



HEXAGON TRANSPORTATION CONSULTANTS, INC.

Memorandum

Date: March 21, 2013

To: Ms. Bridgit Koller, Warmington Residential California

From: Gary Black

Subject: Traffic Operational Analysis for the Proposed Residential Development on Trade Zone Boulevard in Milpitas, California

Introduction

Hexagon Transportation Consultants, Inc. has completed a traffic operational analysis for the proposed Warmington residential development on Trade Zone Boulevard, located in Milpitas, California. The residential development would be located on the north side of Trade Zone Boulevard between Ringwood Avenue and Lundy Avenue (see Figure 1). The project as proposed would replace an auto wrecking and recycling business, a vacant building, and a fenced lot (see Figure 2). The proposed project, known as Traverse, is a residential development with a total of 206 dwelling units: 98 townhomes and 108 condominiums (see Figure 3). Access to the site will be provided by two streets: Momentum Drive, which is along the western edge of the property, and a new public street running along the eastern edge of the property, labeled Street "C" on the site plan. Momentum Drive will provide shared access with the adjacent Trumark residential development now under construction.

Scope of Study

According to City staff, California Environmental Quality Act (CEQA) clearance for transportation impacts was obtained through the Transit Area Specific Plan for the area around VTA's Montague Light Rail Transit Station. Therefore, the purpose of this traffic operations study is to determine whether additional traffic improvements are needed to support the proposed development on the streets near the project site.

The Trumark residential development has been approved and is currently under construction on the site adjacent to this project. Most of Momentum Drive will be built by the Trumark development. The Traverse development will build the final one foot of street width. Because the Trumark project's 134 dwelling units will also impact the site vicinity, both projects are included in the operational analysis.

The operations analysis is focused on three nearby signalized intersections:

- Trade Zone Boulevard/Montague Expressway (CMP intersection)
- Trade Zone Boulevard/Ringwood Avenue
- Trade Zone Boulevard/Lundy Avenue

Within the Congestion Management Plan (CMP) data base, Montague Expressway is labeled as an east-west roadway. Trade Zone Boulevard also runs east-west along the project frontage, but then curves in a northerly direction just before the intersection at Montague. Thus, at the Montague intersection, Trade Zone Boulevard is referred to as a north-south roadway. Trade Zone Boulevard becomes McCandless Drive after crossing Montague Expressway. At the intersections with Ringwood Avenue and Lundy Avenue, Trade Zone Boulevard is referred to as the east-west roadway.



LEGEND

-  = Study Intersection
-  = Project Site Location
-  = LRT

Figure 1
Study Area and Study Intersections



Figure 2
Existing Aerial



Future Extension Specified in Transit Area Specific Plan

Figure 3 Existing Site Plan

Traffic conditions at the study intersections were analyzed for the weekday AM and PM peak hours of project generated traffic. The AM peak hour of traffic is generally between 7:00 and 9:00 AM, and the PM peak hour is typically between 4:00 and 6:00 PM. The operations of the study intersections were evaluated for the following conditions:

Condition 1: *Existing Conditions.* All existing peak-hour volumes were obtained from new 2013 intersection counts except for the Trade Zone Boulevard/Montague Expressway PM peak hour count which was obtained from the 2010 CMP count. These counts are shown in the attached appendix.

Condition 2: *Existing Plus Both Projects.* Traffic conditions with both projects were estimated by adding to existing traffic volumes the additional traffic generated by the Traverse project and the adjacent Trumark residential development. Project conditions were evaluated relative to existing conditions in order to determine potential improvements needed for both residential projects.

The study intersections were evaluated for each scenario using level of service (LOS). Level of service is a qualitative measure of traffic operations, ranging from LOS A (free-flow conditions) to LOS F (congested conditions). The levels of service at the study intersections were evaluated using TRAFFIX software. This method uses the *2000 Highway Capacity Manual* methodology to estimate the average delay per vehicle in seconds. This average delay can then be correlated to a level of service as shown in Table 1.

Table 1
Signalized Intersection Level of Service Definitions Based on Delay

Level of Service	Description	Average Control Delay Per Vehicle (sec.)
A	Signal progression is extremely favorable. Most vehicles arrive during the green phase and do not stop at all. Short cycle lengths may also contribute to the very low vehicle delay.	10.0 or less
B	Operations characterized by good signal progression and/or short cycle lengths. More vehicles stop than with LOS A, causing higher levels of average vehicle delay.	10.1 to 20.0
C	Higher delays may result from fair signal progression and/or longer cycle lengths. Individual cycle failures may begin to appear at this level. The number of vehicles stopping is significant, though some may still pass through the intersection without stopping.	20.1 to 35.0
D	The influence of congestion becomes more noticeable. Longer delays may result from some combination of unfavorable signal progression, long cycle lengths, or high volume-to-capacity (V/C) ratios. Many vehicles stop and individual cycle failures are noticeable.	35.1 to 55.0
E	This is considered to be the limit of acceptable delay. These high delay values generally indicate poor signal progression, long cycle lengths, and high volume-to-capacity (V/C) ratios. Individual cycle failures occur frequently.	55.1 to 80.0
F	This level of delay is considered unacceptable by most drivers. This condition often occurs with oversaturation, that is, when arrival flow rates exceed the capacity of the intersection. Poor progression and long cycle lengths may also be major contributing causes of such delay levels.	greater than 80.0

Source: Transportation Research Board, *2000 Highway Capacity Manual* (Washington, D.C., 2000) p10-16.

