RTIP ID# *(required)* LA0G1020 (LA11G5)

TCWG Consideration Date

Project Description *(clearly describe project)*
New project to install a traffic signal at the intersection of Foothill Boulevard and Palm Drive in the City of Azusa.

Type of Project *(use Table 1 on instruction sheet)*
Intersection signalization.

County	**Narrative Location/Route & Postmiles**
Los Angeles	Intersection of Foothill and Palm Drive in the City of Azusa. No postmiles available. **Caltrans Projects – EA#** Local Assistance Project Federal No. STPL-5112 (018)

Lead Agency: City of Azusa

Contact Person	**Phone#**	**Fax#**	**Email**
Nikki Miller	(626) 812-5261	(626) 334-5464	nmiller@ci.azusa.ca.us

Hot Spot Pollutant of Concern *(check one or both)* **PM2.5** X **PM10** X

Federal Action for which Project-Level PM Conformity is Needed *(check appropriate box)*

X	**Categorical Exclusion (NEPA)**	**EA or Draft EIS**	**FONSI or Final EIS**	**PS&E or Construction**	**Other**

Scheduled Date of Federal Action:

NEPA Assignment – Project Type *(check appropriate box)*

Exempt	X **Section 326 –Categorical Exemption**	**Section 327 – Non-Categorical Exemption**

Current Programming Dates *(as appropriate)*

	PE/Environmental	**ENG**	**ROW**	**CON**
Start	2015			2016
End	2016			2016

Project Purpose and Need (Summary): *(attach additional sheets as necessary)*
The project includes the installation of a traffic signal at the intersection of Foothill Boulevard and Palm Drive in the City of Azusa. This is a T-intersection. Foothill Boulevard is an east-west arterial roadway across the City and Palm Drive is a north-south local roadway that terminates at Foothill Boulevard. Currently, there are no traffic signals, crosswalks in north-south direction, stop signs in east-west direction, or other traffic control measures at this intersection. The project would install a traffic signal at this intersection in addition to striping and signage for pedestrians and traffic crossings.

It is recommended that a traffic signal control system at this intersection be installed due to the high volume of pedestrians and bicyclists using only the sidewalk along the south side of Foothill Boulevard and the fact that this sidewalk ends abruptly over 1,000 feet to the west, prior to the nearest convergent intersection at Foothill Boulevard and Historic Route 66, which has no signalized crosswalk. Since the nearest controlled intersection and crosswalk is nearly 900 feet to the east, at Citrus Avenue, a signalized control system at the intersection of Palm Drive and Foothill Boulevard will allow a safe and controlled crosswalk across Foothill Boulevard which, in turn, will encourage pedestrians and bicyclists to use sidewalks along both the north and south sides of Foothill Boulevard on their way to and from the campuses of Azusa Pacific University and Citrus College.

Surrounding Land Use/Traffic Generators *(especially effect on diesel traffic)* The intersection site is surrounded by primarily residential uses. Facilities associated with Azusa Pacific University are located at the northwest corner of the project intersection. Citrus College facilities are located to the east. The future Azusa-Citrus Gold line (light rail) Station is located approximate one-half mile to the north and east. The Foothill (210) Freeway is located about one mile to the south. The project intersection is in an urbanized area. The installation of a traffic signal will not cause an increase in, or effect diesel traffic due to this project.

Opening Year: Build and No Build LOS, AADT, % and # trucks, truck AADT of proposed facility

See below.

RTP Horizon Year / Design Year: Build and No Build LOS, AADT, % and # trucks, truck AADT of proposed facility

See below.

Opening Year: If facility is an interchange(s) or intersection(s), Build and No Build cross-street AADT, % and # trucks, truck AADT

No traffic study was required by Caltrans for the project. Traffic data obtained from the Traffic Signal Warrant Study and previous DEIRs for the study area.

No Build: Foothill Boulevard at Palm Drive LOS C[1]. Year 2015 ADT is 14,659. Percentage of trucks is estimated to be 8 percent, or 1,173 trucks[2].

Build: As the project will not generate traffic, no change in ADTs or LOS is anticipated after installation of traffic signal.

See Table 10 attachment for details.

RTP Horizon Year / Design Year: If facility is an interchange (s) or intersection(s), Build and No Build cross-street AADT, % and # trucks, truck AADT

2030 No Build: Foothill Boulevard at Palm Drive LOS C. Year 2030 ADT is 17,496. Percentage of trucks is estimated to be 8 percent, or 1,400 trucks[3].

Build: No change in ADTs or LOS is anticipated after installation of traffic signal.

See Table 10 attachment for details.

Describe potential traffic redistribution effects of congestion relief *(impact on other facilities)*

No traffic redistribution is anticipated after the traffic signal is completed. Other parallel routes do not offer any major time savings for drivers or truckers traveling through the area. It is expected that through trucks would stay away from this intersection because of pedestrian conflicts and due to the fact that E. Alosta Avenue is an available, more suitable route.

[1] Source: *Table 3-15.9, 2005 Intersection Level of Service Analysis,* page 3.15-36 Gold Line Foothill Extension - Pasadena to Montclair Final EIR, February 2007.

[2,2] Using Riverside County General Plan average vehicle mix data.

Comments/Explanation/Details *(attach additional sheets as necessary)* The following is used to determine whether the proposed project is considered to be a project of air quality concern (POAQC) for PM10 and PM2.5. According to the U.S. EPA Transportation Conformity Guidance (Final Rule), March 10 2006 (which did not change in the 2010 guidance), the following types of projects are considered POAQC:

1) *New or expanded highway projects that have a significant number of or significant increase in diesel vehicles (significant number is defined as greater than 125,000 Annual Average Daily Traffic (AADT) and 8% or more of such AADT is diesel truck traffic, or in practice 10,000 truck AADT or more regardless of total AADT; significant increase is defined in practice as a 10% increase in heavy duty truck traffic);*

   The proposed project is a traffic signalization project, as stated in the approved PES, and therefore would not significantly increase the traffic volumes along Foothill Boulevard or Palm Drive. Table 10 shows that at General Plan (GP) Buildout (2030), the traffic volumes along Foothill Boulevard (the roadway segment with the highest total traffic volume; as Palm Drive only has a volume of 2,171 vehicles at GP Buildout) would not approach or exceed the 125,000 AADT criterion for a POAQC. In addition, at 1,400 (a total of 8 percent of roadway traffic) the total truck volume would remain well below the 10,000 AADT criterion (8% of 125,000 AADT) for POAQC.

   Existing (2015) traffic counts were obtained by Traffic Design, Inc. (October 2015) for the *Traffic Signal Warrant Study, Foothill Boulevard and Palm Drive*. The traffic counts showed that Foothill Boulevard, east and west of Palm Drive had a two-way traffic volume of 14,659. Using the Riverside County General Plan traffic mix percentages for major roads (as the mix is a conservative representation of much of Southern California traffic), the percentage of total trucks is 8 percent (3 percent medium trucks and 5 percent heavy trucks). The 2015 volume along Foothill Boulevard would yield 1,173 total trucks. Again this is well below the 10,000 AADT criterion (8% of 125,000 AADT) for POAQC. The mix of vehicles is not anticipated to change significantly at buildout. Therefore, as diesel emissions are sourced primarily from heavy trucks, the project will not involve a significant increase in diesel vehicles and as the road design volume is far less than 125,000 ADT (as discussed above and shown in Table 10), the project would not be considered to be a POAQC.

2) *Projects affecting intersections that are at a Level of Service D, E, F, with a significant number of diesel vehicles, or that that will change to Level of Service D, E, or F because of increased traffic volumes from a significant number of diesel vehicles related to the project;*

   As stated above, the project intersection is currently operating at LOS C during the peak hours. This is not expected to change with installation of the traffic signal. The project site does not have a significant number of diesel vehicles. Therefore, the project will not affect intersections that are at a Level of Service D, E, F, with a significant number of diesel vehicles, or that will change to Level of Service D, E, or F because of increased traffic volumes from a significant number of diesel vehicles related to the project and the project would not be considered to be a POAQC.

3) *New bus and rail terminals and transfer points that have a significant number of diesel vehicles congregating at a single location;*

   The project does not involve the construction or operation of new and rail terminals and transfer points that have a significant number of diesel vehicles congregating at a single location. Therefore, the project would not be considered to be a POAQC.

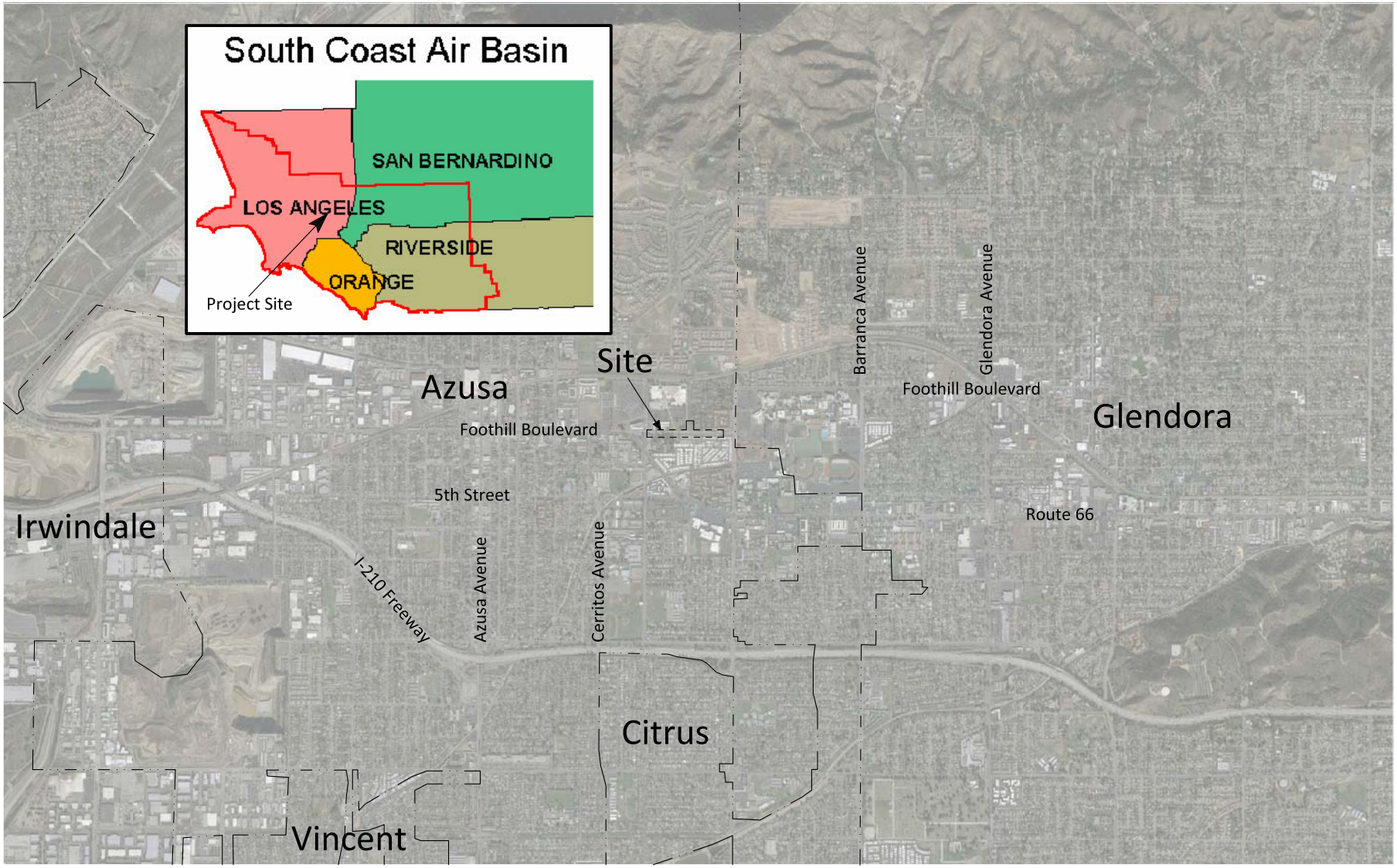
4) *Expanded bus and rail terminals and transfer points that significantly increase the number of diesel vehicles congregating at a single location;*

The project does not involve the expansion of bus and rail terminals and transfer points that significantly increase the number of diesel vehicles congregating at a single location. Therefore, the project would not be considered to be a POAQC.

