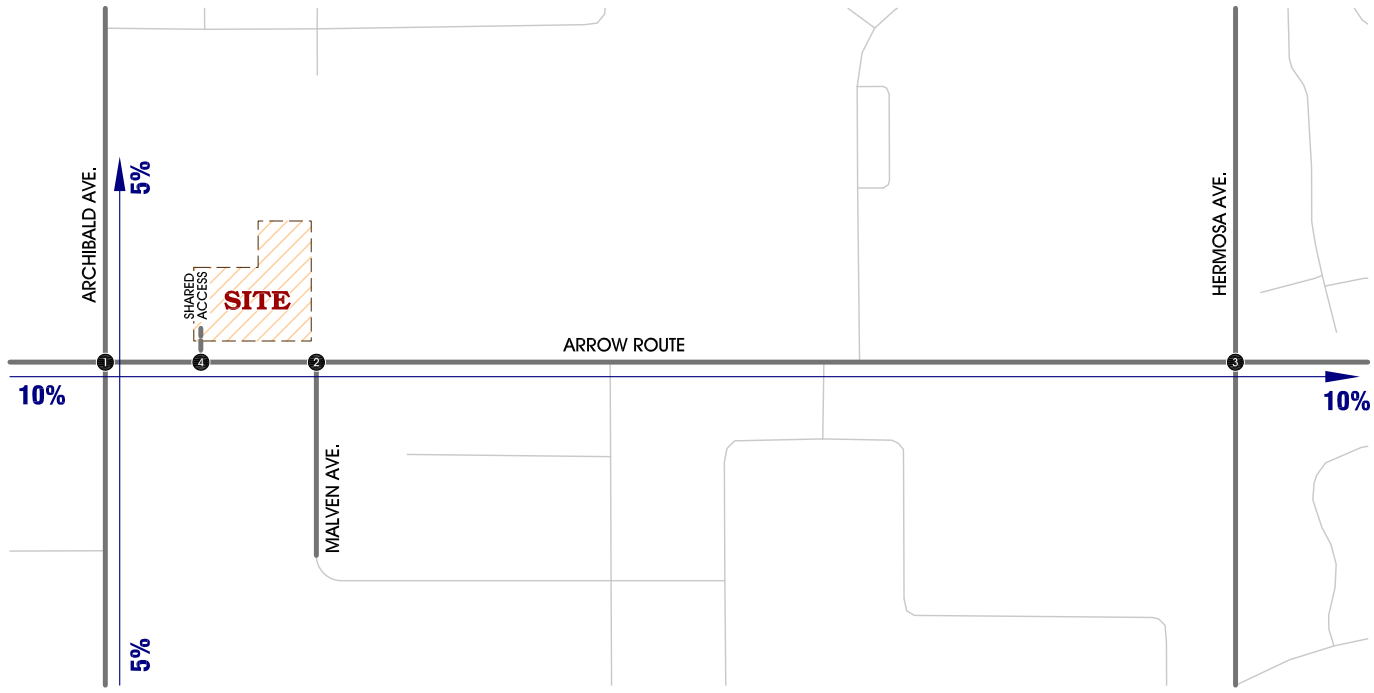
3 = DRC 2017-00654

N

Arbor Car Wash Traffic Impact Analysis
Rancho Cucamonga, CA (0301-0001:02 - cm.dwg)

TRAMES SOLUTIONS INC.

FIGURE 4-G
DRC 2016-00695 TRIP DISTRIBUTION



4

LEGEND:

- 4 = INTERSECTION ID
- = FUTURE PROJECT DRIVEWAY
- 10% = PERCENT TO/FROM PROJECT
- 4 = DRC 2016-00695

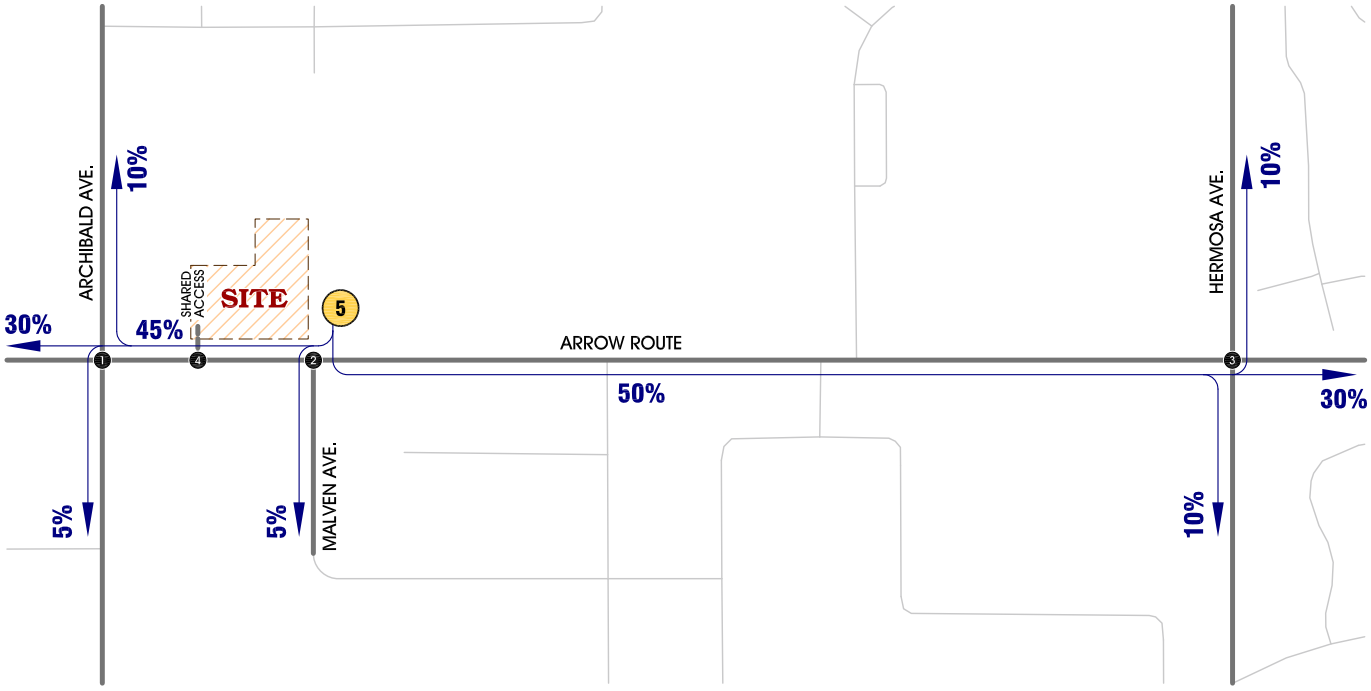
N

Arbor Car Wash Traffic Impact Analysis
Rancho Cucamonga, CA (0301-0001:02 - cm.dwg)

TRAMES SOLUTIONS INC.

FIGURE 4-H

NEIGHBORING PROPERTY TRIP DISTRIBUTION



LEGEND:

4 = INTERSECTION ID

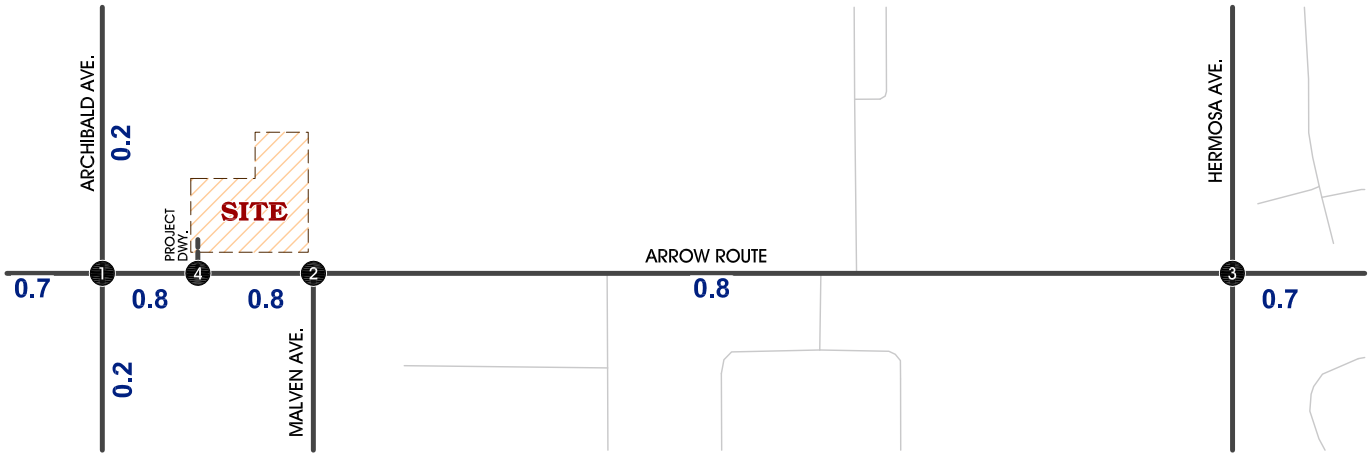
= FUTURE PROJECT DRIVEWAY

10% = PERCENT TO/FROM PROJECT

5 = NEIGHBORING PROPERTY

N

FIGURE 4-I
CUMULATIVE DEVELOPMENT ONLY TRAFFIC VOLUMES



AM PEAK HOUR

1. Archibald Ave. / Arrow Route		2. Malven Ave. / Arrow Route		3. Hermosa Ave. / Arrow Route		4. Project Dwy. / Arrow Route
0 26 1	0 42 0	43 0		1 0 0	0 43 0	FUTURE INTERSECTION
0 11 0	0 3 0	12 0	0 0	0 10 0	1 0 0	

PM PEAK HOUR

1. Archibald Ave. / Arrow Route		2. Malven Ave. / Arrow Route		3. Hermosa Ave. / Arrow Route		4. Project Dwy. / Arrow Route
0 3 2	2 22 1	24 1		2 0 0	0 21 0	FUTURE INTERSECTION
0 46 0	0 23 1	49 0	0 1	2 46 2	2 0 0	