Existing Intersection Analysis

Existing traffic volumes at each of the study intersections are shown in Figure 4. Traffic operations at the study intersections were then evaluated using TRAFFIX software to determine level of service for the AM and PM peak hours. Based on the analysis, the intersection of Trade Zone Boulevard/Montague Expressway operates poorly at LOS F during both the AM peak hour and the PM peak hour. It should be noted that in the future, Montague Expressway may be widened from three lanes to four lanes in each direction at this intersection. This would improve the level of service at the intersection.

The intersection of Trade Zone Boulevard/Ringwood Avenue currently operates at LOS A in the AM peak hour and LOS B in the PM peak hour. The fact that this intersection is frequently congested and vehicles cannot make the left turn from Ringwood onto Trade Zone is a result of the congestion at Trade Zone/Montague and the fact that the intersections are less than 600 feet apart. The LOS ratings for this intersection indicate that the traffic volumes at Trade Zone/Ringwood by themselves would not create any delay if the intersection were not so impacted by the queues from Trade Zone/Montague.

During both the AM and PM peak hours the intersection of Trade Zone Boulevard/Lundy Avenue operates at LOS C. The TRAFFIX calculation sheets are included in the attached appendix.

Traffic conditions in the field were observed in order to identify existing operational deficiencies and to confirm the accuracy of calculated levels of service. The purpose of this effort was (1) to identify any existing traffic problems that may not be directly related to intersection level of service, and (2) to identify any locations where the level of service calculation does not accurately reflect level of service in the field. The field observations revealed that the level of service analysis accurately reflects actual existing traffic conditions.

It is apparent that the high traffic volume on Montague Expressway during the peak hours causes congestion and poor peak hour level of service at the intersection of Montague Expressway and Trade Zone Boulevard/McCandless Drive. During the AM peak, the traffic on Montague heading towards Interstate 880 was sometimes observed to form queues from Oakland Road to Trade Zone Boulevard, causing delays for through traffic on Montague.

This, combined with the long cycle lengths on Montague, also causes a back-up on Trade Zone Boulevard and long queues that also affect the operation of the Trade Zone Boulevard/Ringwood Avenue intersection. The queues, which will occasionally stretch back to Lundy Avenue, often block vehicles on Ringwood Avenue from making left turns onto Trade Zone Boulevard at the intersection. In addition, the queues extending back from Montague sometimes also block traffic on Trade Zone Boulevard from proceeding straight through the Ringwood intersection when the light is green. Traffic did not always clear within a cycle length. During the PM peak hour, the traffic on Trade Zone was observed to be very heavy in both directions.

The queue on Trade Zone Boulevard extends along the Traverse project frontage, and sometimes stretches back to Lundy Avenue. However, it does not appear to affect the operation of the Trade Zone Boulevard/Lundy Avenue intersection.

Trip Generation and Project Assignment

Trip generation estimates were calculated for the weekday AM and PM peak hours of traffic. The trip rates used for this study were obtained from the Institute of Transportation Engineers (ITE) manual entitled *Trip Generation*, 9th Edition. The trip generation rates used for both proposed residential developments are based on the rates published for "Residential Condominium/Townhouse" (ITE Code 230). Based on these rates, the Traverse project would generate 92 trips during the AM peak hour and 109 trips during the PM peak hour (see Table 2).

For the purpose of this analysis, the traffic that would be generated by the existing uses on the site was ignored, since one building, located at 595 Trade Zone Blvd., was vacant at the time of the intersection counts and the other appeared to generate negligible traffic. Thus, no credit was given for existing use trips in the trip generation estimates.

Table 2
Warmington Traverse Project: Trip Generation Estimates

Land Use	Size	Daily Rate	Daily Trips	AM Peak Hour				PM Peak Hour			
				Rate	Total Trips	In	Out	Rate	Total Trips	In	Out
Residential Condominium/Townhouse	206 units	5.86	1,206	0.45	92	16	76	0.53	109	73	36

Note: Rates based on ITE *Trip Generation, 9th Edition*, 2012: fitted curve equation used from Condo/Townhome (ITE 230).

This operational analysis also considers the traffic from the adjacent Trumark residential development because the two projects will share an access road (Momentum Drive), and they will both affect the study intersections. In order to determine how best to modify signal timing and intersection coordination, it makes sense to consider both projects in combination. The trip generation estimates for the adjacent project are shown below in Table 3.

