TRAFFIC OPERATIONS STUDY

FOR

PLAZA 2555

Davis, CA

Prepared For:

City of Davis
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PLAZA 2555
TRAFFIC OPERATIONS STUDY

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EXECUTIVE SUMMARY

Project Description. This study evaluates the traffic impacts associated with the proposed apartment project at 2555 Research Park Drive in Davis. The project is located in the northwest quadrant of the Cowell Blvd / Research Park Drive – Green Terrace intersection. The project consists of a 200-unit apartment complex. Access to the site will be via driveways along Cowell Blvd and Research Park Drive. A short-term parking lot for the leasing office will allow for deliveries, car sharing and car hailing, and electric vehicles will be provided adjacent to the Cowell Blvd / Research Park Drive – Green Terrace intersection. This parking lot will be served by one-way access with the inbound driveway located close to the intersection and the outbound driveway further west. Two alternatives were considered in developing the projected trips expected for the site. The first alternative considered the site as off-campus student housing. Under this scenario 70 new a.m. peak hour motor vehicle trips and 125 new p.m. peak hour motor vehicle trips are projected. The second alternative considered the project is developed as a multi-family apartment complex. Under this alterative the project is expected to generate approximately 162 new a.m. peak hour trips and 131 new p.m. peak hour trips. This study analyzed the project using the highest motor vehicle generation expected.

Existing Setting. Levels of Service were evaluated for one (1) intersection in the area of the proposed project, the Cowell Blvd / Research Park Drive – Green Terrace intersection adjacent to the project site. The analysis considered both a.m. and p.m. traffic for intersection analysis. The intersection currently operates at acceptable levels of service, at LOS E or better which satisfies the City's LOS E minimum threshold in this area of the City. Three traffic signal warrants were reviewed for the intersection, peak hour, 4-hour and 8-hour. None of the warrants were met. In addition, the multi-way stop warrant was reviewed and this also was not met. Existing queues are less than 25 feet except along the eastbound shared through-left lane where the queue is about 180 feet.

Existing Plus Project Specific Impacts. The eastbound Research Park Drive approach to the intersection will decline to LOS F in the p.m. peak hour. The intersection will not meet the peak hour signal warrant. Thus, the project's traffic impact is not significant based on the City's significance criteria.. Under project conditions the queues along each intersection approach are less than 25 feet except at the eastbound shared through-left lane along Research Park Drive approaching Cowell Blvd where the queue is projected to lengthen to about 220 feet. This queue may block outbound left turns from the short-term parking lot used by delivery vehicles, car sharing and electric vehicles.

The following items should be implemented:

- Standard City of Davis conditions of approval will require payment of existing MPFP fees as mitigation for city-wide impacts.

- A marked crosswalk should be installed across Research Park Drive at the Cowell Blvd intersection.
- A pedestrian actuated rectangular rapid flashing beacon (RRFB) with crosswalk markings and pedestrian crossing signs should be installed across the south side of the Cowell Blvd / Research Park Drive – Green Terrace intersection.
- A bus shelter should be installed at the 'W' Line Research Park Drive bus stop to promote bus ridership.
- A bike lane with buffer should be installed along the Cowell Blvd project frontage.
- To facilitate pedestrian travel between the project and Playfields Park and the 'W' Line bus stop a mid-block pedestrian crossing should be constructed along the Research Park Drive project frontage. The crossing should be located near the Playfields Park entrance and include a signed and marked crosswalk and a pedestrian actuated RRFB to alert approaching motorists of cross pedestrian / bicycle traffic.
- Curb extensions should be considered across Research Park Drive to reduce pedestrian exposure to motor vehicles. This includes curb extensions at the Cowell Blvd intersection (northwest and southwest quadrants) and at the crossing at the Playfields Park entrance (mid-block).

Cumulative Year 2035 Conditions without Project. The analysis of Cumulative 2035 impacts is intended to consider the impact of this project within the context of future conditions in the City of Davis. Intersection turning movement volumes for Cumulative 2035 traffic conditions are based on information provided by Fehr & Peers Associates for the *3820 Chiles Road Apartments DEIR*. The current travel demand model includes development of the project site assuming auto sales land uses as noted in an October 17, 2017 memo from Fehr and Peers. To establish a baseline condition under Cumulative No Project conditions peak hour project traffic for the auto sales land use was subtracted from the Cumulative intersection turning volumes. The cumulative analysis assumes regional circulation system improvements will be completed by 2035; however, there are no identified improvements local to the project site. Cowell Blvd / Research Park Drive – Green Terrace intersection will decline to LOS F conditions along the Research Park Drive approach with a delay of 220.2 seconds. The intersection will also meet the peak hour signal warrant.

Installation of a traffic signal will improve the intersection to LOS B conditions (12.2. seconds of delay) in the p.m. peak hour.

Cumulative Year 2035 Conditions with Project. The addition of the project's trips will maintain the LOS F condition along the eastbound Research Park Drive approach. The intersection will continue to meet the peak hour traffic signal warrant with the delay increasing to 280.2 seconds of delay.

Under the signalized condition as identified in the Cumulative No Project condition the intersection will operate at LOS B conditions (13.1 seconds) in the p.m. peak hour. The project should pay their fair share for this improvement. Using the Caltrans methodology to calculate fair share, the project should pay 19.4% of the project cost.

PLAZA 2555
TRAFFIC OPERATIONS STUDY

INTRODUCTION

Study Purpose and Objectives

This study evaluates the traffic impacts associated with the proposed apartment project at 2555 Research Park Drive in Davis. The project is located in the northwest quadrant of the Research Park Drive / Cowell Blvd intersection (Figure 1). The project consists of a 200-unit apartment complex. The site plan is illustrated in Figure 2. Access to the site will be along Cowell Blvd and Research Park Drive.

The study parameters are consistent with City of Davis guidelines. The study addresses the following traffic scenarios:

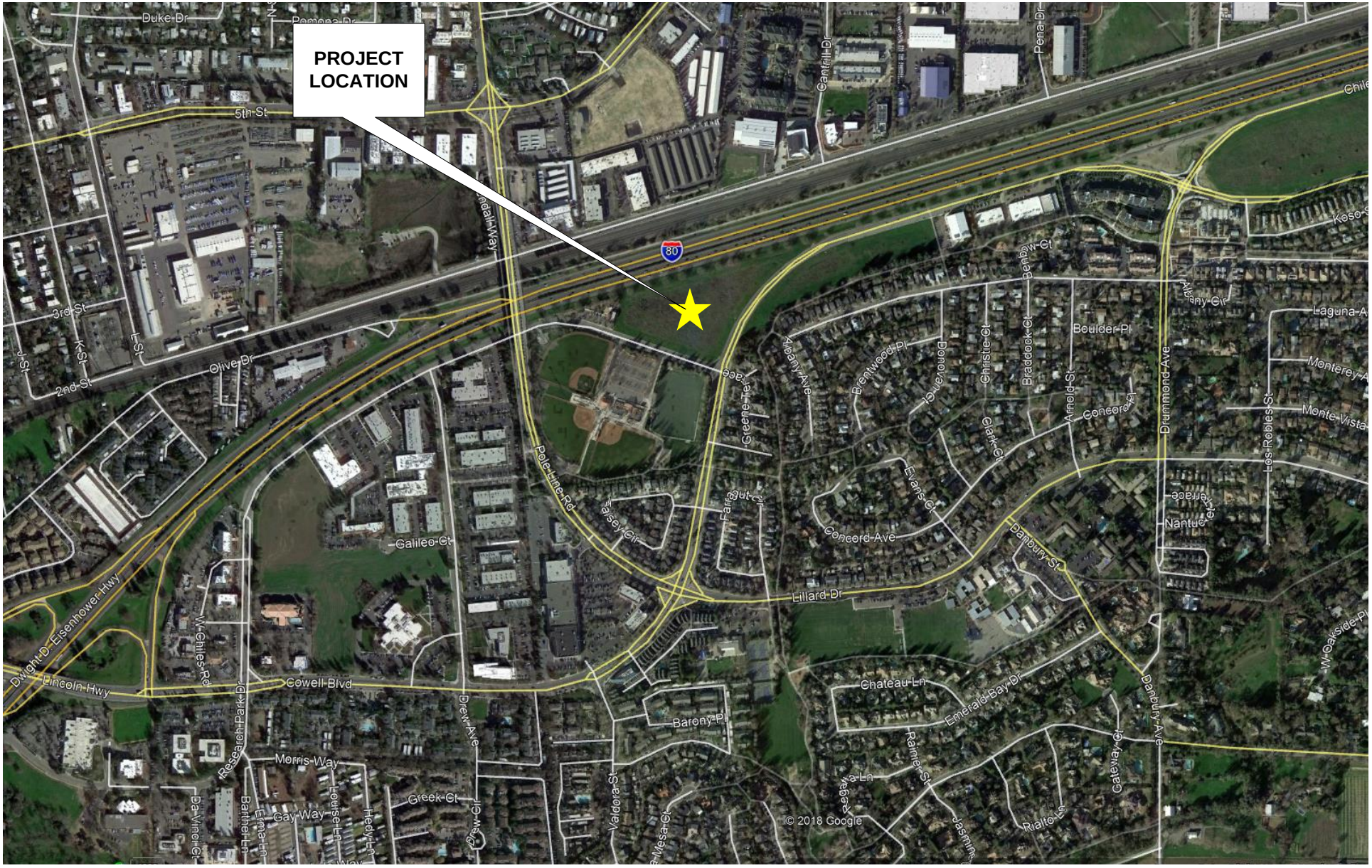
1. Existing A.M. and P.M. Peak Hour Traffic Conditions;
2. Existing Plus Project A.M. and P.M. Peak Hour Traffic Conditions;
3. Cumulative Year 2035 Conditions;
4. Cumulative Year 2035 Conditions plus development on site;

The objective of this study is to identify what effects the projects will have on the area roadway network and local intersections.

Project Description

The Plaza 2555 project is an apartment complex consisting of a variety of micro studio, 1-bedroom, 2-bedroom and 3-bedroom units. Access to the project will include two driveways, one along Cowell Blvd and one along Research Park Drive. A short-term parking lot consisting of 12 spaces for deliveries, car sharing, car hailing and electric vehicles will be provided at the leasing office, at the corner of Cowell Blvd and Research Park Drive. Access to this lot will include one-way right-in access on Research Park Drive. The lot will be one way with full outbound access west of the inbound driveway.

The primary driveways will be located at the west end of the site along Research Park Drive and on the north end of the site along Cowell Blvd. The project intends to provide 367 on-site parking spaces within carports, surface lots and tandem spaces. 607 bicycle parking spaces will be provided with 264 spaces located in secured bike barns and 343 short term spaces throughout the site.



VICINITY MAP

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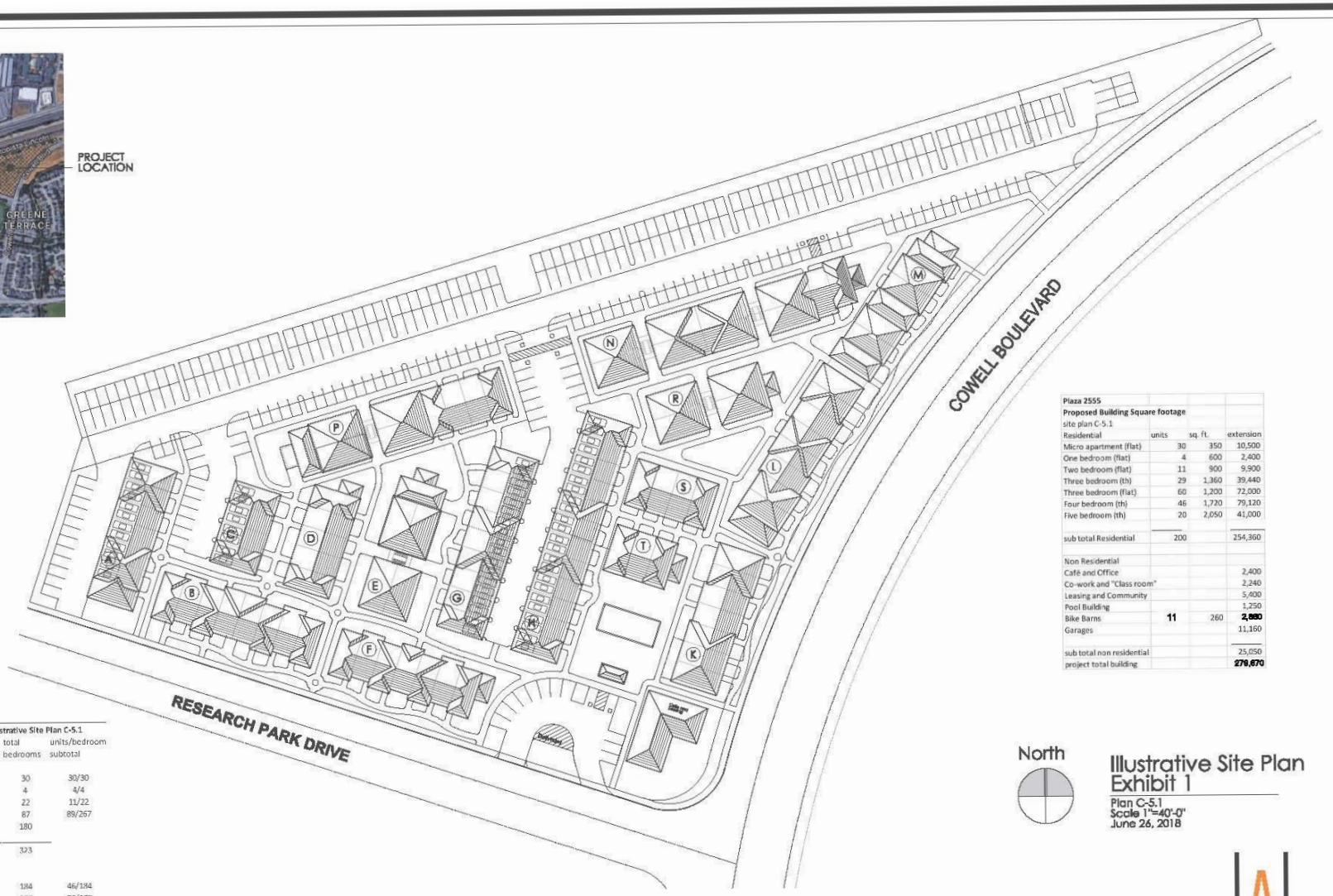
figure 1