5) *Projects in or affecting locations, areas, or categories of sites which are identified in the PM2.5 or PM10 implementation plan or implementation plan submission, as appropriate, as sites of possible violation.*

The project location is not identified in the PM2.5 or PM10 implementation plan as a site of possible violation. Therefore, the project would not be considered to be a POAQC.

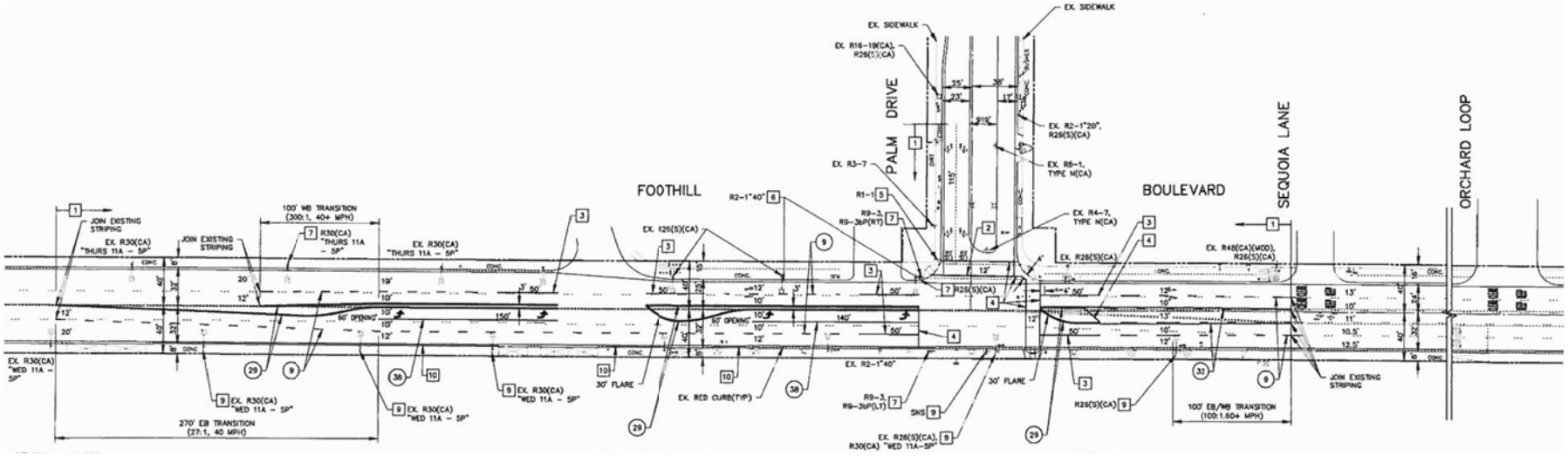
Figure 1
Regional Location Map



KUNZMAN ASSOCIATES, INC.
OVER 40 YEARS OF EXCELLENT SERVICE

JN 6489

Figure 2
Site Plan



Los Angeles Metropolitan Transportation Authority

2015 Federal Transportation Improvement Program ($000)

TIP ID **LA0G1020 (LA11G5)** Implementing Agency **Azusa, City of**

Project Description: Construct a new traffic signal at the intersection of Foothill Boulevard and Palm Drive .

SCAG RTP Project #:
Study:N/A Is Model: Model #:
PM: Carl Hassel - (626) 812-5064
Email: chassel@ci.azusa.ca.us
LS: Y LS GROUP#: LA11G5
Conformity Category: EXEMPT - 93.127

System :Local Hwy Route : Postmile: Distance: Phase: Engineering/Plans, Specifications and Estimates (PS&E) Completion Date 09/30/2014

Lane # Extd: Lane # Prop: Imprv Desc:

Toll Rate: Toll Colc Loc: Toll Method: Hov acs eg loc:

Air Basin: SCAB Envir Doc: CATEGORICALLY EXEMPT - 10/01/2013

Uza: Los Angeles-Long Beach-Santa Ana Sub-Area: Sub-Region:

CTIPS ID: EA #: PPNO:

Program Code: NCNH2 - SIGNAL(S)-AT INTERSECTIONS (NON SIGNAL SYNCH) Stop Loc:

	PHASE	PRIOR	14/15	15/16	16/17	17/18	18/19	19/20	BEYOND	TOTAL
	PE									
	RW									
	CON									
	SUBTOTAL									
STPL - STP Local	PE	$25								$25
	RW	$0								$0
	CON	$295								$295
	SUBTOTAL	$320								$320
	TOTAL	**$320**								**$320**

TOTAL PE: $25 **TOTAL RW: $0** **TOTAL CON: $295**

- **General Comment:** New project to install a traffic signal at the intersection of Foothill and Palm Drive in the City of Azusa.
- **Mdeling Comment:**
- **TCM Comment:**
- **Narrative:** Project cost stays the same

Change Project Description:
- from "Construct a new traffic signal at the intersection of Foothill Boulevard and Palm Drive. Toll credit added in FY 15/16 for 3 in PS&E Phase and 34 for Construction"
to "Construct a new traffic signal at the intersection of Foothill Boulevard and Palm Drive."

Changed Project Completion Date:
- from "9/30/2016" to "9/30/2014"

Revise Funds Between Fiscal Years
STPL:
► Add funds in 13/14 in ENG for $25, CON for $295
— Delete funds in 15/16 in ENG for $25, CON for $295
Total project cost remains the same at $320

Last Revised **Adoption 15-00 - SCAG PENDING** Change reason:Carry Over, MINOR CHANGE Total Cost **$320**

Previously Approved TIP ID LA0G1020 (LA11G5) Implementing Agency **Azusa, City of**

Project Description: Construct a new traffic signal at the intersection of Foothill Boulevard and Palm Drive . Toll credit added in FY 13/14 for 3 in PS&E Phase and 34 for Construction. Toll Credits of $3 will be used to match FY14 federal funds for the PE phase, Toll Credits of $34 will be used to match FY14 federal funds for the CON phase

SCAG RTP Project #:
Study:N/A Is Model: Model #:
PM: Daniel Bobadilla - (626) 812-5264
Email: dbobadilla@ci.azusa.ca.us
LS: Y LS GROUP#: LA11G5
Conformity Category: EXEMPT - 93.127

System :Local Hwy Route : Postmile: Distance: Phase: Engineering/Plans, Specifications and Estimates (PS&E) Completion Date 09/30/2016

Lane # Extd: Lane # Prop: Imprv Desc:

Toll Rate: Toll Colc Loc: Toll Method: Hov acs eg loc:

Air Basin: SCAB Envir Doc: CATEGORICALLY EXEMPT - 10/01/2013

Uza: Los Angeles-Long Beach-Santa Ana Sub-Area: Sub-Region:

CTIPS ID: EA #: n/a PPNO:

Program Code: NCNH2 - SIGNAL(S)-AT INTERSECTIONS (NON SIGNAL SYNCH) Stop Loc:

	PHASE	PRIOR	14/15	15/16	16/17	17/18	18/19	19/20	BEYOND	TOTAL
STPL - STP Local	PE			$25						$25
	RW									
	CON			$295						$295
	SUBTOTAL			$320						$320
	TOTAL			**$320**						**$320**

TOTAL PE: $25 **TOTAL RW: $0** **TOTAL CON: $295**

Los Angeles Metropolitan Transportation Authority

2015 Federal Transportation Improvement Program ($000)

TIP ID **LA0G1020 (LA11G5)**	Implementing Agency **Azusa, City of**	
Last Revised **Amendment 13-18.1 - APPROVED**	Change reason:NEW PROJECT	Total Cost **$320**

Department of Public Health
Riverside County Community Health Agency

Office of Industrial Hygiene
4065 County Circle Drive, Suite 318,
Riverside, CA 92503 909-358-5050
FAX: 909-358-5443
TDD: 909-358-512

MEMO: Requirements for Determining and Mitigating Traffic Noise Impacts to Residential Structures.

NOISE STANDARDS:

1. The Noise Element of the General Plan indicates that to avoid future noise hazard, the maximum capacity design standard for highways and major roads will be used for determining the maximum future noise level or, in the case of freeways and airports, the estimated conditions 20 years in the future.
2. The interior noise levels in residential dwellings shall not exceed 45 Ldn/CNEL.
3. The exterior noise level shall not exceed 65 Ldn/CNEL.
4. Required Noise Prediction Model B Traffic Noise: FHWA RD 77-108 Highway Traffic Prediction Model, Sound 32 or the equivalent.