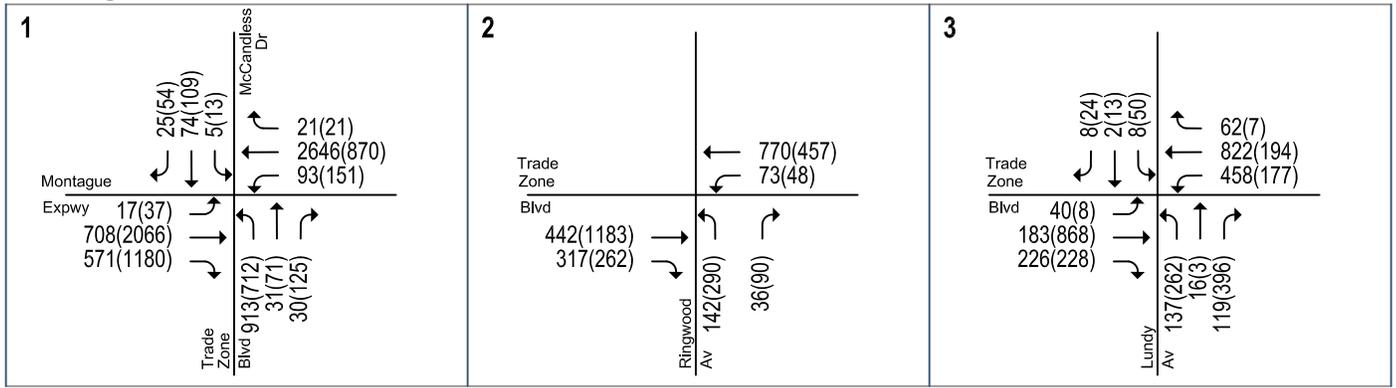
Table 3
Trumark Project: Trip Generation Estimates

Land Use	Size	Peak-Hour Rate ¹	AM Peak Hour			PM Peak Hour			
			Total Trips	In	Out	Total Trips	In	Out	
Residential Condominium/Townhouse ²	92 units	0.52	48	8	40	0.61	56	38	18
Single-family Detached Housing ³	42 units	0.93	39	10	29	1.15	48	30	18
Total Project Trips			87	18	69		104	68	36

1. All rates based on "Fitted Curve Equation." Rates expressed in trips per dwelling unit.
 2. "Residential Condominium/Townhouse" (230) rate from ITE Trip Generation, 9th edition. Note that the rate is different from the rate for the Traverse Project in Table 2 above because there are less than half as many units and a fitted curve equation was used.
 3. "Single-Family Detached Housing" (210) rate from ITE Trip Generation, 8th edition.

The traffic generated by both projects was assigned to nearby roadways based on traffic distribution patterns from recently completed traffic studies for residential projects in the area. Figure 5 shows the proposed Traverse project's trip distribution and assignment. Figure 6 shows the Trumark project's trip distribution and assignment.

Warmington Site on Trade Zone Boulevard



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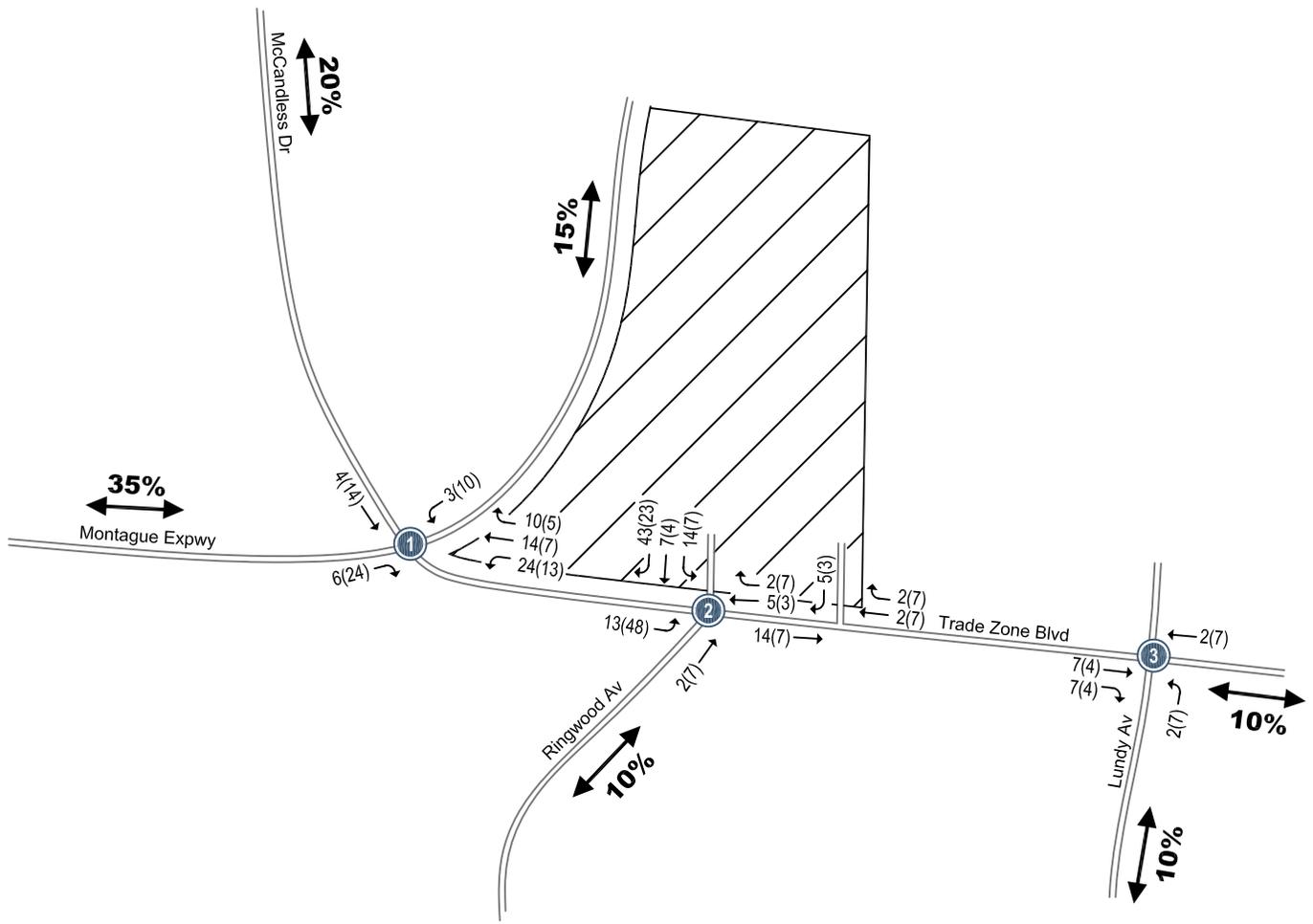
= Study Intersection