VICINITY MAP
No Scale



Plaza 2555				
Proposed Building Square footage				
site plan C-5.1				
Residential	units		sq. ft.	extension
Micro apartment (flat)		30	350	10,500
One bedroom (flat)		4	600	2,400
Two bedroom (flat)		11	900	9,900
Three bedroom (th)		29	1,360	39,440
Three bedroom (flat)		60	1,200	72,000
Four bedroom (th)		46	1,720	79,120
Five bedroom (th)		20	2,050	41,000
sub total Residential		200		254,360
Non Residential				
Café and Office				2,400
Co-work and "Class room"				2,240
Leasing and Community				5,400
Pool Building				1,250
Bike Barns		11	260	2,860
Garages				11,160
sub total non residential				25,050
project total building				279,870

Plaza 2555	Proposed	Illustrative Site Plan C-5.1		
Proposed Unit Mix	% of all		total	units/bedroom
Unit types	Units	# of Units	bedrooms	subtotal
Smaller Units				
Micro unit (min)	15%	30	30	30/30
One bedroom		4	4	4/4
Two bedroom		11	22	11/22
Three bedroom th		29	87	89/267
three bedroom flat		60	180	
subtotal				
three bedrooms or less	67%	134	323	
Larger Units				
Four bedroom th		46	184	46/184
Five bedroom th (max)	10%	20	100	20/100
subtotal				
four bedrooms or more	33%	66	284	
Total Units		200	607	

North

Illustrative Site Plan
Exhibit 1
Plan C-5.1
Scale 1"=40'-0"
June 26, 2018

PRELIMINARY PLANNED DEVELOPMENT

Plaza 2555
Davis, California

Blue Bus, L. P.

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SITE PLAN

EXISTING SETTING

Study Area

This study addresses traffic conditions at the adjacent Cowell Blvd / Research Park Drive intersection and project driveways that will be used to access the site including a review of the site plan.

Intersections

The quality of traffic flow is often governed by the operation of the local intersections. For this study one existing intersection was identified for evaluation. The study location includes:

The **Cowell Blvd / Research Park Drive – Greene Terrace intersection** is a side street stop-controlled intersection adjacent to the project site. The intersection is a four-leg intersection. The northbound Cowell Blvd approach includes a dedicated left turn lane, and a through-right lane. The southbound approach includes a single shared left-through-right lane. Research Park Drive includes a dedicated left turn lane and a shared through-right lane while Greene Terrace consists of a single shared left-through-right lane. Currently, sidewalk is present along the south side of Research Park Drive along the project frontage and along the north side of the street along the Comcast site frontage. Sidewalk is also present along both sides of Cowell Blvd south of Research Park Drive. There is no sidewalk along Cowell Blvd north of the Research Park Drive intersection.

Marked crosswalks are not present at the intersection. Bicycle lanes exist along the Cowell Blvd and Research Park Drive approaches. A bike undercrossing exists across Cowell Blvd on the south side of Playfields Park, about 500 feet south of the intersection.

Level of Service Analysis

Methodology. *Level of Service Analysis* has been employed to provide a basis for describing existing traffic conditions and for evaluating the significance of project traffic impacts. Level of Service measures the *quality* of traffic flow and is represented by letter designations from "A" to "F", with a grade of "A" referring to the best conditions, and "F" representing the worst conditions. Table 1 presents typical Level of Service characteristics.

Local agencies adopt minimum Level of Service standards for their facilities. The City of Davis identifies LOS 'E' as the acceptable Level of Service within the City during the peak hour while LOS F is acceptable for the 'Core Area'. The *Highway Capacity Manual 6th Edition* was used to provide a basis for describing existing traffic conditions and for evaluating the significance of project traffic impacts.

Various software programs have been developed to assist in calculating intersection Level of Service, and the level of sophistication of each program responds to factors that affect the overall flow of traffic. Synchro software was used for this analysis. This method considers gap acceptance and the average delay of motorists on minor streets and in main line turn lanes to

calculate the weighted average total delay for each controlled movement and for the intersection as a whole. The intersection levels of service presented in this analysis are based on the weighted average total delay per vehicle for the intersection as a whole based on the delay thresholds shown in Table 1.

TABLE 1
LEVEL OF SERVICE DEFINITIONS

Level of Service	Signalized Intersection	Unsignalized Intersection	Roadway (Daily)
"A"	Uncongested operations, all queues clear in a single-signal cycle. Delay ≤ 10.0 sec	Little or no delay. Delay ≤ 10 sec/veh	Completely free flow.
"B"	Uncongested operations, all queues clear in a single cycle. Delay > 10.0 sec and ≤ 20.0 sec	Short traffic delays. Delay > 10 sec/veh and ≤ 15 sec/veh	Free flow, presence of other vehicles noticeable.
"C"	Light congestion, occasional backups on critical approaches. Delay > 20.0 sec and ≤ 35.0 sec	Average traffic delays. Delay > 15 sec/veh and ≤ 25 sec/veh	Ability to maneuver and select operating speed affected.
"D"	Significant congestion of critical approaches but intersection functional. Cars required to wait through more than one cycle during short peaks. No long queues formed. Delay > 35.0 sec and ≤ 55.0 sec	Long traffic delays. Delay > 25 sec/veh and ≤ 35 sec/veh	Unstable flow, speeds and ability to maneuver restricted.
"E"	Severe congestion with some long standing queues on critical approaches. Blockage of intersection may occur if traffic signal does not provide for protected turning movements. Traffic queue may block nearby intersection(s) upstream of critical approach(es). Delay > 55.0 sec and ≤ 80.0 sec	Very long traffic delays, failure, extreme congestion. Delay > 35 sec/veh and ≤ 50 sec/veh	At or near capacity, flow quite unstable.
"F"	Total breakdown, stop-and-go operation. Delay > 80.0 sec	Intersection blocked by external causes. Delay > 50 sec/veh	Forced flow, breakdown.
Sources: Highway Capacity Manual 6th Edition, Transportation Research Board (TRB).			

Significance Thresholds.

Intersections. Significant traffic impacts at intersections within the City of Davis jurisdiction are defined when the addition of proposed project traffic causes any of the following:

a) For signalized intersections outside the Core Area, causes overall intersection operations to deteriorate from an acceptable level (LOS E or better in the AM or PM peak hour) to an unacceptable level (LOS F in the AM or PM peak hour);

b) For signalized intersections outside the Core Area, exacerbate unacceptable (LOS F) operations by increasing an intersection's average delay by five seconds or more;

c) For unsignalized intersections outside the Core Area, causes the worst-case movement (or average of all movements for all-way stop-controlled intersections) to deteriorate from an acceptable level (LOS E or better in the AM or PM peak hour) to an unacceptable level (LOS F in the AM or PM peak hour) and meet the California Manual on Uniform Traffic Control Devices (MUTCD) peak hour signal warrant;

d) For unsignalized intersections outside the Core Area that operate unacceptably (LOS F in the AM or PM peak hour) and meet MUTCD's peak hour signal warrant without the project, exacerbate operations by increasing the overall intersection's volume by more than one percent; or

e) For unsignalized intersections that operate unacceptably, but do not meet MUTCD's peak hour signal warrant without the project, add sufficient volume to meet the MUTCD peak hour signal warrant.

Existing Traffic Conditions

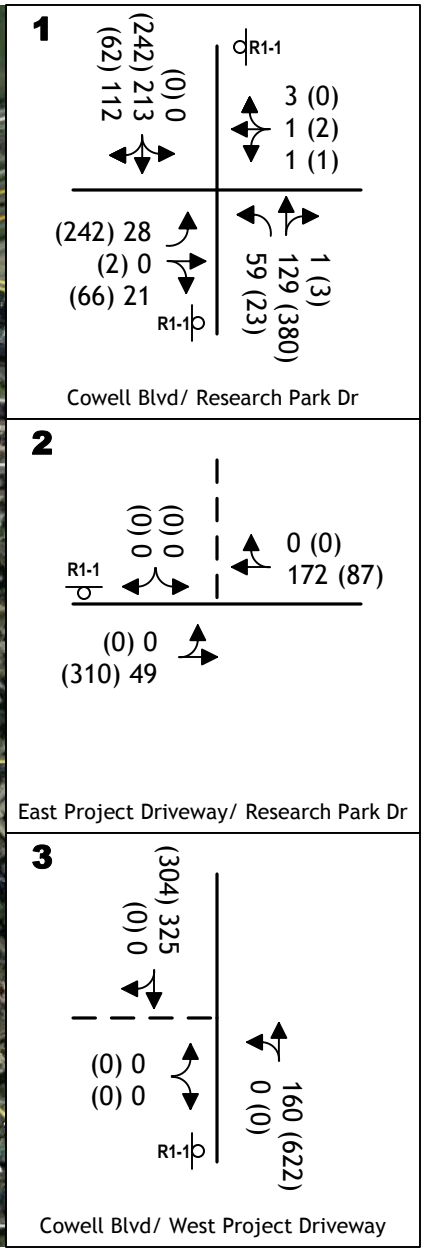
A.m. and p.m. traffic counts data were conducted June 6 and 7, 2018 by Fehr and Peers. Davis School District and UC Davis schools were in session. Figure 3 displays the existing traffic volumes for the study intersection.

Intersection Levels of Service. The Level of Service for unsignalized intersections is based on and measured in terms of the length of control delay occurring during the peak fifteen-minute analysis period within the peak hour. Table 2 summarizes the current Levels of Service at the Cowell Blvd / Research Park Drive intersection during the a.m. and p.m. peak hours. The peak hours occur inside the peak 2-hour periods of 7:00 to 9:00 a.m. and 4:00 to 6:00 p.m. The intersection currently operates at LOS B in the a.m. peak hour and LOS E in the p.m. peak hour. This meets the minimum City standards.

TABLE 2
EXISTING PEAK HOUR LEVELS OF SERVICE AT INTERSECTIONS

Location	Control	AM Peak Hour		PM Peak Hour		Peak Hour Warrant Met?
		LOS	Average Delay (secs)	LOS	Average Delay (secs)	
1. Cowell Blvd / Research Park Drive – Greene Terrace	EB/WB Stop*					No
NB Left		A	8.1	A	8.0	
SB Left		-	-	-	-	
EB		B	12.2	E	45.4	
WB		B	11.0	C	17.3	

* Research Park Drive and Greene Terrace are considered east-west



EXISTING TRAFFIC VOLUMES AND LANE CONFIGURATIONS

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figure 3

Traffic Signal Warrants. Traffic volumes at the intersection were evaluated to determine whether any traffic signal warrants were met. Daily counts were conducted by DKS Associates in February 2017 at the Cowell Blvd / Research Park Drive – Greene Terrace intersection; the Greene Terrace approach was not counted as the side street portion of the analyses use the highest volume approach only. A p.m. peak hour count was conducted in June 2018 while DJUSD and UCD schools were still in session. Three signal warrants were evaluated, the 8-hour warrant, the 4-hour warrant and the peak hour warrant.

The CA MUTCD notes that in analyzing traffic signal warrants engineering judgement should be used in applying the various traffic signal warrants. Specifically, it notes that:

Engineering judgment should also be used in applying various traffic signal warrants to cases where approaches consist of one lane plus one left-turn or right-turn lane. The site-specific traffic characteristics should dictate whether an approach is considered as one lane or two lanes. For example, for an approach with one lane for through and right-turning traffic plus a left-turn lane, if engineering judgment indicates that it should be considered a one-lane approach because the traffic using the left-turn lane is minor, the total traffic volume approaching the intersection should be applied against the signal warrants as a one-lane approach. The approach should be considered two lanes if approximately half of the traffic on the approach turns left and the left-turn lane is of sufficient length to accommodate all left-turn vehicles. Similar engineering judgment and rationale should be applied to a street approach with one through/left-turn lane plus a right-turn lane. In this case, the degree of conflict of minor-street right-turn traffic with traffic on the major street should be considered. Thus, right-turn traffic should not be included in the minor-street volume if the movement enters the major street with minimal conflict. The approach should be evaluated as a one-lane approach with only the traffic volume in the through/left-turn lane considered.

Because the northbound Cowell Blvd left turn and eastbound Research Park Drive right turn volumes are less than 50% of the adjacent lane traffic the peak hour analysis was conducted with single lanes along both the major and minor approaches with those volumes removed from the analysis. Under this condition, the intersection does not meet any of the three warrants.

Multi-Way Stop Applications. The peak hour volumes were also reviewed to determine whether all-way stop control should be installed at the intersection. The minimum volumes along the major street include at least 300 vehicles per hour for any eight hours of a typical day and at least 200 vehicles, pedestrians and bicyclists combined for the same eight hours are met, with an average delay of at least 30 seconds per vehicle for side street traffic. Based on the daily volume data collected in 2017 the intersection does not meet the side street volume of at least 200 units to warrant an all-way stop.

Intersection Queues. The quality of traffic flow can also be affected by queuing at intersections. For this study, the lengths of peak period queues have been identified and compared to available storage in order to determine whether spillover from turn lanes can affect adjoining travel or extend through adjacent intersections. 95th percentile queue lengths have

been calculated as a byproduct of the Synchro Level of Service results. Those locations where the 95th percentile queue exceeds the available storage have also been noted.

