Appendix H Traffic Study

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City of San Bernardino

Arrowhead Springs Specific Plan

TRAFFIC IMPACT ANALYSIS & MITIGATION MEASURES

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PREPARER'S CERTIFICATION

TRAFFIC IMPACT ANALYSIS & MITIGATION MEASURES ARROWHEAD SPRINGS SPECIFIC PLAN SAN BERNARDINO, CALIFORNIA

This is to certify that the above titled traffic study has been prepared under the supervision of M. Yunus Rahi, Ph.D, P.E, a California Registered Professional Engineer.

12-29-04

M. Yunus Rahi, Ph.D, P.E Date

Professional Engineer's Stamp

TRAFFIC IMPACT ANALYSIS & MITIGATION MEASURES ARROWHEAD SPRINGS SPECIFIC PLAN
SAN BERNARDINO, CALIFORNIA

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TRAFFIC IMPACT ANALYSIS & MITIGATION MEASURES ARROWHEAD SPRINGS SPECIFIC PLAN SAN BERNARDINO, CALIFORNIA

INTRODUCTION

This report presents the findings of a traffic impact analysis conducted to evaluate traffic impacts associated with proposed specific plan developments in the Arrowhead Springs community of San Bernardino County. The Arrowhead Springs Specific Plan, developed in compliance with the City of San Bernardino guidelines, provides the framework for incorporation of the community of Arrowhead Springs into the City when adopted by the City Council. The purpose of the traffic impact analysis is to identify and mitigate any potential traffic impacts anticipated from proposed developments under the Specific Plan.

PROJECT DESCRIPTION

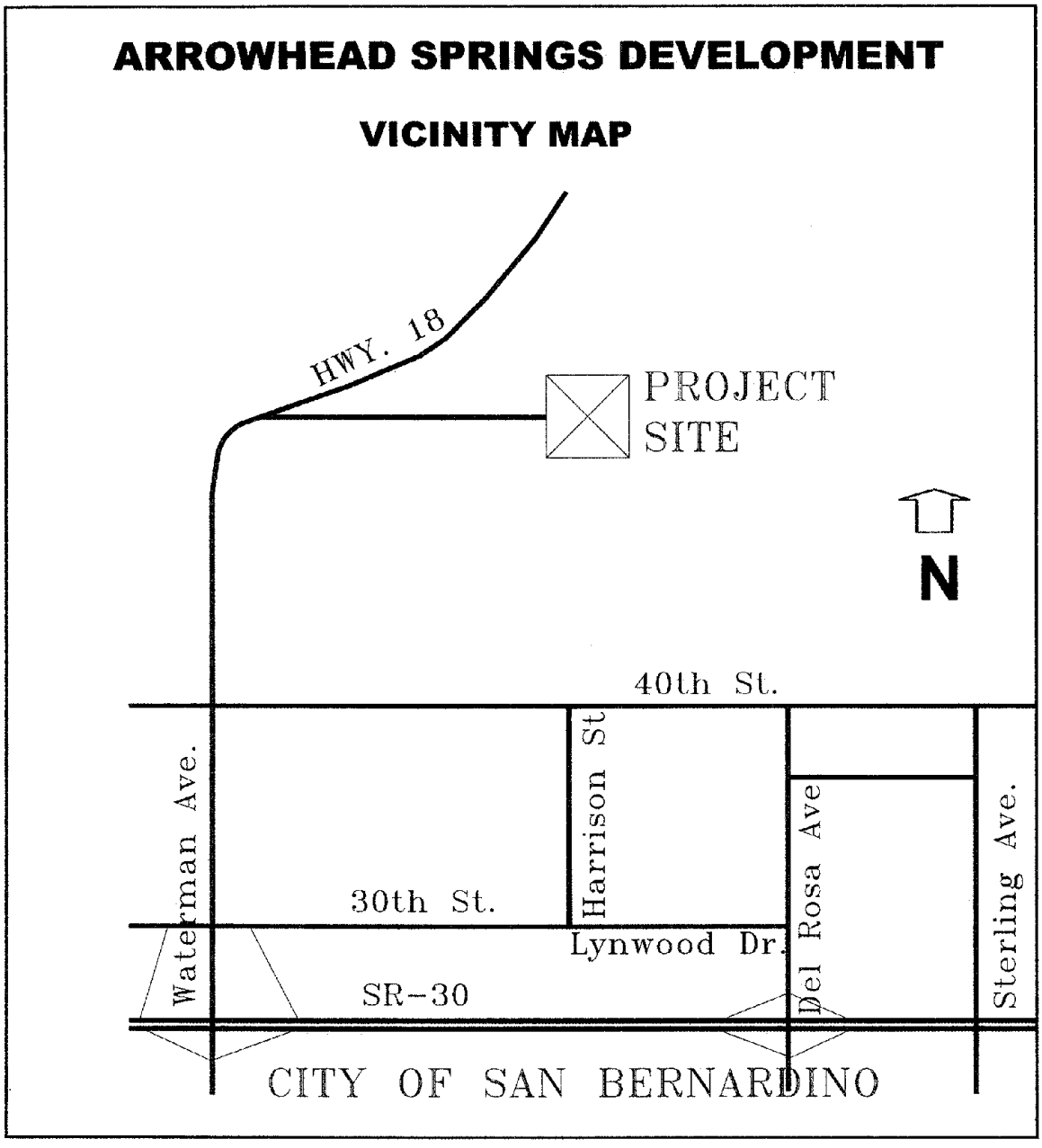
The proposed Arrowhead Springs Specific Plan consists of a total of 1,916 acres, and accommodates the development of the following:

- 1,350 single-family detached and multi-family residential units
- 1,049,190 square feet of commercial and office uses
- A 199-acre, 18-hole public golf course
- A new 300-room hotel
- A conference center
- Reuse of the historic Arrowhead Springs Hotel
- Reuse and expansion of the historic Arrowhead Springs spa/resort

The proposed developments would be accommodated within approximately 506 acres of the total 1,916 acres of the Specific Plan. The remaining lands would be preserved to provide a scenic backdrop and multi-purpose recreational amenity unique in Southern California.

Figure 1 shows a vicinity map of the project.

Figure 1: Vicinity Map



PROJECT ACCESS

The proposed Arrowhead Springs Specific Plan developments would be accessed from the west off State Route 18 (Rim of the World Highway) via Old Waterman Canyon Road and Arrowhead Springs Road and from the south off 40th Street via a new access road connecting the project with 40th Street. Additionally, access improvements would be provided south of 40th Street through construction of new streets and/or widening/improvement of existing roadways between 40th Street and State Route 30 Freeway interchanges at Waterman Avenue. A number of alternative alignments have been identified for the southern access improvements and their impact and feasibility of development have been analyzed. These alternative alignments are as follows:

Alternative 1:

A new north-south expressway would traverse through the Arrowhead Springs Development connecting Highway 18 to the north with 30th Street to the south. Between 40th Street and 30th Street, the proposed expressway would be aligned along the west side of existing Flood Control basin. Approximately 70% of traffic to and from Highway 18 currently using Waterman Avenue is expected to be diverted to the new expressway.

Alternative 2:

Same as Alternative 1, except that between 30th Street and 40th Street the expressway would be aligned along the center of existing Flood Control basin.

Alternative 3:

Same as Alternative 1, except that between 30th Street and 40th Street the expressway would be aligned along the east side of existing Flood Control basin.

Alternative 4:

Same as Alternative 1, except that between 30th Street and 40th Street the expressway would be aligned along Harrison Street with appropriate radius of curvature and widening of the street along the west side to connect with the proposed access road north of 40th Street and 30th Street on the south.

Alternative 4A.1:

Same as Alternative 4, except the expressway would be aligned along Harrison Avenue up to 40th Street on the north and with appropriate radius of curvature and widening of the street along the west side to connect with 30th Street on the south. The project traffic would travel along 40th Street between Harrison Street and the

project access road. The segment of 40th street and the intersection of 40th Street and Harrison Street would be adequately improved to accommodate additional traffic.