= Project Site Location

= Trumark Site

XX(XX) = AM(PM) Peak-Hour Traffic Volumes

Figure 4
Existing Traffic Volumes



LEGEND

① = Study Intersection

▨ = Trumark Site

XX(XX) = AM(PM) Peak-Hour Traffic Volumes

Figure 6

Trumark Project Trip Distribution and Assignment

Existing Plus Both Projects Intersection Analysis

Existing plus project conditions are defined as existing traffic volumes plus the addition of traffic from both residential projects. Figure 7 presents existing traffic volumes plus the estimated trips generated by both projects. The results of the level of service analysis show that the Trade Zone/Lundy intersection will continue to operate at LOS C in both peak periods, and there will be almost no increase in average delay compared with existing conditions (see Table 4). At the Trade Zone/Ringwood intersection, the LOS would degrade from A to B in the AM peak hour and from B to C in the PM peak hour and the average delay would increase by 9.4 and 10.3 seconds, respectively. Both of these intersections still will operate well within the acceptable Milpitas standard of LOS D.

The Trade Zone/Montague intersection already operates at LOS F, and it would continue to operate at LOS F, with an increase in average delay of 20.1 seconds and 8.8 seconds, respectively, for the AM peak hour and PM peak hour with both projects. Thus, it can be stated that two of the study intersections would not have a noticeable decline in operation under the existing plus project conditions. The additional 20 second delay at Trade Zone/Montague intersection in the AM peak would be noticeable, but that is because the intersection is already functioning so poorly that any additional traffic affects its performance. The levels of service calculation sheets are included in the appendix.

Table 4
Study Intersection Level of Service

	Peak Hour	Count Date	Existing		Existing + Both Projects	
			Avg. Delay	LOS	Avg. Delay	LOS
Lundy Avenue and Trade Zone Boulevard	AM	2/6/13	23	C	24	C
	PM	2/6/13	28	C	28	C
Ringwood Avenue and Trade Zone Boulevard	AM	2/6/13	8	A	17	B
	PM	2/6/13	11	B	22	C
McCandless Dr./Trade Zone Blvd. and Montague Expwy.*	AM	2/6/13	113	F	133	F
	PM	9/28/10	81	F	90	F

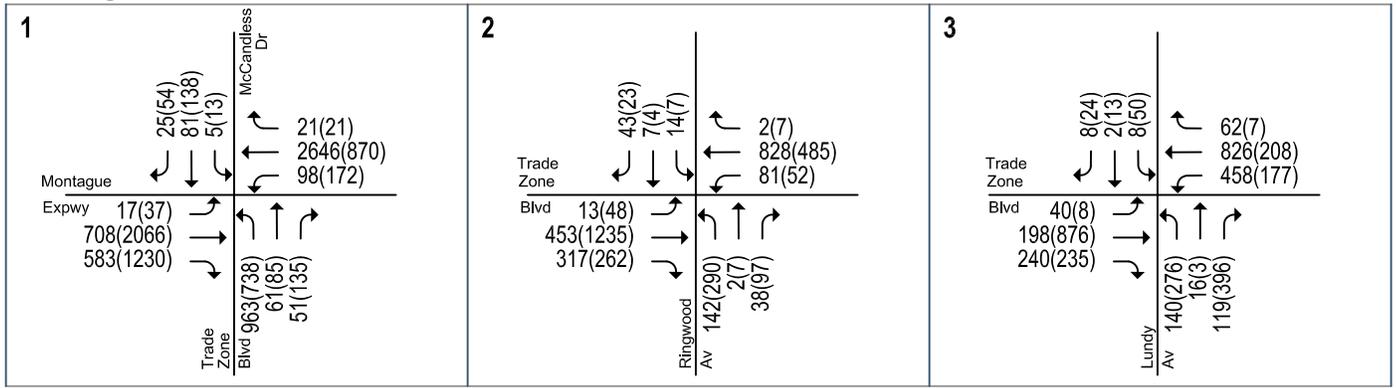
* Denotes CMP Intersection

Although the decline in operation at the study intersections would be minimal for the existing plus project conditions, it would be beneficial for the City of Milpitas and Santa Clara County, which operates Montague Expressway, to check operations in the field after completion of both residential projects and make adjustments to the traffic signal timing and coordination, as necessary.