Table 3 presents information regarding current peak period queuing in lanes at the Cowell Blvd / Research Park Drive – Green Terrace intersection. The available storage is shown with the 95th percentile queue lengths for all lanes with turning movements; this includes through lanes to show whether turning vehicles may impact through traffic.

The intersection has storage capacity that can accommodate peak period queues; the eastbound through-left lane has a queue in the p.m. peak hour of about 180 feet. This queue is able to use the through lane approach because it is a shared lane.

TABLE 3
EXISTING PEAK HOUR QUEUES

Location	Length	AM Peak Hour Queue (feet)	PM Peak Hour Queue (feet)
1. Cowell Blvd / Research Park Drive – Green Terrace			
NB left turn lane	135’	<25’	<25’
SB left-through-right lane	†	<25’	<25’
EB through-left lane	†	<25’	180’
EB right turn lane	60’	<25’	<25’
WB left-through-right lane	†	<25’	<25’

† through lane with left turning traffic

Non-Automobile Transportation

Public Transit. Unitrans and Yolo Bus provide public fixed-route transit service in Davis. There are scheduled routes along Cowell Blvd and Research Park Drive. The nearest Unitrans stop is at the Cowell Blvd / Research Park Drive intersection, across the street from the project. The facilities serving the area of the proposed project include:

1. ***Unitrans***. This is operated by the Associated Students of the University of California Davis (ASUCD). The ‘M’ and ‘W’ routes provide citywide service. The ‘M’ route provides service between the Memorial Union (MU) on the UCD campus and the Research Park area of south Davis. In south Davis, the route proceeds in a clockwise direction onto Drew Avenue, Research Park Drive and Cowell Blvd where it then returns to the MU. The route departs the MU on about an hourly basis beginning at 7:00 a.m. with the last bus leaving the MU at 8:10 p.m. The route operates on weekends with the first bus departing the MU at 9:00 a.m. and the last one departing at 6:10 p.m. Each roundtrip loop takes about 25 minutes to complete. There is a stop along Research Park Drive at the Cowell Blvd intersection.

The 'W' route operates similarly to the 'M' route with service provided between the Silo on the UCD campus and the Cowell Blvd / Chiles Road – Drummond Avenue intersection. The route operates during the midweek only and departs the Silo twice an hour, at the hour and 20 minutes after the hour between 7:00 a.m. and noon. During the afternoon and evening the route continues to depart twice an hour, departing the Silo 10 minutes after the hour and at the half hour. The route generally takes about 30 minutes to complete.

2. ***Yolo Bus.*** Yolo Bus provides service in the project vicinity with two routes, 242 and 44. Route 242 provides service between Davis and Woodland with one morning and pone afternoon trip Monday through Friday. The route departs downtown Woodland in the morning at 6:54 a.m. and arrives at the Cowell Blvd / Drew Avenue intersection at 7:40 a.m. In the afternoon it departs the Cowell Blvd / Drew Avenue intersection at 5:13 p.m., arriving in downtown Woodland at 5:58 p.m.

   Route 44 operates Monday through Friday with three runs into Sacramento in the a.m. and p.m. The closest stops nearest the project site are at the Cowell Blvd / Pole Line Road – Lillard Avenue intersection and the Cowell Blvd / Chiles Road – Drummond Avenue intersection; the route uses Lillard Avenue to connect these two stops. The morning runs depart the Cowell Blvd / Chiles Road – Drummond Avenue intersection at 6:20 a.m., 7:01 a.m. and 7:45 a.m. In the evening the first bus arrives at the intersection at about 5:09 p.m. with the third bus arriving about 5:59. This route does not operate on weekends.

Bicycle and Pedestrian Facilities. Bicycle and pedestrian facilities are available throughout the City of Davis. The City has developed an extensive bicycle system connecting with the networks on the UCD campus and in Yolo County. On-street and off-street facilities are available in the project area. Bike lanes are present along Cowell Blvd and Research Park Drive. Bike paths are also present in the vicinity with pathways available through Playfields Park and east into south Davis. There are several bike undercrossings to provide bicyclists and pedestrians the ability to cross Cowell Blvd, Pole Line Road and Lillard Avenue without interacting with motor vehicles. Sidewalk is also present along the south side of Research Park Drive and both sides o Cowell Blvd from Research Park Drive south to the Pole Line Road – Lillard Avenue intersection.

PROJECT IMPACTS

Project Characteristics

The development of this project will attract additional traffic to the project site. The amount of additional traffic on a particular section of the street network is dependent upon two factors:

I. Trip Generation, the number of new vehicular trips generated by the project, and
II. Trip Distribution and Assignment, the specific routes that the new traffic takes.

Vehicular Trip Generation. Trip generation is determined by identifying the type and size of land use being developed, and recognized sources of trip generation data may then be used to calculate the total number of trip ends. The project is proposed to be a 200-unit, 646-bedroom apartment complex. The analysis considered two alternative scenarios, an off-campus student housing project and a multi-family residential apartment complex. The higher rates for the a.m. and p.m. peak periods were used to develop a worst-case scenario.

Trip generation rates for off-campus student housing were based on data collected as part of the Sterling Apartments traffic impact study completed in 2015. The two sites studied included Greystone Apartments and The U Apartments. Both are located near the 5th Street / Cantrill Drive intersection. These apartments have similar characteristics to the proposed Plaza 2555 site, being about 1¾ miles from the UC campus and on Unitrans bus lines. Table 4 presents the average rates developed from these apartment sites. The average trip rates per bedroom is 0.109 trips per bedroom in the a.m. peak hour and 0.194 trips per bedroom in the p.m. peak hour.

TABLE 4
OFF-CAMPUS STUDENT HOUSING TRIP GENERATION

Location	Total Bedrooms	Total Motor Vehicle Trips AM	AM Trip Rate	Total Motor Vehicle Trips PM	PM Trip Rate
The U	504	42	0.104	83	0.205
Greystone	405	57	0.113	93	0.185
Average Trip Rate per Bedroom			**0.109**		**0.194**

Trip generation for the multi-family residential alternative was based on the number of residents that could be expected in the complex. The density, in residents per bedroom, was derived from information compiled from data provided in The Sterling Apartments and Lincoln 40 student housing project traffic impact studies as part of their respective environmental documents. The trip generation calculations utilized the estimated density and the trip rates and directional distributions provided in *ITE Trip Generation, 10th Edition* for Land Use 221, Multi-Family Residential (Mid-Rise).

Table 5 presents the average density for the three sites. The average density is about 1.20 beds per bedroom. This rate was applied to the total project bedrooms to derive a total predicted residency (773 residents) for the site.

TABLE 5
ROOM DENSITY FOR OFF-CAMPUS STUDENT HOUSING

Location	Total Beds (Residents)	Total Bedrooms	Total Residents
The U†	582	504	
Lexington Apartments‡	407	347	
Arbors Apartments‡	275	206	
Average Density (Beds per Bedroom)		**1.20**	
Plaza 2555		646	**773**

†Sterling Apartments DEIR, September 2016
‡ Lincoln40 Apartments DEIR, June 2017

Table 6 displays the projected a.m. and p.m. peak hour trip generation for each alternative for the Plaza 2555 project. Using off-campus student housing as the independent variable the project is expected to generate 70 a.m. and 125 p.m. peak hour trips. With the total number of multi-family residents used, the project could generate 162 a.m. peak hour trips and 131 p.m. peak hour trips. The highest trip generation is shown to occur in the a.m.; often, the p.m. peak hour is identified with a higher number of trips. The projected trips represent the peak hour of the a.m. and p.m. peak periods, which are typically multi-houred. The morning rate may be higher as this time is a more constrained period with more people leaving to go to work and school in a shorter span. During the p.m. period there are fewer constraints with households having a greater period in completing tasks, resulting in fewer peak hour trips, but not necessarily fewer p.m. peak period trips.

Based on the trip generation comparison the multi-family residential alternative is projected to have a higher number of trips on the site in both peak periods.

TABLE 6
PROJECT TRIP GENERATION COMPARISON

Land Use	Amount	Trip Generation Rate		Trips			
		AM Peak Hour	PM Peak Hour	AM Peak Hour		PM Peak Hour	
Off-Campus Student Housing	646 Bedrooms	0.11	0.19	70		125	
				In	Out	In	Out
				20%	80%	63%	37%
New Trips – Off Campus Student Housing				**14**	**56**	**79**	**46**
		Trip Generation Rate		Trips			
Land Use	**Amount**	**AM Peak Hour**	**PM Peak Hour**	**AM Peak Hour**		**PM Peak Hour**	
Multi-Family Residential (LU 221)	773 Residents	0.21	0.17	162		131	
				In	Out	In	Out
				26%	74%	64%	36%
New Trips – Multi-Family Residential				**42**	**120**	**84**	**47**

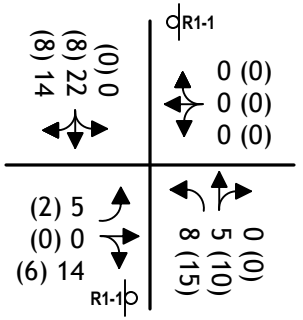
Vehicle Trip Distribution. The distribution of project vehicular traffic was determined based on review of the existing traffic counts at the surrounding intersections, knowledge of the City's attractors and destinations including the UCD campus and proximity to the I-80 interchange at Richards Blvd and the route choices available. Table 7 displays the trip distribution assumptions used for the proposed project.

Vehicle Trip Assignment. Traffic generated by the project was assigned to the study area street system based on the projected distribution percentages. It is expected that most traffic heading towards I-80 will use Research Park Drive to bypass the Pole Line Road – Lillard Drive intersections and the three traffic signals between the project site and the Cowell Blvd / Research Park Drive intersection while traffic crossing into central Davis using Pole Line Road will use Cowell Blvd. Figure 4 displays the project generated traffic alone assuming access as proposed. Figure 5 displays the resulting sum of existing a.m. and p.m. peak hour volumes and project trips at the study intersections for the Existing plus Project condition.

TABLE 7
TRIP DISTRIBUTION

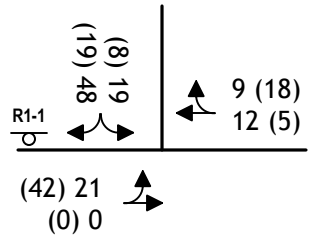
Route	% of Total Trips	
	AM	PM
East on Cowell Blvd	20%	20%
West on Cowell Blvd	30%	30%
West on Research Park Drive	50%	50%
Total	100%	100%

1



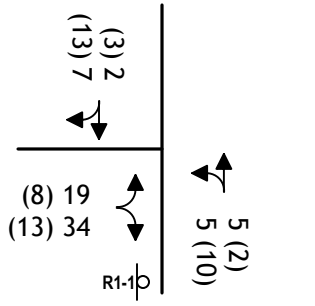
Cowell Blvd/ Research Park Dr

2



East Project Driveway/ Research Park Dr

3



Cowell Blvd/ West Project Driveway

PROJECT ONLY TRAFFIC VOLUMES AND LANE CONFIGURATIONS

KD Anderson & Associates, Inc.
Transportation Engineers

1

(0) 0
(250) 235
(70) 126
R1-1
3 (0)
1 (2)
1 (1)
(244) 33
(2) 0
(72) 35
R1-1
1 (3)
134 (390)
67 (38)

Cowell Blvd/ Research Park Dr

2

(8) 19
(19) 48
R1-1
9 (18)
184 (92)
(42) 21
(310) 49

East Project Driveway/ Research Park Dr

3

(307) 327
(13) 7
(8) 19
(13) 34
R1-1
165 (624)
5 (10)

Cowell Blvd/ West Project Driveway

EXISTING PLUS PROJECT TRAFFIC VOLUMES AND LANE CONFIGURATIONS

KD Anderson & Associates, Inc.
Transportation Engineers

2100-08 RA 8/20/2018

figure 5

Existing Plus Project Level of Service Impacts

Intersection Levels of Service. Table 8 displays the a.m. and p.m. peak period level of service at each study intersection with the proposed project. The Cowell Blvd / Research Park Drive intersection is projected to decline to LOS F conditions in the p.m. peak hour along the Research Park Drive approach. All other intersections will operate at LOS B or better. None of the unsignalized study intersections will carry traffic volumes that meet the peak hour signal warrant. Thus, based on the City's LOS policy the project's traffic impacts are not significant.

Peak Hour Traffic Signal Warrant. The peak hour traffic signal warrant was again reviewed under Existing plus Project conditions. While the intersection operates acceptably the warrant provides an indication whether the intersection may exhibit short term delays during the peak hour. Under project conditions the intersection will not meet the peak hour warrant.

Intersection Queues. Table 9 presents information regarding Existing plus Project peak period queuing at the three study intersections. All movements at each of the intersections except the eastbound shared through-left lane at the Cowell Blvd / Research Park Drive intersection has turn lane storage capacity that can accommodate peak period queues. The queue for the shared eastbound through-left lane will lengthen to 220 feet in the p.m. peak hour. This queue may block outbound left turns from the short-term parking lot used by delivery vehicles, car sharing and electric vehicles.