Alternative 5:

A new north-south expressway would traverse through the Arrowhead Springs Development connecting Highway 18 to the north with 40th Street to the south. Traffic to and from the expressway would then turn west and east to travel on 40th Street to Waterman Avenue as well as to Harrison Street and Sterling Avenue. Approximately 70% of traffic to and from Highway 18 currently using Waterman Avenue is expected to be diverted to the new expressway.

Alternative 6:

No new expressway would be built. Highway 18 traffic would continue to use existing alignment up to and through Waterman Avenue. Traffic to and from Arrowhead Springs Development would use a proposed collector street through the site to access Highway 18 to the north and 40th Street to the south. This traffic would then travel east or west to access Harrison Street, Waterman Avenue, Valencia Avenue, Sterling Avenue, etc.

Detailed analysis of these alternative alignments have been conducted separately and documented in "Arrowhead Parkway Alternative Roadway Alignments Fatal Flaw Analysis". Based on this analysis, Alternative 4A.1 has been recommended as part of Arrowhead Springs Specific Plan developments.

STUDY METHODOLOGY

The Highway Capacity Manual (HCM) method developed by Transportation Research Board was used in calculating the peak hour intersection capacity and level of service at 16 key intersections. This method is based on increase/decrease in operational delay in traffic movement due to peak hour traffic volumes at the intersections. There are 6 levels of service defined for various amounts of delay experienced by traffic. These are LOS A, LOS B, LOS C, LOS D, LOS E, and LOS F. LOS A defines a minimum delay, ideal traffic conditions while LOS F defines the worst delay and congested traffic conditions. LOS is defined as the maximum capacity condition. For urban intersections, a LOS D condition is the worst traffic conditions acceptable. Traffic mitigation measures are usually required for an intersection when existing or future traffic projection at that intersection results in a LOS worse than LOS D.

A complete description of the meaning of level of service can be found in the Highway Research Board's Special Report 209 titled Highway Capacity Manual (HCM). The manual establishes the definitions for levels of service A through F.

Brief descriptions of the six levels of service, as extracted from the manual, are listed in **Table 1**.

Table 1
LEVEL OF SERVICE DEFINITIONS

LOS	Description
A	No approach phase is fully utilized by traffic and no vehicle waits longer than one red indication. Typically, the approach appears quite open, turns are made easily and nearly all drivers find freedom of operation.
B	This service level represents stable operation, where an occasional approach phase is fully utilized and a substantial number are approaching full use. Many drivers begin to feel restricted within platoons of vehicles.
C	This level still represents stable operating conditions. Occasionally, drivers have to wait through more than one red signal indication, and backups may develop behind turning vehicles. Most drivers feel somewhat restricted.
D	This level encompasses a zone of increasing restriction approaching instability at the intersection. Delays to approaching vehicles may be substantial during short peaks within the peak period; however, enough cycles with lower demand occur to permit periodic clearance of developing queues, thus preventing excessive backups.
E	Capacity occurs at the upper end of this service level. It represents the most vehicles that any particular intersection can accommodate. Full utilization of every signal cycle is seldom attained no matter how great the demand.
F	This level describes forced flow operations at low speeds, where volumes exceed capacity. These conditions usually result from queues of vehicles backing up from restriction downstream. Speeds are reduced substantially and stoppages may occur for short or long periods of time due to congestion. In the extreme case, both speed and volume can drop to zero.

The thresholds of level of service for unsignalized and signalized intersections are shown in **Table 2**, as follows:

Table 2
LEVEL OF SERVICE CRITERIA

Level of Service	Two-Way or All-Way Stop Controlled Intersection Average Delay per Vehicle (sec)	Signalized Intersection Average Delay per Vehicle (sec)
A	0-10	# 10
B	> 10 - 15	> 10 - 20
C	> 15 - 25	> 20 - 35
D	> 25 - 35	> 35 - 55
E	> 35 - 50	> 55 - 80
F	> 50	> 80 or a V/C ratio equal or greater than 1.0

LOS D is the minimum threshold at all key intersections in the City of San Bernardino. However, for roadways, the City's minimum threshold is LOS C. The traffic study guidelines require that traffic mitigation measures be identified to provide for operations at the minimum threshold levels.

For the study area intersections, the TRAFFIX computer software, Version 7.6 has been utilized to determine intersection levels of service. Levels of service are presented for the entire intersection, consistent with the HCM Operation Delay methodology.

While the level of service concepts and analysis methodology provide an indication of the performance of the entire intersection, the single letter grade A through F cannot describe specific operational deficiencies at intersections. Progression, queue formation, and left-turn storage are examples of the operational issues that affect the performance of an intersection, but do not factor into the strict calculation of level of service. However, the TRAFFIX software does provide an output that quantifies operational features at intersections, such as vehicle clearance, queue formation, and left-turn storage requirements.

A project's traffic impact is determined based upon whether or not traffic volume associated with the project deteriorates the level of service at an intersection location to an unacceptable LOS E or F.

According to the City of San Bernardino Traffic Impact Study Guidelines, traffic impacts at an intersection are to be considered "significant" when any of the following changes in the volume to capacity (V/C) ratios occur between the "without project" and the "with project" conditions:

LOS	V/C with Project Increases
C	> 0.0400
D	> 0.0200
E, F	> 0.0100

The LOS and V/C ratios above are based on the delay methodology outlined in the Highway Capacity Manual.

TRAFFIC GENERATION AND DISTRIBUTION

Various components of Arrowhead Springs Specific Plan developments are expected to generate approximately 29,640 new vehicular trips per day on an average weekday, of which approximately 1,442 trips will be during the AM commuter peak hour (one hour between 7 AM and 9 AM) and 2,417 trips will be during the PM commuter peak hour (one hour between 4 PM and 6 PM). These estimates are based on proposed land use information of Arrowhead Springs Development and trip generation rates for these land uses published by Institute of Transportation Engineers (Reference: "Trip Generation", 6th Edition, ITE) and other applicable trip generation data and information.

Table 3 shows traffic generation estimates for Arrowhead Springs Development.

Figure 2 shows project traffic distribution percentages on various roadway segments under the preferred alternative alignment scenarios (Alignment 4A.1).

Table 3
TRIP GENERATION BY ARROWHEAD SPRINGS DEVELOPMENT AT PHASE I AND FULL PROJECT BUILD-OUT

Land Use & ITE Code	Size & Unit	Traffic Composition		Rates & Vol	Average Daily Traffic Volume			AM Peak Hour Traffic Volume			PM Peak Hour Traffic Volume		
		Type	%		Total	IN	OUT	Total	IN	OUT	Total	IN	OUT
PHASE I													
1a. Hotel (330)*:	193	Cars & Trucks	100%	Rate	8.00	50%	50%	0.37	72%	28%	0.49	43%	57%
Conf.Ctr./Bungalows/Spa	Room			Vol	**1,544**	**772**	**772**	**71**	**51**	**20**	**95**	**41**	**54**
1b. Hotel (330):	115	Cars & Trucks	100%	Rate	8.00	50%	50%	0.37	72%	28%	0.49	43%	57%
Annex	Room			Vol	**920**	**460**	**460**	**43**	**31**	**12**	**56**	**24**	**32**
2. Spa (Included in 1a above)													
3a. Condo (230):	285	Cars & Trucks	100%	Rate	5.86	50%	50%	0.44	17%	83%	0.54	67%	33%
Townhomes/ Hilltown	DU			Vol	**1,670**	**835**	**835**	**125**	**21**	**104**	**154**	**103**	**51**
3b. Commercial (820):	34,167 GSF	Cars & Trucks	100%	Rate	42.92	50%	50%	1.03	61%	39%	3.74	48%	52%
Golf-related:22,000 sf				Vol	1,466	733	733	35	21	14	128	61	66
Chapel*: 1,500 sf		Pass-By Trips	34%	Rate	14.59	50%	50%	0.35	61%	39%	1.27	48%	52%
Spring House*: 2,667 sf				Vol	499	249	249	12	7	5	43	21	23
Hilltown Shops: 8,000 sf		Net Trips			**968**	**484**	**484**	**23**	**14**	**9**	**84**	**40**	**44**
4. Golf Course (430)	199 Acre	Cars & Trucks	100%	Rate	5.04	50%	50%	0.21	74%	26%	0.30	34%	66%
				Vol	**1,003**	**501**	**501**	**42**	**31**	**11**	**60**	**20**	**39**
5a. Estate Homes (210):	24	Cars & Trucks	100%	Rate	9.57	50%	50%	0.75	25%	75%	1.01	64%	36%
Res. North	DU			Vol	**230**	**115**	**115**	**18**	**5**	**14**	**24**	**16**	**9**
6a. Estate Homes (210):	12	Cars & Trucks	100%	Rate	9.57	50%	50%	0.75	25%	75%	1.01	64%	36%
Res. South	DU			Vol	**115**	**57**	**57**	**9**	**2**	**7**	**12**	**8**	**4**
6b. Senior Housing (253)	300 DU	Cars & Trucks	100%	Rate	3.48	50%	50%	0.07	63%	37%	0.10	59%	41%
				Vol	**1,044**	**522**	**522**	**21**	**13**	**8**	**30**	**18**	**12**
TOTAL NET TRIPS BY ALL USES IN PHASE I					**7,494**	**3,747**	**3,747**	**352**	**169**	**183**	**516**	**270**	**246**