These adjustments may be beneficial because:

- The poor existing level of service at the Trade Zone Boulevard/Montague Expressway intersection makes the performance of the intersection sensitive to the addition of any amount of traffic.
- The close proximity of the Trade Zone Boulevard/Montague Expressway and the Trade Zone Boulevard/Ringwood Avenue intersections (less than 600 ft) can cause the poor performance of one intersection to adversely affect the performance of the other.
- The re-use of the existing driveway at the Trade Zone Boulevard/Ringwood Avenue intersection by the Trumark project will effectively change the operation of that intersection from a three-legged to a four-legged intersection.

Warmington Site on Trade Zone Boulevard



LEGEND

= Study Intersection

= Project Site Location

= Trumark Site

XX(XX) = AM(PM) Peak-Hour Traffic Volumes

Figure 7
Existing Plus Project Traffic Volumes

- The long queues on Trade Zone Boulevard, sometimes extending from Ringwood Avenue to Lundy Avenue, could make it difficult for vehicles to exit the Traverse site during peak hours.

In the westbound direction, when vehicles on the Trade Zone Boulevard approach at the Trade Zone Boulevard/Montague Expressway intersection have a green phase, the westbound through movements on Trade Zone Boulevard at the Trade Zone Boulevard/Ringwood Avenue intersection should also have a green phase to allow the queues on Trade Zone Boulevard to dissipate. In addition, at the conclusion of the Trade Zone Boulevard green phase at the Trade Zone Boulevard/Montague Expressway intersection, the westbound through movements on Trade Zone Boulevard at the Trade Zone Boulevard/Ringwood Avenue intersection should be given a red phase to keep the queues on Trade Zone from blocking the intersection at Ringwood Avenue. This will also provide queue space on Trade Zone Boulevard at Montague Expressway for left-turn vehicles from Ringwood Avenue and right-turn vehicles from the Trumark project's driveway.

In the eastbound direction, consideration of the signal timing and phasing at the Trade Zone Boulevard/Ringwood Avenue intersection should be made so that vehicles do not queue back on Trade Zone Boulevard to Montague Expressway.

The cycle phase at the Trade Zone Boulevard/Ringwood Avenue intersection was observed to be 60 seconds currently. The City of Milpitas will need to lengthen this cycle length (in coordination with the timing of the signal at Montague, as described above) when this intersection becomes 4-legged due to the driveway for the Trumark site.

As a joint effort between Santa Clara County, the City of Milpitas, and the City of San Jose, there are long-range improvements that are planned for the Trade Zone Boulevard/Montague Expressway intersection. These improvements include additional through lanes and left-turn lanes on Montague Expressway. In addition, three northbound left-turn lanes from Trade Zone Boulevard to Montague Expressway are proposed. These changes will also significantly improve the functioning of the Trade Zone/Ringwood intersection and will improve the access into and out of the project site. Currently, the City of Milpitas and the City of San Jose are collecting traffic fees to pay for these improvements. However, no construction date has been set at this time. As a condition of approval, the Trumark project will be adding a crosswalk to the intersection so that pedestrians can cross Montague Expressway. This will require signal modifications. No other improvements are fully funded at this time.

Currently, Trade Zone Boulevard along the Traverse project frontage has four lanes, two eastbound lanes and two westbound lanes. It narrows along a portion of the project frontage due to a frontage offset that currently juts out into Trade Zone Boulevard. The Traverse project will eliminate this offset, which currently blocks part of the right lane on westbound Trade Zone Boulevard, and will widen Trade Zone Boulevard along its frontage. An additional lane will be constructed, which will be a two-way center turn lane beginning east of Momentum Drive (the right-in/right-out only driveway to be shared with the Trumark project) and extending along the project frontage. This additional lane will improve the traffic flow along the project frontage, as well as improve site access.

Vehicle Queuing

A left-turn queuing analysis was performed for all left turn movements at the project intersections that would have traffic added due to both proposed projects. Adequate left-turn storage should be provided at the study intersections to allow turning vehicles to not block through lanes. Vehicle queues were estimated using a Poisson probability distribution. The basis of the analysis is as follows: (1) the Poisson probability distribution is used to estimate the 95th percentile maximum number of queued vehicles per signal cycle for a particular movement; (2) the estimated maximum number of vehicles in the queue is translated into a queue length, assuming 25 feet per vehicle; and (3) the estimated maximum queue length is compared to the existing or planned available storage capacity for the movement.

