July 5, 2019

Mr. Jesus Saldana, Senior Engineering Technician
CITY OF SIGNAL HILL
2175 Cherry Avenue
Signal Hill, CA 90755

RE: Signal Hill Business Center Signal Warrant Analysis
18-0056

Mr. Jesus Saldana:

INTRODUCTION

Ganddini Group, Inc. is pleased to submit this Signal Warrant Analysis for the Signal Hill Business Center project. As requested by City of Signal Hill engineering staff, the purpose of this Signal Warrant Analysis is to evaluate the potential need for installation of a traffic signal at the intersection of Walnut Avenue and Hill Street.

This analysis supplements the Signal Hill Business Center Traffic Impact Analysis (Kunzman Associates, Inc., Final July 2019) ["Project Traffic Impact Analysis"] and the Supplemental Afternoon School Peak Hour Analysis (Kunzman Associates, Inc, May 31, 2018). The project site is generally bounded by Gundry Avenue to the west, Gundry Hill Apartments and American University of Health Sciences to the north, Gaviota Avenue to the east, and the Signal Hill City Limits and Alamitos Avenue to the south. The project site is currently vacant. The proposed project involves developing the project site with a business park consisting of nine buildings totaling 139,080 square feet plus 12,000 square feet of mezzanine, for a total of 151,080 square feet of gross floor area. Full access driveways are proposed at Gundry Avenue, Walnut Avenue, and Alamitos Avenue. The proposed project is anticipated to be constructed and fully operational by Year 2020.

Although this is a technical report, effort has been made to write the report clearly and concisely. A glossary is provided in Appendix A to assist the reader with technical terms related to transportation engineering.

EXISTING ROADWAY CONDITIONS

The study intersection of Walnut Avenue at Hill Street is currently all-way stop controlled. Each approach provides one shared left/through/right turn lane, except for the southbound approach, which provides one shared left turn/through lane and one dedicated right turn lane. The study intersection provides school crosswalk markings on all four legs.

Walnut Avenue is a two lane undivided roadway trending in a north-south direction in the project vicinity. North of Hill Street, Walnut Avenue has a curb-to-curb width of approximately 52 feet with on-street parking permitted on both sides of the roadway. South of Hill Street, Walnut Avenue has a curb-to-curb width of approximately 42 feet with on-street parking permitted on both sides of the roadway. The posted speed limit on Walnut Avenue is 30 miles per hour in the project vicinity, except near the intersection at Hill Street where a school zone speed limit of 25 miles per hour applies when children are present.

Hill Street is a two lane undivided roadway trending in an east-west direction in the project vicinity. Hill Street has a curb-to-curb width of approximately 36 feet with on-street parking permitted on both sides of the roadway.

Existing vehicular and pedestrian volumes were obtained at the study intersection in October 2018 during typical weekday conditions. Appendix B contains the traffic count worksheets.

EXISTING TRAFFIC SIGNAL WARRANT ANALYSIS

The application of traffic control devices is governed by Federal standards adopted by the State of California and contained in the California Manual on Uniform Traffic Control Devices (California MUTCD, 2014). Part 4C – Traffic Control Signal Needs Studies of the California MUTCD contains a total of nine traffic signal warrants, or criteria, which serve to determine whether installation of a traffic signal is justified at a particular location. As noted in the California MUTCD, application of the traffic signal warrants should be based on engineering judgement; satisfaction of one or more traffic signal warrants shall not in itself require the installation of a traffic signal.

The traffic signal warrants are based on criteria for "urban" or "rural" settings. Urban criteria are used when the speed limit (or critical speed) for major street is 40 miles per hour or less. Rural criteria are used when the speed limit for the major street is greater than 40 miles per hour or the intersection is located in the built up area of an isolated community (i.e., population less than 10,000). For purposes of this traffic signal warrant analysis, the study area is considered urban since the posted speed limit is less than 40 miles per hour.

The following provides a brief summary of the evaluation for each of the traffic signal warrants based on existing conditions. Detailed traffic signal warrant worksheets are included in Appendix C.

Warrant 1 – Eight-Hour Vehicular Volume

Warrant 1 considers vehicular traffic volume for each of any eight hours of an average day. To determine if Warrant 1 is satisfied, eight hour vehicular volumes are evaluated against criteria for minimum vehicular volume (Condition A) and interruption of continuous traffic (Condition B). One or both conditions may be satisfied, or 80% of both conditions, for Warrant 1 to be satisfied. Based on the existing traffic data collected, Warrant 1 is not currently satisfied at the study intersection.

Warrant 2 – Four-Hour Vehicular Volume

Warrant 2 considers vehicular traffic volume for each of any four hours of an average day. To determine if Warrant 2 is satisfied, major street approach volumes versus the higher minor street approach volume are plotted against the applicable curve line (i.e., minimum volume criteria). Warrant 2 is satisfied if all four plotted points fall above the applicable curve. Based on the existing traffic data collected, Warrant 2 is not currently satisfied at the study intersection.

Warrant 3 – Peak Hour Vehicular Volume

Warrant 3 considers vehicular traffic volume for the peak hour of an average day. To determine if Warrant 3 is satisfied, major street approach volumes versus the higher minor street approach volume are plotted against the applicable curve line (i.e., minimum volume criteria). Warrant 3 is satisfied if the plotted point falls above

the applicable curve. Based on the existing traffic data collected, Warrant 3 is not currently satisfied at the study intersection.

Warrant 4 – Pedestrian Volume

Warrant 4 considers four-hour and peak hour pedestrian volumes compared to the traffic volumes on the major street on an average day. To determine if Warrant 4 is satisfied, four-hour and peak hour pedestrian volumes versus major street approach volumes are plotted against the applicable curve lines (i.e., minimum volume criteria). Warrant 4 is satisfied if the plotted points fall above the applicable curve. Based on the existing traffic data collected, Warrant 4 is not currently satisfied at the study intersection.

Warrant 5 – School Crossing

Warrant 5 considers the frequency and adequacy of gaps in the vehicular traffic stream as related to the number and size of groups of schoolchildren at an established school crossing across the major street. The California MUTCD defines "schoolchildren" as elementary through high school students. This warrant also requires a minimum of 20 school age pedestrians crossing the major street per hour.

As stated in the California MUTCD, before a decision is made to install a traffic control signal based on school crossing needs, consideration shall be given to the implementation of other remedial measures, such as warning signs and flashers, school speed zones, school crossing guards, or a grade-separated crossing. It should be noted that the study intersection is currently all-way stop-controlled, is located within a school speed zone, and provides a school crossing guard during school commute times. The presence of an adult crossing guard effectively ensures school-age children receive the necessary gaps for crossing the intersection. There were no reported collisions involving bicycles or pedestrians based on review of the collision records discussed under Warrant 7.

Based on the existing school crossing measures, Warrant 5 is not currently satisfied at the study intersection.

Warrant 6 – Coordinated Signal System

Warrant 6 considers whether a traffic signal may be necessary to maintain proper progression and platooning of vehicles in a coordinated traffic signal system. Neither Walnut Avenue nor Hill Street are required to maintain proper progression, therefore, Warrant 6 is not currently satisfied at the study intersection.

Warrant 7 – Crash Experience

Warrant 7 considers the severity and frequency of traffic collisions within a 12-month period that are susceptible to correction by installation of a traffic signal, such as broadside or right-of-way violations involving vehicles, bicycles, or pedestrians.

Collision records were obtained for the period from January 1, 2013 to November 2, 2018. Collision history for January 2013 to December 2017 was mapped using the Transportation Injury Mapping System (TIMS) developed by University of California, Berkeley. Since the TIMS database does not currently include collision records for 2018, additional records for the period from January 1, 2018 to November 2, 2018 were obtained from the Statewide Integrated Traffic Records System (SWITRS). Collision records are provided in Appendix D.

A total of five collisions were reported within 100 feet of the study intersection during the review period. Only three of the five collisions within 100 feet of the study intersection are susceptible to correction by installation of a traffic signal, two of which occurred within a 12-month period. Based on review of collision records obtained, Warrant 7 is not currently satisfied at the study intersection.

Warrant 8 – Roadway Network

Warrant 8 considers whether installation of a traffic signal would be justified to encourage concentration and organization of traffic flow on a roadway network. All parts of Warrant 8 must be satisfied, including minimum peak hour volumes, 5-year projected volumes, and major route characteristics. Consistent with the Signal Hill Business Center Traffic Impact Analysis, five-year projected volumes were determined by increasing existing volumes by one-percent (1%) per year over a five-year period. Based on the existing traffic data collected, Warrant 8 is not currently satisfied at the study intersection.

Warrant 9 – Intersection Near a Grade Crossing

Warrant 9 considers the proximity to the intersection of a railway grade crossing on an intersection approach controlled by a STOP or YIELD sign. This warrant does not apply since there are no railway grade crossings in the project vicinity.

FUTURE CONDITIONS

The Project Traffic Impact Analysis and the Supplemental Afternoon School Peak Hour Analysis contain future traffic volume projections for the AM, School PM, and PM peak hours. Based on the peak hour traffic signal warrants for General Plan Buildout With Project volumes, a traffic signal is not forecast to be warranted for future conditions. The future conditions peak hour traffic signal warrant worksheets are provided in Appendix E.

CONCLUSION

The following is a summary of the results of the traffic signal warrant analysis for existing conditions:

Traffic Signal Warrant	Satisfied?
Warrant 1 - Eight Hour Vehicular Volume	No
Warrant 2 - Four Hour Vehicular Volume	No
Warrant 3 - Peak Hour Vehicular Volume	No
Warrant 4 - Pedestrian Volume	No
Warrant 5 - School Crossing	No
Warrant 6 - Coordinated Signal System	No
Warrant 7 - Crash Experience	No
Warrant 8 - Roadway Network	No
Warrant 9 - Intersection Near Grade Crossing	Not Applicable

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Since none of the traffic signal warrants are currently satisfied, installation of a traffic signal at the study intersection is not warranted based on existing conditions.

Based on the peak hour traffic signal warrants for General Plan Buildout With Project volumes, a traffic signal is not forecast to be warranted for future conditions.

We appreciate the opportunity to assist you on this project. Should you have any questions or if we can be of further assistance, please do not hesitate to call at (714) 795-3100.

Sincerely,

Giancarlo Ganddini, PE, PTP
Principal

APPENDIX A

GLOSSARY

GLOSSARY OF TERMS

ACRONYMS

AC	Acres
ADT	Average Daily Traffic
Caltrans	California Department of Transportation
DU	Dwelling Unit
ICU	Intersection Capacity Utilization
LOS	Level of Service
TSF	Thousand Square Feet
V/C	Volume/Capacity
VMT	Vehicle Miles Traveled

TERMS

AVERAGE DAILY TRAFFIC: The average 24-hour volume for a stated period divided by the number of days in that period. For example, Annual Average Daily Traffic is the total volume during a year divided by 365 days.

BANDWIDTH: The number of seconds of green time available for through traffic in a signal progression.

BOTTLENECK: A point of constriction along a roadway that limits the amount of traffic that can proceed downstream from its location.