(Continued to Next Page...)

Table 3 (Cond.)
TRIP GENERATION BY ARROWHEAD SPRINGS DEVELOPMENT AT PHASE I AND FULL PROJECT BUILD-OUT

Land Use & ITE Code	Size & Unit	Traffic Composition		Rates & Vol	Average Daily Traffic Volume			AM Peak Hour Traffic Volume			PM Peak Hour Traffic Volume		
		Type	%		Total	IN	OUT	Total	IN	OUT	Total	IN	OUT
PHASE II													
5b. Condo (230):	429	Cars & Trucks	100%	Rate	5.86	50%	50%	0.44	17%	83%	0.54	67%	33%
Townhomes/ Res. North	DU			Vol	**2,514**	**1,257**	**1,257**	**189**	**32**	**157**	**232**	**155**	**76**
7. Hotel (330):	300	Cars & Trucks	100%	Rate	8.00	50%	50%	0.37	72%	28%	0.49	43%	57%
IHEI	Room			Vol	**2,400**	**1,200**	**1,200**	**111**	**80**	**31**	**147**	**63**	**84**
8. Office (710)	250,000	Cars & Trucks	100%	Rate	11.01	50%	50%	1.56	88%	12%	1.49	17%	83%
	GSF			Vol	**2,753**	**1,376**	**1,376**	**390**	**343**	**47**	**373**	**63**	**309**
9a. Commercial (820):		Cars & Trucks	100%	Rate	42.92	50%	50%	1.03	61%	39%	3.74	48%	52%
Village Walk:200,000 sf	200,000			Vol	8,584	4,292	4,292	206	126	80	748	359	389
	GSF	Pass-By Trips	34%	Rate	14.59	50%	50%	0.35	61%	39%	1.27	48%	52%
				Vol	2,919	1,459	1,459	70	43	27	254	122	132
		Net Trips			**5,665**	**2,833**	**2,833**	**136**	**83**	**53**	**494**	**237**	**257**
9b. Condo (230):	266	Cars & Trucks	100%	Rate	5.86	50%	50%	0.44	17%	83%	0.54	67%	33%
Village Walk	DU			Vol	**1,559**	**779**	**779**	**117**	**20**	**97**	**144**	**96**	**47**
9c. Apartments (220)	34	Cars & Trucks	100%	Rate	6.72	50%	50%	0.51	20%	80%	0.62	65%	35%
Village Walk	DU			Vol	**228**	**114**	**114**	**17**	**3**	**14**	**21**	**14**	**7**
10. Restaurant (831):	20,000	Cars & Trucks	100%	Rate	89.95	50%	50%	0.81	50%	50%	7.49	67%	33%
Windy Point	GSF			Vol	**1,799**	**900**	**900**	**16**	**8**	**8**	**150**	**100**	**49**
TOTAL NET TRIPS BY ALL USES IN PHASE II					**16,918**	**8,459**	**8,459**	**977**	**570**	**407**	**1,560**	**729**	**830**
TOTAL NET TRIPS BY ALL USES AT BUILD-OUT					**24,412**	**12,206**	**12,206**	**1,329**	**738**	**591**	**2,075**	**999**	**1,076**

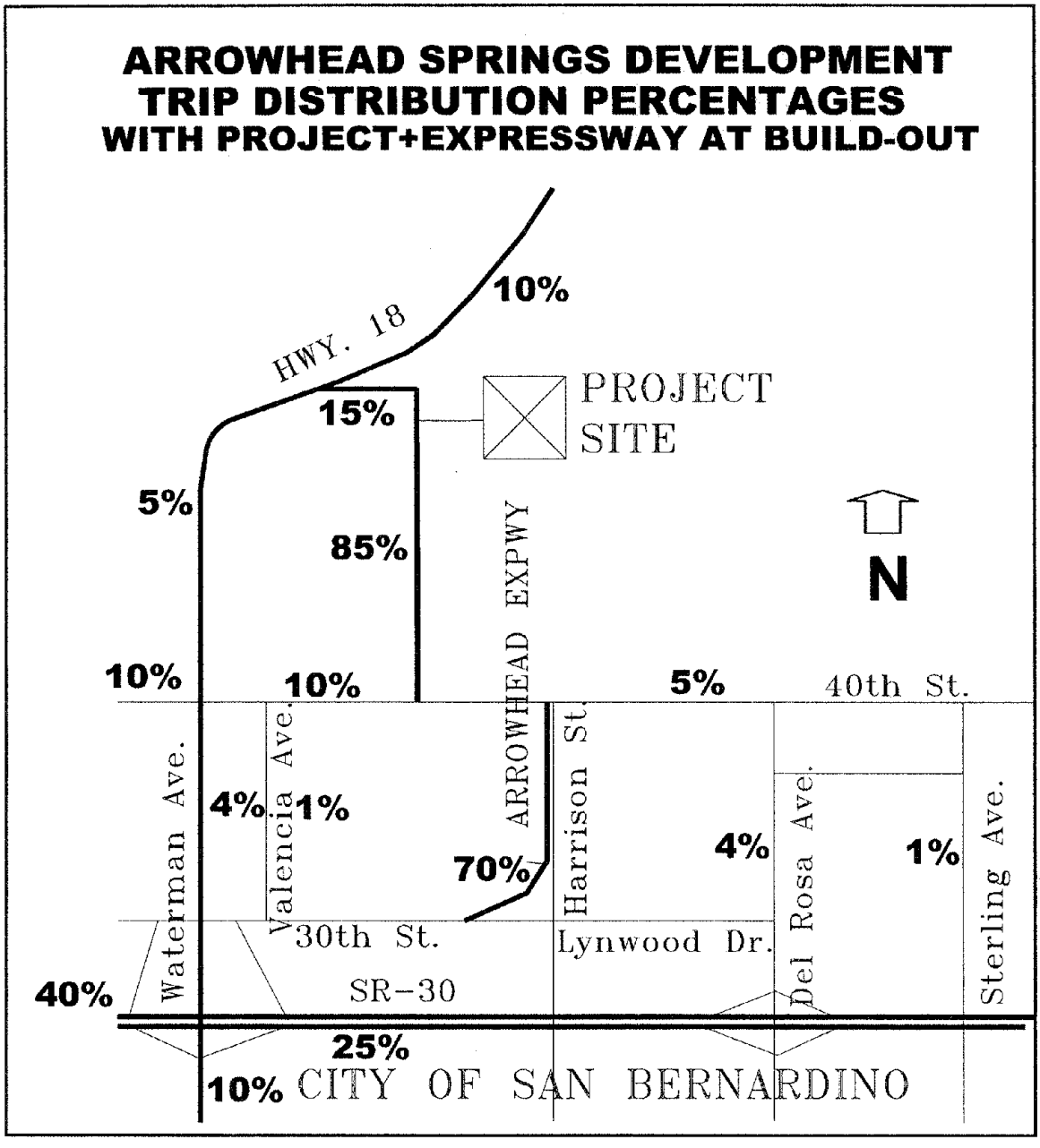
Land Use Codes/notes: 820 = Shopping Center; 330 = Resort Hotel; 430 = Golf Course; 253 = Senior Housing