The results of the analysis show that for the Trade Zone Boulevard/Montague Expressway intersection the northbound through/left turn lanes have inadequate storage during the AM and PM peak hours under existing and project conditions (see Table 5). In addition, the westbound left-turn lane (turning from Montague onto

Table 5
Queuing Analysis

Measurement	McCandless / Montague NBT/L AM	McCandless / Montague NBT/L PM	McCandless / Montague WBL AM	McCandless / Montague WBL PM	Street "C" / Trade Zone SBR/L AM	Street "C" / Trade Zone SBR/L PM	Street "C" / Trade Zone EBL AM	Street "C" / Trade Zone EBL PM	Lundy / Trade Zone NBT/L AM	Lundy / Trade Zone NBT/L PM
Existing										
Cycle/Delay ¹ (sec)	170	190	170	190	1	1	1	1	108	98
Volume (vphpl)	472	392	93	151	0	0	0	0	77	133
Avg. Queue (veh./In.)	22.3	20.7	4.4	8.0	0.0	0.0	0.0	0.0	2.3	3.6
Avg. Queue ² (ft./In)	557	517	110	199	0	0	0	0	58	91
95th % . Queue (veh./In.)	30	28	8	13	0	0	0	0	5	7
95th % . Queue (ft./In)	750	700	200	325	0	0	0	0	125	175
Storage (ft./ In.)	515 ³	515 ³	280	280	150 ⁴	150 ⁴	300	300	600 ³	600 ³
Adequate (Y/N)	N	N	Y	N	Y	Y	Y	Y	Y	Y
Existing + Project										
Cycle/Delay ¹ (sec)	170	190	170	190	19	16	10	9	108	98
Volume (vphpl)	512	412	98	172	38	18	13	59	78	140
Avg. Queue (veh./In.)	24.2	21.7	4.6	9.1	0.2	0.1	0.0	0.1	2.3	3.8
Avg. Queue ² (ft./In)	604	544	116	227	5	2	1	4	59	95
95th % . Queue (veh./In.)	33	30	8	14	1	1	1	1	5	7
95th % . Queue (ft./In)	825	750	200	350	25	25	25	25	125	175
Storage (ft./ In.)	515 ³	515 ³	280	280	150 ⁴	150 ⁴	300	300	600 ³	600 ³
Adequate (Y/N)	N	N	Y	N	Y	Y	Y	Y	Y	Y
Notes:										
¹ Vehicle queue calculations based on cycle length for signalized intersections.										
² Assumes 25 Feet Per Vehicle Queued.										
³ This is a shared thru-left lane, so volume and storage capacity are calculated for both of these movements.										
⁴ This is a shared right-left lane, so volume and storage capacity are calculated for both of these movements.										

Trade Zone) has inadequate storage during the PM peak hour under existing and project conditions. Field observations confirmed the results of the queuing analysis.

The long queues exist mainly because of two reasons: the long green time for Montague Expressway due to heavy volume on the expressway, and the close proximity to the Ringwood Avenue/Trade Zone Boulevard intersection. Although shortening the cycle length at the Trade Zone Boulevard/Montague Expressway intersection would shorten the northbound through/left-turn queue, it would create major problems for through traffic on Montague Expressway, until the expressway is widened. It may be desirable to add the pavement legend "KEEP CLEAR" to the Ringwood Avenue/Trade Zone Boulevard intersection in conjunction with opening of the Trumark development. In addition, as mentioned in the intersection level of service analysis, Santa Clara County and the City of Milpitas can coordinate the Trade Zone Boulevard/Montague Expressway and Trade Zone Boulevard/Ringwood Avenue intersections to ensure that as much of the queue on Trade Zone is dissipated as possible with each cycle.

The long-range plan to add a third left-turn lane from Trade Zone Boulevard to Montague Expressway will reduce the queue length by providing an additional lane of storage. Also, the long-range plan to widen Montague Expressway to four lanes in each direction will improve the intersection levels of service, which will reduce queue lengths.

According to the queue analysis, the westbound left-turn lane from Montague Expressway onto Trade Zone Boulevard would need 70 feet of additional storage to accommodate the largest peak-hour queue under the Project Conditions scenario. There is plenty of room in the median to extend the left-turn pocket 70+ feet to accommodate the calculated queue length. Observations of existing conditions confirmed that the existing left-turn storage is inadequate as the storage consistently filled up every cycle leaving a couple of cars out of the left-turn storage area. If no extensions are made to the left-turn pocket, the queues under Project Conditions would operate similarly to Existing Conditions, since only one more queued vehicle is expected. Therefore, there should not be any breakdown in intersection operation due to queue lengths with the current storage capacity under Project Conditions. Since extending the turn pocket would not significantly improve traffic conditions, it is recommended that the turn pocket not be increased.

Site Access and Circulation

This section describes the site access and circulation of the proposed project. This review is based on a project site plan dated February 2013 prepared by Carlson, Barbee & Gibson, Inc. (see Figure 3).

Site Access

Access to the Traverse site was evaluated to determine the adequacy of the project driveways with regard to the following: corner sight distance, traffic volume, average delays, vehicle queuing, and truck access. Under Project Conditions, access to the site will be provided by two roads: Momentum Drive on Trade Zone Boulevard approximately 360 feet east of the intersection at Ringwood Avenue, and a new road, labeled Street "C" on the site plan, located approximately 540 feet east of the Momentum Drive driveway. The intersection of Trade Zone Boulevard/Momentum Drive will only allow right turns in and out. The Trumark project is building a pork-chop island to prohibit left turns. The intersection of Trade Zone Boulevard/Street "C" will allow all turns. The Traverse project will be widening Trade Zone Boulevard along its frontage and will be painting a center two-way left turn lane, which will provide channelization and storage for left turns into the Traverse project site.