CAPACITY: The maximum number of vehicles that can be reasonably expected to pass over a given section of a lane or a roadway in a given time period.

CHANNELIZATION: The separation or regulation of conflicting traffic movements into definite paths of travel by the use of pavement markings, raised islands, or other suitable means to facilitate the safe and orderly movements of both vehicles and pedestrians.

CLEARANCE INTERVAL: Nearly same as yellow time. If there is an all red interval after the end of a yellow, then that is also added into the clearance interval.

CONTROL DELAY: The component of delay, typically expressed in seconds per vehicle, resulting from the type of traffic control at an intersection. Control delay is measured by comparison with the uncontrolled condition; it includes delay incurred by slowing down, stopping/waiting, and speeding up.

CORDON: An imaginary line around an area across which vehicles, persons, or other items are counted (in and out).

CORNER SIGHT DISTANCE: The minimum sight distance required by the driver of a vehicle to cross or enter the lanes of the major roadway without requiring approaching traffic travelling at a given speed to radically alter their speed or trajectory. Corner sight distance is measured from the driver's eye at 42 inches above the pavement to an object height of 36 inches above the pavement in the center of the nearest approach lane.

CYCLE LENGTH: The time period in seconds required for a traffic signal to complete one full cycle of indications.

CUL-DE-SAC: A local street open at one end only and with special provisions for turning around.

DAILY CAPACITY: A theoretical value representing the daily traffic volume that will typically result in a peak hour volume equal to the capacity of the roadway.

DELAY: The time consumed while traffic is impeded in its movement by some element over which it has no control, usually expressed in seconds per vehicle.

DEMAND RESPONSIVE SIGNAL: Same as traffic-actuated signal.

DENSITY: The number of vehicles occupying in a unit length of the through traffic lanes of a roadway at any given instant. Usually expressed in vehicles per mile.

DETECTOR: A device that responds to a physical stimulus and transmits a resulting impulse to the signal controller.

DESIGN SPEED: A speed selected for purposes of design. Features of a highway, such as curvature, superelevation, and sight distance (upon which the safe operation of vehicles is dependent) are correlated to design speed.

DIRECTIONAL SPLIT: The percent of traffic in the peak direction at any point in time.

DIVERSION: The rerouting of peak hour traffic to avoid congestion.

FORCED FLOW: Opposite of free flow.

FREE FLOW: Volumes are well below capacity. Vehicles can maneuver freely and travel is unimpeded by other traffic.

GAP: Time or distance between successive vehicles in a traffic stream, rear bumper to front bumper.

HEADWAY: Time or distance spacing between successive vehicles in a traffic stream, front bumper to front bumper.

INTERCONNECTED SIGNAL SYSTEM: A number of intersections that are connected to achieve signal progression.

LEVEL OF SERVICE: A qualitative measure of a number of factors, which include speed and travel time, traffic interruptions, freedom to maneuver, safety, driving comfort and convenience, and operating costs.

LOOP DETECTOR: A vehicle detector consisting of a loop of wire embedded in the roadway, energized by alternating current and producing an output circuit closure when passed over by a vehicle.

MINIMUM ACCEPTABLE GAP: Smallest time headway between successive vehicles in a traffic stream into which another vehicle is willing and able to cross or merge.

MULTI-MODAL: More than one mode; such as automobile, bus transit, rail rapid transit, and bicycle transportation modes.

OFFSET: The time interval in seconds between the beginning of green at one intersection and the beginning of green at an adjacent intersection.

PLATOON: A closely grouped component of traffic that is composed of several vehicles moving, or standing ready to move, with clear spaces ahead and behind.

PASSENGER CAR EQUIVALENT (PCE): A metric used to assess the impact of larger vehicles, such as trucks, recreational vehicles, and buses, by converting the traffic volume of larger vehicles to an equivalent number of passenger cars.

PEAK HOUR: The 60 consecutive minutes with the highest number of vehicles.

PRETIMED SIGNAL: A type of traffic signal that directs traffic to stop and go on a predetermined time schedule without regard to traffic conditions. Also, fixed time signal.

PROGRESSION: A term used to describe the progressive movement of traffic through several signalized intersections.

QUEUE: The number of vehicles waiting at a service area such as a traffic signal, stop sign, or access gate.

QUEUE LENGTH: The length of vehicle queue, typically expressed in feet, waiting at a service area such as a traffic signal, stop sign, or access gate.

SCREEN-LINE: An imaginary line or physical feature across which all trips are counted, normally to verify the validity of mathematical traffic models.

SHARED/RECIPROCAL PARKING AGREEMENT: A written binding document executed between property owners to provide a designated number of off-street parking stalls within a designated area to be available for specified businesses or land uses.

SIGHT DISTANCE: The continuous length of roadway visible to a driver or roadway user.

SIGNAL CYCLE: The time period in seconds required for one complete sequence of signal indications.

SIGNAL PHASE: The part of the signal cycle allocated to one or more traffic movements.

STACKING DISTANCE: The length of area available behind a service area, such as a traffic signal or gate, for vehicle queueing to occur.

STARTING DELAY: The delay experienced in initiating the movement of queued traffic from a stop to an average running speed through an intersection.

STOPPING SIGHT DISTANCE: The minimum distance required by the driver of a vehicle on the major roadway travelling at a given speed to bring the vehicle to a stop after an object on the road becomes visible. Stopping sight distance is measured from the driver's eye at 42 inches above the pavement to an object height of 6 inches above the pavement.

TRAFFIC-ACTUATED SIGNAL: A type of traffic signal that directs traffic to stop and go in accordance with the demands of traffic, as registered by the actuation of detectors.

TRIP: The movement of a person or vehicle from one location (origin) to another (destination). For example, from home to store to home is two trips, not one.

TRIP-END: One end of a trip at either the origin or destination (i.e., each trip has two trip-ends). A trip-end occurs when a person, object, or message is transferred to or from a vehicle.

TRIP GENERATION RATE: The quantity of trips produced and/or attracted by a specific land use stated in terms of units such as per dwelling, per acre, and per 1,000 square feet of floor space.

TRUCK: A vehicle having dual tires on one or more axles, or having more than two axles.

TURNING RADIUS: The circular arc formed by the smallest turning path radius of the front outside tire of a vehicle, such as that performed by a U-turn maneuver. This is based on the length and width of the wheel base as well as the steering mechanism of the vehicle.

UNBALANCED FLOW: Heavier traffic flow in one direction than the other. On a daily basis, most facilities have balanced flow. During the peak hours, flow is seldom balanced in an urban area.

VEHICLE MILES OF TRAVEL: A measure of the amount of usage of a section of highway, obtained by multiplying the average daily traffic by length of facility in miles.

APPENDIX B

VOLUME COUNT WORKSHEETS

Counts Unlimited
PO Box 1178
Corona, CA 92878
(951) 268-6268

City of Signal Hill
N/S: Walnut Avenue
E/W: Hill Street
Weather: Clear

File Name : SGH_Walnut_Hill 12
Site Code : 22518786
Start Date : 10/18/2018
Page No : 1

Groups Printed- Total Volume

	Walnut Avenue Southbound				Hill Street Westbound				Walnut Avenue Northbound				Hill Street Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
07:00 AM	0	17	2	19	8	10	6	24	0	38	1	39	6	10	1	17	99
07:15 AM	5	22	7	34	5	19	8	32	4	50	2	56	8	12	5	25	147
07:30 AM	23	34	35	92	11	13	16	40	5	54	1	60	7	24	9	40	232
07:45 AM	16	39	50	105	15	18	8	41	13	49	6	68	10	19	18	47	261
Total	44	112	94	250	39	60	38	137	22	191	10	223	31	65	33	129	739
08:00 AM	16	42	43	101	18	16	6	40	9	47	7	63	7	13	19	39	243
08:15 AM	0	40	11	51	8	17	0	25	6	45	4	55	7	26	12	45	176
08:30 AM	0	41	6	47	6	20	4	30	9	44	4	57	6	50	24	80	214
08:45 AM	5	35	2	42	5	32	7	44	16	48	3	67	12	60	29	101	254
Total	21	158	62	241	37	85	17	139	40	184	18	242	32	149	84	265	887
09:00 AM	4	26	9	39	2	16	4	22	5	51	2	58	1	18	3	22	141
09:15 AM	2	31	10	43	8	8	9	25	2	33	1	36	7	15	3	25	129
09:30 AM	6	36	23	65	11	11	12	34	3	30	7	40	4	10	5	19	158
09:45 AM	4	23	12	39	1	9	3	13	5	35	0	40	6	7	4	17	109
Total	16	116	54	186	22	44	28	94	15	149	10	174	18	50	15	83	537
10:00 AM	9	15	7	31	8	13	4	25	1	38	1	40	3	9	6	18	114
10:15 AM	3	22	4	29	3	22	4	29	3	28	2	33	4	11	2	17	108
10:30 AM	9	25	4	38	4	12	8	24	3	28	8	39	4	10	5	19	120
10:45 AM	5	22	9	36	4	9	5	18	3	25	4	32	4	4	1	9	95
Total	26	84	24	134	19	56	21	96	10	119	15	144	15	34	14	63	437
11:00 AM	6	27	14	47	4	11	5	20	2	32	0	34	6	11	3	20	121
11:15 AM	1	24	24	49	4	12	4	20	0	35	2	37	6	6	3	15	121
11:30 AM	4	32	12	48	7	8	6	21	2	46	3	51	5	11	2	18	138
11:45 AM	1	32	9	42	3	17	4	24	4	51	4	59	5	10	2	17	142
Total	12	115	59	186	18	48	19	85	8	164	9	181	22	38	10	70	522
12:00 PM	10	36	8	54	3	13	4	20	11	57	15	83	9	22	3	34	191
12:15 PM	7	37	7	51	6	16	7	29	1	50	5	56	3	11	2	16	152
12:30 PM	8	47	5	60	7	16	5	28	2	43	8	53	1	14	1	16	157
12:45 PM	6	40	8	54	11	18	13	42	5	42	5	52	9	14	5	28	176
Total	31	160	28	219	27	63	29	119	19	192	33	244	22	61	11	94	676
01:00 PM	7	30	7	44	4	16	4	24	6	35	1	42	8	8	4	20	130
01:15 PM	13	29	16	58	5	11	3	19	8	47	2	57	6	13	14	33	167
01:30 PM	15	37	34	86	5	30	4	39	9	41	5	55	6	19	16	41	221
01:45 PM	14	36	39	89	6	10	8	24	2	56	7	65	4	13	8	25	203
Total	49	132	96	277	20	67	19	106	25	179	15	219	24	53	42	119	721
02:00 PM	6	32	14	52	3	25	3	31	3	45	6	54	7	17	3	27	164
02:15 PM	5	24	10	39	2	17	10	29	6	31	5	42	5	8	2	15	125
02:30 PM	4	37	4	45	7	16	2	25	2	41	3	46	3	16	3	22	138
02:45 PM	3	38	10	51	5	10	3	18	4	49	10	63	9	11	8	28	160
Total	18	131	38	187	17	68	18	103	15	166	24	205	24	52	16	92	587
03:00 PM	1	31	11	43	5	15	5	25	2	57	3	62	6	25	4	35	165
03:15 PM	5	39	9	53	6	19	6	31	2	42	2	46	1	14	2	17	147
03:30 PM	9	45	7	61	5	10	5	20	5	47	7	59	7	40	20	67	207
03:45 PM	8	43	9	60	6	54	12	72	29	50	5	84	2	48	15	65	281
Total	23	158	36	217	22	98	28	148	38	196	17	251	16	127	41	184	800
04:00 PM	11	45	8	64	5	13	7	25	9	45	9	63	10	22	5	37	189
04:15 PM	4	49	11	64	5	22	5	32	5	41	4	50	9	14	5	28	174
04:30 PM	7	47	10	64	1	13	3	17	5	62	5	72	1	18	7	26	179
04:45 PM	7	37	11	55	4	15	9	28	12	56	4	72	3	19	4	26	181
Total	29	178	40	247	15	63	24	102	31	204	22	257	23	73	21	117	723