831 = Quality Restaurant; 710 = Office; 230 = Condominium/Townhouse

210 = Single Family Detached Houses; 220 = Apartments

* = Existing Land Uses

Figure 2: Trip Distribution Percentages



A total of 10 mid-block roadway locations and 16 intersections were selected to evaluate the traffic impacts under various scenarios and roadway alignment alternatives with and without Arrowhead Springs Development. Average daily traffic (ADT) counts as well as peak hour traffic counts of turn movements were conducted during the months of March and April, 2003 to determine existing traffic volume conditions. The ADT volumes with and without Arrowhead Springs Development were estimated for the 10 mid-block roadway locations for comparison purposes. The capacity and level of service (LOS) calculations were also conducted for peak hour traffic conditions at these mid-block locations.

Table 4 shows existing 2003 ADT volumes and levels of service (LOS) on mid-block locations.

Table 4
EXISTING 2003 AVERAGE DAILY TRAFFIC (ADT) VOLUMES AND LOS ON ROADWAYS IN THE VICINITY OF ARROWHEAD SPRINGS DEVELOPMENT

Roadways	Facility Type	No. of Lanes	Capacity, Veh/day (C)	Existing 2003 Conditions		
				Volume, Veh/day (V)	V/C Ratio	LOS
New Road (Project to 40th St.)	Collector	2	10,000	0	0.000	A
Harrison Parkway (40th St to 30th St)	Major Arterial	4	40,000	0	0.000	A
Highway 18 N/O Waterman Avenue	Major Arterial	4	40,000	19,194	0.480	A
Waterman Avenue S/O 40th Street	Major Arterial	4	40,000	17,170	0.429	A
Waterman Avenue N/O 30th Street	Major Arterial	4	40,000	21,220	0.531	A
40th Street E/O Waterman Avenue	Major Arterial	4	40,000	10,150	0.254	A
Harrison Street S/O 40th Street	Secondary Arterial	2	12,000	960	0.080	A
Sterling Avenue S/O Foothill Drive	Major Arterial	2	15,000	1,510	0.101	A
Valencia Avenue S/O 40th Street	Secondary Arterial	2	12,000	4,110	0.343	A
Valencia Avenue N/O 30th Street	Secondary Arterial	2	12,000	4,320	0.360	A

Note: Existing ADT volumes on were determined based on Caltrans publications, existing 24-hour traffic counts or peak hour traffic counts, assuming that PM peak hour volume represents approx. 10% of ADT volumes.

Table 5 shows existing 2003 ADT volumes and levels of service (LOS) at key intersection locations.

Table 5
INTERSECTION LEVEL OF SERVICE SUMMARY
(Existing 2003 Conditions)

Intersection	Peak Hour	Existing Conditions		
		LOS	Delay	V/C
1. Waterman Avenue at 40th Street	AM	C	25.3	0.592
	PM	C	29.3	0.47
2. Waterman Avenue at Parkdale Drive	AM	B	10.5	0.573
	PM	B	11.3	0.485
3. Waterman Avenue at 36th Street (Unsignalized)	AM	D	33.6	
	PM	C	21.6	
4. Waterman Avenue at 34th Street (Unsignalized)	AM	D	26.0	
	PM	D	29.4	
5. Waterman Avenue at Marshall Blvd	AM	A	3.2	0.486
	PM	A	4.0	0.433
6. Waterman Avenue at 30th Street	AM	C	25.5	0.747
	PM	C	22.9	0.609
7. Valencia Avenue at 40th Street	AM	B	9.9	0.300
	PM	B	11.3	0.332
8. Arrowhead Springs Road at 40th Street	AM	NA		
	PM	NA		
9. Harrison Street at 40th Street (Unsignalized)	AM	B	12.1	
	PM	B	13.3	
10. Del Rosa Avenue at Foothill Blvd (Unsignalized)	AM	B	11.2	
	PM	B	11.5	
11. Sterling Avenue at Foothill Blvd	AM	A	7.8	0.156
	PM	A	7.9	0.131
12. Valencia Avenue at 30th Street	AM	B	14.7	0.231
	PM	B	14.9	0.255
13. 30th Street at Lynwood Drive	AM	NA		
	PM	NA		
14. Del Rosa Avenue at Lynwood Drive	AM	B	15.8	0.429
	PM	B	15.3	0.556
15. Sterling Avenue at Lynwood Drive	AM	B	12.5	0.462
	PM	B	12.6	0.437
16. 30th Street at Lynwood Drive (Unsignalized)	AM	B	13.3	
	PM	B	14.2	

Note: V/C ratios are not calculated for unsignalized intersections.

The project will have 2 phases of development. Phase 1 will be completed by the year 2007 prior to construction of Harrison Parkway with its preferred alignment. See Table 3 for the land uses to be developed under Phase 1. Traffic from project will use the existing system of circulation network. However, site-specific roadway and intersection improvements will be completed for existing intersections and roadways based on project-related impacts expected with Phase 1 traffic volumes. Therefore, roadway and intersection traffic analysis was conducted separately for Phase 1 development and the 2030 build-out development including the proposed Harrison Parkway construction.

Table 6 shows the results of roadway LOS analysis with and without Phase 1 development by 2007. **Table 7** shows Project Phase 1 trips at key intersections during the AM and PM peak hours.

Table 6
2007 AVERAGE DAILY TRAFFIC (ADT) VOLUMES AND LOS ON ROADWAYS IN THE VICINITY OF ARROWHEAD SPRINGS DEVELOPMENT

Roadways	Facility Type	No. of Lanes	Capacity, Veh/day (C)	2007 W/O Project Conditions			2007 With Project Conditions			Diff. in V/C by Project
				Volume, Veh/day (V)	V/C Ratio	LOS	Volume, Veh/day (V)	V/C Ratio	LOS	
New Road (Project to 40th St.)	Collector	2	10,000	0	0.000	A	0	0.000	A	0.000
Harrison Parkway (40th St to 30th St)	Major Arterial	4	40,000	0	0.000	A	0	0.000	A	0.000
Highway 18 N/O Waterman Avenue	Major Arterial	4	40,000	20,730	0.518	A	27,474	0.687	B	0.169
Waterman Avenue S/O 40th Street	Major Arterial	4	40,000	18,544	0.464	A	23,789	0.595	A	0.131
Waterman Avenue N/O 30th Street	Major Arterial	4	40,000	22,918	0.573	A	28,163	0.704	B	0.131
40th Street E/O Waterman Avenue	Major Arterial	4	40,000	10,962	0.274	A	11,711	0.293	A	0.019
Harrison Street S/O 40th Street	Secondary Arterial	2	12,000	1,037	0.086	A	1,412	0.118	A	0.031
Sterling Avenue S/O Foothill Drive	Major Arterial	2	15,000	1,631	0.109	A	2,006	0.134	A	0.025
Valencia Avenue S/O 40th Street	Secondary Arterial	2	12,000	4,439	0.370	A	4,439	0.370	A	0.000
Valencia Avenue N/O 30th Street	Secondary Arterial	2	12,000	4,666	0.389	A	4,666	0.389	A	0.000

Note: A 2% per year traffic growth factor was assumed through year 2025 due to normal traffic growth in the area. The 2% yearly growth rate assumption was made per discussion with City staff.