It is important to note that the City of Milpitas plans to eventually develop additional roadways that would provide access to the northern portion of the site when other parcels in the area are developed. One roadway would extend east (parallel to Trade Zone) from the northeast corner of the site. Another roadway would extend north (perpendicular to Trade Zone) from a point roughly midway along the site's northern boundary. The site plan indicates that access to those future roadways has been provided for and there will be stub ends of streets within the site that can eventually connect. Project access will be greatly enhanced when those roadways are constructed in the future, since they will permit access to the site by roads other than Trade Zone Boulevard. However, it is unknown when those roadways might be constructed, since they are contingent on the development of other nearby parcels.

Corner Sight Distance

Based on the site plan and field observations, adequate sight distance will be provided at both Momentum Drive and Street "C" to ensure that exiting vehicles can see vehicles on Trade Zone Boulevard.

Although drivers' sight distance should be adequate at both streets, consideration of the locations of new landscaping improvements such as large trees, grass hills, or signage should be taken into consideration to ensure the sight distance remains adequate after all project improvements are made. Because both streets will be unsignalized and the traffic on Trade Zone Boulevard is substantial, it will be important to provide drivers as much sight distance in both directions as possible.

Traffic Volume

Under conditions with the Traverse project, Street "C" would have 16 inbound trips and 38 outbound trips during the AM peak hour and 70 inbound trips and 18 outbound trips during the PM peak hour (see Figure 5).

At Momentum Drive, it is estimated that the Traverse project would generate zero inbound trips and 38 outbound trips during the AM peak hour and 3 inbound trips and 18 outbound trips during the PM peak hour. Since this driveway will be shared with the Trumark site, the total numbers of trips estimated for Momentum Drive are 2 inbound trips and 43 outbound trips during the AM peak hour and 10 inbound trips and 21 outbound trips during the PM peak hour.

Driveway Operation

At Momentum Drive on Trade Zone Boulevard, delays would be reasonably short since only right turns will be allowed. However, as discussed in the vehicle queuing section, AM and PM peak hour westbound queues on Trade Zone Boulevard often stretch from Montague Expressway past the project site driveways.

As described above, the Traverse project will construct a two-way center turn lane on Trade Zone Boulevard that would begin east of the Momentum Drive intersection. This two-way center turn lane should begin far enough east of Momentum Drive so that drivers are not tempted to make an illegal left turn from Momentum Drive into that lane.

Street "C" will be located approximately 540 feet east of the Momentum Drive driveway and will run along the eastern edge of the project site. Left turn access into the site from eastbound Trade Zone Boulevard will be able to use the two-way center turn lane that will be constructed. The City of Milpitas may find it desirable to paint a "KEEP CLEAR" pavement legend in the westbound direction of Trade Zone Boulevard at Street "C" once the Traverse project is constructed. The KEEP CLEAR marking would allow vehicles to enter the site even when there are long queues on westbound Trade Zone Boulevard.

The "KEEP CLEAR" pavement legend also would allow vehicles turning left out of the site to pass through the westbound queue and access the center turn lane. The signal at Trade Zone Boulevard and Lundy Avenue will help provide gaps in traffic that will allow vehicles to turn out of the site.

Driveway Queuing

Based on the site plan, there would be at least 150 feet of queue space for outbound vehicles on Street "C" at Trade Zone Boulevard. The peak hour volume of traffic exiting the site at Street "C" is estimated to be only 38 vehicles, and the longest queue expected at Street "C" is only one or two cars. Thus, the maximum queue easily can be accommodated in the 150 feet of proposed queue storage.

For left turns into Street "C" from eastbound Trade Zone Boulevard, storage space will be provided by the two-way center turn lane that will be constructed as part of the widening of Trade Zone Boulevard. There will be 70 vehicles during the peak hour that will make left turns into the site. The queuing analysis indicates that there will be a maximum queue of only one or two cars, which easily can be accommodated in the center turn lane.

There is a driveway on the other side of Trade Zone Boulevard approximately across the street from Street "C." However, this driveway is gated and not in use, except perhaps as an emergency vehicle access point. Because that driveway is not open to regular vehicle traffic, there will be no conflicts in the center turn lane.

It is unlikely that there would be a problem with queuing at Momentum Drive on Trade Zone Boulevard since only right turns will be allowed. Momentum Drive has room for queue storage of over 200 feet, so no queuing issues are anticipated at this access point.

Truck Access

An analysis was conducted to determine the adequacy of site access for the truck category SU 30, which includes small buses, fire trucks, garbage trucks, and other single unit trucks. According to this analysis, trucks would be able to negotiate the on-site streets. Therefore, the proposed design is adequate to handle the anticipated level of truck traffic.

On-Site Circulation

The onsite circulation was reviewed in accordance with generally accepted traffic engineering standards. Generally, the proposed plan provides adequate connectivity throughout the site for each dwelling unit and the parking spaces provided for vehicles. The primary roadways for the site, labeled Momentum Drive, Street "A," and Street "C" on the site map connect to secondary roadways and drive aisles. On-street parking is provided on one side of each primary and secondary roadway and on both sides of Momentum Drive.