Counts Unlimited
PO Box 1178
Corona, CA 92878
(951) 268-6268

City of Signal Hill
N/S: Walnut Avenue
E/W: Hill Street
Weather: Clear

File Name : SGH_Walnut_Hill 12
Site Code : 22518786
Start Date : 10/18/2018

Groups Printed- Total Volume

	Walnut Avenue Southbound				Hill Street Westbound				Walnut Avenue Northbound				Hill Street Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
05:00 PM	9	57	15	81	0	12	8	20	8	53	7	68	10	29	2	41	210
05:15 PM	9	54	11	74	2	17	7	26	4	50	7	61	7	22	3	32	193
05:30 PM	13	54	18	85	7	18	4	29	3	57	6	66	4	15	1	20	200
05:45 PM	14	56	22	92	3	22	8	33	9	41	1	51	8	11	7	26	202
Total	45	221	66	332	12	69	27	108	24	201	21	246	29	77	13	119	805
06:00 PM	6	44	10	60	4	18	7	29	0	35	10	45	13	23	7	43	177
06:15 PM	5	44	16	65	7	25	6	38	1	49	6	56	3	16	3	22	181
06:30 PM	2	64	7	73	6	19	1	26	3	39	5	47	5	20	5	30	176
06:45 PM	7	43	6	56	8	21	3	32	3	37	4	44	8	12	4	24	156
Total	20	195	39	254	25	83	17	125	7	160	25	192	29	71	19	119	690
Grand Total	334	1760	636	2730	273	804	285	1362	254	2105	219	2578	285	850	319	1454	8124
Apprch %	12.2	64.5	23.3		20	59	20.9		9.9	81.7	8.5		19.6	58.5	21.9		
Total %	4.1	21.7	7.8	33.6	3.4	9.9	3.5	16.8	3.1	25.9	2.7	31.7	3.5	10.5	3.9	17.9	

	Walnut Avenue Southbound				Hill Street Westbound				Walnut Avenue Northbound				Hill Street Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 06:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:30 AM																	
07:30 AM	**23**	34	35	92	11	13	**16**	40	5	**54**	1	60	7	24	9	40	232
07:45 AM	16	39	**50**	**105**	15	**18**	8	**41**	**13**	49	6	**68**	**10**	19	18	**47**	**261**
08:00 AM	16	**42**	43	101	**18**	16	6	40	9	47	**7**	63	7	13	**19**	39	243
08:15 AM	0	40	11	51	8	17	0	25	6	45	4	55	7	**26**	12	45	176
Total Volume	55	155	139	349	52	64	30	146	33	195	18	246	31	82	58	171	912
% App. Total	15.8	44.4	39.8		35.6	43.8	20.5		13.4	79.3	7.3		18.1	48	33.9		
PHF	.598	.923	.695	.831	.722	.889	.469	.890	.635	.903	.643	.904	.775	.788	.763	.910	.874

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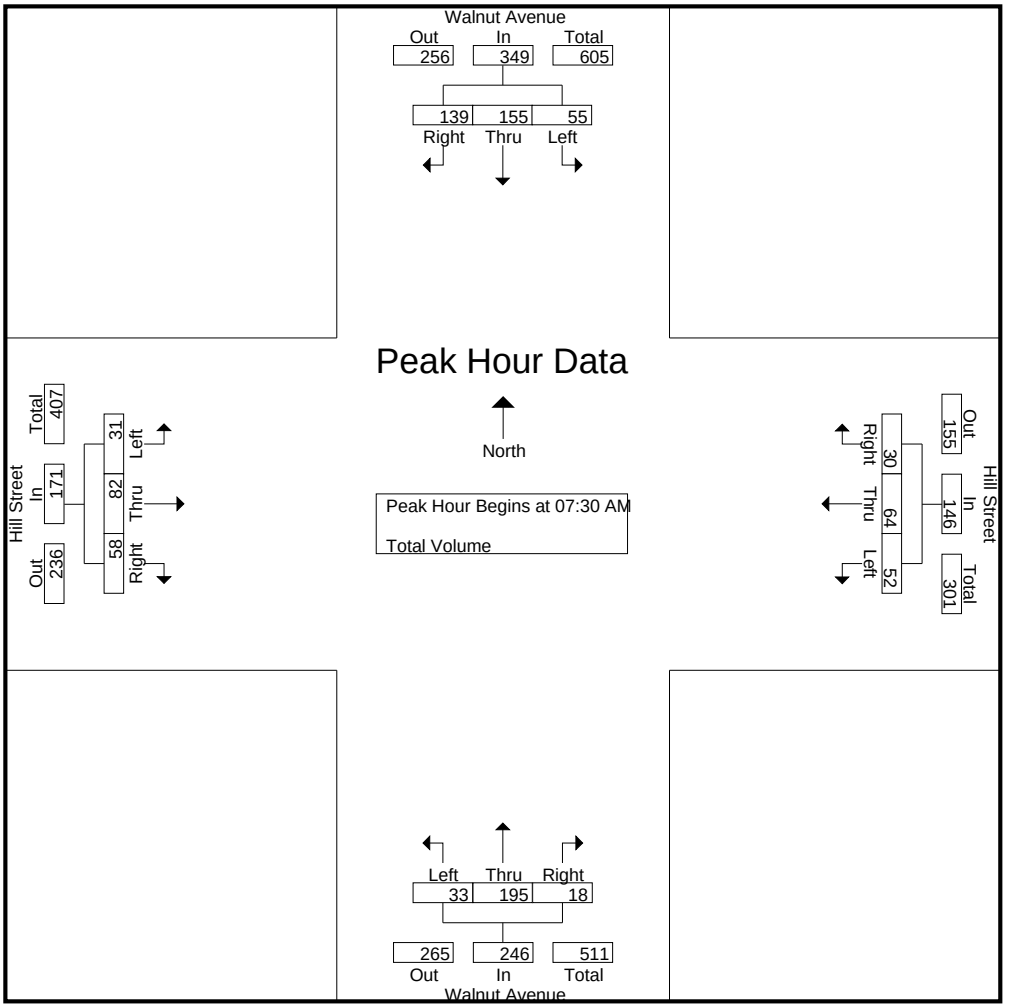
City of Signal Hill
N/S: Walnut Avenue
E/W: Hill Street
Weather: Clear

File Name : SGH_Walnut_Hill 12
Site Code : 22518786
Start Date : 10/18/2018
Page No : 3



Peak Hour Analysis From 07:00 AM to 06:45 PM - Peak 1 of 1
Peak Hour for Each Approach Begins at:

	07:30 AM				07:15 AM				04:30 PM				08:00 AM			
+0 mins.	**23**	34	35	92	5	**19**	8	32	5	**62**	5	**72**	7	13	19	39
+15 mins.	16	39	**50**	**105**	11	13	**16**	40	**12**	56	4	72	7	26	12	45
+30 mins.	16	**42**	43	101	15	18	8	**41**	8	53	**7**	68	6	50	24	80
+45 mins.	0	40	11	51	**18**	16	6	40	4	50	7	61	**12**	**60**	**29**	**101**
Total Volume	55	155	139	349	49	66	38	153	29	221	23	273	32	149	84	265
% App. Total	15.8	44.4	39.8		32	43.1	24.8		10.6	81	8.4		12.1	56.2	31.7	
PHF	.598	.923	.695	.831	.681	.868	.594	.933	.604	.891	.821	.948	.667	.621	.724	.656

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City of Signal Hill
N/S: Walnut Avenue
E/W: Hill Street
Weather: Clear

File Name : SGH_Walnut_Hill 12
Site Code : 22518786
Start Date : 10/18/2018

Groups Printed- Bikes

	Walnut Avenue Southbound				Hill Street Westbound				Walnut Avenue Northbound				Hill Street Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
07:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:15 AM	0	0	0	0	0	0	0	0	0	3	0	3	0	0	0	0	3
07:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:45 AM	0	1	0	1	0	0	0	0	0	1	0	1	0	0	0	0	2
Total	0	1	0	1	0	0	0	0	0	4	0	4	0	0	0	0	5
08:00 AM	0	0	0	0	0	0	0	0	0	1	0	1	0	1	0	1	2
08:15 AM	0	0	2	2	0	1	0	1	0	0	0	0	0	0	0	0	3
08:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1
08:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	2	2	0	1	0	1	0	1	0	1	1	1	0	2	6
09:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09:30 AM	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
09:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
10:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:15 AM	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1
10:30 AM	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	1
10:45 AM	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
Total	0	1	1	2	0	0	0	0	0	1	0	1	0	0	0	0	3
11:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:45 AM	0	1	1	2	0	0	0	0	0	0	0	0	0	0	0	0	2
Total	0	1	1	2	0	0	0	0	0	0	0	0	0	0	0	0	2
12:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01:15 PM	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	1
01:30 PM	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
01:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	1	0	0	1	0	1	0	1	0	0	0	0	0	0	0	0	2
02:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02:15 PM	0	1	0	1	0	0	0	0	0	1	0	1	0	0	0	0	2
02:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02:45 PM	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1
Total	0	1	1	2	0	0	0	0	0	1	0	1	0	0	0	0	3
03:00 PM	0	1	0	1	0	0	0	0	0	1	0	1	0	0	0	0	2
03:15 PM	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	1
03:30 PM	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
03:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	2	0	2	0	0	0	0	0	2	0	2	0	0	0	0	4
04:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:15 PM	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
04:30 PM	0	0	1	1	0	1	0	1	0	0	0	0	0	1	0	1	3
04:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	1	1	2	0	1	0	1	0	0	0	0	0	1	0	1	4

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City of Signal Hill
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E/W: Hill Street
Weather: Clear

File Name : SGH_Walnut_Hill 12
Site Code : 22518786
Start Date : 10/18/2018
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Groups Printed- Bikes