Table 7
ARROWHEAD SPRINGS TRIP DISTRIBUTION
(Phase 1 Without Expressway)

Trip Generation Estimates

AM IN	PM IN	AM OUT	PM OUT	DAILY TOTAL
169	270	183	246	7,494

Intersection	DIR	AM IN	AM OUT	AM TOTAL	PM IN	PM OUT	PM TOTAL
Waterman/30th	NL	0	0	0	0	0	0
	NT	106	0	106	170	0	170
	NR	0	0	0	0	0	0
	SL	0	0	0	0	0	0
	ST	0	20	20	0	27	27
	SR	0	116	116	0	154	154
	EL	0	0	0	0	0	0
	ET	0	0	0	0	0	0
	ER	0	0	0	0	0	0
	WL	0	18	18	0	25	25
	WT	0	0	0	0	0	0
	WR	18	0	18	30	0	30
Waterman/Marshall	NL	0	0	0	0	0	0
	NT	124	0	124	200	0	200
	NR	0	0	0	0	0	0
	SL	0	0	0	0	0	0
	ST	0	136	136	0	181	181
	SR	0	0	0	0	0	0
	EL	0	0	0	0	0	0
	ET	0	0	0	0	0	0
	ER	0	0	0	0	0	0
	WL	0	0	0	0	0	0
	WT	0	0	0	0	0	0
	WR	0	0	0	0	0	0
Waterman/34th	NL	0	0	0	0	0	0
	NT	124	0	124	200	0	200
	NR	0	0	0	0	0	0
	SL	0	0	0	0	0	0
	ST	0	136	136	0	181	181
	SR	0	0	0	0	0	0
	EL	0	0	0	0	0	0
	ET	0	0	0	0	0	0
	ER	0	0	0	0	0	0
	WL	0	0	0	0	0	0
	WT	0	0	0	0	0	0

	WR	0	0	0	0	0	0
Waterman/36th	NL	0	0	0	0	0	0
	NT	124	0	124	200	0	200
	NR	0	0	0	0	0	0
	SL	0	0	0	0	0	0
	ST	0	136	136	0	181	181
	SR	0	0	0	0	0	0
	EL	0	0	0	0	0	0
	ET	0	0	0	0	0	0
	ER	0	0	0	0	0	0
	WL	0	0	0	0	0	0
	WT	0	0	0	0	0	0
	WR	0	0	0	0	0	0
Waterman/Parksdale	NL	0	0	0	0	0	0
	NT	124	0	124	200	0	200
	NR	0	0	0	0	0	0
	SL	0	0	0	0	0	0
	ST	0	136	136	0	181	181
	SR	0	0	0	0	0	0
	EL	0	0	0	0	0	0
	ET	0	0	0	0	0	0
	ER	0	0	0	0	0	0
	WL	0	0	0	0	0	0
	WT	0	0	0	0	0	0
	WR	0	0	0	0	0	0
Waterman/40th	NL	0	0	0	0	0	0
	NT	7	0	7	11	0	11
	NR	118	0	118	189	0	189
	SL	0	0	0	0	0	0
	ST	0	7	7	0	10	10
	SR	0	0	0	0	0	0
	EL	0	0	0	0	0	0
	ET	17	0	17	27	0	27
	ER	0	0	0	0	0	0
	WL	0	129	129	0	172	172
	WT	0	18	18	0	25	25
	WR	0	0	0	0	0	0
Lynwood/30th	NL	0	0	0	0	0	0
	NT	0	0	0	0	0	0
	NR	0	0	0	0	0	0
	SL	0	0	0	0	0	0
	ST	0	0	0	0	0	0
	SR	0	0	0	0	0	0
	EL	0	0	0	0	0	0

	ET	0	0	0	0	0	0
	ER	0	0	0	0	0	0
	WL	0	0	0	0	0	0
	WT	0	0	0	0	0	0
	WR	0	0	0	0	0	0
Lynwood/Del Rosa	NL	0	0	0	0	0	0
	NT	7	0	7	11	0	11
	NR	0	0	0	0	0	0
	SL	0	0	0	0	0	0
	ST	0	7	7	0	10	10
	SR	0	0	0	0	0	0
	EL	0	0	0	0	0	0
	ET	0	0	0	0	0	0
	ER	0	0	0	0	0	0
	WL	0	0	0	0	0	0
	WT	0	0	0	0	0	0
	WR	0	0	0	0	0	0
Lynwood/Sterling	NL	0	0	0	0	0	0
	NT	2	0	2	3	0	3
	NR	0	0	0	0	0	0
	SL	0	0	0	0	0	0
	ST	0	2	2	0	2	2
	SR	0	0	0	0	0	0
	EL	0	0	0	0	0	0
	ET	0	0	0	0	0	0
	ER	0	0	0	0	0	0
	WL	0	0	0	0	0	0
	WT	0	0	0	0	0	0
	WR	0	0	0	0	0	0
Harrison/40th	NL	0	0	0	0	0	0
	NT	0	0	0	0	0	0
	NR	0	0	0	0	0	0
	SL	0	0	0	0	0	0
	ST	0	0	0	0	0	0
	SR	0	0	0	0	0	0
	EL	0	0	0	0	0	0
	ET	0	9	9	0	12	12
	ER	0	0	0	0	0	0
	WL	0	0	0	0	0	0
	WT	8	0	8	14	0	14
	WR	0	0	0	0	0	0
Del Rosa/Foothill	NL	0	0	0	0	0	0
	NT	7	0	7	11	0	11
	NR	0	0	0	0	0	0

	SL	0	2	2	0	2	2
	ST	0	7	7	0	10	10
	SR	0	0	0	0	0	0
	EL	0	0	0	0	0	0
	ET	0	0	0	0	0	0
	ER	0	0	0	0	0	0
	WL	0	0	0	0	0	0
	WT	0	0	0	0	0	0
	WR	2	0	2	3	0	3
Sterling/Foothill	NL	2	0	2	3	0	3
	NT	0	0	0	0	0	0
	NR	0	0	0	0	0	0
	SL	0	0	0	0	0	0
	ST	0	0	0	0	0	0
	SR	0	0	0	0	0	0
	EL	0	0	0	0	0	0
	ET	0	0	0	0	0	0
	ER	0	2	2	0	2	2
	WL	0	0	0	0	0	0
	WT	0	0	0	0	0	0
	WR	0	0	0	0	0	0
Expressway/40th	NL	0	0	0	0	0	0
	NT	0	0	0	0	0	0
	NR	0	0	0	0	0	0
	SL	0	9	9	0	12	12
	ST	0	0	0	0	0	0
	SR	0	147	147	0	196	196
	EL	134	0	134	216	0	216
	ET	0	0	0	0	0	0
	ER	0	0	0	0	0	0
	WL	0	0	0	0	0	0
	WT	0	0	0	0	0	0
	WR	8	0	8	14	0	14

Table 8 shows the results of intersection LOS analysis with and without Phase 1 development by 2007.