Special attention was paid to the intersection of Momentum Drive and Street "A." Rather than forming an intersection, these streets actually just form a right-angle bend in the street. The driveway to the Trumark project intersects Momentum Drive right at the bend. This creates a potential sight distance problem for the Trumark Driveway. Vehicles entering the Trumark Driveway may have a difficult time seeing vehicles on Street "A." Therefore, it is recommended that stop signs be installed on Momentum Drive and on Street "A" to insure that vehicles do not travel at excessive speeds around the bend. The stop signs also will insure safe operation of the driveway to the nearest cluster of homes on the Traverse site.

Pedestrian, Bike, and Transit Access

Currently, pedestrian facilities adjacent to and near the proposed project site are lacking or disjointed. Sidewalks are not consistently present on Trade Zone Boulevard, Ringwood Avenue, or Lundy Avenue and are completely absent on Montague Expressway in the vicinity of the project. In addition, no crosswalks are available to cross Montague Expressway at Trade Zone Boulevard.

As a condition of approval, the Trumark project will be constructing a crosswalk across Montague Expressway on the east leg of the intersection with Trade Zone Boulevard. Along with the crosswalk, the Trumark project will be making changes to the traffic signal to include pedestrian phases. Trumark also will be building a crosswalk and pedestrian signal modifications across their driveway.

The Warmington project will be adding sidewalks along their project frontage in conjunction with the Trade Zone Boulevard widening. The Trumark project will be building sidewalks along their frontages on Trade Zone Boulevard and Montague Expressway. Thus, after both projects are completed, pedestrian circulation will be much improved versus existing conditions.

In the longer range, it will be desirable to provide better pedestrian connections to the VTA Montague Light Rail Station. A BART stop is also planned for that location when BART service is extended to Milpitas. Both the Trumark and the Traverse sites are within the City of Milpitas's Transit Area Specific Plan (TASP). Once the TASP street network is completely developed, there will be an easy walk from both project sites to the rail station. In the meantime, Milpitas should work with individual developments as they are proposed to add sidewalks along their frontages to complete the sidewalk network in the area.

Bicycle facilities in the area consist of Class II bike lanes on McCandless Drive north of Montague Expressway, on Ringwood Avenue, and on Lundy Avenue. In addition, Montague Expressway can be used by bicyclists and has striped shoulders in some areas that bicyclists can use. The TASP calls for the addition of bike lanes on Trade Zone Boulevard, which would complete the bike lane network in the area. Most of Trade Zone Boulevard is already wide enough for bike lanes. The Warmington project will widen Trade Zone Boulevard along its frontage, which will provide sufficient width for bike lanes.

Regarding transit access, there are transit stops at the intersections of Trade Zone Boulevard/Ringwood Avenue and Trade Zone Boulevard/Lundy Avenue for VTA Bus Route 77 (Eastridge to Great Mall). There is also a transit stop nearby in the opposite direction. The sidewalk that will be constructed along the project frontage will improve access to both bus stops.

VTA also operates Limited Stop Bus Route 321 (Great Mall to Lockheed Martin) on Montague Expressway. The improvements in sidewalk connectivity that will be built by the Trumark and the Traverse developments will allow project residents to walk to the bus stops on Montague Expressway.

Conclusion

Based on the analysis of the proposed residential project on Trade Zone Boulevard, the following are transportation-related issues and recommendations:

Trade Zone Boulevard/Montague Expressway operates at poor level of service under Existing and Existing plus Project Conditions.

Recommendation:

It is recommended that Santa Clara County and Milpitas work together to make adjustments to the operation of the traffic signals after buildout of both residential projects. Adjustments to the signal operation should include modifications to signal timing and intersection coordination. These adjustments, such as coordinating green phases on Trade Zone Boulevard at the Trade Zone Boulevard/Montague Expressway and Trade Zone Boulevard/Ringwood Avenue intersections, will allow traffic to flow as efficiently as possible through these intersections.

The northbound through/left turn lanes at the Trade Zone Boulevard/Montague Expressway intersection have inadequate storage during both peak hours under Existing and Existing plus Project Conditions.

Recommendation:

Since there are no viable options to reduce queuing until the expressway is widened and an additional left turn lane is added to Trade Zone at Montague, it is recommended that the City of Milpitas consider the addition of a pavement legend "KEEP CLEAR" in the westbound direction within the Ringwood Avenue/Trade Zone Boulevard intersection to allow room for vehicles from Ringwood to maneuver through the intersection.

Westbound queues on Trade Zone Boulevard occasionally stretch along the Traverse project frontage from Ringwood Avenue back to Lundy Avenue. These queues could make it difficult for vehicles to get into and out of the Traverse site during peak hours.

Recommendation:

The City of Milpitas should consider adding the pavement legend "KEEP CLEAR" for the westbound lanes of Trade Zone Boulevard at the intersection with Street "C." This will enable vehicles to make left turns into the site and to make right and left turns out of the site when westbound traffic has formed queues on Trade Zone Boulevard past the project's driveway.

Technical Appendices

Appendix A
Traffic Counts

Appendix B
Level of Service Calculation Sheets