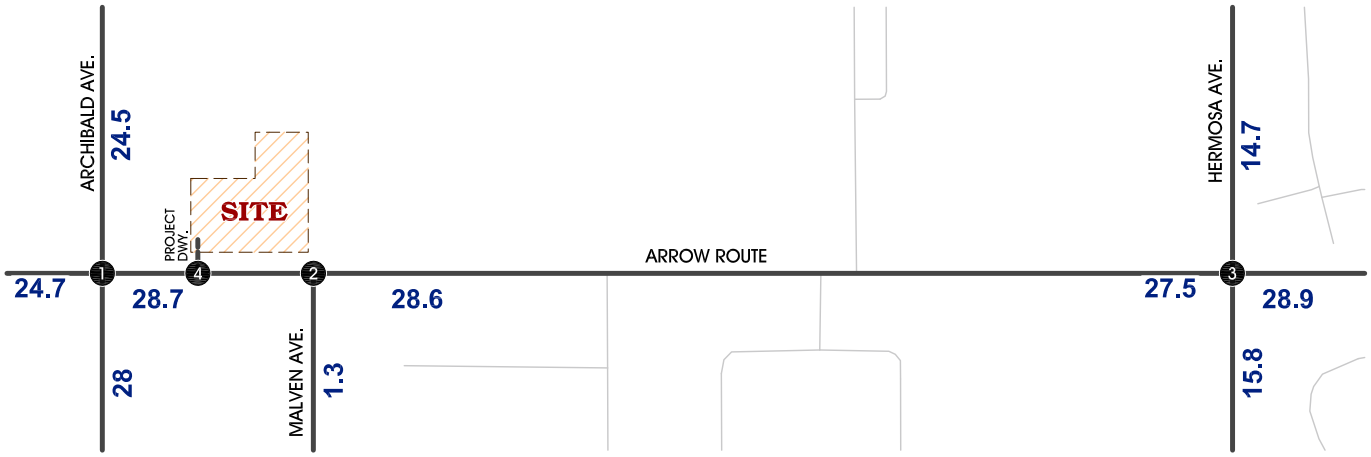
LEGEND:

4 = INTERSECTION ID

10.0 = VEHICLES PER DAY (1000's)

N

FIGURE 4-J
OPENING DAY PLUS AMBIENT PLUS CUMULATIVE (ODAC 2019) TRAFFIC VOLUMES



AM PEAK HOUR

1. Archibald Ave. / Arrow Route		2. Malven Ave. / Arrow Route		3. Hermosa Ave. / Arrow Route		4. Project Dwy. / Arrow Route
119 ↓ 919 ↓ 144	↳94 ←850 ↰240	←1174 ↰50		118 ↓ 455 ↓ 96	↳80 ←941 ↰129	FUTURE INTERSECTION
65 → 606 → 108 →	136 ↑ 496 ↑ 222 ↱	956 → 17 →	26 ↱ 23 ↱	84 → 761 → 147 →	52 ↑ 258 ↑ 97 ↱	

PM PEAK HOUR

1. Archibald Ave. / Arrow Route		2. Malven Ave. / Arrow Route		3. Hermosa Ave. / Arrow Route		4. Project Dwy. / Arrow Route
69 ↓ 605 ↓ 112	↳143 ←759 ↰191	←1057 ↰39		63 ↓ 270 ↓ 64	↳96 ←922 ↰120	FUTURE INTERSECTION
119 → 881 → 84 →	154 ↑ 999 ↑ 311 ↱	1267 → 16 →	22 ↱ 29 ↱	122 → 1045 → 64 →	88 ↑ 609 ↑ 168 ↱	

LEGEND:

4 = INTERSECTION ID

10.0 = VEHICLES PER DAY (1000's)

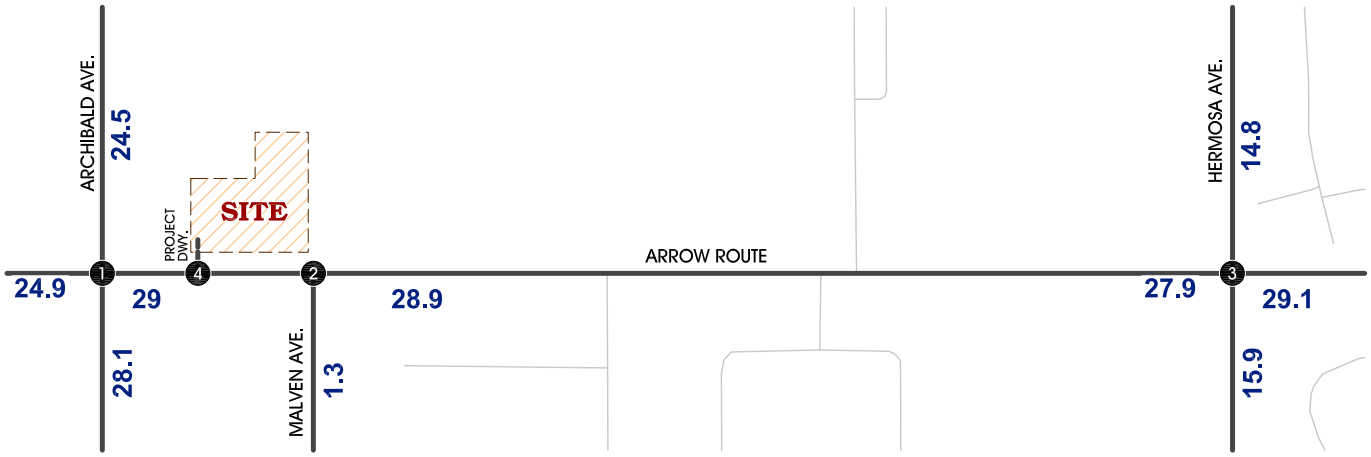
N

Opening Day plus Ambient plus Cumulative plus Project (ODACP 2019) traffic volumes are shown on Figure 4-K.