Table 8
INTERSECTION LEVEL OF SERVICE SUMMARY
(Future 2007 Conditions With and Without Project Phase I)

Intersection	Peak Hour	2007 Conditions Without Project			2007 Conditions With Phase I		
		LOS	Delay	V/C	LOS	Delay	V/C
1. Waterman Avenue at 40th Street	AM	C	26.8	0.670	C	26.5	0.677
	PM	C	25.2	0.528	C	26.0	0.599
2. Waterman Avenue at Parkdale Drive	AM	B	11.2	0.641	B	11.0	0.693
	PM	B	11.7	0.543	B	11.2	0.604
3. Waterman Avenue at 36th Street (Unsignalized)	AM	E	45.1		F	64.9	
	PM	D	26.9		E	43.7	
4. Waterman Avenue at 34th Street (Unsignalized)	AM	F	81.1		A	1.3	
	PM	F	55.9		F	73.6	
5. Waterman Avenue at Marshall Blvd	AM	A	3.4	0.544	A	3.5	0.586
	PM	A	4.2	0.486	A	4.1	0.547
6. Waterman Avenue at 30th Street	AM	C	29.0	0.843	C	30.7	0.885
	PM	C	24.2	0.693	C	24.8	0.725
7. Valencia Avenue at 40th Street	AM						
	PM						
8. Arrowhead Springs Road at 40th Street	AM	NA			C	21.5	0.335
	PM	NA			C	20.2	0.493
9. Harrison Street at 40th Street (Unsignalized)	AM	B	12.8		B	13.0	
	PM	B	14.4		B	14.7	
10. Del Rosa Avenue at Foothill Blvd (Unsignalized)	AM	B	11.9		B	12.1	
	PM	B	12.3		B	12.5	
11. Sterling Avenue at Foothill Blvd	AM	A	7.9	0.176	A	7.9	0.179
	PM	A	8.0	0.149	A	8.1	0.154
12. Valencia Avenue at 30th Street	AM						
	PM						
13. 30th Street at Lynwood Drive (Unsignalized)	AM	NA					
	PM	NA					
14. Del Rosa Avenue at Lynwood Drive	AM	B	15.1	0.308	B	15.1	0.310
	PM	B	14.2	0.374	B-	14.1	0.377
15. Sterling Avenue at Lynwood Drive	AM	B	14.1	0.509	B	14.0	0.545
	PM	B	12.6	0.437	B	14.2	0.513
16. 30th Street at Lynwood Drive (Unsignalized)	AM	B	12.4		B	12.4	
	PM	A	7.5		A	7.5	

[Note: V/C ratios are not calculated for unsignalized intersections.]

The following intersections are expected to be impacted by Phase 1 Project related traffic:

1. Waterman Avenue and 36th Street
2. Waterman Avenue and 34theStreet

Table 9 shows the results of roadway LOS analysis with and without Project build-out by 2030. **Table 10** shows Project build-out trips at key intersections during the AM and PM peak hours.

Table 9
2030 AVERAGE DAILY TRAFFIC (ADT) VOLUMES AND LOS ON ROADWAYS IN THE VICINITY OF ARROWHEAD SPRINGS DEVELOPMENT

Roadways	Facility Type	No. of Lanes	Capacity, Veh/day (C)	2030 W/O Project Conditions			2030 With Project Conditions			Diff. in V/C by Project
				Volume, Veh/day (V)	V/C Ratio	LOS	Volume, Veh/day (V)	V/C Ratio	LOS	
New Road (Project to 40th St.)	Major Arterial	4	40,000	0	0.000	A	20,750	0.519	A	0.519
Harrison Parkway (40th St to 30th St)	Major Arterial	4	40,000	0	0.000	A	18,309	0.458	A	0.458
Highway 18 N/O Waterman Avenue	Major Arterial	4	40,000	24,062	0.602	A	25,283	0.632	B	0.031
Waterman Avenue S/O 40th Street	Major Arterial	4	40,000	24,062	0.602	A	24,062	0.602	A	0.000
Waterman Avenue N/O 30th Street	Major Arterial	4	40,000	24,062	0.602	A	24,062	0.602	A	0.000
40th Street E/O Waterman Avenue	Major Arterial	4	40,000	17,908	0.448	A	19,129	0.478	A	0.031
Harrison Street S/O 40th Street	Secondary Arterial	2	12,000	0	0.000	A	0	0.000	A	0.000
Sterling Avenue S/O Foothill Drive	Major Arterial	2	15,000	2,166	0.144	A	3,387	0.226	A	0.081
Valencia Avenue S/O 40th Street	Secondary Arterial	2	12,000	4,794	0.399	A	6,015	0.501	A	0.102
Valencia Avenue N/O 30th Street	Secondary Arterial	2	12,000	5,039	0.420	A	6,259	0.522	A	0.102

Notes:
The 2030 condition assumes that a new roadway will be constructed to join 30th Street with 40th Street along an alignment immediately west of Harrison Street. The new roadway is projected to attract approximately 70% of existing traffic from Highway 18, 40th Street and Waterman Avenue.

The project generated traffic is assumed to be distributed as follows: 15% to and from Highway 18 north of the site, 5% to and from 40th Street west of Waterman Avenue, 70% to and from SR-30 using the new roadway connecting 30th Street with 40th Street, and 10% to and from 40th Street east of the new roadway connecting the site with 40th Street. Without new roadway, project traffic will be distributed 75% to the west on 40th Street and 10% to the east on 40th Street (using Harrison Street, Del Rosa Avenue or Sterling Avenue).

Table 10
ARROWHEAD SPRINGS TRIP DISTRIBUTION
(At Project Build-out)

Trip Generation Estimates

AM IN	PM IN	AM OUT	PM OUT	DAILY TOTAL
738	999	591	1,076	24,412

Intersection	DIR	AM IN	AM OUT	AM TOTAL	PM IN	PM OUT	PM TOTAL
Waterman/30th	NL	0	0	0	0	0	0
	NT	22	0	22	40	0	40
	NR	443	0	443	599	0	599
	SL	0	0	0	0	0	0
	ST	0	6	6	0	11	11
	SR	0	18	18	0	32	32
	EL	0	0	0	0	0	0
	ET	0	0	0	0	0	0
	ER	0	0	0	0	0	0
	WL	0	59	59	0	108	108
	WT	0	355	355	0	646	646
	WR	7	0	7	10	0	10
Waterman/Marshall	NL	0	0	0	0	0	0
	NT	30	0	30	40	0	40
	NR	0	0	0	0	0	0
	SL	0	0	0	0	0	0
	ST	0	24	24	0	43	43
	SR	0	0	0	0	0	0
	EL	0	0	0	0	0	0
	ET	0	0	0	0	0	0
	ER	0	0	0	0	0	0
	WL	0	0	0	0	0	0
	WT	0	0	0	0	0	0
	WR	0	0	0	0	0	0
Waterman/34th	NL	0	0	0	0	0	0
	NT	30	0	30	40	0	40
	NR	0	0	0	0	0	0
	SL	0	0	0	0	0	0
	ST	0	24	24	0	43	43
	SR	0	0	0	0	0	0
	EL	0	0	0	0	0	0
	ET	0	0	0	0	0	0
	ER	0	0	0	0	0	0
	WL	0	0	0	0	0	0
	WT	0	0	0	0	0	0

	WR	0	0	0	0	0	0
Waterman/36th	NL	0	0	0	0	0	0
	NT	30	0	30	40	0	40
	NR	0	0	0	0	0	0
	SL	0	0	0	0	0	0
	ST	0	24	24	0	43	43
	SR	0	0	0	0	0	0
	EL	0	0	0	0	0	0
	ET	0	0	0	0	0	0
	ER	0	0	0	0	0	0
	WL	0	0	0	0	0	0
	WT	0	0	0	0	0	0
	WR	0	0	0	0	0	0
Waterman/Parksdale	NL	0	0	0	0	0	0
	NT	30	0	30	40	0	40
	NR	0	0	0	0	0	0
	SL	0	0	0	0	0	0
	ST	0	24	24	0	43	43
	SR	0	0	0	0	0	0
	EL	0	0	0	0	0	0
	ET	0	0	0	0	0	0
	ER	0	0	0	0	0	0
	WL	0	0	0	0	0	0
	WT	0	0	0	0	0	0
	WR	0	0	0	0	0	0
Waterman/40th	NL	0	0	0	0	0	0
	NT	30	0	30	40	0	40
	NR	0	0	0	0	0	0
	SL	0	0	0	0	0	0
	ST	0	24	24	0	43	43
	SR	0	0	0	0	0	0
	EL	0	0	0	0	0	0
	ET	74	0	74	100	0	100
	ER	0	0	0	0	0	0
	WL	0	0	0	0	0	0
	WT	0	59	59	0	108	108
	WR	0	0	0	0	0	0
Lynwood/30th	NL	0	0	0	0	0	0
	NT	0	0	0	0	0	0
	NR	517	0	517	699	0	699
	SL	0	0	0	0	0	0
	ST	0	0	0	0	0	0
	SR	0	0	0	0	0	0
	EL	0	0	0	0	0	0