	Walnut Avenue Southbound				Hill Street Westbound				Walnut Avenue Northbound				Hill Street Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
05:00 PM	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	1
05:15 PM	0	0	0	0	0	0	0	0	0	1	0	1	1	0	0	1	2
05:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:45 PM	0	1	0	1	0	0	0	0	0	1	0	1	0	0	0	0	2
Total	0	1	0	1	0	0	0	0	0	3	0	3	1	0	0	1	5
06:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06:15 PM	0	1	0	1	0	0	0	0	0	1	0	1	0	0	0	0	2
06:30 PM	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1
06:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	1	1	2	0	0	0	0	0	1	0	1	0	0	0	0	3
Grand Total	1	10	7	18	0	3	0	3	0	13	0	13	2	2	0	4	38
Apprch %	5.6	55.6	38.9		0	100	0		0	100	0		50	50	0		
Total %	2.6	26.3	18.4	47.4	0	7.9	0	7.9	0	34.2	0	34.2	5.3	5.3	0	10.5	

	Walnut Avenue Southbound				Hill Street Westbound				Walnut Avenue Northbound				Hill Street Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 06:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:45 AM																	
07:45 AM	0	**1**	0	1	0	0	0	0	0	**1**	0	**1**	0	0	0	0	2
08:00 AM	0	0	0	0	0	0	0	0	0	1	0	1	0	**1**	0	**1**	2
08:15 AM	0	0	**2**	**2**	0	**1**	0	**1**	0	0	0	0	0	0	0	0	**3**
08:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	**1**	0	0	1	1
Total Volume	0	1	2	3	0	1	0	1	0	2	0	2	1	1	0	2	8
% App. Total	0	33.3	66.7		0	100	0		0	100	0		50	50	0		
PHF	.000	.250	.250	.375	.000	.250	.000	.250	.000	.500	.000	.500	.250	.250	.000	.500	.667

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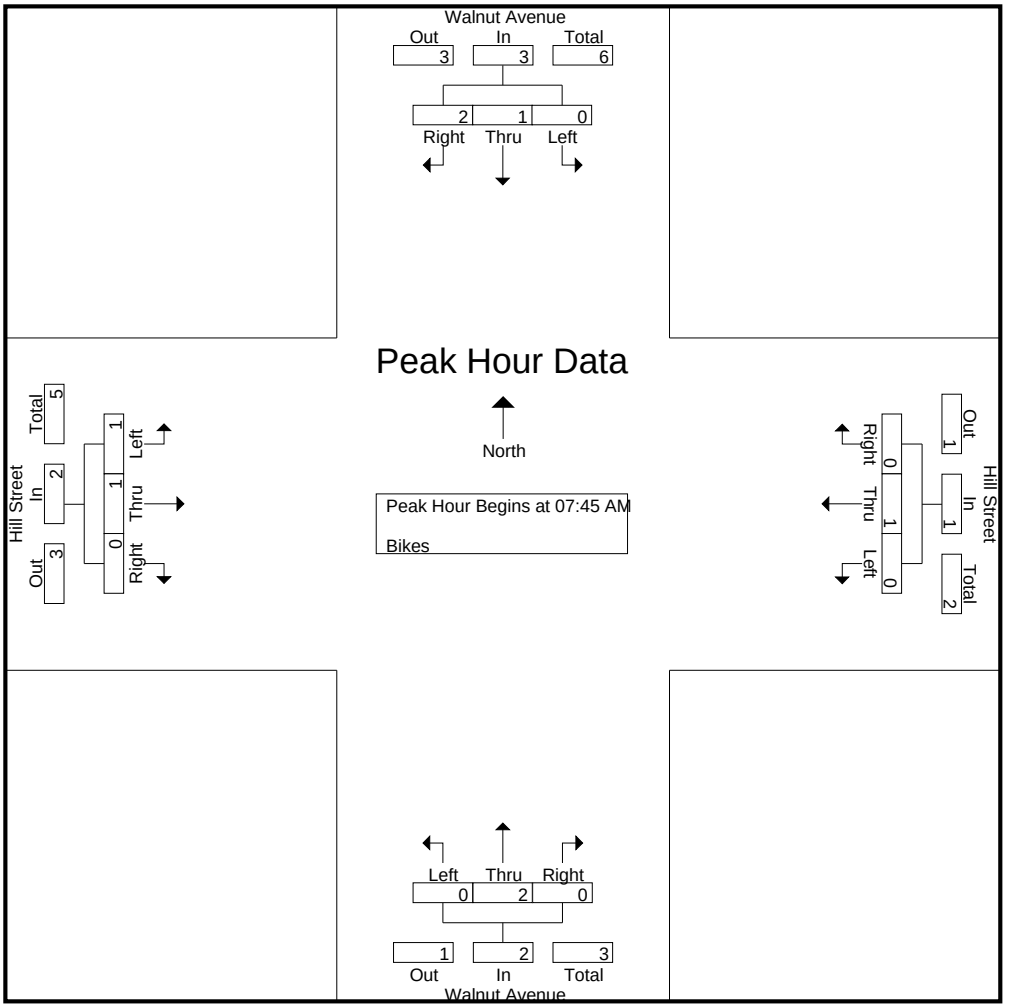

Peak Hour Analysis From 07:00 AM to 06:45 PM - Peak 1 of 1
Peak Hour for Each Approach Begins at:

	07:30 AM				07:30 AM				07:15 AM				07:45 AM			
+0 mins.	0	0	0	0	0	0	0	0	0	**3**	0	**3**	0	0	0	0
+15 mins.	0	**1**	0	1	0	0	0	0	0	0	0	0	0	**1**	0	**1**
+30 mins.	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0
+45 mins.	0	0	**2**	**2**	0	**1**	0	**1**	0	1	0	1	**1**	0	0	1
Total Volume	0	1	2	3	0	1	0	1	0	5	0	5	1	1	0	2
% App. Total	0	33.3	66.7		0	100	0		0	100	0		50	50	0	
PHF	.000	.250	.250	.375	.000	.250	.000	.250	.000	.417	.000	.417	.250	.250	.000	.500

Location: Signal Hill
N/S: Walnut Avenue
E/W: Hill Street

Date: 10/18/2018
Day: Thursday

PEDESTRIANS

Time	North Leg Walnut Avenue	East Leg Hill Street	South Leg Walnut Avenue	West Leg Hill Street	TOTAL
7:00 AM	2	1	0	0	3
7:15 AM	1	0	1	0	2
7:30 AM	1	1	1	3	6
7:45 AM	14	3	3	22	42
8:00 AM	30	20	6	28	84
8:15 AM	1	0	1	4	6
8:30 AM	1	3	0	1	5
8:45 AM	0	0	1	1	2
9:00 AM	2	2	2	0	6
9:15 AM	4	2	4	12	22
9:30 AM	4	2	2	18	26
9:45 AM	0	3	3	0	6
10:00 AM	0	3	2	3	8
10:15 AM	0	2	1	0	3
10:30 AM	0	0	0	0	0
10:45 AM	2	4	1	3	10
11:00 AM	3	0	0	2	5
11:15 AM	3	1	2	14	20
11:30 AM	3	1	0	4	8
11:45 AM	6	2	0	4	12
12:00 PM	6	0	2	9	17
12:15 PM	1	2	2	0	5
12:30 PM	4	2	0	2	8
12:45 PM	0	0	0	0	0
1:00 PM	1	0	0	3	4
1:15 PM	7	1	6	16	30
1:30 PM	26	10	5	30	71
1:45 PM	10	7	1	6	24
2:00 PM	2	0	2	3	7
2:15 PM	1	2	0	0	3
2:30 PM	2	2	2	2	8
2:45 PM	0	0	0	1	1
3:00 PM	0	0	1	0	1
3:15 PM	1	1	0	1	3
3:30 PM	0	0	2	0	2
3:45 PM	0	2	0	1	3
4:00 PM	0	0	1	0	1
4:15 PM	0	0	1	1	2
4:30 PM	0	0	1	1	2
4:45 PM	0	1	1	0	2
5:00 PM	3	3	4	0	10
5:15 PM	0	4	8	0	12
5:30 PM	1	0	1	2	4
5:45 PM	1	3	4	5	13
6:00 PM	0	0	5	2	7
6:15 PM	1	1	2	1	5
6:30 PM	4	1	2	1	8
6:45 PM	4	0	3	3	10
TOTAL VOLUMES:	152	92	86	209	539

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APPENDIX C

TRAFFIC SIGNAL WARRANT WORKSHEETS

Figure 4C-101 (CA). Traffic Signal Warrants Worksheet (Sheet 1 of 5)

Count Date: 10/18/2018

City of Signal Hill — Jurisdiction
Walnut Ave/Hill St — Intersection
Calc: _____ Date: _____
Check: _____ Date: _____

Major St: Walnut Ave — Critical Approach Speed: 25 mph
Minor St: Hill St — Critical Approach Speed: N/A mph

☐ eed limit or critical speed on major street traffic > 40 mph .....
or
☐ built up area of isolated community of < 10,000 population ..... } RURAL (R)

☑ URBAN (U)

WARRANT 1 - Eight Hour Vehicular Volume

SATISFIED ☐ YES ☑ NO

(Condition A or Condition B or Combination of A and B must be satisfied)

Condition A - Minimum Vehicle Volume

100% SATISFIED ☐ YES ☑ NO
80% SATISFIED ☐ YES ☑ NO

	MINIMUM REQUIREMENTS (80% SHOWN IN BRACKETS)												
	Urban	Rural	Urban	Rural									
APPROACH LANES	1		2 or More		5:00 PM	4:00 PM	1:00 PM	8:00 AM	7:00 AM	3:00 PM	12:00 PM	6:00 PM	Hour
Both Approaches Major Street	500 (400)	350 (280)	600 (480)	420 (336)	578	504	496	483	473	468	463	446	
Highest Approach Minor Street	150 (120)	105 (84)	200 (160)	140 (112)	119	117	119	265	137	184	119	125	

Condition B - Interruption of Continuous Traffic

100% SATISFIED ☐ YES ☑ NO
80% SATISFIED ☐ YES ☑ NO

	MINIMUM REQUIREMENTS (80% SHOWN IN BRACKETS)												
	Urban	Rural	Urban	Rural									
APPROACH LANES	1		2 or More		5:00 PM	4:00 PM	1:00 PM	8:00 AM	7:00 AM	3:00 PM	12:00 PM	6:00 PM	Hour
Both Approaches Major Street	750 (600)	525 (420)	900 (720)	630 (504)	578	504	496	483	473	468	463	446	
Highest Approach Minor Street	75 (60)	53 (42)	100 (80)	70 (56)	119	117	119	265	137	184	119	125	

Combination of Conditions A & B

SATISFIED ☐ YES ☑ NO

REQUIREMENT	CONDITION	X	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

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

Figure 4C-101 (CA). Traffic Signal Warrants Worksheet (Sheet 2 of 5)

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	8:00 AM	3:00 PM	5:00 PM	7:00 AM	Hour
Both Approaches - Major Street	X		483	468	578	473	
Higher Approach - Minor Street	X		265	184	119	137	

*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

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	8:00 AM
Both Approaches - Major Street	X		483
Higher Approach - Minor Street	X		265

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.

Figure 4C-101 (CA). Traffic Signal Warrants Worksheet (Sheet 3 of 5)

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

SATISFIED ☐ YES ☑ NO

Part 1 (Parts A or B must be satisfied)

A.

Hours - - - >	1:00 PM	8:00 AM	7:00 AM	9:00 AM
Vehicles per hour for any 4 hours	496	483	473	360
Pedestrians per hour for any 4 hours	73	57	30	39

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

B.