Horizon Year (2040) Without Project Traffic Volumes are shown on Figure 4-L. The Horizon Year forecasts were based on applying a 2% per year growth rate to the existing traffic volumes and additional traffic from previously identified cumulative development projects.

Horizon Year (2040) With Project AM and PM peak hour intersection turning movement volumes are shown on Figure 4-M. These forecasts were based on the adding the project traffic to the Horizon Year without Project traffic forecasts.

FIGURE 4-K
OPENING DAY PLUS AMBIENT PLUS CUMULATIVE PLUS PROJECT (ODACP 2019) TRAFFIC VOLUMES



AM PEAK HOUR

1. Archibald Ave. / Arrow Route		2. Malven Ave. / Arrow Route		3. Hermosa Ave. / Arrow Route		4. Project Dwy. / Arrow Route	
119 ↓ 919 ↓ 146	96 → 855 → 241	← 1185 ← 50		120 ↓ 455 ↓ 96	80 → 947 → 129	12 ↓ 16	17 → 1179
65 → 612 → 108	136 ↑ 496 ↑ 223	964 → 18	27 ↑ 23	86 → 766 → 149	54 ↑ 258 ↑ 97	16 → 965	

PM PEAK HOUR

1. Archibald Ave. / Arrow Route		2. Malven Ave. / Arrow Route		3. Hermosa Ave. / Arrow Route		4. Project Dwy. / Arrow Route	
69 ↓ 605 ↓ 115	147 → 770 → 193	← 1072 ← 39		66 ↓ 270 ↓ 64	96 → 931 → 120	25 ↓ 30	26 → 1083
119 → 890 → 84	154 ↑ 999 ↑ 313	1285 → 18	24 ↑ 29	126 → 1056 → 68	91 ↑ 609 ↑ 168	25 → 1294	

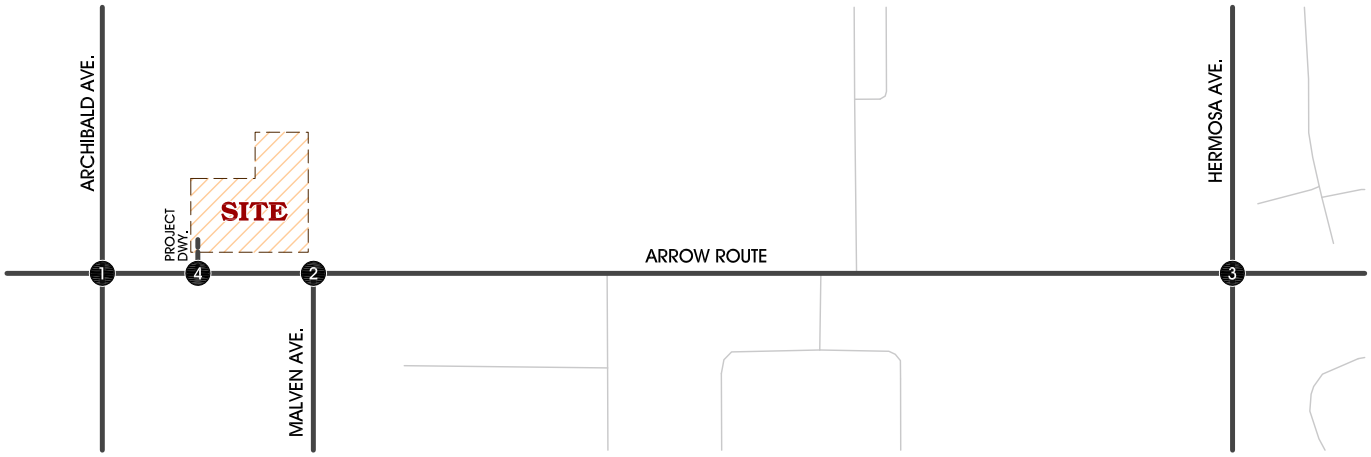
LEGEND:

4 = INTERSECTION ID

10.0 = VEHICLES PER DAY (1000's)

N

FIGURE 4-L
HORIZON YEAR (2040) WITHOUT PROJECT TRAFFIC VOLUMES



AM PEAK HOUR

1. Archibald Ave. / Arrow Route		2. Malven Ave. / Arrow Route		3. Hermosa Ave. / Arrow Route		4. Project Dwy. / Arrow Route
168 ↓ 1286 ← 203	← 132 ← 1182 ↰ 338	← 1640 ↰ 50		167 ↓ 642 ← 135	← 112 ← 1310 ↰ 181	FUTURE INTERSECTION
92 → 851 → 153 ↴	192 ↑ 699 ↑ 314 ↱	1344 → 17 ↴	26 ↱ 23	118 → 1070 → 207 ↴	73 ↑ 364 ↑ 137 ↱	