REQUIRED TRAFFIC NOISE MODELING PARAMETERS:

1. Roadway Classification: All roadways must be classified into one of the following categories as defined in the General Plan: Secondary, Major, Arterial, Urban Arterial, Expressway, Freeway, and Specific Plan Road.
2. Roadway Traffic Volume: All roadways must be modeled using Average Daily Trip (ADT) Level of Service "C" design capacities. For roadways classified by the General Plan as variable, future build-out traffic volumes must be obtained from the County's Transportation Department
3. or in the case of freeways, from Caltrans.
4. Required vehicle mix.
   - Freeways: Vehicle mix information must be obtained from Caltrans.
   - Roadways designated as major, arterial highways, or expressways:

VEHICLE	OVERALL %	DAY (7AM-7PM) %	EVENING (7PM-10PM) %	NIGHT (10PM-7AM) %
Auto	92	69.5	12.9	9.6
Medium Truck	3	1.44	0.06	1.5
Heavy Truck	5	2.4	0.1	2.5

   - Roadways designated as secondary, collectors, or smaller:

VEHICLE	OVERALL %	DAY (7AM-7PM) %	EVENING (7PM-10PM) %	NIGHT (10PM-7AM) %
Auto	97.4	73.6	13.6	10.22
Medium Truck	1.84	0.9	0.04	0.9
Heavy Truck	0.74	0.35	0.04	0.35

5. Traffic Speed: For County roads assume an average traffic speed of 40 MPH. For freeways, contact CALTRANS and use what speed they recommend.
6. Terrain conditions for modeling noise propagation: Assume Ahard site@ conditions in determining noise propagation (no more than 3 dB of attenuation per doubling of distance between source and receiver).
7. Noise attenuation attributed to standard residential architecture: It is assumed that standard residential design (with windows closed) will provide no more than 20 dB (A) of attenuation. Additional mitigation must be demonstrated via modeling.

Table 10

Vehicle Mix and Volumes on Foothill Boulevard East and West of Palm Drive

Vehicle Classification	Percent (24-hour)[1]	2015 Two-Way Traffic Volume (ADT)[2] on Foothill Blvd at Palm Drive	Corresponding Vehicle Volume per Vehicle Type[3]
Passenger Vehicles	92.00%	14,659	13,486
Medium Trucks	3.00%	14,659	440
Heavy Trucks	5.00%	14,659	733
Total Trucks	***8.00%***	***14,659***	***1,173***
Threshold for significant increase in number of trucks (8% or more of 125,000 AADT			10,000
Exceeds threshold?			**No**

Road Segment	Existing (2015)[2]	(2030)[4]	Maximum Volume of Truck Traffic (8%)[5]
Foothill Blvd at Palm Dr	14,659	17,496	1,400
Palm Dr at Foothill Blvd	1,819	2,171	174
Threshold for significant increase in number of trucks (8% or more of 125,000 AADT			10,000
Exceeds threshold?			**No**

[1] Source: Riverside County General Plan Appendix I-1 Noise Element Data for major highways (see Appendix C).

[2] Source: Traffic Design Inc. Traffic Signal Warrant Study, Foothill Boulevard and Palm Drive, Azusa, California24 hour average daily traffic volumes at Palm Drive and Foothill Boulevard. Counted September 17, 2015 (see Appendix C for entire study).

[3] Average Daily Traffic volume multiplied by percent.

[4] Source: Table 3-15.11 Year 2030 No Build Growth Factors. Growth rate of 1.29% annual growth. Gold Line Foothill Extension - Pasadena to Montclair Final EIR. Feb 2007. Page 3-15-43 (see Appendix C).

[5] 8% multiplied by the GP buildout volume.

TABLE 3-15.9
2005 INTERSECTION LEVEL OF SERVICE ANALYSIS

N/S Street	E/W Street	Jurisdiction	Traffic Conditions	
			V/C or Delay	LOS
Virginia Ave	Sixth St	Azusa	11.2	B
San Gabriel Ave	Ninth St	Azusa	0.235	A
San Gabriel Ave	Foothill Blvd	Azusa	0.626	B
Azusa Ave	Ninth St	Azusa	20.1	C
Azusa Ave	Santa Fe Ave	Azusa	14.4	B
Azusa Ave	Foothill Blvd	Azusa	0.667	B
Alameda Ave	Ninth St	Azusa	11.3	B
Alameda Ave	Santa Fe Ave	Azusa	9.0	A
Alameda Ave	Foothill Blvd	Azusa	0.535	A
Dalton Ave	Ninth St	Azusa	10.4	B
Dalton Ave	***Foothill Blvd***	***Azusa***	***72.8***	***F***
Soldano Ave	Ninth St	Azusa	9.5	A
Soldano Ave	Foothill Blvd	Azusa	27.1	D
Pasadena Ave	Ninth St	Azusa	8.5	A
Pasadena Ave	Foothill Blvd	Azusa	0.620	B
Palm Dr	Foothill Blvd	Azusa	16.4	C
Citrus Ave	Foothill Blvd	Azusa	0.629	B
Citrus Ave	Alosta Ave	Azusa	0.846	D
Barranca Ave	Bennett Ave	Glendora	11.5	B
Barranca Ave	Foothill Blvd	Glendora	0.401	A
Grand Ave	Foothill Blvd	Glendora	0.624	B
Vermont Ave	Ada Ave	Glendora	10.6	B
Vermont Ave	Route 66	Glendora	0.446	A
Vermont Ave	Foothill Blvd	Glendora	0.409	A
Vermont Ave	Ada Ave	Glendora	11.6	B
Glendora Ave	Foothill Blvd	Glendora	0.606	B
Glendora Ave	Ada Ave	Glendora	12.3	B
Glendora Ave	Route 66	Glendora	0.831	D
Pasadena Ave	Lemon Ave	Glendora	7.4	A
Pasadena Ave	Route 66	Glendora	0.620	B
Glenwood Ave	Lemon Ave	Glendora	10.0	B
Glenwood Ave	***Route 66***	***Glendora***	***72.3***	***F***
Elwood Ave	Lemon Ave	Glendora	9.8	A
Elwood Ave	Route 66	Glendora	0.575	A
Loraine Ave	Lemon Ave	Glendora	15.7	C
Loraine Ave	Route 66	Glendora	0.562	A
Lone Hill Ave	Auto Centre Dr	Glendora	0.788	C
Barranca Ave	Sierra Madre Ave	Glendora	14.6	B
Glendora Ave	Sierra Madre Ave	Glendora	17.8	C
Lone Hill Ave	Glendora Marketplace	Glendora	0.458	A
Lone Hill Ave	Gladstone St	San Dimas	0.557	A
SR-57 SB	Arrow Hwy	San Dimas	0.684	B
SR-57 NB	Arrow Hwy & Bonita Ave	San Dimas	0.714	C
Eucla Ave	Fifth St	San Dimas	8.0	A
Eucla Ave	Second St	San Dimas	9.4	A

growth within the 13 cities of the study area, and the long-range traffic projections from the modeling efforts as part of this study. This assessment resulted in the determination that the No Build future traffic projections would be developed by factoring the existing peak hour traffic data with a growth factor developed for each city. The growth factor represents the growth rate for each city based on population annual growth and half the rate of the employment annual growth, accumulated from 2005 to 2030. The total growth factor and the annual growth rates are provided in Table 3-15.11.

The growth factors were applied to each of the 153 study intersections according to their jurisdiction. With one exception, the 2030 volumes for the No Build condition at the intersection of Lone Hill Avenue and Auto Centre Drive in the City of Glendora was determined with additional information from two other new major developments planned and approved in the area. It was agreed upon by Glendora City officials and the Construction Authority, that for this particular intersection, the 2005 data would be grown to 2006 at a 0.65% annual rate and then the Diamond Ridge Project Only and Costco Project Only volumes would be added. The 0.65% annual growth rate came from the City of Glendora. Once a set of 2006 with Projects turn volumes was determined, a 0.65% annual growth rate was used for 24 years to reach the year 2030 No Build without LRT turn volumes. Based on this approach, the overall intersection growth comes to 1.57% annually with the turn movements that are impacted by these new developments (Diamond Ridge and Costco) reaching 2.04% annual growth.

TABLE 3-15.11
YEAR 2030 NO BUILD GROWTH FACTORS

City	Combined Annual Growth	Combined Accumulated Growth 2005 to 2030
Pasadena	1.20%	34.61%
Arcadia	1.19%	34.41%
Monrovia	0.75%	20.54%
Duarte	0.75%	20.54%
Irwindale	2.00%	64.06%
Azusa	1.29%	37.73%
Glendora	0.92%	25.79%
San Dimas	1.06%	30.02%
La Verne	1.11%	31.71%
Pomona	1.25%	36.53%
Claremont	0.98%	27.69%
Montclair	1.33%	39.21%
Upland	1.47%	43.95%
Study Area	***1.18%***	***34.37%***

Sources: SCAG 2005; Arcadia annual growth factor provided by the City of Arcadia's Draft Transportation Plan Update Study

The future No Build conditions were analyzed and the resulting operating conditions and corresponding levels of service are provided in Table 3-15.12. As noted earlier, this analysis includes all highway and transit projects and operations that the region and MTA expect to be in place by the year 2030. These transportation projects were identified earlier in Chapter 2, Section 2-2.1.1 and are accounted for in the travel demand forecasting model that was used to develop the growth factors.

Two intersections, one in Arcadia and one in Glendora, are slated for modification. Therefore, the 2030 No Build configuration and operation for these intersections differ slightly from the 2005 condition. The Arcadia intersection of Santa Clara Avenue and First Street is unsignalized in 2005 and will be signalized

TRAFFIC SIGNAL WARRANT STUDY
FOOTHILL BOULEVARD AND PALM DRIVE
AZUSA, CALIFORNIA

♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦

Prepared for

Evan Brooks Associates

1030 South Arroyo Parkway, Suite 204
Pasadena, CA 91105
Tel: (626) 799-8011
Attn.: Hal Suetsugu
Email: hal@ebaplanning.com

Per Direction of

City of Azusa

Public Works Department

♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦

Prepared by

Traffic Design, Inc.

862 Canterbury Ln
San Dimas, CA 91773
Tel: 626-826-7560

Under the Supervision of:
M. Yunus Rahi, Ph.D, P.E, T.E
Registered Civil and Traffic Engineer
Email: myrahi@hotmail.com

October 20, 2015

TDI2015-20/YR

PREPARER'S CERTIFICATION

TRAFFIC SIGNAL WARRANT STUDY
FOOTHILL BOULEVARD AND PALM DRIVE
AZUSA, 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, T.E, a Professional Civil and Traffic Engineer, registered in the State of California.

M. Yunus Rahi, Ph.D, P.E, T.E
Registration #: C59183, TR-1726

10-20-2015
Date

Professional Engineer's Stamp

TRAFFIC SIGNAL WARRANT STUDY
FOOTHILL BOULEVARD AND PALM DRIVE
AZUSA, CALIFORNIA

Introduction

A Traffic Signal Warrant Analysis was conducted for the Intersection of Foothill Boulevard and Palm Drive for a possible installation of a signal control at the intersection.

The intersection has 3 approaches. Traffic is controlled by a STOP sign placed on the minor street, Palm Drive. The east-west street, Foothill Boulevard, is 56 feet wide, curb-to-curb, and provides 2 lanes in each direction. The directional travel is separated by a yellow centerline stripe. The north-south street, Palm Drive, is 60 feet wide, and provides 1 lane in each direction. At the intersection, the southbound approach provides two lanes, one for the left-turn and the other is for right-turn movements. The primary land uses in the area are residential and school, with retail businesses located to the west, where Foothill Boulevard converges with Historic Route 66. The posted speed limit is 40 miles per hour on Foothill Boulevard and 25 miles per hour on Palm Drive. The nearest signalized intersection is at Foothill Boulevard and Citrus Avenue, which is approximately 900 feet to the east. Access to Azusa Pacific University campus is located to the west of the intersection, while access to Citrus College campus is located to the east.