Hours - - - >	1:00 PM
Vehicles per hour for any 1 hour	496
Pedestrians per hour for any 1 hour	73

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
(Part A and Part B must be satisfied)

SATISFIED ☐ YES ☑ NO

Part A **SATISFIED** ☐ YES ☑ NO

Gap/Minutes and # of Children — 12:00 AM — Hour

Gaps vs Minutes	Minutes Children Using Crossing	n/a
	Number of Adequate Gaps	n/a
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

Existing adult crossing guard ensures adequate gaps are provided.

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 proposal 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.

Figure 4C-101 (CA). Traffic Signal Warrants Worksheet (Sheet 4 of 5)

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

Minimum Requirements	DISTANCE TO NEAREST SIGNAL				
≥ 1000 ft.	N **N/A**	S **N/A**	E **N/A**	W **N/A**	☐ YES ☑ NO
On a one-way street or a street that has traffic predominantly in any direction, the adjacent traffic control signals are so far apart that they do not provide the necessary degree of vehicular platooning.					
OR, On a two-way street, adjacent traffic control signal do not provide the necessary degree of platooning and the proposed and adjacent traffic control signals will collectively provide a progressive operation.					☐ YES ☑ NO

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	**2**		
REQUIREMENTS	CONDITIONS	✓	
ONE CONDITION SATISFIED 80%	Warrant 1, Condition A - Minimum Vehicular Volume		☐ YES ☑ NO
	OR, Warrant 1, Condition B - Interruption of Continuous Traffic		
	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		✓	FUFILLED
1000 Veh/Hr	During Typical Weekday Peak Hour **912** 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 **0** Veh/Hr			
CHARACTERISTICS OF MAJOR ROUTES		MAJOR ROUTE A	MAJOR ROUTE B	
Hwy. System Serving as Principal Network for Through Traffic				
Rural or Suburban Highway Outside Of, Entering, or Traversing a City				
Appears as Major Route on an Official Plan				
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 signal.

Figure 4C-101 (CA). Traffic Signal Warrants Worksheet (Sheet 5 of 5)

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

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 0 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: 0 VPH

Minor Street - Crosses the track (one direction only, approaching the intersection):

0 VPH X AF (Use Table 4C-2, 3 & 4 below to calculate AF) = 0 VPH

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.

☐ YES ☐ NO

Major Street - Total of both approaches: 0 VPH

Minor Street - Crosses the track (one direction only, approaching the intersection):

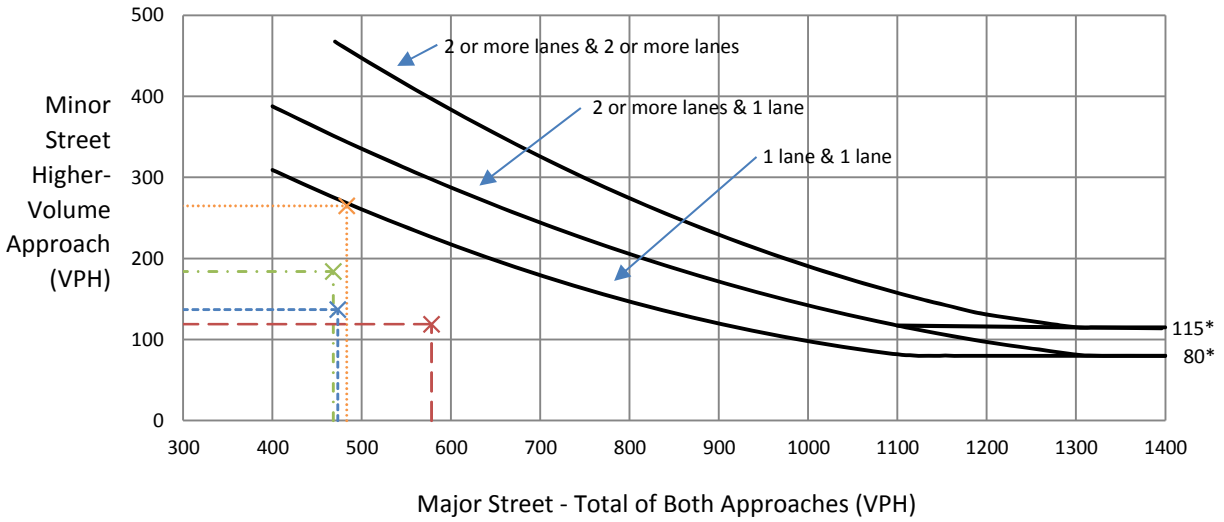
0 VPH X AF (Use Tables 4C-2, 3, & 4 below to calculate AF) = 0 VPH

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

1- Number of Rail Traffic per Day	0	Adjustment factor from table 4C-2	0
2- Percentage of High-Occupancy Buses on Minor Street Approach	0	Adjustment factor from table 4C-3	0
3- Percentage of Tractor-Trailer Trucks on Minor Street Approach	0	Adjustment factor from table 4C-4	0

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

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



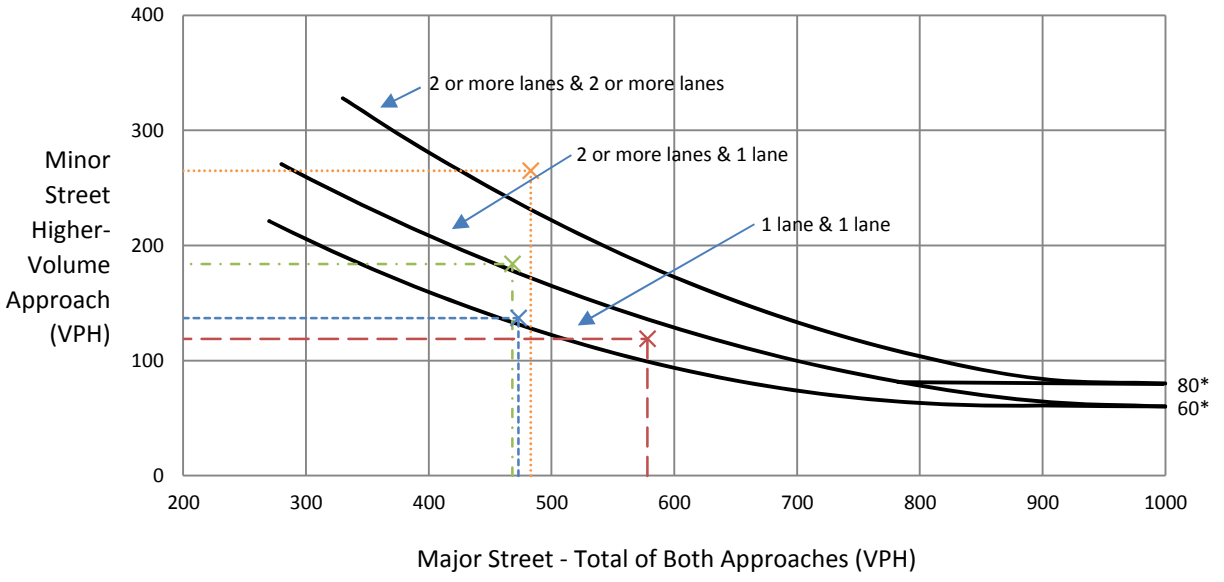
Traffic Signal Warrant Is NOT Satisfied

*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.

**CAUTION: One or more points are within the margin of error (within 5 vehicles of the curve).

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

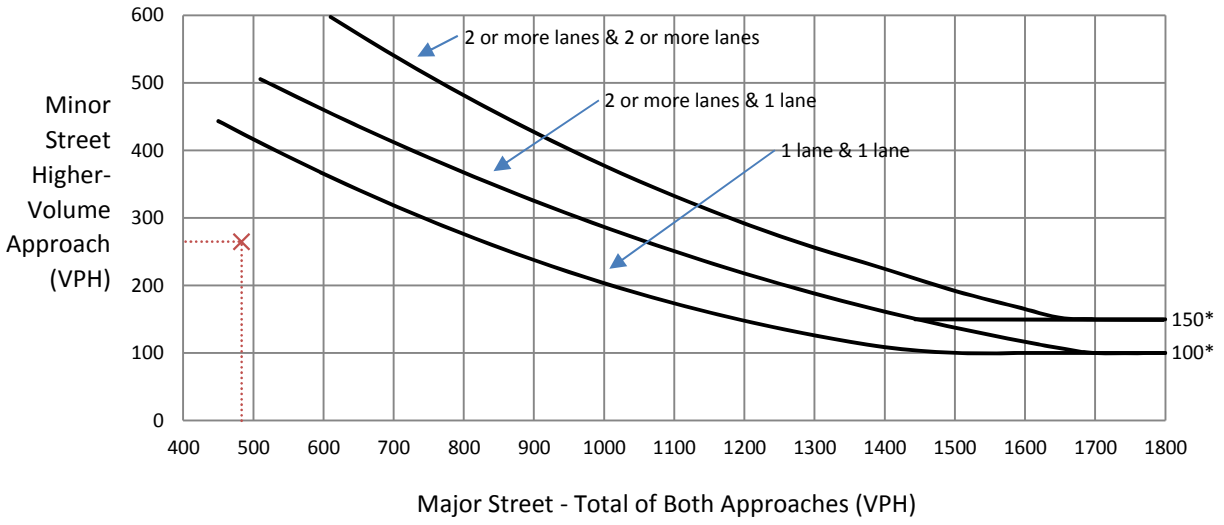
(Community less than 10,000 population or above 40 mph on the major street)



This figure is not applicable; see Figure 4C-1 above.