TABLE 8
EXISTING PLUS PROJECT PEAK HOUR INTERSECTION LEVELS OF SERVICE

Location	Control	Existing				Existing Plus Project				Peak Hour Warrant Met?
		AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour		
		LOS	Average Delay (secs)	LOS	Average Delay (secs)	LOS	Average Delay (secs)	LOS	Average Delay (secs)	
1. Cowell Blvd / Research Park Drive – Greene Terrace										
NB Left	EB/WB	A	8.1	A	8.0	A	8.3	A	8.1	No
SB Left	Stop*	---	---	---	---	---	---	---	---	
EB		B	12.2	E	45.4	B	12.6	F	61.1	
WB		B	11.0	C	17.3	B	11.4	C	18.6	
2. Cowell Blvd / Project Access										
NB Left Turn	EB Stop	---	---	---	---	B	10.0	B	10.1	No
EB		---	---	---	---	A	7.7	A	7.5	
3. Cowell Blvd / Project Access										
SB	SB Stop	---	---	---	---	A	8.0	A	8.0	No
EB Left Turn		---	---	---	---	B	11.5	B	14.1	

* Research Park Drive and Greene Terrace are considered east-west

TABLE 9
EXISTING PLUS PROJECT PEAK HOUR QUEUES

Location	Length	Existing plus Project AM Peak Hour Queue (feet)	Existing plus Project PM Peak Hour Queue (feet)
1. Cowell Blvd / Research Park Drive – Green Terrace			
NB left turn lane	135'	<25'	<25'
SB left-through-right lane	†	<25'	<25'
EB through-left lane	†	<25'	220'
EB right turn lane	60'	<25'	<25'
WB left-through-right lane	†	<25'	<25'
2. Cowell Blvd / Research Park Drive			
SB left-right lane	†	<25'	<25'
EB left-through lane	†	<25'	<25'
3. Cowell Blvd / Research Park Drive			
NB left-through lane	†	<25'	<25'
EB left-right lane	†	<25'	<25'

† through lane with left turning traffic

Site Access Analysis

This report section provides additional details regarding the operation of the project's site access.

Circulation Layout. The project is located in the northwest quadrant of the Cowell Blvd / Research Park Drive intersection. There are two primary driveways providing access to the project's primary surface parking, one along Research Park Drive, about 550 feet from Cowell Blvd and one along Cowell Blvd, about 600 feet from Research Park Drive. The Research Park Drive driveway is expected to be situated directly across from the westerly driveway for Playfields Park. This will be about 75 feet away from a driveway at the adjacent Comcast Service Center. Two additional driveways are proposed along Research Park Drive to provide short term parking for deliveries, rental inquiries, car sharing/hailing and electric vehicle recharging. These driveways are adjacent to the Cowell Blvd / Research Park Drive intersection and would be directional with inbound only closest to the intersection.

The two driveways leading to the surface parking are located at the back edges of the site, with the most parking spaces situated against I-80. There are two internal drive aisles providing access to 60 covered garage spaces. These aisles also provide emergency vehicle access to the interior of the complex.

Bicycles

As described earlier there are numerous bicycle facilities in the project vicinity that provides access to points throughout the City. These include bicycle lanes along Research Park Drive and

Cowell Blvd and multi-use pathways through Playfields Park and south Davis. The project intends to provide multi-use pathways serving both pedestrian and bicyclists throughout the project, separated from the motor vehicle facilities. Multiple connections between the streets (Cowell Blvd and Research Park Drive) and the project are proposed to allow bicyclists to enter or depart the street at convenient access points to all apartments.

Bikes heading east either on Cowell Blvd or on the multi-use path have to cross the street by traveling south through Playfields Park to the bike undercrossing or by crossing at the Research Park Drive – Green Terrace intersection. Crossing using the multi-use path requires out of direction travel and is likely not to be used frequently. Currently, a marked crosswalk does not exist at the Research Park Drive intersection.

The project proposes to install bicycle facilities throughout the complex, with 264 spaces provided in secured "bicycle barns". An additional 343 short term spaces are proposed throughout the site with bike racks provided adjacent to each building cluster.

Pedestrians

Sidewalk is present in the surrounding vicinity, along the south side of Research Park Drive, along the north side of Research Park Drive along the Comcast Service Center frontage and along both sides of Cowell Blvd south of Research Park Drive. The project will install sidewalk along the project frontage with multi-use paths throughout the site to accommodate both bicyclists and pedestrians. As noted earlier there are two Unitrans routes that pass the site, the 'M' route which operates in a clockwise direction along Research Park Drive and the 'W' route which operates in a counter-clockwise direction along Lillard Drive, Drummond Avenue and Cowell Blvd. The 'M' Line currently stops about 175' west of the Cowell Blvd intersection. The closest 'W' route stop to the site is currently at the Halsey Circle / Cowell Blvd intersection, about 775 feet south of the project. The project intends to install a "transit plaza" which is intended to provide shelters for bus riders waiting during inclement weather, a bus schedule board, direct access to a proposed on-site café. This plaza will also serve as a pick-up/drop-off location for ride hailing services.

Children and adults living at the Plaza 2555 are likely to be drawn to facilities and events held at Playfield Park directly across the street from the project. Along Research Park Drive the perimeter of the park is fenced except between the two driveways located about 300 feet and 550 feet west of the Cowell Blvd intersection. A significant number of units are located along Research Park Drive and it is not expected that these residents will walk to the adjacent intersection to cross at a marked or unmarked crosswalk.

Safe Routes to School

Children living at Plaza 2555 will attend Montgomery Elementary School located on Lillard Drive and Harper Middle School on East Covell Blvd. The City's Suggested Routes to School Map for Montgomery Elementary School indicates that the route nearest the project site begins at Playfields Park and routes students under Cowell Blvd to a multi-use path along Evans Court where they can cross to the school. The return from the school would be the same route with two

street crossings necessary, adjacent to the school and at the Cowell Blvd / Research Park Drive intersection.

Middle School age students will attend Harper Middle School located on the north side of I-80 along East Covell Blvd. There appear to be two potential routes, one requiring out-of-direction travel across the Pole Line Road Overcrossing and the second across the Dave Pelz bike crossing. For students using the Pole Line Road Overcrossing they would enter Cowell Blvd and proceed to Pole Line Road, cross I-80 and head east along 5th Street to Oceano Way where they can enter the school. Using the Dave Pelz overcrossing students would have to use the undercrossing below Cowell Blvd to access the multi-use path to Willow Creek Park, cross Cowell Blvd to the overcrossing and continue along the north side pathway to 5th Street onto Oceano Way and to the school. The return would follow the same route in reverse.

A quicker route that may be used by some bicyclists, although not on the Safe Route to School, would be riding along Cowell Blvd to and from the overcrossing.

Unitrans Utilization

Unitrans operates two routes, the 'M' and 'W' routes that pass the project site. The 'M' route has a stop at the Cowell Blvd / Research Park Drive intersection while the closest existing stop along the 'W' route is along Cowell Blvd at Halsey Circle. The project will introduce new riders to this route. Based on data from The Sterling Apartments DEIR, Unitrans staff has indicated that more students are drawn to routes that terminate at the Silo ('W' Line) as it is closer to UCD classrooms than the Memorial Union ('M' Line).

Based on trip rates derived from observations conducted as part of the Sterling Apartments DEIR transit ridership rates assuming a worst-case student housing use is expected to be about 0.080 trips per resident in the a.m. peak hour and 0.068 trips in the p.m. peak hour. This equates to about 62 morning riders and 53 p.m. riders.

Unitrans staff provided information regarding their operations. Buses generally have 36 to 40 seats. With "standees" Unitrans considers the design capacity of their buses to be 60 passengers for planning purposes. Given the variance in day to day ridership there may be more than 60 passengers on a bus, and Unitrans can get up to 100 passengers on a bus in what is termed a "crush load".

According to the *Unitrans General Manager's Report Fiscal Year 2016-2017* (October 2017), certain bus lines can experience overcrowding, particularly during inclement weather conditions. Most Unitrans buses can accommodate 60 passengers without crowding, with their double decker buses accommodating 100 passengers. The report notes that daily ridership is about 46 passengers per hour on the 'M' Line and 73 passengers per hour on the 'W' line. The 'W' Line operates twice an hour while the 'M' Line operate once each hour. Based on the projected additional peak hour transit trips, both routes can be supported without approaching a crush condition.

Parking / Transportation Systems Management

Based on the most recent site plan dated July 13, 2018 the project is proposing 367 on-site motor vehicle parking spaces. While the site currently provides 607 bicycle parking spaces the City's zoning code identifies one bike parking space for each bedroom. As the project is projected to have 646 bedrooms the site will need to provide an additional 39 bike parking spaces.

The City's Transportation Policy 5.1 notes that parking management techniques should be employed to efficiently manage motor vehicle parking supply and promote sustainability. The Plaza 2555 project includes several characteristics with respect to site location, planned land uses, and design elements that can lead to reduced automobile use and associated emissions. These land use characteristics are further supplemented by a variety of programs already available in the project vicinity. These include accessibility to fixed route bus service and access to the City's existing bicycle and pedestrian network. In addition, various amenities (e.g., supermarket and restaurants) are about ¼ mile away from the project and can be accessed by foot or bike and the project proposed to include electric vehicle recharging stations on site.

CUMULATIVE YEAR 2035 IMPACTS

Background Information

The analysis of Cumulative Year 2035 impacts is intended to consider the impact of this project within the context of future conditions under the City of Davis General Plan while also providing information regarding other reasonably foreseeable development proposals. Intersection turning movement volumes for Cumulative 2035 traffic conditions are based on information provided by Fehr & Peers Associates for the *3820 Chiles Road Apartments DEIR*. Peak hour traffic volumes from the travel model volumes were used to generate growth factors which were applied to existing peak hour intersection turning movement traffic volumes. The development of future year intersection turning movement traffic volumes requires that the turning movements at each intersection "balance". To achieve the balance, inbound traffic volumes must equal the outbound traffic volumes, and the volumes must be distributed among the various left-turn, through, and right-turn movements at each intersection. The "balancing" of future year intersection turning movement traffic volumes was conducted using methods described in the Transportation Research Board's (TRB's) National Cooperative Highway Research Program (NCHRP) Report 255, *Highway Traffic Data for Urbanized Area Project Planning and Design*. The NCHRP 255 method applies the desired peak hour directional volumes to the intersection turning movement volumes, using an iterative process to balance and adjust the resulting forecasts to match the desired peak hour directional volumes.

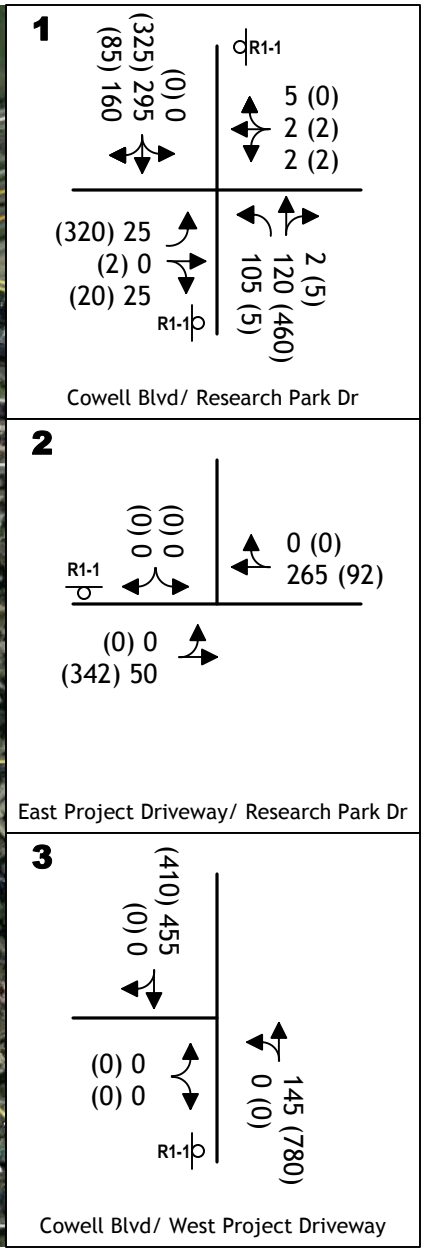
The current travel demand model includes development of the project site assuming auto sales land uses as noted in an October 17, 2017 memo from Fehr and Peers. To establish a baseline condition under Cumulative No Project conditions peak hour project traffic for the auto sales land use was subtracted from the Cumulative intersection turning volumes developed using the NCRHP 255 methodology.

The cumulative analysis assumes regional circulation system improvements will be completed by 2035; however, there are no identified improvements local to the project site.

Figure 6 presents the Cumulative 2035 traffic volumes and lane configurations at the Cowell Blvd / Research Park Drive – Green Terrace intersection.

Intersection Levels of Service. Future growth in Davis will increase the volume of traffic on the study roadways. Table 10 displays the a.m. and p.m. peak hour Levels of Service in the Cumulative 2035 "No Project" condition. The Cowell Blvd / Research Park Drive – Green Terrace intersection will decline to LOS F conditions along the Research Park Drive approach with a delay of 220.2 seconds. The intersection will also meet the peak hour signal warrant.

Intersection Queues. Table 11 presents information regarding projected peak period queuing in the Cumulative peak hours. All movements at the Cowell Blvd / Research Park Drive – Green Terrace intersection other than the eastbound shared through-left lane has turn lane storage capacity that can accommodate peak period queues. The shared through-left lane is projected to have a queue of about 475 feet in the p.m. peak hour. This queue will block the easterly driveway to the Playfields Park parking lot.