	ET	0	0	0	0	0	0
	ER	0	0	0	0	0	0
	WL	0	414	414	0	753	753
	WT	0	0	0	0	0	0
	WR	0	0	0	0	0	0
Lynwood/Del Rosa	NL	0	0	0	0	0	0
	NT	30	0	30	40	0	40
	NR	0	0	0	0	0	0
	SL	0	0	0	0	0	0
	ST	0	24	24	0	43	43
	SR	0	0	0	0	0	0
	EL	0	0	0	0	0	0
	ET	0	0	0	0	0	0
	ER	0	0	0	0	0	0
	WL	0	0	0	0	0	0
	WT	0	0	0	0	0	0
	WR	0	0	0	0	0	0
Lynwood/Sterling	NL	0	0	0	0	0	0
	NT	7	0	7	10	0	10
	NR	0	0	0	0	0	0
	SL	0	0	0	0	0	0
	ST	0	6	6	0	11	11
	SR	0	0	0	0	0	0
	EL	0	0	0	0	0	0
	ET	0	0	0	0	0	0
	ER	0	0	0	0	0	0
	WL	0	0	0	0	0	0
	WT	0	0	0	0	0	0
	WR	0	0	0	0	0	0
Harrison/40th	NL	517	0	517	699	0	699
	NT	0	0	0	0	0	0
	NR	0	0	0	0	0	0
	SL	0	0	0	0	0	0
	ST	0	0	0	0	0	0
	SR	0	0	0	0	0	0
	EL	0	0	0	0	0	0
	ET	0	30	30	0	54	54
	ER	0	414	414	0	753	753
	WL	0	0	0	0	0	0
	WT	37	0	37	50	0	50
	WR	0	0	0	0	0	0
Del Rosa/Foothill	NL	0	0	0	0	0	0
	NT	30	0	30	40	0	40
	NR	0	0	0	0	0	0

	SL	0	6	6	0	11	11
	ST	0	24	24	0	43	43
	SR	0	0	0	0	0	0
	EL	0	0	0	0	0	0
	ET	0	0	0	0	0	0
	ER	0	0	0	0	0	0
	WL	0	0	0	0	0	0
	WT	0	0	0	0	0	0
	WR	7	0	7	10	0	10
Sterling/Foothill	NL	7	0	7	10	0	10
	NT	0	0	0	0	0	0
	NR	0	0	0	0	0	0
	SL	0	0	0	0	0	0
	ST	0	0	0	0	0	0
	SR	0	0	0	0	0	0
	EL	0	0	0	0	0	0
	ET	0	0	0	0	0	0
	ER	0	6	6	0	11	11
	WL	0	0	0	0	0	0
	WT	0	0	0	0	0	0
	WR	0	0	0	0	0	0
Expressway/40th	NL	0	0	0	0	0	0
	NT	0	0	0	0	0	0
	NR	0	0	0	0	0	0
	SL	0	443	443	0	807	807
	ST	0	0	0	0	0	0
	SR	0	59	59	0	108	108
	EL	74	0	74	100	0	100
	ET	0	0	0	0	0	0
	ER	0	0	0	0	0	0
	WL	0	0	0	0	0	0
	WT	0	0	0	0	0	0
	WR	554	0	554	749	0	749

Table 11 shows the results of intersection LOS analysis with and without Project build-out by 2030.

Table 11
INTERSECTION LEVEL OF SERVICE SUMMARY
(Build-out 2030 Conditions With and Without Project)

Intersection	Peak Hour	2030 Base Conditions			2030 Base + Project Conditions		
		LOS	Delay	V/C	LOS	Delay	V/C
1. Waterman Avenue at 40th Street	AM	C	28.5	0.820	C	30.8	0.856
	PM	D	42.9	0.982	D	51.5	1.033
2. Waterman Avenue at Parkdale Drive	AM	A	3.7	0.553	A	3.7	0.559
	PM	A	5.3	0.651	A	5.3	0.662
3. Waterman Avenue at 36th Street (Unsignalized)	AM	F	54.8		F	58.4	
	PM	F	87.5		F	99.1	
4. Waterman Avenue at 34th Street (Unsignalized)	AM	D	26.7		D	27.5	
	PM	F	110.6		F	125.2	
5. Waterman Avenue at Marshall Blvd	AM	A	4.6	0.626	A	4.6	0.633
	PM	A	5.0	0.633	A	5.0	0.644
6. Waterman Avenue at 30th Street	AM	F	138.9	1.215	F	115.6	1.222
	PM	F	96.5	1.180	F	88.8	1.200
7. Valencia Avenue at 40th Street	AM	C	15.0	0.667			
	PM	F	72.4	1.129			
8. Arrowhead Springs Road at 40th Street	AM	NA			C	22.4	0.784
	PM	NA			F	143.5	1.271
9. Harrison Street at 40th Street (Unsignalized)	AM	D	26.6		F	Overflow	
	PM	F	Overflow		F	Overflow	
10. Del Rosa Avenue at Foothill Blvd (Unsignalized)	AM	B	14.8		C	15.7	
	PM	C	17.5		C	20.2	
11. Sterling Avenue at Foothill Blvd	AM	A	8.1	0.245	A	8.2	0.253
	PM	B	10.2	0.419	B	10.4	0.436
12. Valencia Avenue at 30th Street	AM	A	1.0	0.137			
	PM	B	12.7	0.304			
13. 30th Street at Lynwood Drive	AM	NA					
	PM	NA					
14. Del Rosa Avenue at Lynwood Drive	AM	B	16.6	0.558	B	16.5	0.564
	PM	B	12.7	0.612	B	12.6	0.623
15. Sterling Avenue at Lynwood Drive	AM	B	11.2	0.366	B	11.2	0.372
	PM	C	20.0	0.775	C	20.5	0.781
16. 30th Street at Lynwood Drive (Unsignalized)	AM	A	9.7		D	25.8	
	PM	B	11.5		F	185.3	

[Note: V/C ratios are not calculated for unsignalized intersections.]

The following intersections are expected to be impacted by the Project related traffic at build-out:

1. Waterman Avenue and 30th Street
2. Harrison Street and 40th Street
3. Waterman Avenue and 36th Street
4. 30th Street and Lynwood Drive
5. Waterman Avenue and 40th Street
6. Waterman Avenue and 34th Street
7. Arrowhead Village Road (Expressway) and 40th Street

MITIGATION MEASURES

Traffic mitigation measures were identified for those intersections where future level of service with Arrowhead Springs Development indicates an unacceptable condition, i.e., LOS E or worse.

Phase 1 Mitigation Measures

The following mitigation measures were identified for the two intersections expected to be impacted by Phase 1 project traffic:

1. Waterman Avenue @ 36th Street will operate at LOS F and E during the AM and PM peak hours, respectively. With signalization with permitted phasing the intersection will operate at LOS A during both peak hours.

2. Waterman Avenue @ 34th Street will operate at LOS E and F during the AM and PM peak hours, respectively. With signalization with permitted phasing the intersection will operate at LOS A during both AM and PM peak hours.

Table 12 shows the results of intersection LOS analysis before and after above mitigation measures.