*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 Vehicular Volume

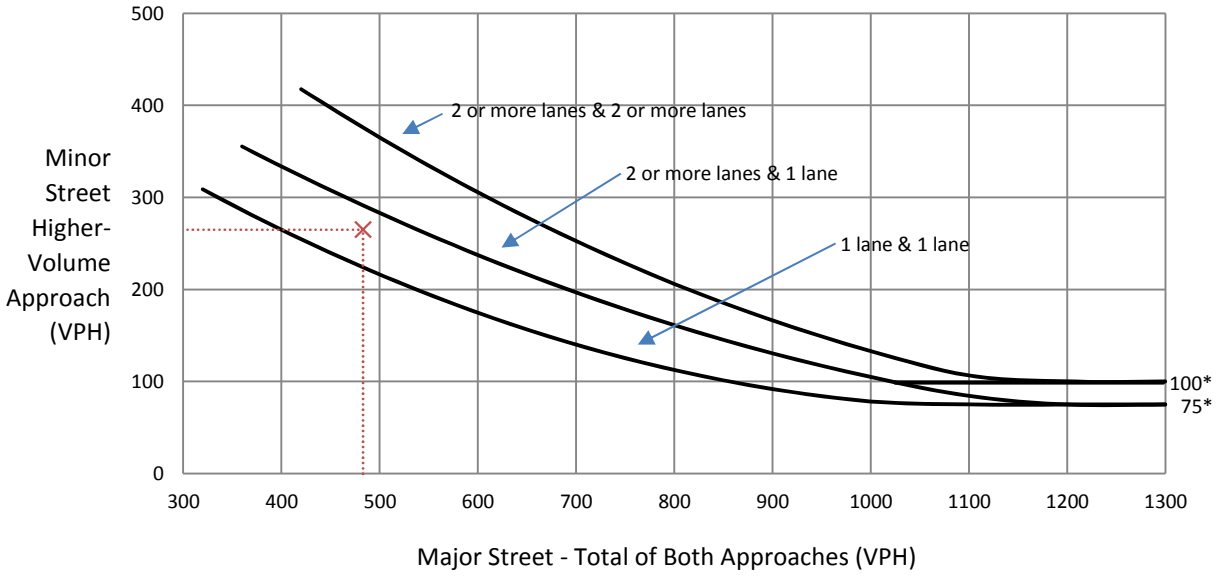


Traffic Signal Warrant Is NOT Satisfied

*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 Vehicular Volume (70% Factor)

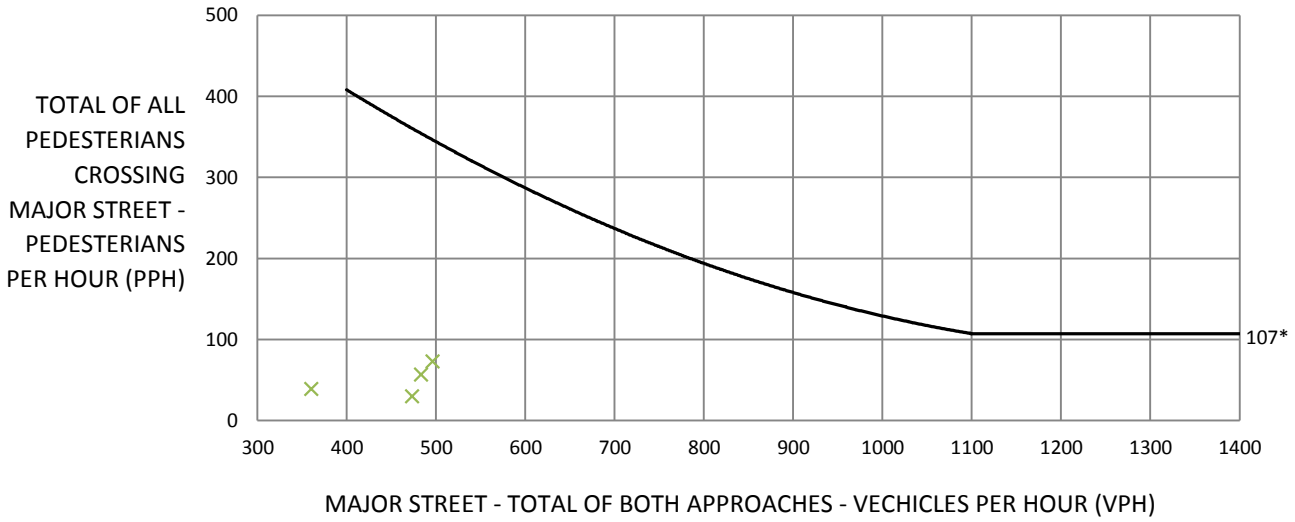
(Community less than 10,000 population or above 40 mph on the major street)



This figure is not applicable; see Figure 4C-3 above.

*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.

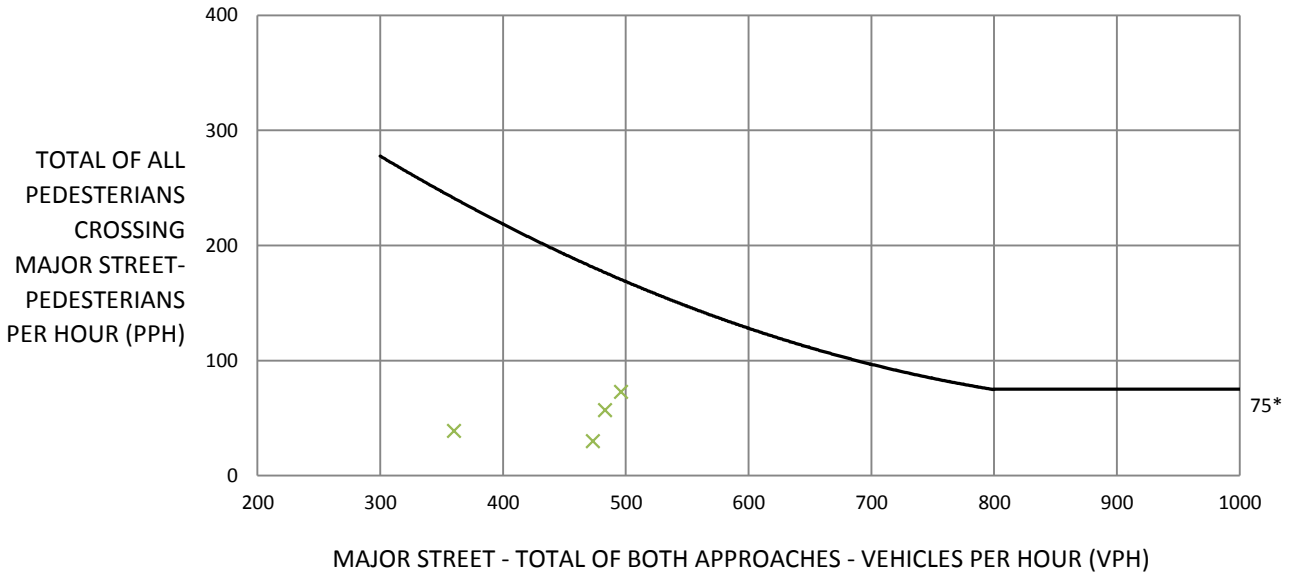
Figure 4C-5. Warrant 4, Pedestrian Four-Hour Volume



Traffic Signal Warrant Is NOT Satisfied

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

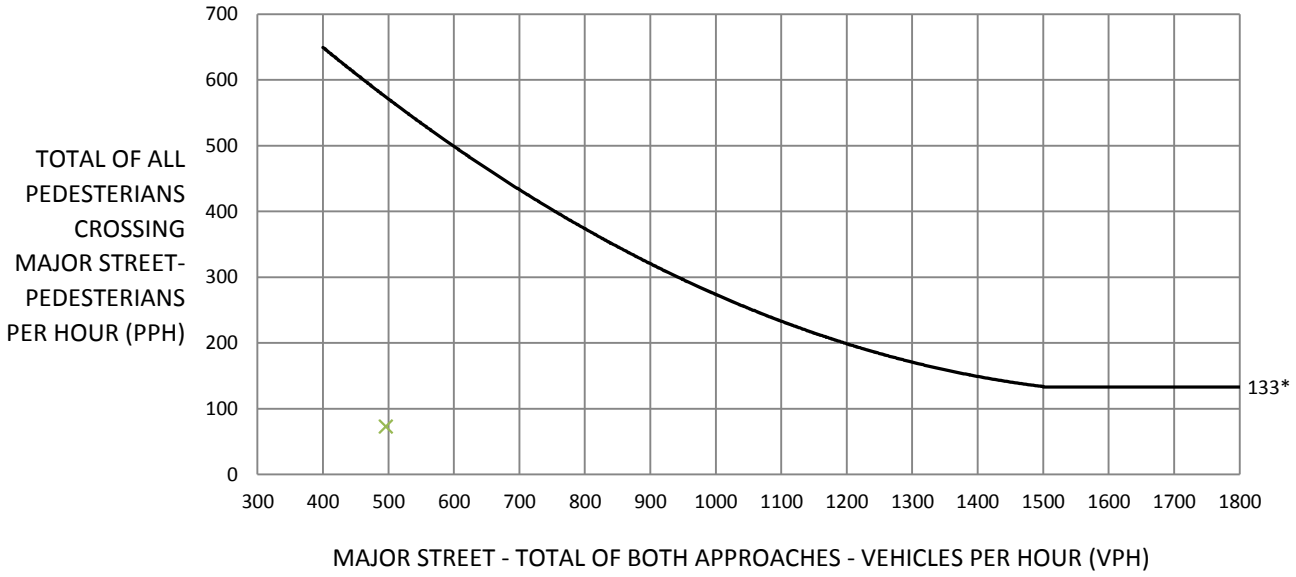
Figure 4C-6. Warrant 4, Pedestrian Four-Hour Volume (70% Factor)



This figure is not applicable; see Figure 4C-5 above.

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

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



Traffic Signal Warrant Is NOT Satisfied

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

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

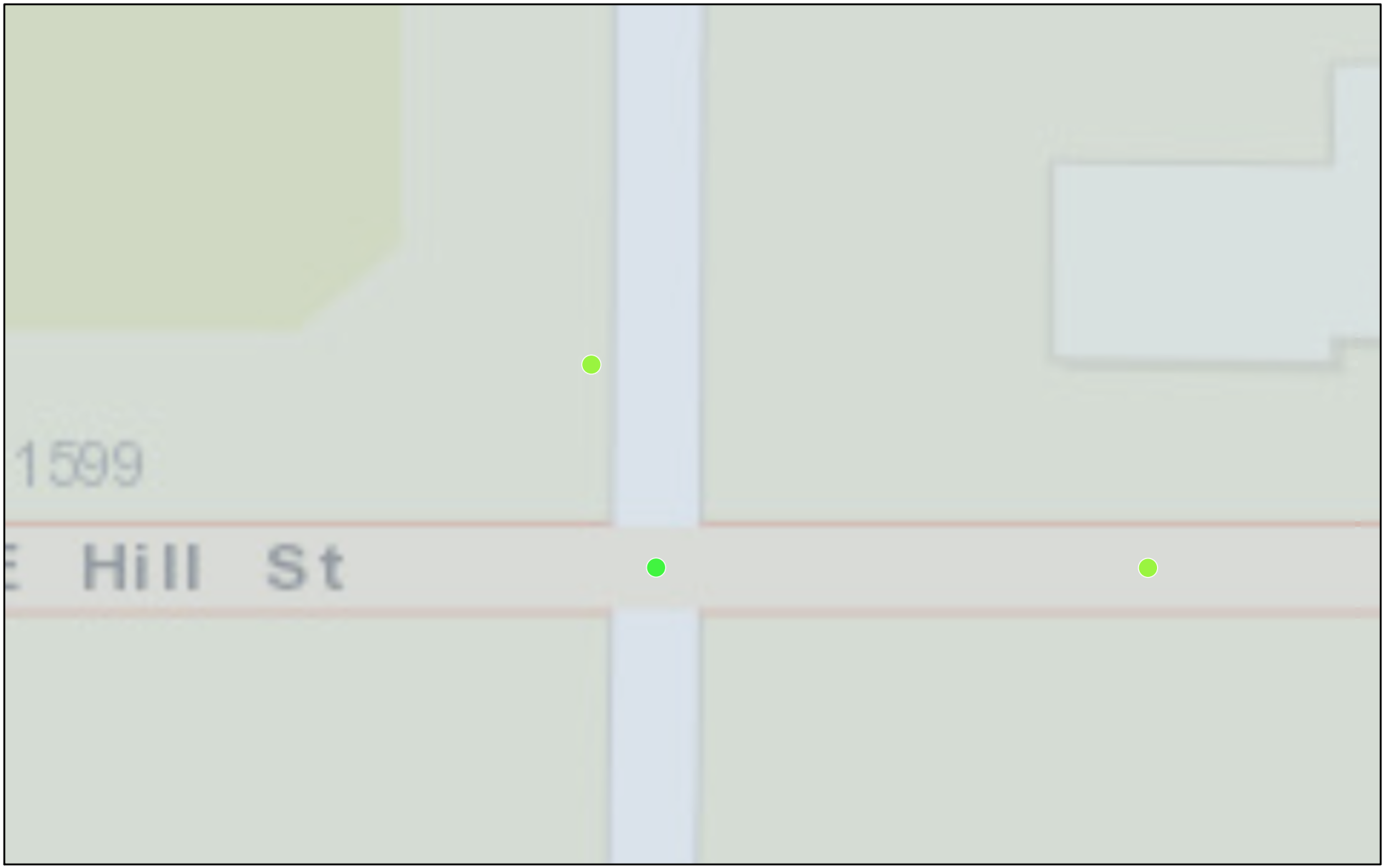
This figure is not applicable; see Figure 4C-7 above.