CUMULATIVE TRAFFIC VOLUMES AND LANE CONFIGURATIONS

KD Anderson & Associates, Inc.
Transportation Engineers

2100-08 RA 8/20/2018

figure 6

TABLE 10
CUMULATIVE YEAR 2035 PEAK HOUR INTERSECTION LEVELS OF SERVICE

Location	Control	Cumulative				Cumulative Plus Project				Peak Hour Warrant Met?
		AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour		
		LOS	Average Delay (secs)	LOS	Average Delay (secs)	LOS	Average Delay (secs)	LOS	Average Delay (secs)	
1. Cowell Blvd / Research Park Drive – Greene Terrace										
NB Left	EB/WB	A	8.7	A	8.2	A	8.9	A	8.3	Yes†
SB Left	Stop*	---	---	---	---	---	---	---	---	
EB		B	14.5	F	220.2	B	14.9	F	280.2	
WB		B	13.0	C	19.8	B	13.7	C	21.6	
2. Cowell Blvd / Project Access										
NB Left Turn	EB Stop	---	---	---	---	B	10.9	B	10.3	No
EB		---	---	---	---	A	7.9	A	7.5	
3. Cowell Blvd / Project Access										
SB	SB Stop	---	---	---	---	A	8.4	A	8.3	No
EB Left Turn		---	---	---	---	B	13.1	C	17.8	

* Research Park Drive and Greene Terrace are considered east-west
† meets p.m. peak hour without and with project

TABLE 11
CUMULATIVE PEAK HOUR QUEUES

Location	Length	Cumulative AM Peak Hour Queue (feet)	Cumulative PM Peak Hour Queue (feet)
1. Cowell Blvd / Research Park Drive – Green Terrace			
NB left turn lane	135	<25’	<25’
SB left-through-right lane	†	<25’	<25’
EB through-left lane	†	<25’	475’
EB right turn lane	60	<25’	<25’
WB left-through-right lane	†	<25’	<25’

† through lane with left turning traffic

Cumulative Year 2035 Plus Project Traffic Conditions

Intersection Levels of Service. Figure 7 displays the Cumulative Year 2035 plus Project volumes and lane configurations at each study intersection. Table 10 displays the resulting a.m. and p.m. peak hour Levels of Service with the project. The Cowell Blvd / Research Park Drive – Green Terrace intersection will decline to LOS F conditions along the Research Park Drive approach with a delay of 280.2 seconds. The remaining intersections will continue to operate at LOS C or better. The Cowell Blvd / Research Park Drive – Green Terrace intersection will continue to meet the peak hour signal warrant. This is a significant impact.

Intersection Queues. Table 12 presents information regarding Cumulative plus Project peak period queuing at the three study intersections. All movements at each of the intersections except the eastbound shared through-left lane at the Cowell Blvd / Research Park Drive intersection has turn lane storage capacity that can accommodate peak period queues. The queue for the shared eastbound through-left lane will lengthen to about 538 feet in the p.m. peak hour. This queue will block the outbound left turns from the short-term parking lot as well as both Playfields Park parking lot driveways.

TABLE 12
CUMULATIVE PLUS PROJECT PEAK HOUR QUEUES

Location	Length	Cumulative plus Project AM Peak Hour Queue (feet)	Cumulative plus Project PM Peak Hour Queue (feet)
1. Cowell Blvd / Research Park Drive – Green Terrace			
NB left turn lane	135	<25’	<25’
SB left-through-right lane	†	<25’	<25’
EB through-left lane	†	<25’	538’
EB right turn lane	60	<25’	<25’
WB left-through-right lane	†	<25’	<25’

† through lane with left turning traffic

1

(333) 317 (0) 0
(93) 174
R1-1
5 (0)
2 (2)
2 (2)
(322) 30
(2) 0
(26) 39
R1-1
2 (5)
125 (470)
113 (20)

Cowell Blvd/ Research Park Dr

2

(8) 19
(19) 48
R1-1
9 (18)
277 (97)
(42) 21
(342) 50

East Project Driveway/ Research Park Dr

3

(413) 457
(13) 7
(8) 19
(13) 34
R1-1
150 (782)
5 (10)

Cowell Blvd/ West Project Driveway

CUMULATIVE PLUS PROJECT TRAFFIC VOLUMES AND LANE CONFIGURATIONS

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Transportation Engineers

2100-08 RA 8/20/2018

figure 7

Sight Distance. A sight distance analysis was completed at the proposed project driveways along Research Park Drive and Cowell Blvd. Available sight distance was evaluated using the standards documented in the Caltrans *Highway Design Manual* (HDM). Based on the locations of the driveways "**Minimum Stopping Sight** Distance" (MSSD) and "**Corner Sight Distance**" (CSD) was considered. These criteria are documented in Tables 201.1 and 405.1A of the HDM; the HDM notes that the MSSD criterion is used for CSD evaluation at driveways.

Research Park Drive Driveway. The posted speed limit along Research Park Drive is 40 mph. The corresponding minimum sight distance standard for this speed is 300 feet. A curve is present along Research Park Drive just west of the project driveway. The driveway is located along the top side of the curve, allowing a clear view of the roadway for motorists leaving the driveway. It is assumed that the driveway will be located opposite the Playfields Park driveway. From this location the available sight distance looking west is about 400 feet while the sight distance looking east towards Cowell Blvd exceeds 400 feet. All landscaping over 2 feet in height as well as project signage should be placed outside of the sight lines to provide adequate sight distance.

Cowell Blvd Driveway. The posted speed limit along Cowell Blvd is 40 mph. The corresponding minimum sight distance standard for this speed is 300 feet. A curve is present along Cowell Blvd just east of the project driveway, and the driveway is located along the top side of the curve, allowing a clear view of the roadway for motorists leaving the driveway. The available sight distance looking in both directions along Cowell Blvd exceeds 400 feet. All landscaping over 2 feet in height as well as project signage should be placed outside of the sight lines to provide adequate sight distance.

SUMMARY / RECOMMENDED MEASURES

The preceding analysis has identified project impacts that may occur without changes to the roadway network. The text that follows identifies a strategy for improving operations with the proposed project.

Existing Conditions

Recommendations. All intersections operate at acceptable Levels of Service, at LOS E or better. This satisfies the City's LOS E minimum.

Existing queues are less than 25 feet except along the eastbound shared through-left lane where the queue is about 180 feet.

Existing Plus Project Conditions

Adequate operating level of service will be maintained at the project driveways with the addition of project traffic; however, the eastbound approach of the Cowell Blvd / Research Park Drive – Green Terrace intersection will decline to LOS F. The intersection will not meet the peak hour traffic signal warrant; thus, the project's traffic impact is not significant based on the City's significance criteria.

Under project conditions the queues along each intersection approach are less than 25 feet except at the eastbound shared through-left lane along Research Park Drive approaching Cowell Blvd where the queue is projected to lengthen to about 220 feet. This queue may block outbound left turns from the short-term parking lot used by delivery vehicles, car sharing and electric vehicles.

The following items should be implemented:

- Standard City of Davis conditions of approval will require payment of existing MPFP fees as mitigation for city-wide impacts.
- A marked crosswalk should be installed across Research Park Drive at the Cowell Blvd intersection.
- A pedestrian actuated rectangular rapid flashing beacon (RRFB) with crosswalk markings and pedestrian crossing signs should be installed across the south side of the Cowell Blvd / Research Park Drive – Green Terrace intersection.
- A bus shelter should be installed at the 'W' Line Research Park Drive bus stop to promote bus ridership.
- A bike lane with buffer should be installed along the Cowell Blvd project frontage.
- To facilitate pedestrian travel between the project and Playfields Park and the 'W' Line bus stop a mid-block pedestrian crossing should be constructed along the Research Park Drive project frontage. The crossing should be located near the Playfields Park entrance and include a signed and marked crosswalk and a pedestrian actuated RRFB to alert approaching motorists of cross pedestrian / bicycle traffic.
- Curb extensions should be considered across Research Park Drive to reduce pedestrian exposure to motor vehicles. This includes curb extensions at the Cowell Blvd

intersection (northwest and southwest quadrants) and at the crossing at the Playfields Park entrance (mid-block).

Cumulative Conditions

Cumulative Year 2035 Conditions. The eastbound approach to the Cowell Blvd / Research Park Drive – Green Terrace intersection will decline to LOS F (220.2 seconds) in the p.m. peak hour of the Cumulative No Project condition. The intersection will meet the peak hour traffic signal warrant.

The following items should be implemented:

- The City's Bicycle, Transportation and Street Safety Commission (BTSSC) reviewed improvement alternatives to this intersection in December 2017. At that time, and given the limited information available, City staff noted that operational improvements including a roundabout, signalization or an all-way stop would not be appropriate at the intersection.

However, with additional analyses conducted operation improvements are identified for the intersection. Two alternatives were considered, a mini-roundabout and a traffic signal. A modern roundabout was identified at the December BTSSC meeting as an alternative and was disregarded due to the projected footprint required. A mini-roundabout is an alternative that could be considered. The footprint appears to be able to fit within the existing street. It allows vehicles to cross onto the central island; rather than having a raised curb the central island is mountable for large vehicles. A roundabout would operate at LOS A conditions (8.7 seconds of delay). A second alternative includes signalization of the intersection. This would result in LOS B conditions (12.2 seconds of delay) in the p.m. peak hour. A traffic signal is the preferred improvement due to the projected increase in pedestrian and bicycle travel.

Cumulative Year 2035 Conditions plus Project. The addition of the project's trips will maintain the LOS F condition at the Cowell Blvd / Research Park Drive intersection and increase the delay to 280.2 seconds.

Under the signalized condition as identified in the Cumulative No Project condition the intersection will operate at LOS B conditions (13.1 seconds) in the p.m. peak hour. The project should pay their fair share for this improvement. Using the Caltrans methodology to calculate fair share, the project should pay 19.4% of the project cost.

REFERENCES

1. ITE *Trip Generation*, 10th Edition, 2017
2. California Manual of Uniform Traffic Control Devices, November, 2014
3. *City of Davis General Plan, Transportation Element*, December 10, 2013.
4. Unitrans, *General Manager's Report Fiscal Year 2016-2017* (October 2017)
5. City of Davis, *Transportation Implementation Plan 2017 Annual Report*, July 2017
6. *Sterling Apartments Draft Environmental Impact Report*, De Novo Planning Group, September 2016
7. *3820 Chiles Road Apartments Draft Environmental Impact Report*, Raney Planning and Management, August 2018
8. Telephone and E-mail correspondence, Ike Njoku and Brian Mickelson, City of Davis, July 2018 through August 2018

APPENDIX A
FAIR SHARE PERCENTAGES & COSTS

$$\frac{\text{(Future + Project Volumes) - Future}}{\text{(Future + Project Volumes) – Existing}}$$

Cowell Blvd / Research Park Dr – Green Terrace

	$\frac{1{,}275 - 1{,}226}{}$
PM	$1{,}275 - 1{,}023$

Average Fair Share Percentage: 19.4%

OTHER APPENDICES

Intersection	
Int Delay, s/veh	2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	28	0	21	1	1	3	59	129	1	0	213	112
Future Vol, veh/h	28	0	21	1	1	3	59	129	1	0	213	112
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	0	-	135	-	-	-	145	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	29	0	22	1	1	3	62	136	1	0	224	118

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	546	544	283	555	603	137	342	0	0	137	0	0
Stage 1	283	283	-	261	261	-	-	-	-	-	-	-
Stage 2	263	261	-	294	342	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	448	446	756	442	413	911	1217	-	-	1447	-	-
Stage 1	724	677	-	744	692	-	-	-	-	-	-	-
Stage 2	742	692	-	714	638	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	428	423	756	412	392	911	1217	-	-	1447	-	-
Mov Cap-2 Maneuver	428	423	-	412	392	-	-	-	-	-	-	-
Stage 1	687	677	-	706	657	-	-	-	-	-	-	-
Stage 2	701	657	-	693	638	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	12.2	11	2.5	0
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1217	-	-	428	756	605	1447	-	-
HCM Lane V/C Ratio	0.051	-	-	0.069	0.029	0.009	-	-	-
HCM Control Delay (s)	8.1	-	-	14	9.9	11	0	-	-
HCM Lane LOS	A	-	-	B	A	B	A	-	-
HCM 95th %tile Q(veh)	0.2	-	-	0.2	0.1	0	0	-	-

Intersection	
Int Delay, s/veh	14

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	242	2	66	1	2	0	23	380	3	0	242	62
Future Vol, veh/h	242	2	66	1	2	0	23	380	3	0	242	62
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	0	-	135	-	-	-	145	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	263	2	72	1	2	0	25	413	3	0	263	67

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	763	763	297	799	795	415	330	0	0	416	0	0
Stage 1	297	297	-	465	465	-	-	-	-	-	-	-
Stage 2	466	466	-	334	330	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	321	334	742	304	320	637	1229	-	-	1143	-	-
Stage 1	712	668	-	578	563	-	-	-	-	-	-	-
Stage 2	577	562	-	680	646	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	314	327	742	269	314	637	1229	-	-	1143	-	-
Mov Cap-2 Maneuver	314	327	-	269	314	-	-	-	-	-	-	-
Stage 1	698	668	-	566	552	-	-	-	-	-	-	-
Stage 2	563	551	-	612	646	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	45.4	17.3	0.5	0
HCM LOS	E	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1229	-	-	314	715	297	1143	-	-
HCM Lane V/C Ratio	0.02	-	-	0.838	0.103	0.011	-	-	-
HCM Control Delay (s)	8	-	-	55.2	10.6	17.3	0	-	-
HCM Lane LOS	A	-	-	F	B	C	A	-	-
HCM 95th %tile Q(veh)	0.1	-	-	7.2	0.3	0	0	-	-

Intersection	
Int Delay, s/veh	2.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	33	0	35	1	1	3	67	134	1	0	235	126
Future Vol, veh/h	33	0	35	1	1	3	67	134	1	0	235	126
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	0	-	135	-	-	-	145	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	35	0	37	1	1	3	71	141	1	0	247	133

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	600	598	314	616	664	142	380	0	0	142	0	0
Stage 1	314	314	-	284	284	-	-	-	-	-	-	-
Stage 2	286	284	-	332	380	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	413	416	726	403	381	906	1178	-	-	1441	-	-
Stage 1	697	656	-	723	676	-	-	-	-	-	-	-
Stage 2	721	676	-	681	614	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	392	391	726	365	358	906	1178	-	-	1441	-	-
Mov Cap-2 Maneuver	392	391	-	365	358	-	-	-	-	-	-	-
Stage 1	655	656	-	680	635	-	-	-	-	-	-	-
Stage 2	674	635	-	646	614	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	12.6	11.4	2.7	0
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1178	-	-	392	726	565	1441	-	-
HCM Lane V/C Ratio	0.06	-	-	0.089	0.051	0.009	-	-	-
HCM Control Delay (s)	8.3	-	-	15.1	10.2	11.4	0	-	-
HCM Lane LOS	A	-	-	C	B	B	A	-	-
HCM 95th %tile Q(veh)	0.2	-	-	0.3	0.2	0	0	-	-