Data Collection

There are 9 different signal warrants specified in California Manual of Uniform Traffic Control Devices (CA-MUTCD), dated November 7, 2014. These warrants were analyzed using all

N

necessary data collected in the field in September, 2015. A 24-hour machine traffic count was conducted on Thursday, September 17, 2015 for the 3 approaches of the intersection to obtain volume data needed for the warrants analysis. In addition, accident history data was collected from the Transportation Injury Mapping System (TIMS) maintained by University of California at Berkeley that uses accident history data from California State-Wide Integrated Traffic Records System (SWITRS).

In order to analyze pedestrian warrant for signalization, peak period (from 7-9 am and 4-6 pm) counts of pedestrian traffic were also counted at the existing pedestrian crosswalk across Palm Drive (Southbound leg). At the same time, bicycle counts were also taken.

It was observed that a total of 8 pedestrians walked along the north side from 7 am to 8 am and 2 pedestrians walked from 8 am to 9 am. However, along the south side (sidewalk) a total of 90 pedestrians walked from 7 am to 8 am and 101 pedestrians walked from 8 am to 9 am. During afternoon peak period (4-6pm) no pedestrian was observed walking along the north side. Along the south side (sidewalk) a total of 210 pedestrians walked from 4 pm to 5 pm and 111 pedestrians walked from 5 pm to 6 pm.

No bicyclists were observed using the crosswalk along the north side (crosswalk) during morning hours (7-8 am). However, along the south side (sidewalk) a total of 32 bicyclists biked from 7 am to 8 am and 29 bicyclists biked from 8 am to 9 am. During afternoon peak period hours (4-6pm), no bicyclists were observed biking along the north side. Along the south side (sidewalk), a total of 35 bicyclists biked from 4 pm to 5 pm and 41 bicyclists biked from 5 pm to 6 pm.

Data Analysis

The table below shows the warrants and the results of this warrant analysis. Detailed calculations and analysis worksheets are placed in the Technical Appendix.

TRAFFIC SIGNAL WARRANTS AND ANAYSIS RESULTS

Warrant No.	Title	Results	Comment
1	Eight-Hour Vehicular Volume	Not Satisfied	Only interruption of both 80% and 100% volume satisfied for 7 of the 8 hours. Four of the 8 hours were satisfied for minimum volume warrant by 80%, none of the 8 hours were satisfied by 100%.
2	Four-Hour Vehicular Volume	Not Satisfied	Volumes during only one of the 4 hours are satisfied by 100%. Volumes during the other three hours nearly approached 100% of requirements.
3	Peak Hour	Not Satisfied	Neither Part A nor Part B was satisfied 100%.
4	Pedestrian Volume	Satisfied	Only Part 2 is satisfied
5	School Crossing	Not Satisfied	Although access to Azusa Pacific University campus is located to the west of the intersection, and access to Citrus College campus is located to the east of the intersection, there is currently no marked pedestrian crosswalk across Foothill Boulevard at the intersection.
6	Coordinated Signal System	Not Satisfied	Only 1 of 2 parts is satisfied. Foothill Boulevard is a major arterial, so signal coordination at its intersections will be necessary. The nearest signals are 900 feet to the east at Citrus Avenue. While minimum requirement is 1,000 ft.
7	Crash Experience	Not Satisfied	Two of the 3 parts are satisfied. Only 1 accident was reported during 8 year (96-month) period from 01/01/06 to 12/31/13. Only 1 of the 5 required accidents occurred in a 12-month period in 2008 – a bicycle and motor vehicle accident on 2/19/08 causing injury.
8	Roadway Network	Not Satisfied	Only 1 of 2 parts is satisfied. Foothill Boulevard is a major arterial posted with 40 mph speed limit. Safe traffic progression along the corridor is necessary.
9	Intersection Near a Grade Crossing	Not Satisfied	None of the 2 parts is satisfied. Rail tracks do not traverse STOP controlled approach of Palm Drive

Conclusion

Only 1 of the 9 warrants for signalization, specified in California Manual of Uniform Traffic Control Devices (CA-MUTCD), dated November 7, 2014, is satisfied at the intersection of Foothill Boulevard and Palm Drive. Only the Pedestrian Volume Warrant (Warrant 4) was satisfied. According to the CA-MUTCD, "The Pedestrian Volume signal warrant is intended for application where the traffic volume on a major street is so heavy that pedestrians experience excessive delay in crossing the major street." Although there is no south leg of the intersection, and the pedestrians and bicyclists do not have any conflict with uninterrupted Foothill Boulevard traffic, a large majority of pedestrians and bicyclists have been observed to use the sidewalk along the south side of Foothill Boulevard.

It is recommended that a signal control system at this intersection be installed due to the high volume of pedestrians and bicyclists using only the sidewalk along the south side of Foothill Boulevard and the fact that this sidewalk ends abruptly over 1000 feet to the west, prior to the nearest convergent intersection at Foothill and Historic Route 66, which has no signalized crosswalk. Since the nearest controlled intersection and crosswalk is nearly 900 feet to the east, at Citrus Avenue, a signalized control system at the intersection of Palm Drive and Foothill Boulevard will allow a safe and controlled crosswalk across Foothill Boulevard which, in turn, will encourage pedestrians and bicyclists to use sidewalks along both the north and south sides of Foothill Boulevard on their way to and from the campuses of Azusa Pacific University and Citrus College.

Appendix

(Field Data and Signal Warrant Forms)

24-hour Traffic Volume Counts

TRAFFIC DESIGN, INC.

TEL: 626-826-7560
myrahi@hotmail.com

Foothill Boulevard W/O Palm Drive
Date: 9/17/2015 Thursday
Dir: Eastbound

Start Time	15-minute Totals AM	15-minute Totals PM	Hour Totals AM	Hour Totals PM
12:00	6	78		
12:15	9	78		
12:30	0	155		
12:45	0	185	15	496
01:00	2	112		
01:15	0	92		
01:30	4	68		
01:45	5	90	11	362
02:00	3	123		
02:15	1	190		
02:30	2	128		
02:45	3	96	9	537
03:00	0	115		
03:15	6	94		
03:30	1	144		
03:45	1	142	8	495
04:00	2	180		
04:15	0	159		
04:30	1	126		
04:45	3	123	6	588
05:00	8	157		
05:15	7	136		
05:30	11	145		
05:45	13	180	39	618
06:00	10	141		
06:15	25	119		
06:30	17	134		
06:45	43	156	95	550
07:00	34	108		
07:15	52	112		
07:30	76	120		
07:45	107	65	269	405
08:00	142	60		
08:15	98	48		
08:30	61	60		
08:45	60	71	361	239
09:00	90	77		
09:15	97	84		
09:30	77	107		
09:45	59	88	323	356
10:00	63	38		
10:15	65	28		
10:30	63	16		
10:45	129	18	320	100
11:00	150	12		
11:15	76	12		
11:30	69	13		
11:45	70	7	365	44
Total	1821	4790		
Percent	27.5%	72.5%		
ADT		6611		
Peak Hour Vol.	424	625		
Began	10:45	03:30		
	AM	PM		

TRAFFIC DESIGN, INC.

TEL: 626-826-7560
myrahi@hotmail.com

Foothill Boulevard E/O Palm Drive
Date: 9/17/2015 Thursday
Dir: Westbound

Start Time	15-minute Totals AM	15-minute Totals PM	Hour Totals AM	Hour Totals PM
12:00	10	64		
12:15	14	124		
12:30	6	211		
12:45	4	164	34	563
01:00	11	177		
01:15	6	90		
01:30	8	79		
01:45	3	63	28	409
02:00	1	107		
02:15	4	153		
02:30	6	156		
02:45	0	130	11	546
03:00	4	115		
03:15	3	74		
03:30	0	92		
03:45	4	114	11	395
04:00	3	176		
04:15	1	139		
04:30	3	116		
04:45	10	87	17	518
05:00	15	98		
05:15	11	148		
05:30	25	136		
05:45	49	122	100	504
06:00	70	117		
06:15	67	87		
06:30	94	110		
06:45	120	108	351	422
07:00	114	114		
07:15	121	112		
07:30	142	111		
07:45	140	71	517	408
08:00	162	73		
08:15	165	76		
08:30	160	108		
08:45	146	76	633	333
09:00	240	83		
09:15	170	60		
09:30	106	62		
09:45	156	61	672	266
10:00	112	66		
10:15	123	51		
10:30	120	40		
10:45	196	14	551	171
11:00	146	28		
11:15	160	21		
11:30	116	20		
11:45	87	10	509	79
Total	3434	4614		
Percent	42.7%	57.3%		
ADT		8048		
Peak Hour Vol.	716	676		
Began	08:30	12:15		
	AM	PM		

TRAFFIC DESIGN, INC.

TEL: 626-826-7560
myrahi@hotmail.com

Palm Drive N/O Foothill Boulevard
Date: 9/17/2015 Thursday
Dir: Southound

Start Time	15-minute Totals AM	15-minute Totals PM	Hour Totals AM	Hour Totals PM
12:00	3	20		
12:15	3	21		
12:30	2	39		
12:45	1	28	9	108
01:00	2	25		
01:15	1	23		
01:30	2	11		
01:45	2	17	7	76
02:00	0	34		
02:15	1	22		
02:30	2	22		
02:45	0	20	3	98
03:00	0	15		
03:15	1	25		
03:30	1	32		
03:45	3	16	5	88
04:00	2	22		
04:15	3	32		
04:30	4	26		
04:45	6	23	15	103
05:00	2	34		
05:15	10	22		
05:30	14	37		
05:45	17	34	43	127
06:00	18	35		
06:15	20	31		
06:30	24	31		
06:45	15	36	77	133
07:00	16	24		
07:15	34	26		
07:30	32	32		
07:45	36	19	118	101
08:00	47	22		
08:15	36	18		
08:30	35	20		
08:45	26	25	144	85
09:00	37	20		
09:15	34	17		
09:30	30	18		
09:45	29	19	130	74
10:00	38	11		
10:15	24	7		
10:30	12	17		
10:45	31	12	105	47
11:00	26	6		
11:15	21	9		
11:30	31	2		
11:45	20	8	98	25
Total	754	1065		
Percent	41.5%	58.5%		
ADT		1819		
Peak Hour Vol.	154	137		
Began	07:45 AM	05:30 PM		