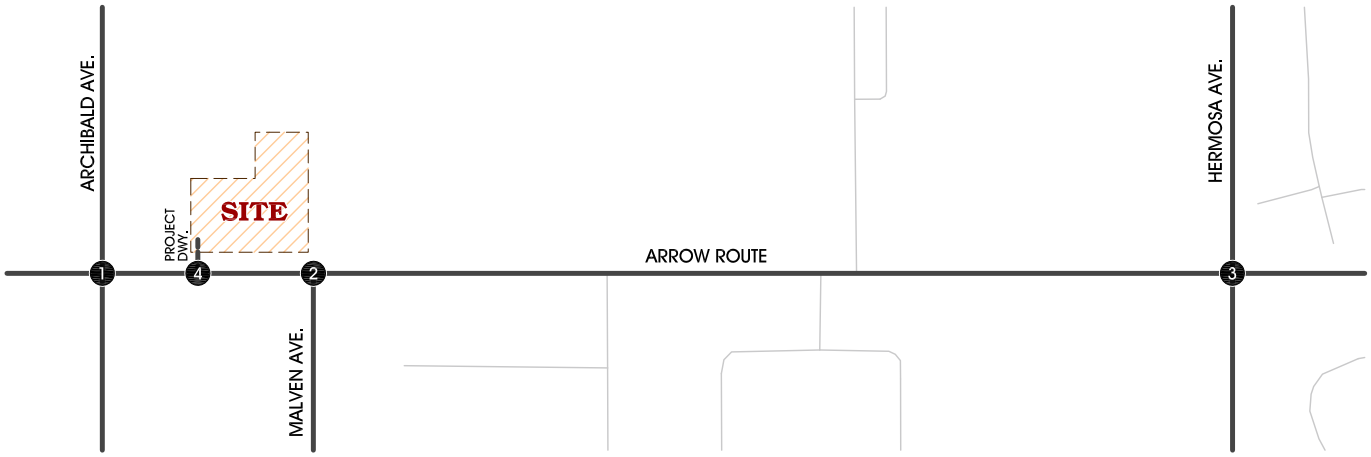
LEGEND:

4 = INTERSECTION ID

PM PEAK HOUR

1. Archibald Ave. / Arrow Route		2. Malven Ave. / Arrow Route		3. Hermosa Ave. / Arrow Route		4. Project Dwy. / Arrow Route
98 ↓ 853 ← 158	← 201 ← 1063 ↰ 269	← 1483 ↰ 39		88 ↓ 382 ← 91	← 135 ← 1293 ↰ 170	FUTURE INTERSECTION
168 → 1225 → 118 ↴	217 ↑ 1401 ↑ 439 ↱	1768 → 16 ↴	22 ↱ 29	172 → 1456 → 90 ↴	123 ↑ 860 ↑ 238 ↱	

FIGURE 4-M
HORIZON YEAR (2040) WITH PROJECT TRAFFIC VOLUMES



AM PEAK HOUR

1. Archibald Ave. / Arrow Route		2. Malven Ave. / Arrow Route		3. Hermosa Ave. / Arrow Route		4. Project Dwy. / Arrow Route	
168 ↓ 1286 ↑ 205	134 ← 1187 ← 339	← 1651 ← 50		169 ↓ 642 ↑ 135	112 ← 1316 ← 181	12 ↓ 16 ↑	17 ← 1649
92 → 857 → 153	192 ↑ 699 ↑ 315	1352 → 18 →	27 ↑ 23 ↑	120 → 1075 → 209 →	75 ↑ 364 ↑ 137 ↑	16 → 1360 →	

PM PEAK HOUR

1. Archibald Ave. / Arrow Route		2. Malven Ave. / Arrow Route		3. Hermosa Ave. / Arrow Route		4. Project Dwy. / Arrow Route	
98 ↓ 853 ↑ 161	205 ← 1074 ← 271	← 1498 ← 39		91 ↓ 382 ↑ 91	135 ← 1302 ← 170	25 ↓ 30 ↑	26 ← 1523
168 → 1234 → 118 →	217 ↑ 1401 ↑ 441 ↑	1786 → 18 →	24 ↑ 29 ↑	176 → 1467 → 94 →	126 ↑ 860 ↑ 238 ↑	25 → 1811 →	

LEGEND:

4 = INTERSECTION ID

N

5.0 TRAFFIC ANALYSIS

Peak hour intersection analysis has been performed at the study area intersections for ODAC of the project scenarios and for projected future conditions. Improvements are recommended to satisfy the level of service requirements of the City of Rancho Cucamonga and if the following impacts are identified:

1) Any study intersection that is operating at LOS “A”, “B”, “C” or “D” for any study scenario without project traffic in which the addition of project traffic causes the intersection to degrade to a LOS “E” or “F” shall mitigate the impact to bring the intersection back to as least LOS “D” .

2) Any study intersection that is operating at a LOS “E” or “F” for any study scenario without project traffic shall mitigate any impacts so as to bring the intersection back to the overall level of delay established prior to project traffic being added..

A. Opening Day Plus Ambient plus Cumulative (ODAC 2019) Conditions

The results of the ODAC conditions intersection analysis are summarized in Table 5-1. The ODAC conditions operations analysis worksheets are provided in Appendix "5.1". As shown on Table 5-1, the intersection of Archibald Avenue/Arrow Route is projected to continue to operate at an unacceptable level of service (LOS “E” or worse) during the AM peak hour with existing geometry and traffic controls.