Table 12
BEFORE AND AFTER MITIGATION LEVEL OF SERVICE SUMMARY
2007 Conditions

Intersection	Peak Hour	Conditions Before Mitigation			Conditions After Mitigation		
		LOS	Delay	V/C	LOS	Delay	V/C
1. Waterman Avenue at 40th Street	AM	C	26.5	0.677			
	PM	C	26.0	0.599			
2. Waterman Avenue at Parkdale Drive	AM	B	11.0	0.693			
	PM	B	11.2	0.604			
3. Waterman Avenue at 36th Street	AM	F	64.9		A	3.8	0.572
	PM	E	43.7		B	3.4	0.501
4. Waterman Avenue at 34th Street	AM	A	1.3		A	3.3	0.569
	PM	F	73.6		A	3.3	0.517
5. Waterman Avenue at Marshall Blvd	AM	A	3.5	0.586			
	PM	A	4.1	0.547			
6. Waterman Avenue at 30th Street	AM	C	30.7	0.885			
	PM	C	24.8	0.725			
7. Valencia Avenue at 40th Street	AM						
	PM						
8. Arrowhead Springs Road at 40th Street	AM	C	21.5	0.335			
	PM	C	20.2	0.493			
9. Harrison Street at 40th Street	AM	B	13.0				
	PM	B	14.7				
10. Del Rosa Avenue at Foothill Blvd	AM	B	12.1				
	PM	B	12.5				
11. Sterling Avenue at Foothill Blvd	AM	A	7.9	0.179			
	PM	A	8.1	0.154			
12. Valencia Avenue at 30th Street	AM						
	PM						
13. 30th Street at Lynwood Drive (Signalized)	AM						
	PM						
14. Del Rosa Avenue at Lynwood Drive	AM	B	15.1	0.310			
	PM	B-	14.1	0.377			
15. Sterling Avenue at Lynwood Drive	AM	B	14.0	0.545			
	PM	B	14.2	0.513			
16. 30th Street at Lynwood Drive (Unsignalized)	AM	B	12.4				
	PM	A	7.5				

Note: Only those intersections operating at unacceptable LOS D, E or F were Mitigated per CMP guidelines.

Project Build-out Mitigation Measures

The following mitigation measures were identified for the two intersections expected to be impacted by Phase 1 project traffic:

1. Waterman Avenue @ 30th Street will operate at LOS F during both AM and PM peak hours under 2030 conditions with project. With protected phasing and 1 additional WB right turn lane, and 1 additional SB right turn lane, both with overlap right turn phasing the intersection will operate at LOS D during both AM and PM peak hours.

2. Harrison Street @ 40th Street will operate at LOS F during both AM and PM peak hours, under 2030 conditions with project (assuming the intersection remains unsignalized with existing lane configurations). With signalization, permitted phasing and 2 NB left turn lanes, 1 NB right turn lane, an exclusive EB right turn lane and an exclusive WB left turn lane, the intersection will operate at LOS B and C during the AM and PM peak hours, respectively.

3. Waterman Avenue @ 36th Street will operate at LOS F during both AM and PM peak hours under 2030 conditions with project. With signalization and permitted phasing the intersection will operate at LOS A and B during the AM and PM peak hours, respectively.

4. 30th Street @ Lynwood Drive is an unusual intersection. Currently the intersection is uncontrolled in the NS direction and stops in the EW directions, with heavy NB right turn and WB Left turn movements. With existing configurations the intersection operates at LOS D and F during AM and PM peak hours, respectively. If the intersection is reconfigured to align with Arrowhead Parkway and with signalization the intersection will operate at LOS A during both peak hours with the addition of project traffic to 2030 model output.

5. Waterman Avenue @ 40th Street will operate at LOS D with a V/C of 1.033 during the AM peak hour. With the addition of an exclusive right-turn lane in each direction and westbound right-turn overlap phasing the intersection will operate LOS B and C during the AM and PM peak hours, respectively.

6. Waterman Avenue @ 34th Street will operate at LOS D and F during AM and PM peak hours, respectively, under 2030 conditions with project. With signalization and permitted phasing the intersection will operate at LOS A during both peak hours.

7. Arrowhead Village Road (Expressway) @ 40th Street will operate at LOS C and F during AM and PM peak hours, respectively, under 2030 conditions with project. With signalization with protected EW phasing and the intersection configuration of; 2 SB left turn lanes, 1 SB right lane, 2 EB thru lanes, 1 EB left turn lane, 2 WB thru lanes and 1 WB right turn lane the intersection will operate at LOS B and C during AM and PM peak hours respectively under 2030 model conditions with project traffic.

Table 13 shows the results of intersection LOS analysis before and after above mitigation measures.

Table 13
BEFORE AND AFTER MITIGATION LEVEL OF SERVICE SUMMARY
2030 Conditions

Intersection	Peak Hour	Conditions Before Mitigation			Conditions After Mitigation		
		LOS	Delay	V/C	LOS	Delay	V/C
1. Waterman Avenue at 40th Street	AM	C	30.8	0.856	C	27.1	0.764
	PM	D	51.5	1.033	C	32.1	0.881
2. Waterman Avenue at Parkdale Drive	AM	A	3.7	0.559			
	PM	A	5.3	0.662			
3. Waterman Avenue at 36th Street	AM	F	58.4		A	3.4	0.537
	PM	F	99.1		B	11.4	0.782
4. Waterman Avenue at 34th Street	AM	D	27.5		A	2.8	0.544
	PM	F	125.2		A	3.5	0.610
5. Waterman Avenue at Marshall Blvd	AM	A	4.6	0.633			
	PM	A	5.0	0.644			
6. Waterman Avenue at 30th Street	AM	F	115.6	1.222	D	51.7	0.928
	PM	F	88.8	1.200	D	38.9	0.912
7. Valencia Avenue at 40th Street	AM						
	PM						
8. Arrowhead Springs Road at 40th Street	AM	C	22.4	0.784	B	15.5	0.503
	PM	F	143.5	1.271	C	21.7	0.747
9. Harrison Street at 40th Street	AM	F	Overflow		B	14.8	0.607
	PM	F	Overflow		C	28.7	0.907
10. Del Rosa Avenue at Foothill Blvd	AM	C	15.7				
	PM	C	20.2				
11. Sterling Avenue at Foothill Blvd	AM	A	8.2	0.253			
	PM	B	10.4	0.436			
12. Valencia Avenue at 30th Street	AM						
	PM						
13. 30th Street at Lynwood Drive (Signalized)	AM						
	PM						
14. Del Rosa Avenue at Lynwood Drive	AM	B	16.5	0.564			
	PM	B	12.6	0.623			
15. Sterling Avenue at Lynwood Drive	AM	B	11.2	0.372			
	PM	C	20.5	0.781			
16. 30th Street at Lynwood Drive (Unsignalized)	AM	D	25.8		A	8.9	
	PM	F	185.3		C	19.0	

Note: Only those intersections operating at unacceptable LOS D, E or F were Mitigated per CMP guidelines.

CONCLUSIONS

Arrowhead Springs Specific Plan consists of developing a mix of residential, commercial and entertainment land uses in the Arrowhead Springs area of San Bernardino County on the north and adjacent to the City of San Bernardino. The project's traffic impact analysis was conducted using SanBAG's Congestion Management Program requirements as well as the City of San Bernardino's Traffic Impact Analysis Guidelines. The project development has been divided in two phases for this analysis – Phase I is expected to be completed by 2007 and Phase II by the build-out year of 2030. No new roadways would be added to the existing circulation system to handle the Phase I estimated traffic volumes. For the build-out traffic scenario, a new expressway – Arrowhead Parkway –joining 40th Street on the north and 30th Street on the south along the western alignment of Harrison Street was incorporated for traffic impact analysis. The project's significant traffic impacts were determined for the both Phase I and build-out traffic scenarios and appropriate mitigation measures were identified.

Arrowhead Springs Specific Plan

TECHNICAL APPENDIX

Arrowhead Springs Specific Plan

INTERSECTION TURNING MOVEMENT COUNTS

THE INFORMATION IN THIS APPENDIX IS AVAILABLE AT THE DEVELOPMENT SERVICES DEPARTMENT OF THE CTY OF SAN BERNARDINO PLEASE CONTACT TERRI RAHHAL, PRINCIPAL PLANNER

Arrowhead Springs Specific Plan

INTERSECTION LOS CALCULATIONS: EXISTING 2003 CONDITIONS

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Arrowhead Springs Specific Plan

INTERSECTION LOS CALCULATIONS: PHASE I (2007) CONDITIONS

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Arrowhead Springs Specific Plan

INTERSECTION LOS CALCULATIONS: BUILD-OUT (2030) CONDITIONS

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