Intersection	
Int Delay, s/veh	2.5

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	21	49	184	9	19	48
Future Vol, veh/h	21	49	184	9	19	48
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	22	52	194	9	20	51

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	203	0	-	0	295	199
Stage 1	-	-	-	-	199	-
Stage 2	-	-	-	-	96	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1369	-	-	-	696	842
Stage 1	-	-	-	-	835	-
Stage 2	-	-	-	-	928	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1369	-	-	-	684	842
Mov Cap-2 Maneuver	-	-	-	-	684	-
Stage 1	-	-	-	-	821	-
Stage 2	-	-	-	-	928	-

Approach	EB	WB	SB
HCM Control Delay, s	2.3	0	10
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1369	-	-	-	790
HCM Lane V/C Ratio	0.016	-	-	-	0.089
HCM Control Delay (s)	7.7	0	-	-	10
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0.3

Intersection	
Int Delay, s/veh	1.2

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	19	34	5	165	327	7
Future Vol, veh/h	19	34	5	165	327	7
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	20	36	5	174	344	7

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	532	348	351	0	-	0
Stage 1	348	-	-	-	-	-
Stage 2	184	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	508	695	1208	-	-	-
Stage 1	715	-	-	-	-	-
Stage 2	848	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	505	695	1208	-	-	-
Mov Cap-2 Maneuver	505	-	-	-	-	-
Stage 1	711	-	-	-	-	-
Stage 2	848	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	11.5	0.2	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1208	-	612	-	-
HCM Lane V/C Ratio	0.004	-	0.091	-	-
HCM Control Delay (s)	8	0	11.5	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0	-	0.3	-	-

Intersection	
Int Delay, s/veh	18.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	244	2	72	1	2	0	38	390	3	0	250	70
Future Vol, veh/h	244	2	72	1	2	0	38	390	3	0	250	70
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	0	-	135	-	-	-	145	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	265	2	78	1	2	0	41	424	3	0	272	76

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	819	819	310	858	856	426	348	0	0	427	0	0
Stage 1	310	310	-	508	508	-	-	-	-	-	-	-
Stage 2	509	509	-	350	348	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	294	310	730	277	295	628	1211	-	-	1132	-	-
Stage 1	700	659	-	547	539	-	-	-	-	-	-	-
Stage 2	547	538	-	666	634	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	285	299	730	240	285	628	1211	-	-	1132	-	-
Mov Cap-2 Maneuver	285	299	-	240	285	-	-	-	-	-	-	-
Stage 1	676	659	-	528	521	-	-	-	-	-	-	-
Stage 2	526	520	-	593	634	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	61.1	18.6	0.7	0
HCM LOS	F	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1211	-	-	285	703	268	1132	-	-
HCM Lane V/C Ratio	0.034	-	-	0.931	0.114	0.012	-	-	-
HCM Control Delay (s)	8.1	-	-	76.4	10.8	18.6	0	-	-
HCM Lane LOS	A	-	-	F	B	C	A	-	-
HCM 95th %tile Q(veh)	0.1	-	-	8.8	0.4	0	0	-	-

Intersection	
Int Delay, s/veh	1.2

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	42	310	92	18	8	19
Future Vol, veh/h	42	310	92	18	8	19
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	46	337	100	20	9	21

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	120	0	-	0	539	110
Stage 1	-	-	-	-	110	-
Stage 2	-	-	-	-	429	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1468	-	-	-	503	943
Stage 1	-	-	-	-	915	-
Stage 2	-	-	-	-	657	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1468	-	-	-	483	943
Mov Cap-2 Maneuver	-	-	-	-	483	-
Stage 1	-	-	-	-	879	-
Stage 2	-	-	-	-	657	-

Approach	EB	WB	SB
HCM Control Delay, s	0.9	0	10.1
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1468	-	-	-	735
HCM Lane V/C Ratio	0.031	-	-	-	0.04
HCM Control Delay (s)	7.5	0	-	-	10.1
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0.1	-	-	-	0.1

Intersection	
Int Delay, s/veh	0.4

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	8	13	10	624	307	13
Future Vol, veh/h	8	13	10	624	307	13
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	9	14	11	678	334	14

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1041	341	348	0	-	0
Stage 1	341	-	-	-	-	-
Stage 2	700	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	255	701	1211	-	-	-
Stage 1	720	-	-	-	-	-
Stage 2	493	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	251	701	1211	-	-	-
Mov Cap-2 Maneuver	251	-	-	-	-	-
Stage 1	709	-	-	-	-	-
Stage 2	493	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	14.1	0.1	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1211	-	417	-	-
HCM Lane V/C Ratio	0.009	-	0.055	-	-
HCM Control Delay (s)	8	0	14.1	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0	-	0.2	-	-

Intersection	
Int Delay, s/veh	2.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	25	0	25	2	2	5	105	120	2	0	295	160
Future Vol, veh/h	25	0	25	2	2	5	105	120	2	0	295	160
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	0	-	135	-	-	-	145	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	26	0	26	2	2	5	111	126	2	0	311	168

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	748	745	395	757	828	127	479	0	0	128	0	0
Stage 1	395	395	-	349	349	-	-	-	-	-	-	-
Stage 2	353	350	-	408	479	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	329	342	654	324	306	923	1083	-	-	1458	-	-
Stage 1	630	605	-	667	633	-	-	-	-	-	-	-
Stage 2	664	633	-	620	555	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	300	307	654	286	275	923	1083	-	-	1458	-	-
Mov Cap-2 Maneuver	300	307	-	286	275	-	-	-	-	-	-	-
Stage 1	566	605	-	599	568	-	-	-	-	-	-	-
Stage 2	590	568	-	595	555	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	14.5	13	4	0
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1083	-	-	300	654	457	1458	-	-
HCM Lane V/C Ratio	0.102	-	-	0.088	0.04	0.021	-	-	-
HCM Control Delay (s)	8.7	-	-	18.2	10.7	13	0	-	-
HCM Lane LOS	A	-	-	C	B	B	A	-	-
HCM 95th %tile Q(veh)	0.3	-	-	0.3	0.1	0.1	0	-	-

Intersection	
Int Delay, s/veh	61.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	320	2	20	2	2	0	5	460	5	0	325	85
Future Vol, veh/h	320	2	20	2	2	0	5	460	5	0	325	85
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	0	-	135	-	-	-	145	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	348	2	22	2	2	0	5	500	5	0	353	92

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	913	914	399	924	958	503	445	0	0	505	0	0
Stage 1	399	399	-	513	513	-	-	-	-	-	-	-
Stage 2	514	515	-	411	445	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	~ 254	273	651	250	257	569	1115	-	-	1060	-	-
Stage 1	627	602	-	544	536	-	-	-	-	-	-	-
Stage 2	543	535	-	618	575	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	~ 251	272	651	239	256	569	1115	-	-	1060	-	-
Mov Cap-2 Maneuver	~ 251	272	-	239	256	-	-	-	-	-	-	-
Stage 1	624	602	-	542	534	-	-	-	-	-	-	-
Stage 2	538	533	-	595	575	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	220.2	19.8	0.1	0
HCM LOS	F	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1115	-	-	251	578	247	1060	-	-
HCM Lane V/C Ratio	0.005	-	-	1.386	0.041	0.018	-	-	-
HCM Control Delay (s)	8.2	-	-	234.5	11.5	19.8	0	-	-
HCM Lane LOS	A	-	-	F	B	C	A	-	-
HCM 95th %tile Q(veh)	0	-	-	19	0.1	0.1	0	-	-

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

Intersection	
Int Delay, s/veh	2.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	30	0	39	2	2	5	113	125	2	0	317	174
Future Vol, veh/h	30	0	39	2	2	5	113	125	2	0	317	174
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	0	-	135	-	-	-	145	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	32	0	41	2	2	5	119	132	2	0	334	183

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	801	798	426	817	888	133	517	0	0	134	0	0
Stage 1	426	426	-	371	371	-	-	-	-	-	-	-
Stage 2	375	372	-	446	517	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	303	319	628	295	283	916	1049	-	-	1451	-	-
Stage 1	606	586	-	649	620	-	-	-	-	-	-	-
Stage 2	646	619	-	591	534	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	273	283	628	252	251	916	1049	-	-	1451	-	-
Mov Cap-2 Maneuver	273	283	-	252	251	-	-	-	-	-	-	-
Stage 1	538	586	-	576	550	-	-	-	-	-	-	-
Stage 2	567	549	-	552	534	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	14.9	13.7	4.2	0
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1049	-	-	273	628	421	1451	-	-
HCM Lane V/C Ratio	0.113	-	-	0.116	0.065	0.023	-	-	-
HCM Control Delay (s)	8.9	-	-	19.9	11.1	13.7	0	-	-
HCM Lane LOS	A	-	-	C	B	B	A	-	-
HCM 95th %tile Q(veh)	0.4	-	-	0.4	0.2	0.1	0	-	-

Intersection	
Int Delay, s/veh	2.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	21	50	277	9	19	48
Future Vol, veh/h	21	50	277	9	19	48
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	23	54	301	10	21	52

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	311	0	-	0	406	306
Stage 1	-	-	-	-	306	-
Stage 2	-	-	-	-	100	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1249	-	-	-	601	734
Stage 1	-	-	-	-	747	-
Stage 2	-	-	-	-	924	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1249	-	-	-	590	734
Mov Cap-2 Maneuver	-	-	-	-	590	-
Stage 1	-	-	-	-	733	-
Stage 2	-	-	-	-	924	-

Approach	EB	WB	SB
HCM Control Delay, s	2.3	0	10.9
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1249	-	-	-	686
HCM Lane V/C Ratio	0.018	-	-	-	0.106
HCM Control Delay (s)	7.9	0	-	-	10.9
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0.1	-	-	-	0.4

Intersection	
Int Delay, s/veh	1.1

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	19	34	5	150	457	7
Future Vol, veh/h	19	34	5	150	457	7
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	21	37	5	163	497	8

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	674	501	505	0	-	0
Stage 1	501	-	-	-	-	-
Stage 2	173	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	420	570	1060	-	-	-
Stage 1	609	-	-	-	-	-
Stage 2	857	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	418	570	1060	-	-	-
Mov Cap-2 Maneuver	418	-	-	-	-	-
Stage 1	606	-	-	-	-	-
Stage 2	857	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	13.1	0.3	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1060	-	504	-	-
HCM Lane V/C Ratio	0.005	-	0.114	-	-
HCM Control Delay (s)	8.4	0	13.1	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0	-	0.4	-	-

Intersection	
Int Delay, s/veh	77.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	322	2	26	2	2	0	20	470	5	0	333	93
Future Vol, veh/h	322	2	26	2	2	0	20	470	5	0	333	93
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	0	-	135	-	-	-	145	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	350	2	28	2	2	0	22	511	5	0	362	101

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	972	973	413	986	1021	514	463	0	0	516	0	0
Stage 1	413	413	-	558	558	-	-	-	-	-	-	-
Stage 2	559	560	-	428	463	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	~ 232	252	639	227	236	560	1098	-	-	1050	-	-
Stage 1	616	594	-	514	512	-	-	-	-	-	-	-
Stage 2	513	511	-	605	564	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	~ 227	247	639	212	231	560	1098	-	-	1050	-	-
Mov Cap-2 Maneuver	~ 227	247	-	212	231	-	-	-	-	-	-	-
Stage 1	604	594	-	504	502	-	-	-	-	-	-	-
Stage 2	501	501	-	576	564	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	280.2	21.6	0.3	0
HCM LOS	F	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1098	-	-	227	574	221	1050	-	-
HCM Lane V/C Ratio	0.02	-	-	1.542	0.053	0.02	-	-	-
HCM Control Delay (s)	8.3	-	-	$ 303.6	11.6	21.6	0	-	-
HCM Lane LOS	A	-	-	F	B	C	A	-	-
HCM 95th %tile Q(veh)	0.1	-	-	21.5	0.2	0.1	0	-	-

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

Intersection	
Int Delay, s/veh	1.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	42	342	97	18	8	19
Future Vol, veh/h	42	342	97	18	8	19
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	46	372	105	20	9	21

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	125	0	-	0	579	115
Stage 1	-	-	-	-	115	-
Stage 2	-	-	-	-	464	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1462	-	-	-	477	937
Stage 1	-	-	-	-	910	-
Stage 2	-	-	-	-	633	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1462	-	-	-	458	937
Mov Cap-2 Maneuver	-	-	-	-	458	-
Stage 1	-	-	-	-	874	-
Stage 2	-	-	-	-	633	-

Approach	EB	WB	SB
HCM Control Delay, s	0.8	0	10.3
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1462	-	-	-	715
HCM Lane V/C Ratio	0.031	-	-	-	0.041
HCM Control Delay (s)	7.5	0	-	-	10.3
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0.1	-	-	-	0.1

Intersection	
Int Delay, s/veh	0.4

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	8	13	10	782	413	13
Future Vol, veh/h	8	13	10	782	413	13
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	9	14	11	850	449	14

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1328	456	463	0	-	0
Stage 1	456	-	-	-	-	-
Stage 2	872	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	171	604	1098	-	-	-
Stage 1	638	-	-	-	-	-
Stage 2	409	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	168	604	1098	-	-	-
Mov Cap-2 Maneuver	168	-	-	-	-	-
Stage 1	626	-	-	-	-	-
Stage 2	409	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	17.8	0.1	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1098	-	304	-	-
HCM Lane V/C Ratio	0.01	-	0.075	-	-
HCM Control Delay (s)	8.3	0	17.8	-	-
HCM Lane LOS	A	A	C	-	-
HCM 95th %tile Q(veh)	0	-	0.2	-	-

