Traffic Impact Study for the Haystack Pacifica Project

Prepared for the City of Petaluma

Submitted by
W-Trans

April 16, 2019

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Table of Contents

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Executive Summary

The proposed Haystack Pacifica mixed use development would include construction of 178 apartment units and 24.855 square feet of commercial space in the City of Petaluma. Access to the site would occur via two driveways to be located on Weller Street. A "transverse" street bisecting the project site and connecting Weller Street and Copeland Street is proposed as part of the project.

Based on standard trip generation rates, the proposed project would be expected to generate an average of 732 daily trips, with 76 trips during the morning peak hour and 95 during the evening peak hour.

The study area includes the intersections of East Washington Street/Weller Street, East Washington Street/ Copeland Street, East D Street/Weller Street, East D Street Copeland Street, and the future intersections of the project's "transverse street" with Weller Street and Copeland Street. All the study intersections are currently operating acceptably overall at LOS D or better and would be expected to continue operating at the same service levels with the addition of project-generated traffic.

Under anticipated future volumes, the study intersections are expected to operate acceptably, except East D Street/Copeland Street, which is expected to operate unacceptably at LOS F during both peak hours. A signal is warranted for East D Street/Copeland Street and is planned per the *Central Petaluma Specific Plan*. Upon signalization, the intersection would operate acceptably during both peak hours. The study intersections would be expected to continue operating acceptably overall upon adding project traffic to future volumes.

The project should pay a proportional share equal to 5.4 percent of the cost of signalization of East D Street/ Copeland Street.

Facilities providing access to the site via alternative modes, including pedestrians, bicyclists, and transit riders, are adequate and would be improved with the project as plans to expand the bike system would be realized. Racks or other structures to provide secure parking facilities for at least 20 bicycles should be provided as part of the project. The project should install colored pavement or other similar traffic calming enhancements to the midblock crosswalk on the Transverse Street. Stamped concrete should be avoided given the potential for bicycle activity. Shared lane bike markings or "Sharrows" should also be provided on Copeland Street and, if desired by the City, along Weller Street. Wayfinding signage should be installed for pedestrians and bicyclists to indicate transit connections and points of interest.

Sight distances at the transverse street intersections with Weller Street and Copeland Street and at all project driveways would be adequate, except that corner sight distance for vehicles turning left onto Weller Street from the transverse street would be limited by the curvature of Weller Street and the location of the project building. Therefore, left-turns from the transverse street to Weller Street should be prohibited. Landscaping at all project driveways should be maintained and trimmed back to provide clear sight lines.

Left-turn lanes are not warranted, and therefore not recommended, at the project's driveways on Weller Street or at the proposed new street intersections on Weller Street and Copeland Street.

Introduction

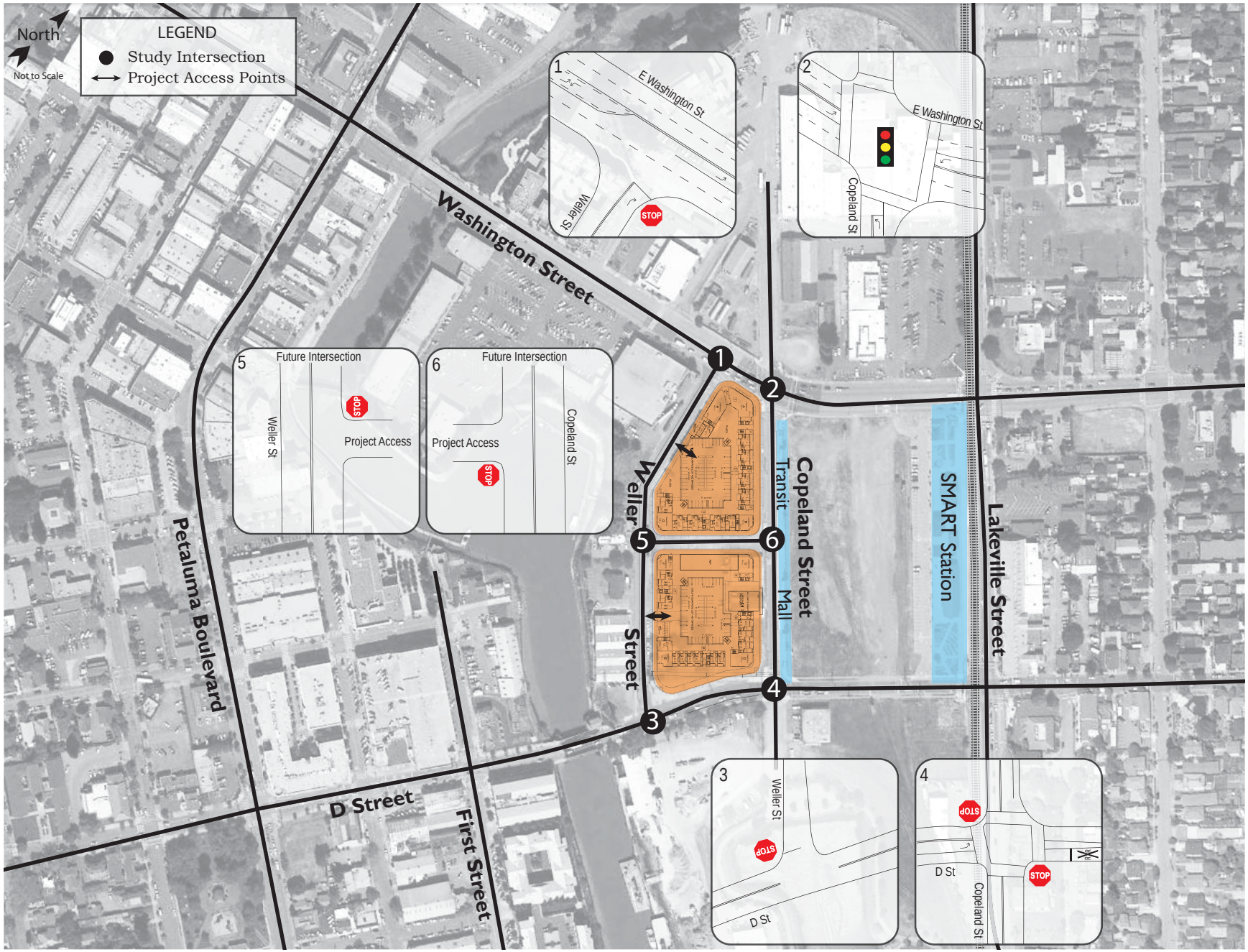
This report presents an analysis of the potential traffic impacts that would be associated with occupation of the proposed Haystack Pacifica mixed use development, which would be located on a vacant parcel bound by Copeland Street, East D Street, Weller Street and East Washington Street in the City of Petaluma adjacent to the Petaluma River turning basin. The traffic study was completed in accordance with the criteria established by the City of Petaluma, and is consistent with standard traffic engineering techniques. Impacts of the project on issues such as traffic safety, intersection level of service, site access, Copeland Street transit mall interaction, pedestrian facilities, bicycle facilities, and transit were explored.