TRAFFIC DESIGN, INC.
TEL: 626-826-7560
myrahi@hotmail.com

24 hour Average Daily Traffic Volumes at Palm Drive and Foothill Boulevard

(Data Sorted for Highest Volumes)

Major Street: Foothill Boulevard East-West)

Minor Street: Palm Drive (North-South)

Date of Count: September 17, 2015, Thursday

Hour	Northbound	Southbound	Eastbound	Westbound	Total Major Street	High Minor Street
Total	0	1,819	6,611	8,048	14,659	1,819
5pm-6pm	0	127	618	504	1,122	127
4pm-5pm	0	103	588	518	1,106	103
2pm-3pm	0	98	537	546	1,083	98
12pm-1pm	0	108	496	563	1,059	108
9am-10am	0	130	323	672	995	130
8am-9am	0	144	361	633	994	144
6pm-7pm	0	133	550	422	972	133
3pm-4pm	0	88	495	395	890	88
11am-12pm	0	98	365	509	874	98
10am-11am	0	105	320	551	871	105
7pm-8pm	0	101	405	408	813	101
7am-8am	0	118	269	517	786	118
1pm-2pm	0	76	362	409	771	76
9pm-10pm	0	74	356	266	622	74
8pm-9pm	0	85	239	333	572	85
6am-7am	0	77	95	351	446	77
10pm-11pm	0	47	100	171	271	47
5am-6am	0	43	39	100	139	43
11pm-12am	0	25	44	79	123	25
12am-1am	0	9	15	34	49	9
1am-2am	0	7	11	28	39	7
4am-5am	0	15	6	17	23	15
2am-3am	0	3	9	11	20	3
3am-4am	0	5	8	11	19	5

Peak Hour Pedestrian and Bicycle Counts

CITY TRAFFIC COUNTERS
WWW.CTCOUNTERS.COM

File Name : palm_foothill_bp
Site Code : 00000000
Start Date : 9/17/2015
Page No : 1

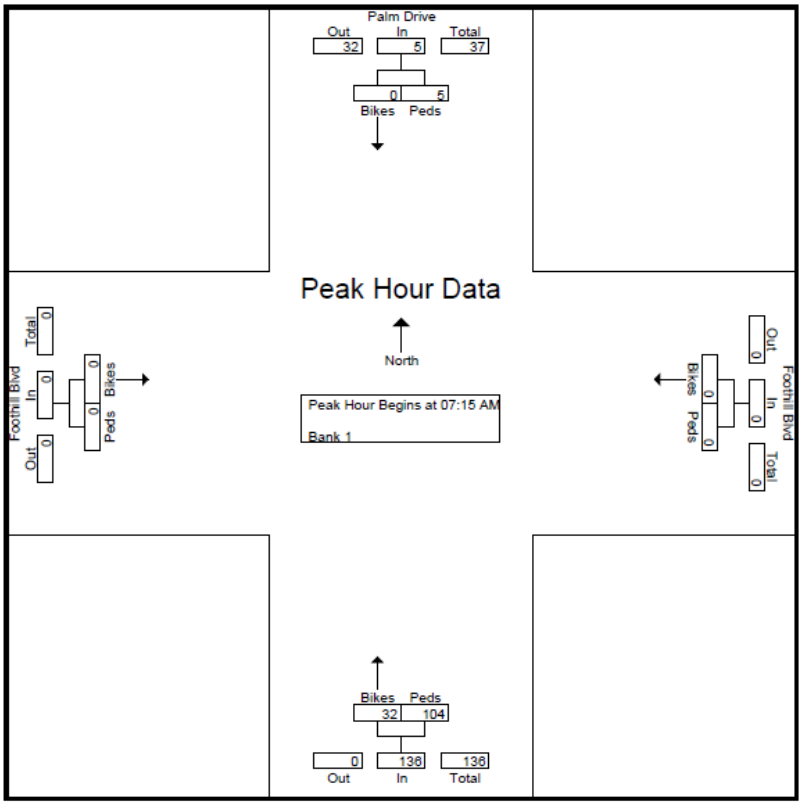
Groups Printed- Bank 1

	Palm Drive Southbound		Foothill Blvd Westbound		Northbound		Foothill Blvd Eastbound		
Start Time	Bikes	Peds	Bikes	Peds	Bikes	Peds	Bikes	Peds	Int. Total
07:00 AM	0	3	0	0	3	6	0	0	12
07:15 AM	0	2	0	0	8	23	0	0	33
07:30 AM	0	3	0	0	11	34	0	0	48
07:45 AM	0	0	0	0	10	27	0	0	37
Total	0	8	0	0	32	90	0	0	130
08:00 AM	0	0	0	0	3	20	0	0	23
08:15 AM	0	1	0	0	6	19	0	0	26
08:30 AM	0	0	0	0	9	28	0	0	37
08:45 AM	0	1	0	0	11	34	0	0	46
Total	0	2	0	0	29	101	0	0	132
04:00 PM	0	0	0	0	19	125	0	0	144
04:15 PM	0	0	0	0	6	26	0	0	32
04:30 PM	0	0	0	0	5	41	0	1	47
04:45 PM	0	0	0	0	5	18	0	0	23
Total	0	0	0	0	35	210	0	1	246
05:00 PM	0	0	0	0	5	14	0	1	20
05:15 PM	0	0	0	1	9	17	0	0	27
05:30 PM	0	0	0	0	14	39	0	0	53
05:45 PM	0	0	0	0	13	41	0	0	54
Total	0	0	0	1	41	111	0	1	154
Grand Total	0	10	0	1	137	512	0	2	662
Apprch %	0	100	0	100	21.1	78.9	0	100	
Total %	0	1.5	0	0.2	20.7	77.3	0	0.3	

CITY TRAFFIC COUNTERS
WWW.CTCOUNTERS.COM

File Name : palm_foothill_bp
Site Code : 00000000
Start Date : 9/17/2015
Page No : 2

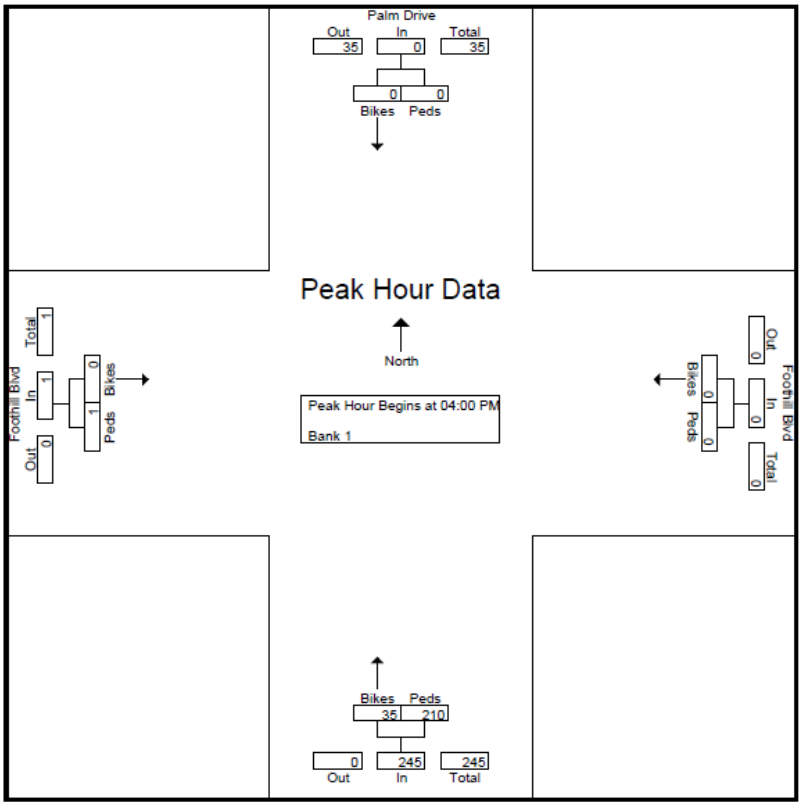
	Palm Drive Southbound			Foothill Blvd Westbound			Northbound			Foothill Blvd Eastbound			
Start Time	Bikes	Peds	App. Total	Bikes	Peds	App. Total	Bikes	Peds	App. Total	Bikes	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 11:45 AM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 07:15 AM													
07:15 AM	0	2	2	0	0	0	8	23	31	0	0	0	33
07:30 AM	0	3	3	0	0	0	11	34	45	0	0	0	48
07:45 AM	0	0	0	0	0	0	10	27	37	0	0	0	37
08:00 AM	0	0	0	0	0	0	3	20	23	0	0	0	23
Total Volume	0	5	5	0	0	0	32	104	136	0	0	0	141
% App. Total	0	100		0	0		23.5	76.5		0	0		
PHF	.000	.417	.417	.000	.000	.000	.727	.765	.756	.000	.000	.000	.734



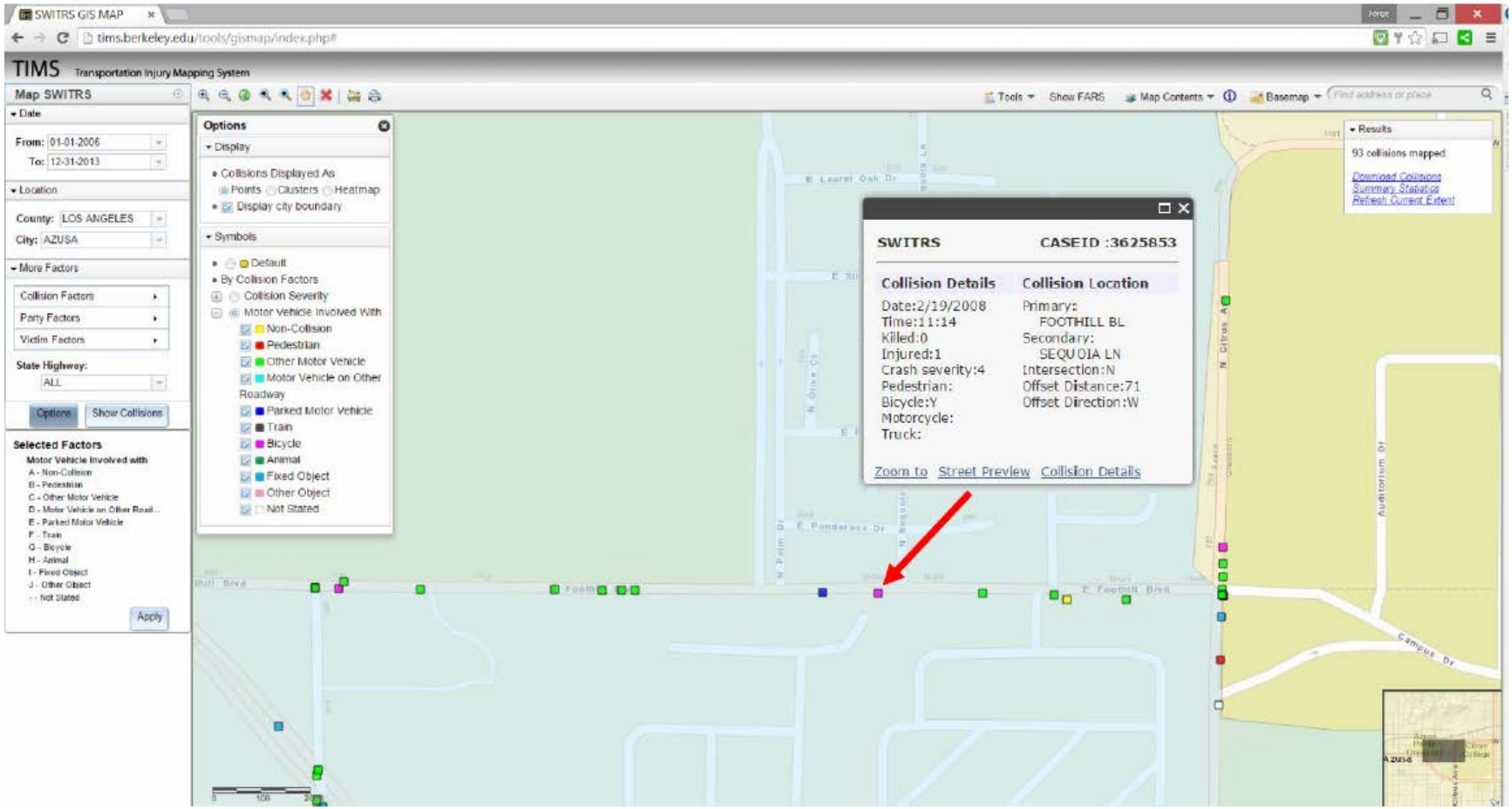
CITY TRAFFIC COUNTERS
WWW.CTCOUNTERS.COM