Providing a separate southbound right turn at the Archibald Avenue/Arrow Route intersection is improve intersection delay to acceptable level of service (LOS “D” or better).

B. Opening Day Plus Ambient plus Cumulative plus Project (ODACP 2019) Conditions

The results of the ODACP conditions intersection analysis are summarized in Table 5-2. The ODACP conditions operations analysis worksheets are provided in Appendix "5.2". As shown on Table 5-4, no new intersections are anticipated to operate at an unacceptable level of service (LOS “E” or worse), in addition to the deficient intersection of Archibald Avenue/Arrow Route as previously identified under Existing and ODAC 2019 conditions, with existing geometry and traffic controls.

The separate southbound right turn improvement identified under ODAC conditions for the intersection of Archibald Avenue/Arrow Route is anticipated to improve intersection LOS to acceptable level of service (LOS “D” or better).

C. Horizon Year (2040) Without Project Conditions

The results of the Horizon Year (2040) Without Project conditions intersection analysis are summarized in Table 5-3. The Horizon Year (2040) Without Project conditions operations analysis worksheets are provided in Appendix "5.3". As shown on Table 5-3, the following

TABLE 5-1

INTERSECTION ANALYSIS FOR
OPENING DAY PLUS AMBIENT PLUS CUMULATIVE (2019) CONDITIONS

ID	Intersection	Traffic Control [1]	Intersection Approach Lanes [2]												Delay [3] (secs.)		Level of Service [3]	
			Northbound			Southbound			Eastbound			Westbound						
			L	T	R	L	T	R	L	T	R	L	T	R	AM	PM	AM	PM
1	Archibald Ave./ Arrow Route	TS	1	2	d	1	2	0	1	2	0	1	2	0	**70.6**	52.8	**E**	D
	- With Improvements[4]	TS	1	2	d	1	2	**1**	1	2	0	1	2	0	54.2	51.4	D	D
2	Malven Ave./ Arrow Route	CSS	0	1	0	0	0	0	0	2	0	1	2	0	30.6	26.3	D	D
3	Hermosa Ave./ Arrow Route	TS	1	2	0	1	1	1	1	2	0	1	2	0	39.8	38.7	D	D
4	Project Driveway / Arrow Route	-	Future Intersection												**-**	**-**	-	-

[1] TS = Traffic Signal; CSS = Cross Street Stop

[2] When a right turn is designated, the lane can either be striped or unstriped. To function as a right turn lane there must be sufficient width for right turning vehicles to travel outside the through lanes.
L = Left; T = Through; R = Right; d = Defacto right turn lane

[3] Delay and level of service calculated using the following analysis software: Synchro 10 HCM6
BOLD = Unacceptable level of service

TABLE 5-2

INTERSECTION ANALYSIS FOR
OPENING DAY PLUS AMBIENT PLUS CUMULATIVE PLUS POJECT (2019) CONDITIONS

ID	Intersection	Traffic Control [1]	Intersection Approach Lanes [2]												Delay [3] (secs.)		Level of Service [3]	
			Northbound			Southbound			Eastbound			Westbound						
			L	T	R	L	T	R	L	T	R	L	T	R	AM	PM	AM	PM
1	Archibald Ave./ Arrow Route	TS	1	2	d	1	2	0	1	2	0	1	2	0	**71.3**	53.9	**E**	D
	- With Improvements	TS	1	2	d	1	2	**1**	1	2	0	1	2	0	54.7	52.5	D	D
2	Malven Ave./ Arrow Route	CSS	0	1	0	0	0	0	0	2	0	1	2	0	31.5	27.9	D	D
3	Hermosa Ave./ Arrow Route	TS	1	2	0	1	1	1	1	2	0	1	2	0	40.1	39.5	D	D
4	Project Driveway / Arrow Route	**CSS**	0	0	0	0	**1**	0	0.5	1.5	0	0	2	0	23.7	30.3	C	D

[1] TS = Traffic Signal; CSS = Cross Street Stop

[2] When a right turn is designated, the lane can either be striped or unstriped. To function as a right turn lane there must be sufficient width for right turning vehicles to travel outside the through lanes.
L = Left; T = Through; R = Right; d = Defacto right turn lane; **1** = Improvement

[3] Delay and level of service calculated using the following analysis software: Synchro 10 HCM6
BOLD = Unacceptable level of service

TABLE 5-3

INTERSECTION ANALYSIS FOR HORIZON YEAR (2040) WITHOUT PROJECT CONDITIONS

ID	Intersection	Traffic Control [1]	Intersection Approach Lanes [2]												Delay [3] (secs.)		Level of Service [3]	
			Northbound			Southbound			Eastbound			Westbound						
			L	T	R	L	T	R	L	T	R	L	T	R	AM	PM	AM	PM
1	Archibald Ave./ Arrow Route	TS	1	2	d	1	2	0	1	2	0	1	2	0	**119.6**	**116.6**	**F**	**F**
	- With Improvements[4]	TS	1	2	d	1	2	**1**	1	2	0	1	2	0	**94.3**	**107.8**	**F**	**F**
2	Malven Ave./ Arrow Route[4,5]	CSS	0	1	0	0	0	0	0	2	0	1	2	0	**37.9**	**57.3**	**E**	**F**
3	Hermosa Ave./ Arrow Route	TS	1	2	0	1	1	1	1	2	0	1	2	0	51.6	52.6	D	D
4	Project Driveway / Arrow Route	-	Future Intersection												**-**	**-**	-	-