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

APPENDIX D

COLLISION RECORDS

SWITRS GIS Map: Los Angeles, Signal Hill 01/01/2013 - 12/31/2017



November 6, 2018

1:282

0 0 0 0.01 mi

0 0 0.01 0.01 km

Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan,

Made by: SWITRS GIS Map at TIMS (https://tims.berkeley.edu), SafeTREC,
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Collision Details for: Case ID 7167369

Collision Information

County	Los Angeles
City	Signal Hill
Date & Time (M/D/Y HH:MM)	01/05/2016 08:40
Location (Intersection)	Hill & Walnut Av
Dist. & Dir. from Intersection	0.00 ft East
State Highway	No
Latidude & Longitude	33.79713011, -118.17202012

Type of Collision	D - Broadside	**Motor Vehicle Involved With**	C - Other Motor Vehicle
Collision Severity	4 - Injury (Complaint of Pain)	**Pedestiran Accident**	No
PCF Violation Category	09 - Automobile Right of Way	**Bicycle Accident**	No
Weather	C - Raining	**Motorcycle Accident**	No
Alcohol Involved	No	**Truck Accident**	No

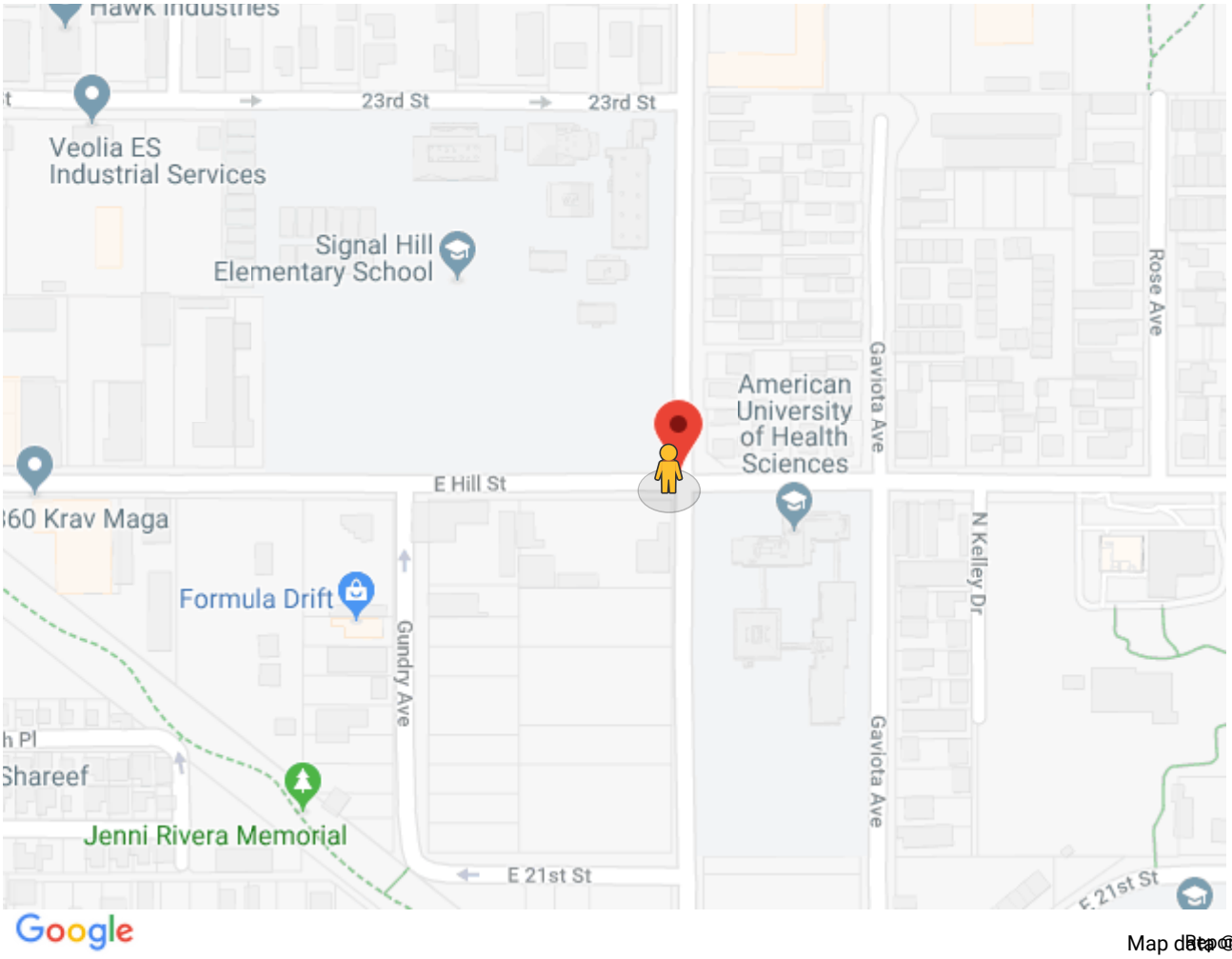
Parties: 2

Party Number	Party Type	Statewide Vehicle Type	At Fault	Party Direction	Movement Preceding Collision
1	1 - Driver (including Hit and Run)	A - Passenger Car/Station Wagon	No	East	B - Proceeding Straight
2	1 - Driver (including Hit and Run)	A - Passenger Car/Station Wagon	No	South	B - Proceeding Straight

Victims: 4

Party Number	Victim Role	Victim Gender	Victim Age	Victim Degree of Injury
1	2 - Passenger	F - Female	11	0 - No Injury
2	2 - Passenger	F - Female	14	4 - Complaint of Pain
2	2 - Passenger	F - Female	12	0 - No Injury
2	2 - Passenger	M - Male	12	0 - No Injury

Map View



Map data ©2018 Google

Street View

1598 E Hill St
Signal Hill, California
View on Google Maps

Collision Details for: Case ID 6234458

Collision Information

County	Los Angeles
City	Signal Hill
Date & Time (M/D/Y HH:MM)	09/14/2013 17:52
Location (Intersection)	Walnut Av & Hill
Dist. & Dir. from Intersection	38.00 ft North
State Highway	No
Latidude & Longitude	33.797209, -118.1720504

Type of Collision	C - Rear End	**Motor Vehicle Involved With**	C - Other Motor Vehicle
Collision Severity	4 - Injury (Complaint of Pain)	**Pedestiran Accident**	No
PCF Violation Category	03 - Unsafe Speed	**Bicycle Accident**	No
Weather	A - Clear	**Motorcycle Accident**	No
Alcohol Involved	No	**Truck Accident**	No

Parties: 2

Party Number	Party Type	Statewide Vehicle Type	At Fault	Party Direction	Movement Preceding Collision
1	1 - Driver (including Hit and Run)	A - Passenger Car/Station Wagon	Yes	South	H - Slowing/Stopping
2	1 - Driver (including Hit and Run)	A - Passenger Car/Station Wagon	No	South	A - Stopped

Victims: 5

Party Number	Victim Role	Victim Gender	Victim Age	Victim Degree of Injury
2	1 - Driver	F - Female	29	4 - Complaint of Pain
2	2 - Passenger	M - Male	47	0 - No Injury
2	2 - Passenger	M - Male	7	0 - No Injury
2	2 - Passenger	M - Male	2	0 - No Injury
2	2 - Passenger	F - Female	5	0 - No Injury

Map View

Street View

2201 N Walnut Ave
Signal Hill, California
View on Google Maps

Collision Details for: Case ID 8439941

Collision Information

County	Los Angeles
City	Signal Hill
Date & Time (M/D/Y HH:MM)	08/18/2017 11:54
Location (Intersection)	Hill & Walnut Av
Dist. & Dir. from Intersection	70.00 ft East
State Highway	No
Latidude & Longitude	33.79713, -118.17179007

Type of Collision	C - Rear End	**Motor Vehicle Involved With**	E - Parked Motor Vehicle
Collision Severity	4 - Injury (Complaint of Pain)	**Pedestiran Accident**	Yes
PCF Violation Category	18 - Other Than Driver (or Pedestrian)	**Bicycle Accident**	No
Weather	A - Clear	**Motorcycle Accident**	No
Alcohol Involved	No	**Truck Accident**	No