File Name : palm_foothill_bp
Site Code : 00000000
Start Date : 9/17/2015
Page No : 3

	Palm Drive Southbound			Foothill Blvd Westbound			Northbound			Foothill Blvd Eastbound			
Start Time	Bikes	Peds	App. Total	Bikes	Peds	App. Total	Bikes	Peds	App. Total	Bikes	Peds	App. Total	Int. Total
Peak Hour Analysis From 12:00 PM to 05:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 04:00 PM													
04:00 PM	0	0	0	0	0	0	**19**	**125**	**144**	0	0	0	**144**
04:15 PM	0	0	0	0	0	0	6	26	32	0	0	0	32
04:30 PM	0	0	0	0	0	0	5	41	46	0	**1**	**1**	47
04:45 PM	0	0	0	0	0	0	5	18	23	0	0	0	23
Total Volume	0	0	0	0	0	0	35	210	245	0	1	1	246
% App. Total	0	0		0	0		14.3	85.7		0	100		
PHF	.000	.000	.000	.000	.000	.000	.461	.420	.425	.000	.250	.250	.427



Accident History


SWITRS GIS MAP
tims.berkeley.edu/tools/gismap/index.php#
TIMS
Transportation Injury Mapping System
Map SWITRS
Tools
Show FARS
Map Contents
Basemap
Date
From: 01-01-2006
To: 12-31-2013
Location
County: LOS ANGELES
City: AZUSA
More Factors
Collision Factors
Party Factors
Victim Factors
State Highway:
ALL
Options
Show Collisions
Selected Factors
Motor Vehicle Involved with
A - Non-Collision
B - Pedestrian
C - Other Motor Vehicle
D - Motor Vehicle on Other Road...
E - Parked Motor Vehicle
F - Train
G - Bicycle
H - Animal
I - Fixed Object
J - Other Object
- - Not Stated
Apply
Options
Display
Collisions Displayed As
Points
Clusters
Heatmap
Display city boundary
Symbols
Default
By Collision Factors
Collision Severity
Motor Vehicle Involved With
Non-Collision
Pedestrian
Other Motor Vehicle
Motor Vehicle on Other Roadway
Parked Motor Vehicle
Train
Bicycle
Animal
Fixed Object
Other Object
Not Stated
Results
93 collisions mapped.
Download Collisions
Summary Statistics
Refresh Current Extent
SWITRS
CASEID :3625853
Collision Details
Date:2/19/2008
Time:11:14
Killed:0
Injured:1
Crash severity:4
Pedestrian:
Bicycle:Y
Motorcycle:
Truck:
Collision Location
Primary:
FOOTHILL BL
Secondary:
SEQUOIA LN
Intersection:N
Offset Distance:71
Offset Direction:W
Zoom to
Street Preview
Collision Details
E Foothill Blvd
Campus Dr
Auditorium Dr

Signal Warrant Forms

TRAFFIC SIGNAL WARRANT ANALYSIS

(Based on CA-MUTCD 2014 Edition)

07	LA	0	AZU
DIST	CO	RTE	PM

COUNT DATE 09/17/15

CALC MYR DATE 10/01/15

CHK MYR DATE 10/01/15

Major Street: Foothill Boulevard

Minor Street: Palm Drive

Date of Count: September 17, 2015, Thursday

Critical Approach Speed: 40 mph

Critical Approach Speed: 25 mph

Urban or Rural?	Urban

WARRANT 1 - Eight Hour Vehicular Volume

Condition A - Minimum Vehicle Volume

100% SATISFIED	**YES**		**NO**	√
80% SATISFIED	**YES**		**NO**	√

	MINIMUM REQUIREMENTS (80% SHOWN IN BRACKETS)											
	U	R	U	R								
Approach Lanes	1		2 or More		5pm-6pm	4pm-5pm	2pm-3pm	12pm-1pm	9am-10am	8am-9am	6pm-7pm	3pm-4pm
Both Approaches Major Street	500	350	**600**	420	1,122	1,106	1,083	1,059	995	994	972	890
	(400)	(280)	**(480)**	(336)								
Highest Approach Minor Street	**150**	105	200	140	127	103	98	108	130	144	133	88
	(120)	(84)	(160)	(112)								

Condition B - Interruption of Continuous Traffic

100% SATISFIED	**YES**	√	**NO**	
80% SATISFIED	**YES**	√	**NO**	

	MINIMUM REQUIREMENTS (80% SHOWN IN BRACKETS)											
	U	R	U	R								
Approach Lanes	1		2 or More		5pm-6pm	4pm-5pm	2pm-3pm	12pm-1pm	9am-10am	8am-9am	6pm-7pm	3pm-4pm
Both Approaches Major Street	750	625	**900**	630	1,122	1,106	1,083	1,059	995	994	972	890
	(600)	(420)	**(720)**	(504)								
Highest Approach Minor Street	**75**	53	100	70	127	103	98	108	130	144	133	88
	(60)	(42)	(80)	(56)								

Combination of Conditions A & B

SATISFIED	**YES**		**NO**	√

REQUIREMENT	CONDITION	√	FULFILLED			
TWO CONDITIONS SATISFIED 80%	A. MINIMUM VEHICULAR VOLUME		Yes		No	√
	AND B. INTERRUPTION OF CONTINUOUS TRAFFIC					
AND AN ADEQUATE TRIAL OF OTHER ALTERNATIVES THAT COULD CAUSE LESS DELAY AND INCONVENIENCE TO TRAFFIC HAS FAILED TO SOLVE THE TRAFFIC PROBLEMS			Yes	√	No	

WARRANT 2 - Four Hour Vehicular Volume **SATISFIED* YES ☐ NO ☒**

Record hourly vehicular volumes for any four hours of an average day.

APPROACH LANES	One	2 or More	Hour			
Both Approaches - Major Street		X	1122	1106	1083	1059
Higher Approach - Minor Street	X		127	103	98	108

*All plotted points fall above the applicable curve in Figure 4C-1. (URBAN AREAS)	Yes ☐	No ☒
OR, All plotted points fall above the applicable curve in Figure 4C-2. (RURAL AREAS)	Yes ☐	No ☐

N/A

WARRANT 3 - Peak Hour **SATISFIED YES ☐ NO ☒**
(Part A or Part B must be satisfied)

PART A **SATISFIED YES ☐ NO ☒**

(All parts 1, 2, and 3 below must be satisfied for the same one hour, for any four consecutive 15-minute periods)

1. The total delay experienced by traffic on one minor street approach (one direction only) controlled by a STOP sign equals or exceeds four vehicle-hours for a one-lane approach, or five vehicle-hours for a two-lane approach; AND	Yes ☐	No ☒
2. The volume on the same minor street approach (one direction only) equals or exceeds 100 vph for one moving lane of traffic or 150 vph for two moving lanes; AND	Yes ☒	No ☐
3. The total entering volume serviced during the hour equals or exceeds 800 vph for intersections with four or more approaches or 650 vph for intersections with three approaches.	Yes ☒	No ☐

PART B **SATISFIED YES ☐ NO ☒**

APPROACH LANES	One	2 or More	Hour
Both Approaches - Major Street		X	1122
Higher Approach - Minor Street	X		127

The plotted point falls above the applicable curve in Figure 4C-3. (URBAN AREAS)	Yes ☐	No ☒
OR, The plotted point falls above the applicable curve in Figure 4C-4. (RURAL AREAS)	Yes ☐	No ☐

The satisfaction of a traffic signal warrant or warrants shall not in itself require the installation of a traffic control signal.

WARRANT 4 - Pedestrian Volume
(Parts 1 and 2 Must Be Satisfied)

SATISFIED YES ☒ NO ☐

Part 1 (Parts A or B must be satisfied)

	Hours - - ->				
A.	Vehicles per hour for any 4 hours	1122	1106	1083	1059
	Pedestrians per hour for any 4 hours	90	101	210	111

Figure 4C-5 or Figure 4C-6
SATISFIED YES ☐ NO ☒

	Hours - - ->				
B.	Vehicles per hour for any 1 hour	1083			
	Pedestrians per hour for any 1 hour	210			

Figure 4C-7 or Figure 4C-8
SATISFIED YES ☐ NO ☒

Part 2 **SATISFIED YES ☒ NO ☐**

AND, The distance to the nearest traffic signal along the major street is greater than 300 ft	Yes ☒ No ☐
OR, The proposed traffic signal will not restrict progressive traffic flow along the major street.	Yes ☒ No ☐

WARRANT 5 - School Crossing
(Parts A and B Must Be Satisfied)

SATISFIED YES ☐ NO ☒

Part A
Gap/Minutes and # of Children

SATISFIED YES ☐ NO ☒

		Hour
Gaps vs Minutes	Minutes Children Using Crossing	
	Number of Adequate Gaps	
School Age Pedestrians Crossing Street / hr		0

Gaps < Minutes YES ☐ NO ☐
AND Children > 20/hr YES ☐ NO ☒

AND, Consideration has been given to less restrictive remedial measures.	Yes ☐ No ☐

Part B **SATISFIED YES ☒ NO ☐**

The distance to the nearest traffic signal along the major street is greater than 300 ft	Yes ☒ No ☐
OR, The proposed signal will not restrict the progressive movement of traffic.	Yes ☒ No ☐

The satisfaction of a traffic signal warrant or warrants shall not in itself require the installation of a traffic control signal.