[1] TS = Traffic Signal; CSS = Cross Street Stop

[2] When a right turn is designated, the lane can either be striped or unstriped. To function as a right turn lane there must be sufficient width for right turning vehicles to travel outside the through lanes.
L = Left; T = Through; R = Right; d = Defacto right turn lane

[3] Delay and level of service calculated using the following analysis software: Synchro 10 HCM6
BOLD = Unacceptable level of service

[4] Additional Improvements are not feasible

[5] The minor approach (northbound left tun movement) is projected to exerience the worse delay and will not impede the flow of traffic on the Arrow Route.

study intersections are projected to operate an unacceptable level of service (LOS “E” or worse) during the peak hours with the existing geometry and traffic controls:

- Archibald Avenue / Arrow Route (#1)
- Malven Avenue / Arrow Route (#2)

For the intersection of Archibald Avenue / Arrow Route (#1) and Malven Avenue / Arrow Route (#2), improvements in addition to the ones identified in Table 5-3 are not feasible due to existing adjacent developments. Therefore, these intersections are anticipated to continue to operate at LOS “E” or worse.

D. Horizon Year (2040) With Project Conditions

The results of the Horizon Year (2040) With Project conditions intersection analysis are summarized in Table 5-4. The Horizon Year (2040) With Project conditions operations analysis worksheets are provided in Appendix "5.4". As shown on Table 5-4, the Project Driveway / Arrow Route (#4) intersection is anticipated to operate at an unacceptable level of service (LOS “E” or worse), in addition to the deficient intersections previously identified under Horizon Year (2040) Without Project conditions.

Similar to Horizon Year (2040) Without Project conditions, the intersections of Archibald Avenue / Arrow Route (#1) and Malven Avenue / Arrow Route (#2), improvements in addition to the ones identified in Table 5-4 are not feasible due to existing adjacent developments. Therefore, these intersections are anticipated to continue to operate at LOS “E” or worse.

For the Project Driveway / Arrow Route (#3) intersection, restricting the driveway to a right-in/right-out/left-in (RIRO/LI) only access (no left-out) is anticipated to improve the intersection LOS to acceptable conditions.

TABLE 5-4

INTERSECTION ANALYSIS FOR HORIZON YEAR (2040) WITH PROJECT CONDITIONS

ID	Intersection	Traffic Control [1]	Intersection Approach Lanes [2]												Delay [3] (secs.)		Level of Service [3]	
			Northbound			Southbound			Eastbound			Westbound						
			L	T	R	L	T	R	L	T	R	L	T	R	AM	PM	AM	PM
1	Archibald Ave./ Arrow Route	TS	1	2	d	1	2	0	1	2	0	1	2	0	**120.2**	**118.2**	**F**	**F**
	- With Improvements[4]	TS	1	2	d	1	2	**1**	1	2	0	1	2	0	**95.4**	**114.9**	**F**	**F**
2	Malven Ave./ Arrow Route[4,5]	CSS	0	1	0	0	0	0	0	2	0	1	2	0	**39.7**	**62.8**	**E**	**F**
3	Hermosa Ave./ Arrow Route	TS	1	2	0	1	1	1	1	2	0	1	2	0	52.3	53.3	D	D
4	Project Driveway / Arrow Route	**CSS**	0	0	0	0	**1**	0	0.5	1.5	0	0	2	0	**48.8**	**46.8**	**E**	**E**
	- With RIRO/LI Access[6]	**CSS**	0	0	0	0	0	**1**	0.5	1.5	0	0	2	0	17.9	17.2	C	C

[1] TS = Traffic Signal; CSS = Cross Street Stop

[2] When a right turn is designated, the lane can either be striped or unstriped. To function as a right turn lane there must be sufficient width for right turning vehicles to travel outside the through lanes.
L = Left; T = Through; R = Right; d = Defacto right turn lane; **1** = Improvement

[3] Delay and level of service calculated using the following analysis software: Synchro 10 HCM6
BOLD = Unacceptable level of service

[4] Additional Improvements are not feasible

[5] The minor approach (northbound left tun movement) is projected to exerience the worse delay and will not impede the flow of traffic on the Arrow Route.

[6] RIRO/LI = Right-In / Right-Out / Left-In Only Driveway

6.0 FINDINGS AND RECOMMENDATIONS

A. Traffic Impacts and Level of Service Analysis

For Existing (2018), ODAC (2019), and ODACP (2019), the intersection of Archibald Avenue / Arrow Route (#1) is operating at an unacceptable level of service (LOS "E" or worse) during the AM peak hour with existing geometry and traffic controls. Providing a separate southbound right turn lane is anticipated to improve the intersection LOS to acceptable conditions.

For Horizon Year (2040) Without Project conditions, the intersection of Archibald Avenue / Arrow Route (#1) and Malven Avenue / Arrow Route (#2) are anticipated to operate at an unacceptable level of service (LOS "E" or worse) during the peak hours. Further improvements in addition to the improvements previously identified under ODAC (2019) conditions are not feasible due to existing adjacent developments. Therefore, these intersections are anticipated to continue to operate at LOS "E" or worse.