Prelude

The purpose of a traffic impact study is to provide City staff and policy makers with data that they can use to make an informed decision regarding the potential traffic impacts of a proposed project, and any associated improvements that would be required in order to mitigate these impacts to a level of insignificance as defined by the City's General Plan or other policies. Vehicular traffic impacts are typically evaluated by determining the number of new trips that the proposed use would be expected to generate, distributing these trips to the surrounding street system based on existing travel patterns or anticipated travel patterns specific to the proposed project, then analyzing the impact the new traffic would be expected to have on critical intersections or roadway segments. Impacts relative to access for pedestrians, bicyclists, and to transit are also addressed.

Project Profile

The Haystack Pacifica project would result in the development of a mixed-use center on a site bound by Copeland Street, East D Street, Weller Street and East Washington Street in the City of Petaluma. The project would include the development of 24.855 square feet of commercial space and 178 apartment units. The project would be developed on two blocks separated by an internal "transverse street" which would provide access between the Petaluma River turning basin and the Copeland Street transit mall. Vehicle access to each of the two blocks for residents, employees and visitors of this mixed-use development would be via two driveways on Weller Street. Pedestrian and bicycle connections would also be provided around the perimeter of the site. The project is in proximity to the Copeland Transit Mall and the SMART rail station, as well as the downtown and riverfront areas of Petaluma. The project location and adjacent roadway network are shown in Figure 1.



183pet.ai 5/18

Traffic Impact Study for the Haystack Pacifica Project

Figure 1 – Study Area and Lane Configurations

Transportation Setting

Operational Analysis

Study Area and Periods

The study area consists of the following intersections, as shown on Figure 1:

1. East Washington Street/Weller Street
2. East Washington Street/Copeland Street
3. East D Street/Weller Street
4. East D Street/Copeland Street
5. Weller Street/Project's "Transverse" Street
6. Copeland Street/ Project's "Transverse" Street

Operating conditions during the a.m. and p.m. peak periods were evaluated to capture the highest potential impacts for the proposed project as well as the highest volumes on the local transportation network. The morning peak hour occurs between 7:00 and 9:00 a.m. and reflects conditions during the home to work or school commute, while the p.m. peak hour occurs between 4:00 and 6:00 p.m. and typically reflects the highest level of congestion during the homeward bound commute.

Study Intersections

Given the orientation of many streets in Petaluma at an angle that is skewed from north-south or east-west, for purposes of the evaluation, the orientation convention used was to consider East Washington Street and D Street as east-west streets.

East Washington Street/Weller Street is a two-way stop-controlled tee intersection with northbound Weller Street approach stop-controlled, while East Washington Street is free flowing. Northbound left-turn movements are restricted by a center median on East Washington Street. There are no marked crosswalks at this intersection.

East Washington Street/Copeland Street is a signalized intersection with permitted left-turn phasing on the Copeland Street approaches and protected left-turn phasing on the East Washington Street approaches. Marked crosswalks and pedestrian signals are provided on all four legs.

East D Street/Weller Street is a tee intersection with stop controls on the Weller Street approach. There are no marked crosswalks at this intersection.