WARRANT 6 - Coordinated Signal System **SATISFIED YES ☐ NO ☒**
(All Parts Must Be Satisfied)

MINIMUM REQUIREMENTS	DISTANCE TO NEAREST SIGNAL	
≥ 1000 ft	N _____ ft, S _____ ft, E 900 ft, W _____ ft	Yes ☐ No ☒
On a one-way street or a street that has traffic predominantly in one direction, the adjacent traffic control signals are so far apart that they do not provide the necessary degree of vehicular platooning.		Yes ☒ No ☐
OR, On a two-way street, adjacent traffic control signals do not provide the necessary degree of platooning and the proposed and adjacent traffic control signals will collectively provide a progressive operation.		

WARRANT 7 - Crash Experience Warrant **SATISFIED YES ☐ NO ☒**
(All Parts Must Be Satisfied)

Adequate trial of alternatives with satisfactory observance and enforcement has failed to reduce the crash frequency.			Yes ☒ No ☐
REQUIREMENTS	Number of crashes reported within a 12 month period susceptible to correction by a traffic signal, and involving injury or damage exceeding the requirements for a reportable crash.		Yes ☐ No ☒
5 OR MORE	1		
REQUIREMENTS	CONDITIONS	✓	
ONE CONDITION SATISFIED 80%	Warrant 1, Condition A - Minimum Vehicular Volume		
	OR, Warrant 1, Condition B - Interruption of Continuous Traffic	√	Yes ☒ No ☐
	OR, Warrant 4, Pedestrian Volume Condition Ped Vol ≥ 152 for any hour OR, Ped Vol ≥ 80 for any 4 hours		

WARRANT 8 - Roadway Network **SATISFIED YES ☐ NO ☒**
(All Parts Must Be Satisfied)

MINIMUM VOLUME REQUIREMENTS	ENTERING VOLUMES - ALL APPROACHES	✓	FULFILLED
1000 Veh/Hr	During Typical Weekday Peak Hour 1,209 Veh/Hr and has 5-year projected traffic volumes that meet one or more of Warrants 1, 2, and 3 during an average weekday.		Yes ☒ No ☐
	OR During Each of Any 5 Hrs. of a Sat. or Sun _____ Veh/Hr		

CHARACTERISTICS OF MAJOR ROUTES	MAJOR ROUTE A	MAJOR ROUTE B	
Hwy. System Serving as Principal Network for Through Traffic	X		
Rural or Suburban Highway Outside Of, Entering, or Traversing a City			
Appears as Major Route on an Official Plan	X		
Any Major Route Characteristics Met, Both Streets			Yes ☐ No ☒

The satisfaction of a traffic signal warrant or warrants shall not in itself require the installation of a traffic control signal.

WARRANT 9 - Intersection Near a Grade Crossing **SATISFIED YES ☐ NO ☒**
(Both Parts A and B Must Be Satisfied)

PART A A grade crossing exists on an approach controlled by a STOP or YIELD sign and the center of the track nearest to the intersection is within 140 feet of the stop line or yield line on the approach. Track Center Line to Limit Line _____ ft	Yes ☐ No ☒
PART B **There is one minor street approach lane at the track crossing -** During the highest traffic volume hour during which rail traffic uses the crossing, the plotted point falls above the applicable curve in Figure 4C-9. Major Street - Total of both approaches: _____ VPH Minor Street - Crosses the track (one direction only, approaching the intersection): _____ VPH X AF (Use Tables 4C-2, 3, & 4 below to calculate AF) = _____ VPH	Yes ☐ No ☒
OR, There are two or more minor street approach lanes at the track crossing - During the highest traffic volume hour during which rail traffic uses the crossing, the plotted point falls above the applicable curve in Figure 4C-10. Major Street - Total of both approaches : _____ VPH Minor Street - Crosses the track (one direction only, approaching the intersection): _____ VPH X AF (Use Tables 4C-2, 3, & 4 below to calcualte AF) = _____ VPH	

The minor street approach volume may be multiplied by up to three following adjustment factors (AF) as described in Section 4C.10.

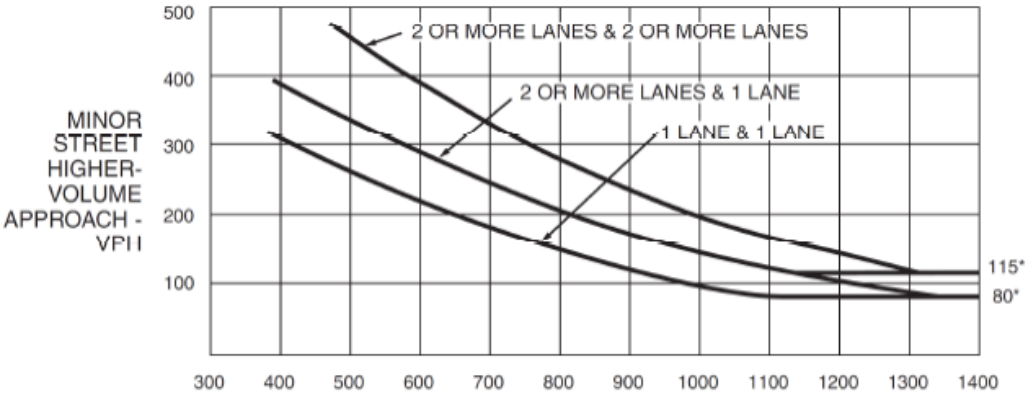
1- Number of Rail Traffic per Day_____ Adjustment factor from table 4C-2____

2- Percentage of High-Occupancy Buses on Minor Street Approach_____ Adjustment factor from table 4C-3____

3- Percentage of Tractor-Trailer Trucks on Minor Street Approach_____ Adjustment factor from table 4C-4____

NOTE: If no data is availale or known, then use AF = 1 (no adjustment)

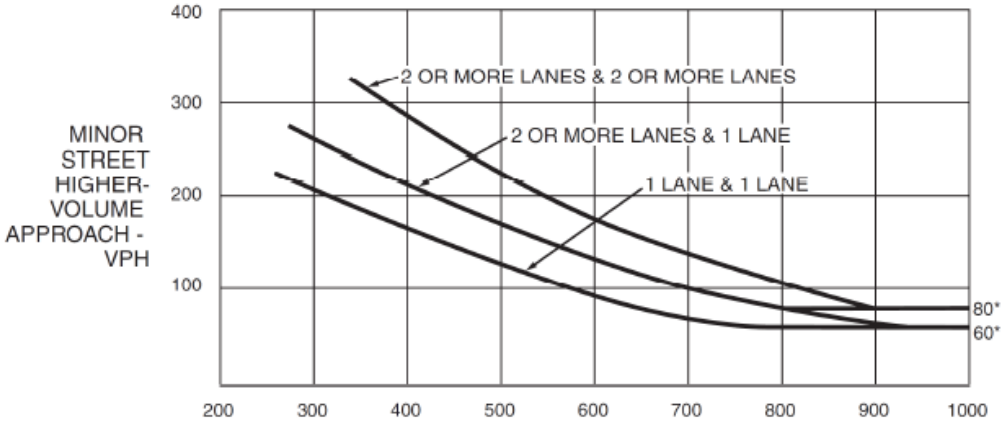
Figure 4C-1. Warrant 2, Four-Hour Vehicular Volume



*Note: 115 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 80 vph applies as the lower threshold volume for a minor-street approach with one lane.

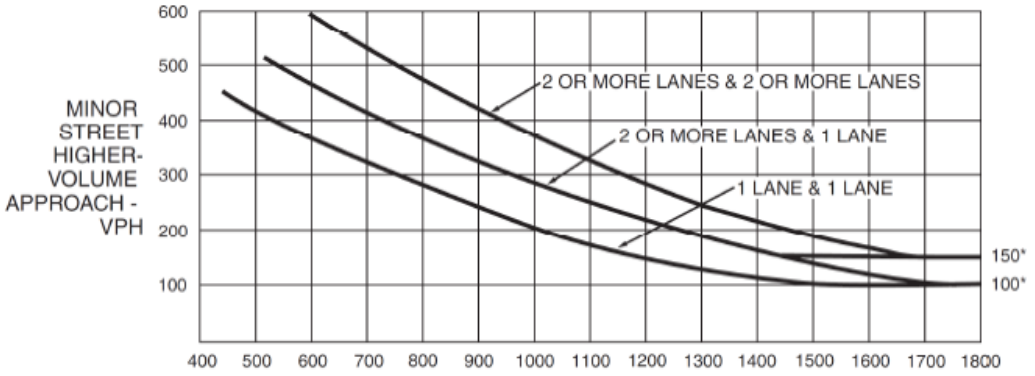
Figure 4C-2. Warrant 2, Four-Hour Vehicular Volume (70% Factor)

(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 40 MPH ON MAJOR STREET)



*Note: 80 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 60 vph applies as the lower threshold volume for a minor-street approach with one lane.