Intersection	
Intersection Delay, s/veh	47.9
Intersection LOS	E

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	320	2	20	2	2	0	5	460	5	0	325	85
Future Vol, veh/h	320	2	20	2	2	0	5	460	5	0	325	85
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	348	2	22	2	2	0	5	500	5	0	353	92
Number of Lanes	1	1	0	0	1	0	1	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	2	1	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	2	2	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	1	1	2
HCM Control Delay	32.8	12.8	63.3	43.1
HCM LOS	D	B	F	E

Lane	NBLn1	NBLn2	EBLn1	EBLn2	WBLn1	SBLn1
Vol Left, %	100%	0%	100%	0%	50%	0%
Vol Thru, %	0%	99%	0%	9%	50%	79%
Vol Right, %	0%	1%	0%	91%	0%	21%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	5	465	320	22	4	410
LT Vol	5	0	320	0	2	0
Through Vol	0	460	0	2	2	325
RT Vol	0	5	0	20	0	85
Lane Flow Rate	5	505	348	24	4	446
Geometry Grp	7	7	7	7	6	6
Degree of Util (X)	0.011	0.99	0.782	0.046	0.012	0.881
Departure Headway (Hd)	7.572	7.052	8.096	6.926	9.73	7.114
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes
Cap	472	516	445	516	370	508
Service Time	5.33	4.81	5.855	4.684	7.73	5.174
HCM Lane V/C Ratio	0.011	0.979	0.782	0.047	0.011	0.878
HCM Control Delay	10.4	63.9	34.4	10	12.8	43.1
HCM Lane LOS	B	F	D	A	B	E
HCM 95th-tile Q	0	13.4	6.9	0.1	0	9.7

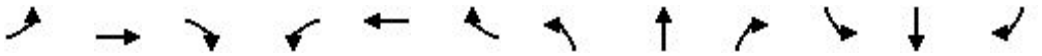
MOVEMENT SUMMARY

Site: 101 [Cowell Blvd / Research Park Rd - Green Terrace]

MITIG8 Cumulative No Project
Site Category: (None)
Roundabout

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed mph
South: Cowell Blvd												
3	L2	5	3.0	0.551	11.3	LOS B	4.7	121.1	0.69	0.72	0.93	32.1
8	T1	500	3.0	0.551	11.3	LOS B	4.7	121.1	0.69	0.72	0.93	32.1
18	R2	5	3.0	0.551	11.3	LOS B	4.7	121.1	0.69	0.72	0.93	31.2
Approach		511	3.0	0.551	11.3	LOS B	4.7	121.1	0.69	0.72	0.93	32.1
East: Green Terrace												
1	L2	2	3.0	0.010	6.7	LOS A	0.0	0.9	0.62	0.50	0.62	33.2
6	T1	2	3.0	0.010	6.7	LOS A	0.0	0.9	0.62	0.50	0.62	33.2
16	R2	1	3.0	0.010	6.7	LOS A	0.0	0.9	0.62	0.50	0.62	32.3
Approach		5	3.0	0.010	6.7	LOS A	0.0	0.9	0.62	0.50	0.62	33.0
North: Cowell Blvd												
7	L2	1	3.0	0.337	5.8	LOS A	2.0	51.9	0.08	0.02	0.08	34.9
4	T1	353	3.0	0.337	5.8	LOS A	2.0	51.9	0.08	0.02	0.08	34.8
14	R2	92	3.0	0.337	5.8	LOS A	2.0	51.9	0.08	0.02	0.08	33.8
Approach		447	3.0	0.337	5.8	LOS A	2.0	51.9	0.08	0.02	0.08	34.6
West: Research Park Dr												
5	L2	348	3.0	0.404	8.5	LOS A	2.1	54.5	0.60	0.52	0.60	31.1
2	T1	2	3.0	0.404	8.5	LOS A	2.1	54.5	0.60	0.52	0.60	31.1
12	R2	22	3.0	0.404	8.5	LOS A	2.1	54.5	0.60	0.52	0.60	30.3
Approach		372	3.0	0.404	8.5	LOS A	2.1	54.5	0.60	0.52	0.60	31.1
All Vehicles		1335	3.0	0.551	8.7	LOS A	4.7	121.1	0.46	0.43	0.55	32.6

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	320	2	20	2	2	0	5	460	5	0	325	85
Future Volume (veh/h)	320	2	20	2	2	0	5	460	5	0	325	85
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	348	2	22	2	2	0	5	500	5	0	353	92
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	603	40	436	334	290	0	10	820	8	0	460	120
Arrive On Green	0.30	0.30	0.30	0.30	0.30	0.00	0.01	0.44	0.44	0.00	0.32	0.32
Sat Flow, veh/h	1415	134	1472	662	978	0	1781	1849	18	0	1430	373
Grp Volume(v), veh/h	348	0	24	4	0	0	5	0	505	0	0	445
Grp Sat Flow(s),veh/h/ln	1415	0	1605	1640	0	0	1781	0	1867	0	0	1803
Q Serve(g_s), s	8.9	0.0	0.4	0.0	0.0	0.0	0.1	0.0	8.1	0.0	0.0	8.7
Cycle Q Clear(g_c), s	9.0	0.0	0.4	0.1	0.0	0.0	0.1	0.0	8.1	0.0	0.0	8.7
Prop In Lane	1.00		0.92	0.50		0.00	1.00		0.01	0.00		0.21
Lane Grp Cap(c), veh/h	603	0	476	624	0	0	10	0	829	0	0	579
V/C Ratio(X)	0.58	0.00	0.05	0.01	0.00	0.00	0.52	0.00	0.61	0.00	0.00	0.77
Avail Cap(c_a), veh/h	901	0	814	979	0	0	227	0	1422	0	0	932
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00	0.00	0.00	1.00
Uniform Delay (d), s/veh	12.9	0.0	9.9	9.7	0.0	0.0	19.5	0.0	8.3	0.0	0.0	12.0
Incr Delay (d2), s/veh	0.9	0.0	0.0	0.0	0.0	0.0	37.2	0.0	0.7	0.0	0.0	2.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.5	0.0	0.1	0.0	0.0	0.0	0.1	0.0	2.2	0.0	0.0	2.9
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	13.7	0.0	9.9	9.7	0.0	0.0	56.7	0.0	9.1	0.0	0.0	14.2
LnGrp LOS	B	A	A	A	A	A	E	A	A	A	A	B
Approach Vol, veh/h		372			4			510			445	
Approach Delay, s/veh		13.5			9.7			9.5			14.2	
Approach LOS		B			A			A			B	

Timer - Assigned Phs		2		4	5	6		8				
Phs Duration (G+Y+Rc), s		22.5		16.7	4.8	17.7		16.7				
Change Period (Y+Rc), s		5.1		5.1	4.6	5.1		* 5.1				
Max Green Setting (Gmax), s		29.9		19.9	5.0	20.3		* 20				
Max Q Clear Time (g_c+I1), s		10.1		11.0	2.1	10.7		2.1				
Green Ext Time (p_c), s		3.0		0.8	0.0	1.9		0.0				

Intersection Summary		
HCM 6th Ctrl Delay	12.2	
HCM 6th LOS	B	

Notes

User approved pedestrian interval to be less than phase max green.

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Intersection	
Intersection Delay, s/veh	52.1
Intersection LOS	F

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	322	2	26	2	2	0	20	470	5	0	333	93
Future Vol, veh/h	322	2	26	2	2	0	20	470	5	0	333	93
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	350	2	28	2	2	0	22	511	5	0	362	101
Number of Lanes	1	1	0	0	1	0	1	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	2	1	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	2	2	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	1	1	2
HCM Control Delay	32.8	13	70.7	46.8
HCM LOS	D	B	F	E

Lane	NBLn1	NBLn2	EBLn1	EBLn2	WBLn1	SBLn1
Vol Left, %	100%	0%	100%	0%	50%	0%
Vol Thru, %	0%	99%	0%	7%	50%	78%
Vol Right, %	0%	1%	0%	93%	0%	22%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	20	475	322	28	4	426
LT Vol	20	0	322	0	2	0
Through Vol	0	470	0	2	2	333
RT Vol	0	5	0	26	0	93
Lane Flow Rate	22	516	350	30	4	463
Geometry Grp	7	7	7	7	6	6
Degree of Util (X)	0.046	1.025	0.783	0.058	0.012	0.903
Departure Headway (Hd)	7.665	7.144	8.241	7.054	9.874	7.216
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes
Cap	470	511	441	511	365	505
Service Time	5.367	4.847	5.941	4.754	7.874	5.216
HCM Lane V/C Ratio	0.047	1.01	0.794	0.059	0.011	0.917
HCM Control Delay	10.7	73.2	34.8	10.2	13	46.8
HCM Lane LOS	B	F	D	B	B	E
HCM 95th-tile Q	0.1	14.7	6.9	0.2	0	10.3

MOVEMENT SUMMARY

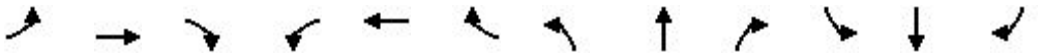
Site: 101 [Cowell Blvd / Research Park Rd - Green Terrace]

MITIG8 Cumulative Plus Project
Site Category: (None)
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed mph
South: Cowell Blvd												
3	L2	22	3.0	0.582	12.1	LOS B	5.5	141.8	0.71	0.78	1.02	31.7
8	T1	511	3.0	0.582	12.1	LOS B	5.5	141.8	0.71	0.78	1.02	31.7
18	R2	5	3.0	0.582	12.1	LOS B	5.5	141.8	0.71	0.78	1.02	30.8
Approach		538	3.0	0.582	12.1	LOS B	5.5	141.8	0.71	0.78	1.02	31.7
East: Green Terrace												
1	L2	2	3.0	0.010	6.9	LOS A	0.0	0.9	0.63	0.51	0.63	33.1
6	T1	2	3.0	0.010	6.9	LOS A	0.0	0.9	0.63	0.51	0.63	33.1
16	R2	1	3.0	0.010	6.9	LOS A	0.0	0.9	0.63	0.51	0.63	32.2
Approach		5	3.0	0.010	6.9	LOS A	0.0	0.9	0.63	0.51	0.63	32.9
North: Cowell Blvd												
7	L2	1	3.0	0.356	6.1	LOS A	2.2	55.8	0.15	0.05	0.15	34.7
4	T1	362	3.0	0.356	6.1	LOS A	2.2	55.8	0.15	0.05	0.15	34.7
14	R2	101	3.0	0.356	6.1	LOS A	2.2	55.8	0.15	0.05	0.15	33.6
Approach		464	3.0	0.356	6.1	LOS A	2.2	55.8	0.15	0.05	0.15	34.4
West: Research Park Dr												
5	L2	350	3.0	0.417	8.8	LOS A	2.2	56.7	0.61	0.54	0.61	31.0
2	T1	2	3.0	0.417	8.8	LOS A	2.2	56.7	0.61	0.54	0.61	31.0
12	R2	28	3.0	0.417	8.8	LOS A	2.2	56.7	0.61	0.54	0.61	30.2
Approach		380	3.0	0.417	8.8	LOS A	2.2	56.7	0.61	0.54	0.61	31.0
All Vehicles		1388	3.0	0.582	9.2	LOS A	5.5	141.8	0.50	0.47	0.62	32.3

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	322	2	26	2	2	0	20	470	5	0	333	93
Future Volume (veh/h)	322	2	26	2	2	0	20	470	5	0	333	93
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	350	2	28	2	2	0	22	511	5	0	362	101
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	593	32	442	327	286	0	38	848	8	0	459	128
Arrive On Green	0.30	0.30	0.30	0.30	0.30	0.00	0.02	0.46	0.46	0.00	0.33	0.33
Sat Flow, veh/h	1415	107	1495	667	967	0	1781	1849	18	0	1407	393
Grp Volume(v), veh/h	350	0	30	4	0	0	22	0	516	0	0	463
Grp Sat Flow(s),veh/h/ln	1415	0	1601	1633	0	0	1781	0	1867	0	0	1800
Q Serve(g_s), s	9.5	0.0	0.6	0.0	0.0	0.0	0.5	0.0	8.6	0.0	0.0	9.7
Cycle Q Clear(g_c), s	9.6	0.0	0.6	0.1	0.0	0.0	0.5	0.0	8.6	0.0	0.0	9.7
Prop In Lane	1.00		0.93	0.50		0.00	1.00		0.01	0.00		0.22
Lane Grp Cap(c), veh/h	593	0	474	613	0	0	38	0	856	0	0	587
V/C Ratio(X)	0.59	0.00	0.06	0.01	0.00	0.00	0.57	0.00	0.60	0.00	0.00	0.79
Avail Cap(c_a), veh/h	852	0	767	923	0	0	214	0	1344	0	0	880
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00	0.00	0.00	1.00
Uniform Delay (d), s/veh	13.7	0.0	10.5	10.3	0.0	0.0	20.1	0.0	8.4	0.0	0.0	12.7
Incr Delay (d2), s/veh	0.9	0.0	0.1	0.0	0.0	0.0	12.7	0.0	0.7	0.0	0.0	2.9
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.7	0.0	0.2	0.0	0.0	0.0	0.3	0.0	2.4	0.0	0.0	3.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	14.6	0.0	10.5	10.3	0.0	0.0	32.8	0.0	9.1	0.0	0.0	15.6
LnGrp LOS	B	A	B	B	A	A	C	A	A	A	A	B
Approach Vol, veh/h		380			4			538			463	
Approach Delay, s/veh		14.3			10.3			10.1			15.6	
Approach LOS		B			B			B			B	

Timer - Assigned Phs		2		4	5	6		8				
Phs Duration (G+Y+Rc), s		24.1		17.4	5.5	18.6		17.4				
Change Period (Y+Rc), s		5.1		5.1	4.6	5.1		* 5.1				
Max Green Setting (Gmax), s		29.9		19.9	5.0	20.3		* 20				
Max Q Clear Time (g_c+I1), s		10.6		11.6	2.5	11.7		2.1				
Green Ext Time (p_c), s		3.1		0.8	0.0	1.9		0.0				

Intersection Summary		
HCM 6th Ctrl Delay		13.1
HCM 6th LOS		B

Notes

User approved pedestrian interval to be less than phase max green.