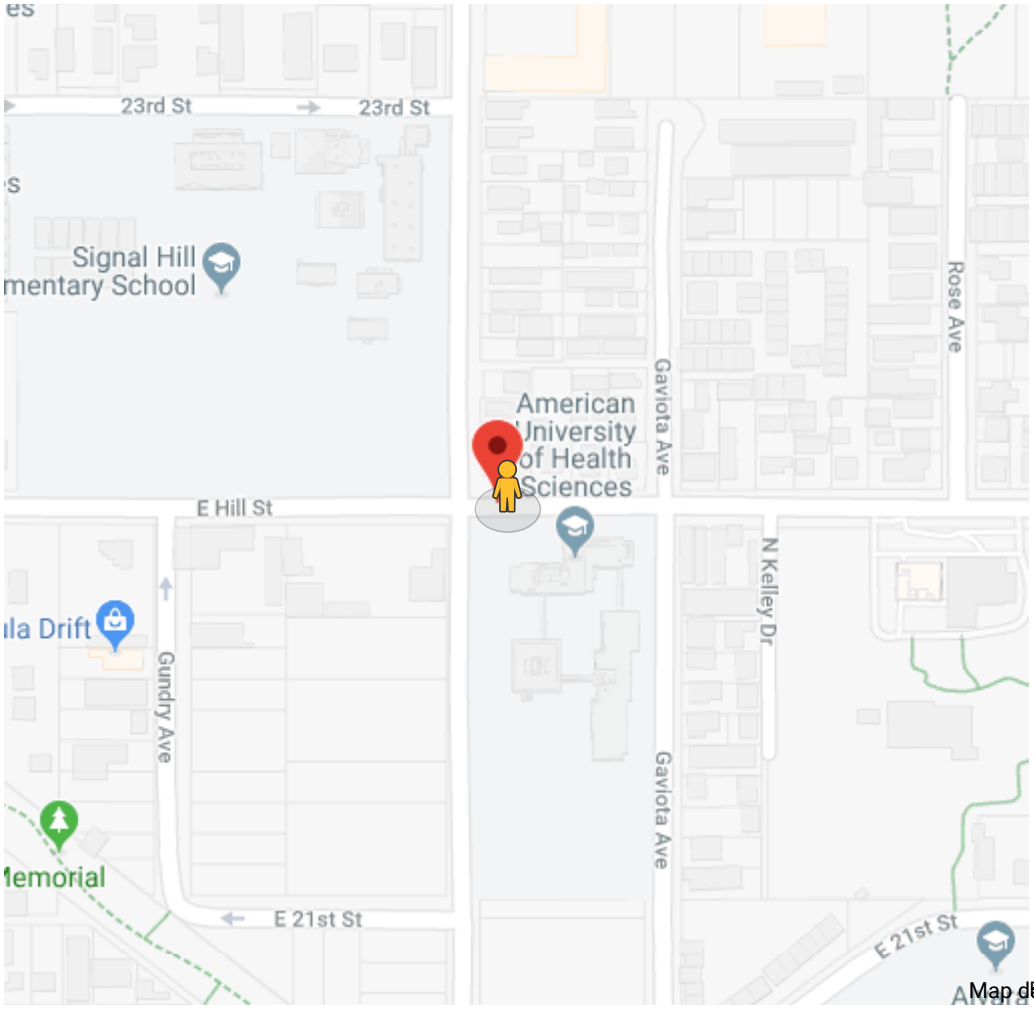
Parties: 3

Party Number	Party Type	Statewide Vehicle Type	At Fault	Party Direction	Movement Preceding Collision
1	1 - Driver (including Hit and Run)	A - Passenger Car/Station Wagon	No	East	B - Proceeding Straight
2	3 - Parked Vehicle	A - Passenger Car/Station Wagon	No	East	O - Parked
3	2 - Pedestrian	N - Pedestrian	No	East	- - Not Stated

Victims: 2

Party Number	Victim Role	Victim Gender	Victim Age	Victim Degree of Injury
1	1 - Driver	F - Female	66	4 - Complaint of Pain
3	3 - Pedestrian	F - Female	25	4 - Complaint of Pain

Map View



Street View

1609 E Hill St
Signal Hill, California
View on Google Maps

January 1, 2018 - November 2, 2018

Case ID	Year	Date	Time	Primary Road	Secondary Road	Distance	Direction	Inter-section?	Severity	# Killed	# Injured	Primary Collision Factor	Type of Collision	MVIW
8575922	2018	20180303	2125	WALNUT AV	28TH	92	N	N	0	0	0	A	D	C
8575926	2018	20180305	2047	WALNUT AV	HILL	0		Y	0	0	0	D	D	C
8581623	2018	20180311	1643	WALNUT AV	SPRING	175	S	N	0	0	0	A	C	E
8609421	2018	20180415	1646	WALNUT AV	HILL	180	S	N	3	0	1	A	B	E
8644588	2018	20180611	1135	WALNUT AV	HILL ST	0		Y	3	0	1	A	D	C
8693361	2018	20180825	1530	WALNUT AV	WILLOW	97	S	N	3	0	1	A	D	C
8707351	2018	20180913	1545	WALNUT AV	WILLOW	40	S	N	4	0	1	A	C	C
8708906	2018	20180929	49	WALNUT AV	28TH ST	202	S	N	3	0	1	A	E	I

APPENDIX E

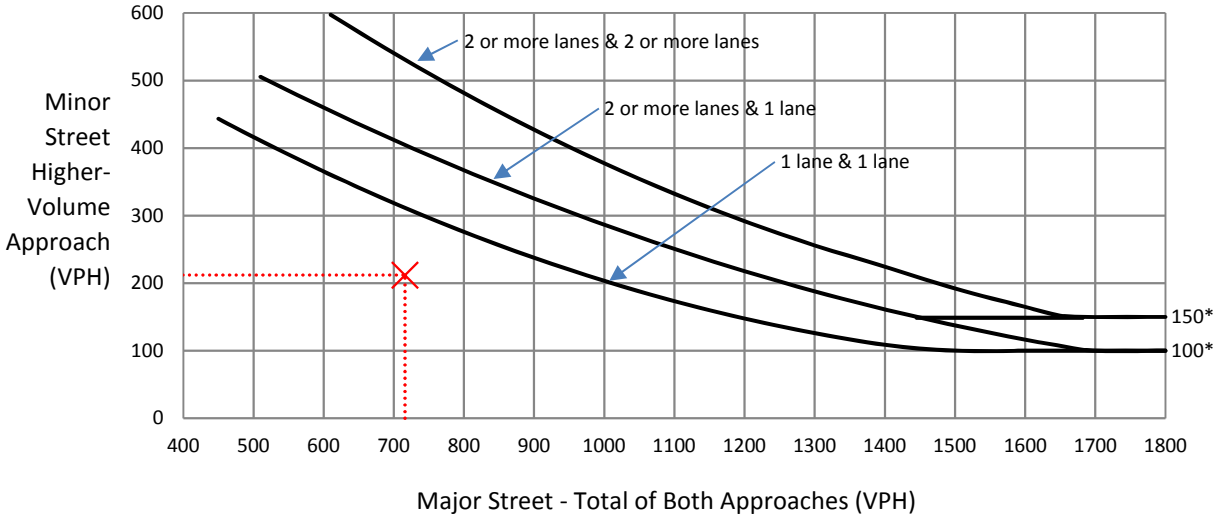
FUTURE CONDITIONS
PEAK HOUR TRAFFIC SIGNAL WARRANT WORKSHEETS

Figure E-1

Walnut Ave (NS) / Hill St (EW) - #10
General Plan Buildout With Project
AM Peak Hour

Major Street:	Walnut Ave	Volume:	716
Minor Street:	Hill St	Volume:	212

Warrant 3, Peak Hour Vehicular Volume (100% Factor)



Traffic Signal Warrant Is NOT Satisfied

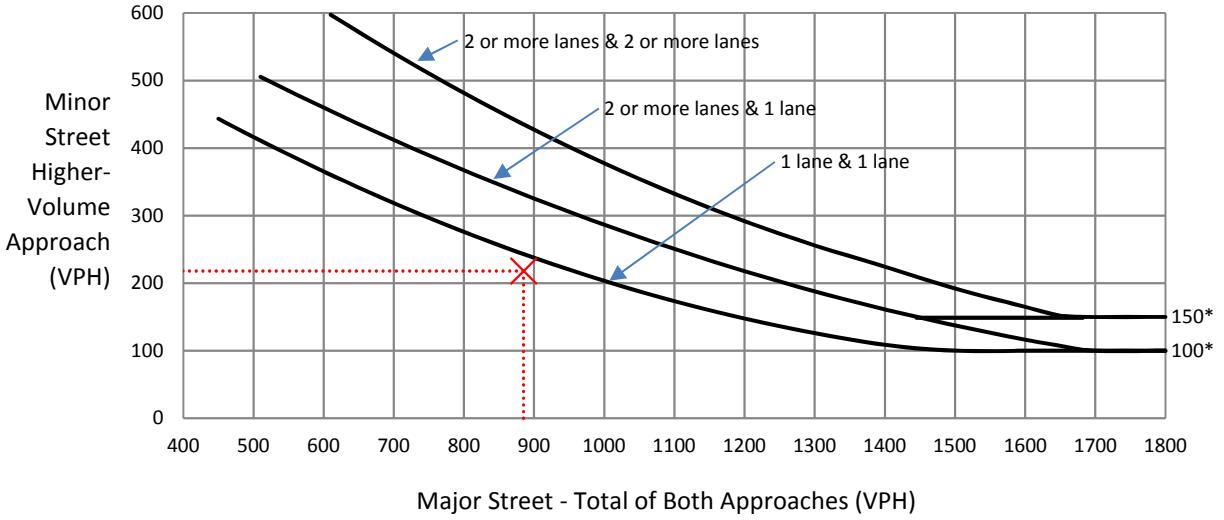
*Note: 150 vph applies as the lower threshold volume for a minor street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor street approach with one lane.

Figure E-2

Walnut Ave (NS) / Hill St (EW) - #10
General Plan Buildout With Project
School PM Peak Hour

Major Street:	Walnut Ave	Volume:	885
Minor Street:	Hill St	Volume:	218

Warrant 3, Peak Hour Vehicular Volume (100% Factor)



Traffic Signal Warrant Is NOT Satisfied

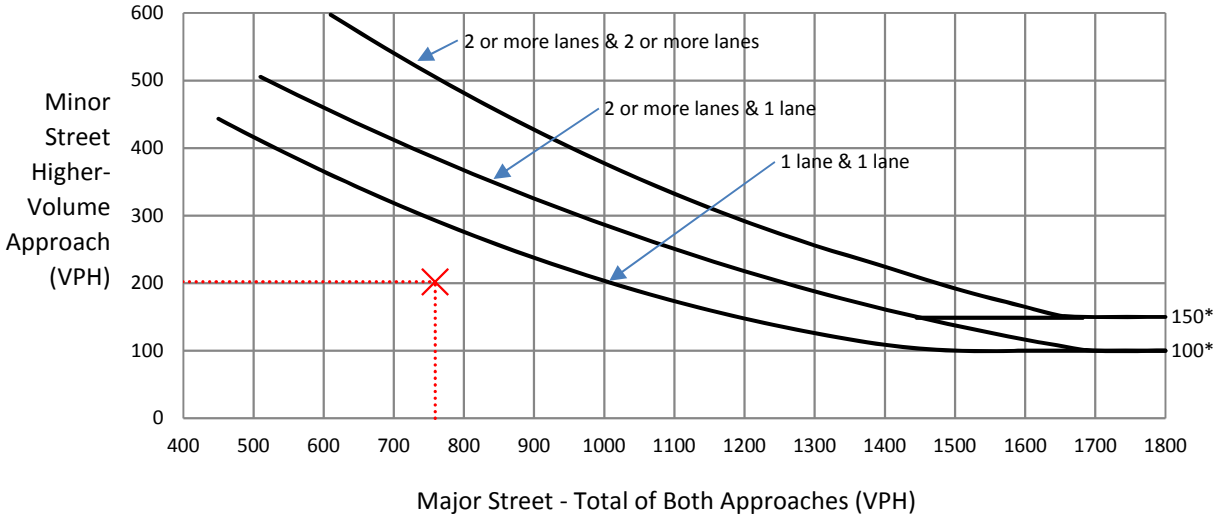
*Note: 150 vph applies as the lower threshold volume for a minor street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor street approach with one lane.

Figure E-3

Walnut Ave (NS) / Hill St (EW) - #10
General Plan Buildout With Project
PM Peak Hour

Major Street:	Walnut Ave	Volume:	759
Minor Street:	Hill St	Volume:	202

Warrant 3, Peak Hour Vehicular Volume (100% Factor)



Traffic Signal Warrant Is NOT Satisfied

*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.