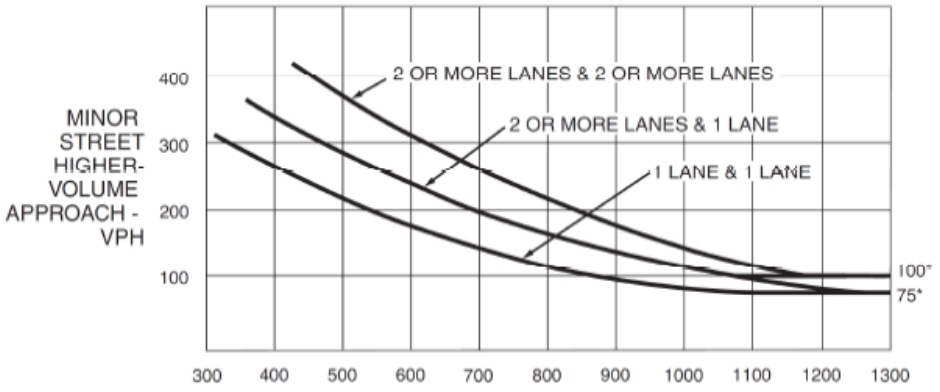
Figure 4C-3. Warrant 3, Peak Hour



*Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

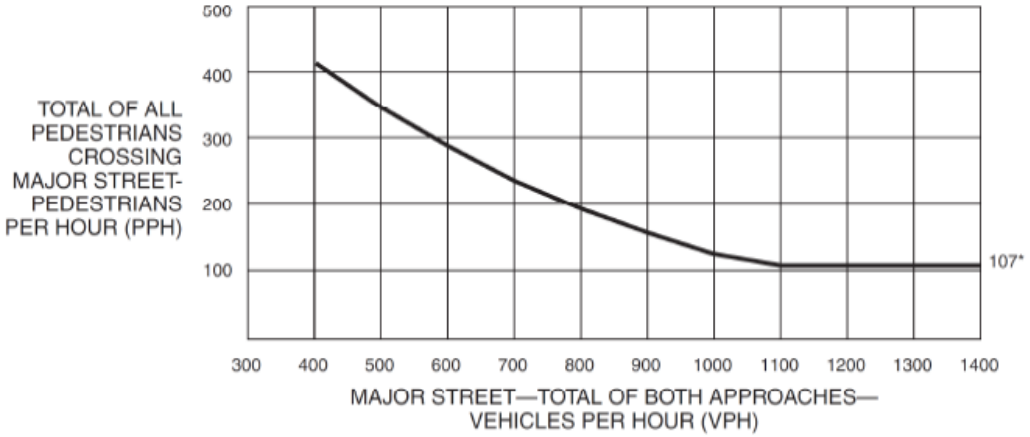
Figure 4C-4. Warrant 3, Peak Hour (70% Factor)

(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 40 MPH ON MAJOR STREET)



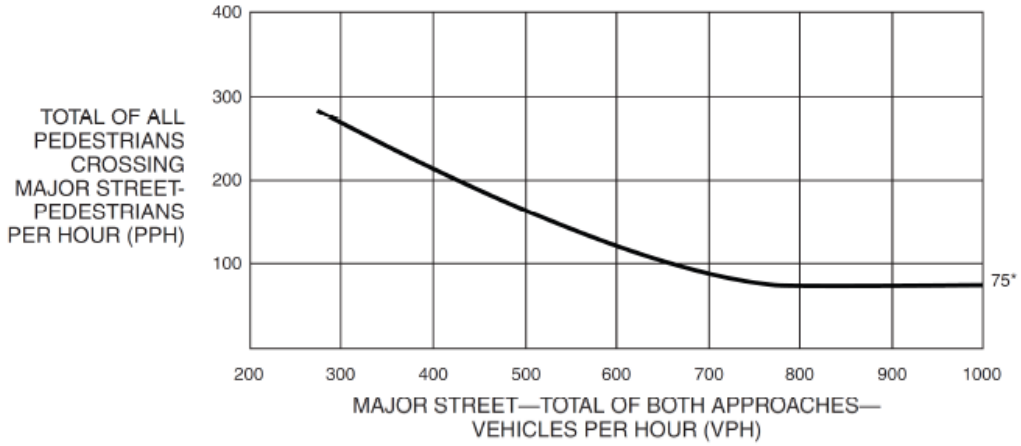
*Note: 100 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 75 vph applies as the lower threshold volume for a minor-street approach with one lane.

Figure 4C-5. Warrant 4, Pedestrian Four-Hour Volume



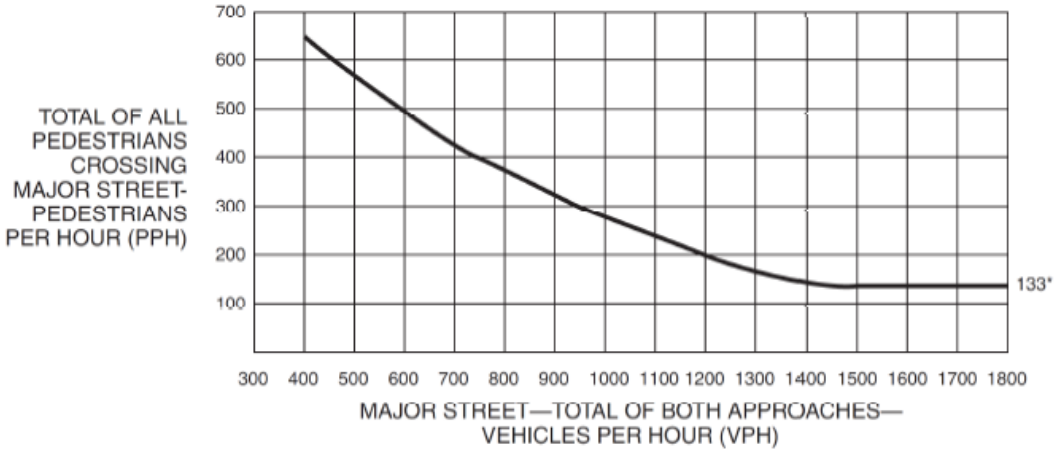
*Note: 107 pph applies as the lower threshold volume.

Figure 4C-6. Warrant 4, Pedestrian Four-Hour Volume (70% Factor)



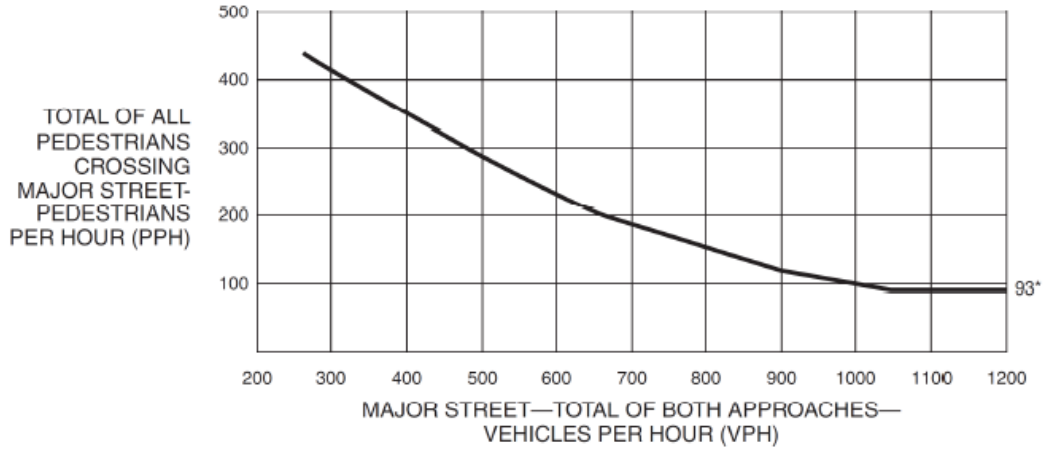
*Note: 75 pph applies as the lower threshold volume.

Figure 4C-7. Warrant 4, Pedestrian Peak Hour



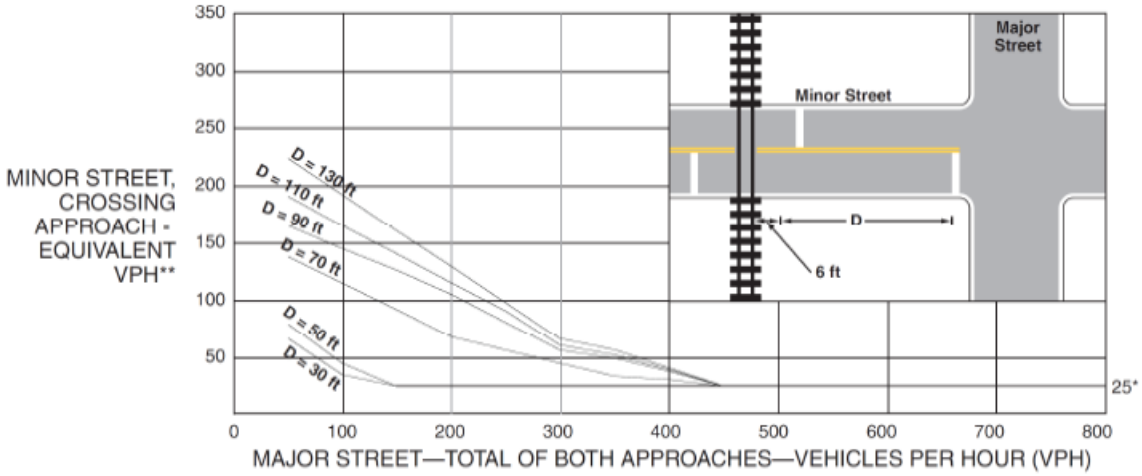
*Note: 133 pph applies as the lower threshold volume.

Figure 4C-8. Warrant 4, Pedestrian Peak Hour (70% Factor)



*Note: 93 pph applies as the lower threshold volume.

Figure 4C-9. Warrant 9, Intersection Near a Grade Crossing (One Approach Lane at the Track Crossing)



* 25 vph applies as the lower threshold volume

** VPH after applying the adjustment factors in Tables 4C-2, 4C-3, and/or 4C-4, if appropriate

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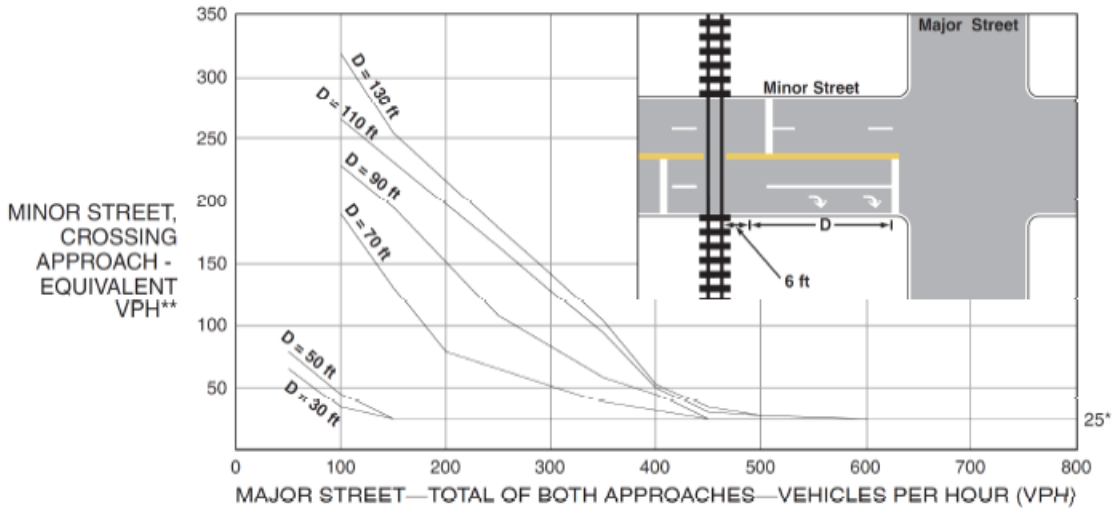
Figure 4C-10. Warrant 9, Intersection Near a Grade Crossing (Two or More Approach Lanes at the Track Crossing)



* 25 vph applies as the lower threshold volume

** VPH after applying the adjustment factors in Tables 4C-2, 4C-3, and/or 4C-4, if appropriate