For Horizon Year (2040) With Project conditions, the Project Driveway / Arrow Route (#4) intersection is anticipated to operate at an unacceptable level of service. Restricting the Project driveway to a right-in/right-out/left-in (RIRO/LI) only access (no left-out) is anticipated to improve the intersection LOS to acceptable conditions.

B. Circulation Recommendations

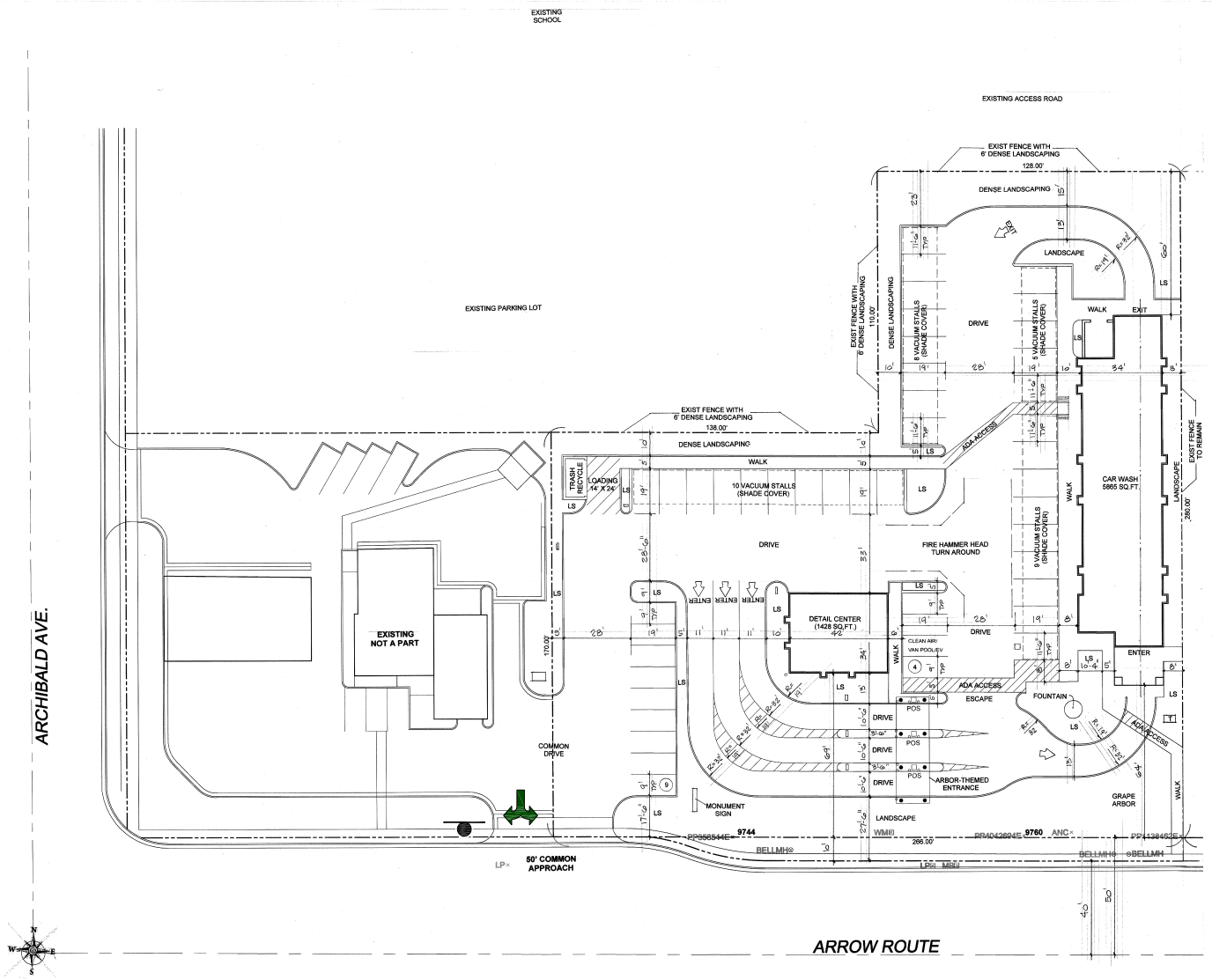
1. On-Site

Figure 6-A illustrates the on-site recommended roadway and intersection lane improvements. Construction of on-site improvements shall occur in conjunction with adjacent project development activity or as needed for project access purposes.

The recommended on-site roadway improvements are described below.

- Provide stop sign control at the project driveways.
- On-site traffic signing and striping should be implemented in conjunction with detailed construction plans for the project.
- Verify that minimum sight distance is provided at the project driveways.

FIGURE 6-A
CIRCULATION RECOMMENDATIONS



PROVIDE STOP SIGN CONTROL AT THE PROJECT DRIVEWAY.

ON-SITE TRAFFIC SIGNING AND STRIPING SHOULD BE IMPLEMENTED IN CONJUNCTION WITH DETAILED CONSTRUCTION PLANS FOR THE PROJECT.

VERIFY THAT MINIMUM SIGHT DISTANCE IS PROVIDED AT THE PROJECT ACCESS POINT.

LEGEND:

= STOP SIGN

= LANE IMPROVEMENT (PROJECT ACCESS)

N