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

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

COUNT DATE _____

DIST _____ CO _____ RTE _____ PM _____

CALC _____ DATE _____

CHK _____ DATE _____

Major St: COWELL BLVD

Minor St: RESEARCH PARK DR

Critical Approach Speed 35 mph

Critical Approach Speed 45 mph

Speed limit or critical speed on major street traffic > 40 mph..... ☐ or ☐ } RURAL (R)

In built up area of isolated community of < 10,000 population..... ☐ 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)				5-6	4-5	6-7	3-4	8-9	12-1	1-2	11-12	Hour
	U	R	U	R									
APPROACH LANES	1		2 or More										
Both Approaches Major Street	500 (400)	350 (280)	600 (480)	420 (336)	822	678	574	599	556	457	489	446	
Highest Approach Minor Street	150 (120)	105 (84)	200 (160)	140 (112)	397	321	168	143	45	126	85	107	

Condition B - Interruption of Continuous Traffic 100% SATISFIED YES ☐ NO ☒

80% SATISFIED YES ☐ NO ☒

	MINIMUM REQUIREMENTS (80% SHOWN IN BRACKETS)				5-6	4-5	6-7	3-4	8-9	12-1	1-2	11-12	Hour
	U	R	U	R									
APPROACH LANES	1		2 or More										
Both Approaches Major Street	750 (600)	525 (420)	900 (720)	630 (504)	822	678	574	599	556	457	489	446	
Highest Approach Minor Street	75 (60)	53 (42)	100 (80)	70 (56)	397	321	168	143	45	126	85	107	

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 ☐

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	5-6	4-5	5-6	3-4 Hour
Both Approaches - Major Street	✓		822	678	574	599
Higher Approach - Minor Street	✓		397	321	168	143

*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
(Part A or Part B must be satisfied)

SATISFIED YES ☐ NO ☒

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 ☒

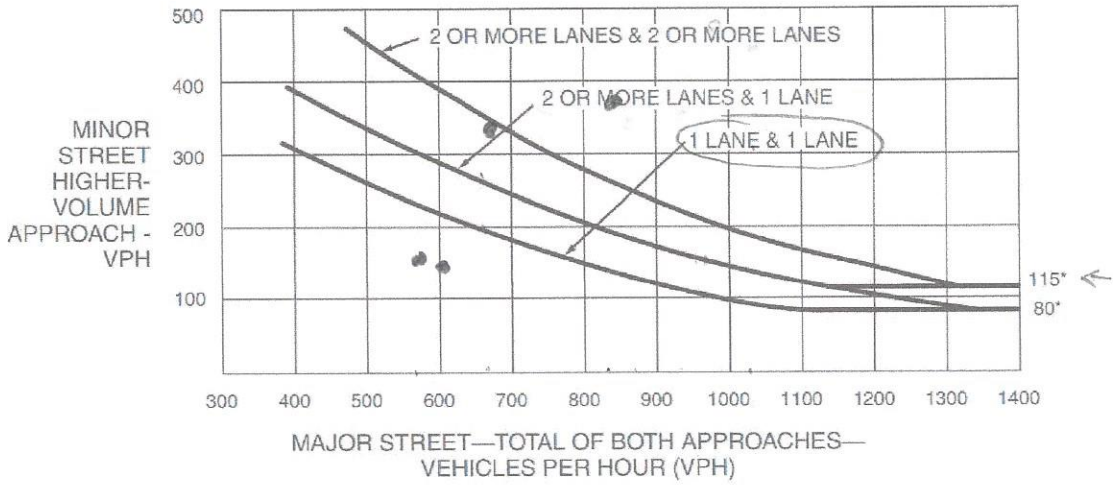
APPROACH LANES	* One	2 or More	Hour
Both Approaches - Major Street	710		
Higher Approach - Minor Street	310		

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.

* SINGLE LANE USED ON ALL APPROACHES AS NB LEFT & EB RIGHT LANES HAVE MINOR TURN VOLUMES RELATIVE TO NB THROUGH & EB LEFT-THROUGH LANES.

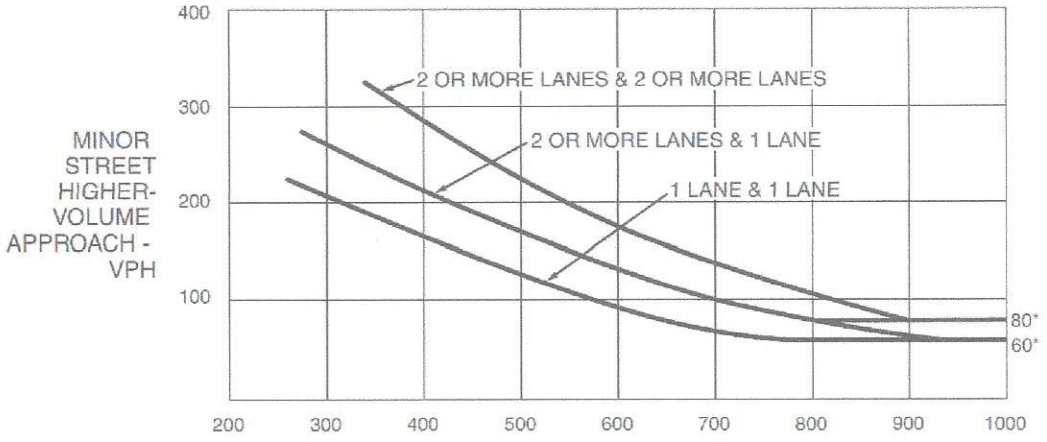
Figure 4C-1. Warrant 2, Four-Hour Vehicular Volume



*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.

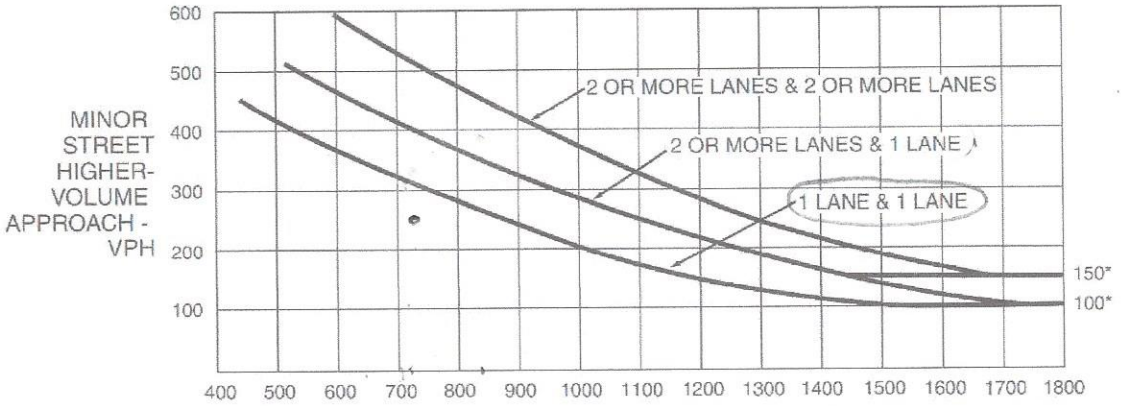
Figure 4C-2. Warrant 2, Four-Hour Vehicular Volume (70% Factor)

(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.

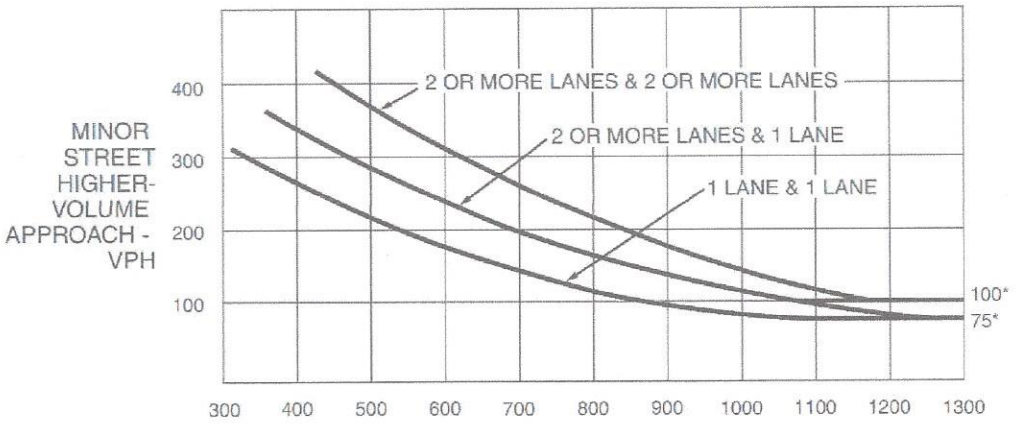
Figure 4C-3. Warrant 3, Peak Hour



*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.

Table 4C-1. Warrant 1, Eight-Hour Vehicular Volume

Condition A—Minimum Vehicular Volume

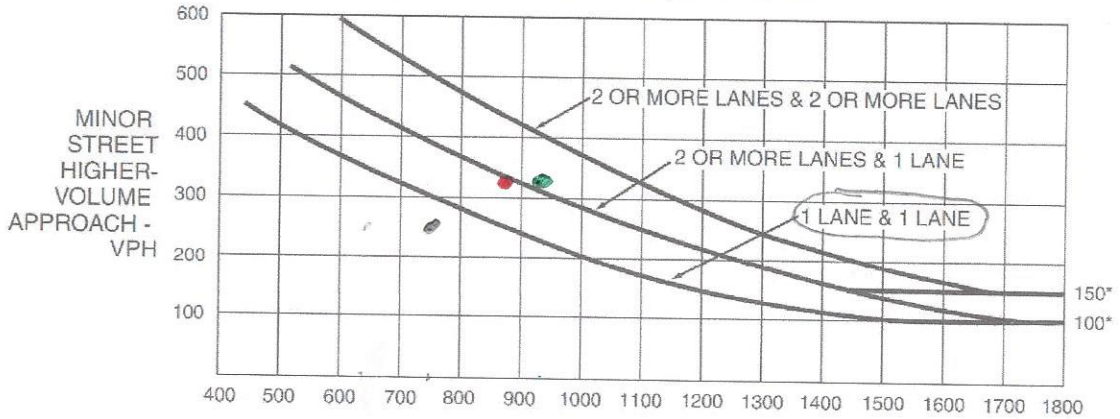
Number of lanes for moving traffic on each approach		Vehicles per hour on major street (total of both approaches)				Vehicles per hour on higher-volume minor-street approach (one direction only)			
Major Street	Minor Street	100%[a]	80%[b]	70%[c]	56%[d]	100%[a]	80%[b]	70%[c]	56%[d]
1	1	500	400	350	280	150	120	105	84
2 or more	1	600	480	420	336	150	120	105	84
2 or more	2 or more	600	480	420	336	200	160	140	112
1	2 or more	500	400	350	280	200	160	140	112

Condition B—Interruption of Continuous Traffic

Number of lanes for moving traffic on each approach		Vehicles per hour on major street (total of both approaches)				Vehicles per hour on higher-volume minor-street approach (one direction only)			
Major Street	Minor Street	100%[a]	80%[b]	70%[c]	56%[d]	100%[a]	80%[b]	70%[c]	56%[d]
1	1	750	600	525	420	75	60	53	42
2 or more	1	900	720	630	504	75	60	53	42
2 or more	2 or more	900	720	630	504	100	80	70	56
1	2 or more	750	600	525	420	100	80	70	56

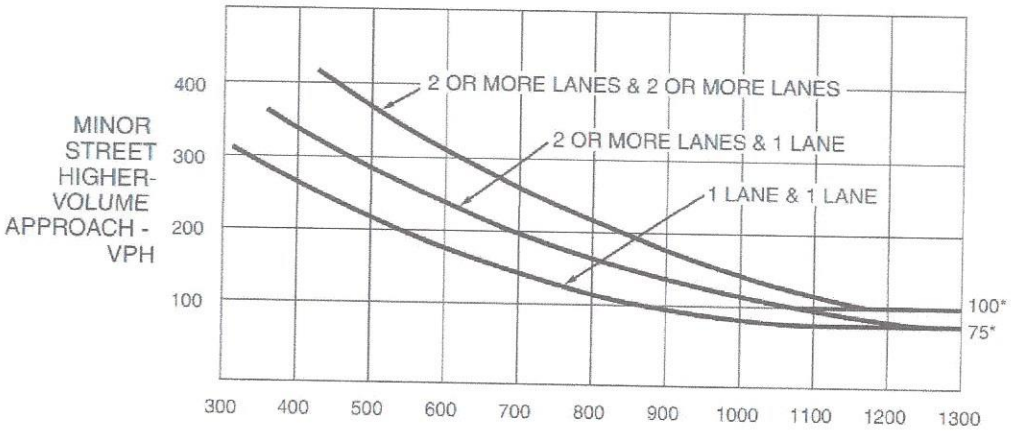
[a] Basic minimum hourly volume
[b] Used for combination of Conditions A and B after adequate trial of other remedial measures
[c] May be used when the major-street speed exceeds 40 mph or in an isolated community with a population of less than 10,000
[d] May be used for combination of Conditions A and B after adequate trial of other remedial measures when the major-street speed exceeds 40 mph or in an isolated community with a population of less than 10,000

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.

- EXISTING +PROJECT
- CUMULATIVE
- CUMULATIVE +PROJECT