East D Street/Copeland Street is a four-legged intersection with stop controls on Copeland Street. Crosswalks are located on all approaches. Pedestrian-activated warning lights are provided on the crossings of East D Street.

Weller Street/Project's "Transverse" Street and **Copeland Street/Project's "Transverse" Street** are proposed to be tee intersections. The project's "transverse" street would bisect the project site and would connect Weller Street with Copeland Street.

The locations of the study intersections and the existing lane configurations and controls are shown in Figure 1.

Collision History

The collision history for the study area was reviewed to determine any trends or patterns that may indicate a safety issue. Collision rates were calculated based on records available from the California Highway Patrol as published in their *Statewide Integrated Traffic Records System (SWITRS)* reports. The most current five-year period available is September 1, 2012 through August 31, 2017.

As presented in Table 1, the calculated collision rates for the study intersections were compared to average collision rates for similar facilities statewide, as indicated in *2014 Collision Data on California State Highways*, California Department of Transportation (Caltrans). The collision rate calculations are provided in Appendix A.

Table 1 – Collision Rates at the Study Intersections

Study Intersection	Number of Collisions (2012-2017)	Calculated Collision Rate (c/mve)	Statewide Average Collision Rate (c/mve)
1. E Washington St/Weller St	2	0.06	0.18
2. E Washington St/Copeland St	4	0.11	0.27
3. E D St/Weller St	**6**	**0.19**	0.18
4. E D St/Copeland St	**13**	**0.42**	0.15

Note: c/mve = collisions per million vehicles entering; **bold** text = collision rate is higher than the statewide average

The collision rate at the intersection of East D Street/Weller Street is slightly higher than the statewide average. Three of the six collisions were rear-end crashes, which are generally associated with the congested urban intersections. The collision rate is nearly equal to the statewide average and the intersection injury rate of 33.3 percent is lower than the 36.4 percent statewide average.

East D Street/Copeland Street has had collisions at a considerably higher rate than the statewide average for similar facilities; however, only 23.1 percent of crashes resulted in injuries, which is substantially lower than the statewide average injury rate of 41.9 percent. The most notable trends were rear-end collisions, which are associated with congestion at the intersection. It is recommended to increase enforcement activity near the intersection to reduce speeding.

Alternative Modes

Pedestrian Facilities

Pedestrian facilities include sidewalks, crosswalks, pedestrian signal phases, curb ramps, and curb extensions. In general, a network of sidewalks, crosswalks, pedestrian signals, and curb ramps provide access for pedestrians in the vicinity of the proposed project site; however, sidewalk gaps are currently found along the Weller Street site frontage. Crosswalks are equipped with pedestrian-activated Rectangular Rapid Flashing Beacons (RRFB) on the East D Street legs at its intersection with Copeland Street. Pedestrian-activated in pavement flashing lights exist at the midblock crosswalk located on Copeland Street between East D Street and East Washington Street. An additional uncontrolled midblock crossing is located on Weller Street between D Street and East Washington Street.

There are continuous sidewalks on East Washington Street connecting the site to the City's downtown core area as well as to commercial areas along East Washington Street northeast of Lakeville Street. A pedestrian connection

exists between the midblock crossing on Weller Street through the Golden Eagle Shopping Center that provides a connection to the downtown via the Balshaw Pedestrian Bridge.

Bicycle Facilities

The *Highway Design Manual*, Caltrans, 2017, classifies bikeways into four categories:

- **Class I Multi-Use Path** – a completely separated right-of-way for the exclusive use of bicycles and pedestrians with cross flows of motorized traffic minimized.
- **Class II Bike Lane** – a striped and signed lane for one-way bike travel on a street or highway.
- **Class III Bike Route** – signing only for shared use with motor vehicles within the same travel lane on a street or highway.
- **Class IV Bikeway** – also known as a separated bikeway, a Class IV bikeway is for the exclusive use of bicycles and includes a separation between the bikeway and the motor vehicle traffic lane. The separation may include, but is not limited to, grade separation, flexible posts, inflexible physical barriers, or on-street parking.

In the project area, Class II bike lanes exist on both sides of Lakeville Street between East D Street and East Washington Street. Bicyclists ride in the roadway and/or on sidewalks along all other streets within the project study area. Table 2 summarizes the existing and planned bicycle facilities in the project vicinity, as contained in the *City of Petaluma: Bicycle and Pedestrian Plan: an Appendix to the General Plan 2025,* May 2008.

Table 2 – Bicycle Facility Summary

Status Facility	Class	Length (miles)	Begin Point	End Point
Existing				
Western Ave	II	1.9	Petaluma Blvd S	City Limits
B St	II	0.8	Petaluma Blvd S	El Rose Dr
D St	II	1.6	Petaluma Blvd S	City Limits
Petaluma Blvd N	III	0.71	Lakeville St	D St
E Washington St	III	1.09	Howard St	Kenilworth Dr
Lakeville St	II	0.13	Washington St	D St
Planned				
NWP Trail	I	2.21	Lynch Creek	Adobe Creek
Copeland St	II	0.17	Madison St	E Washington St
D St	II/III	0.68	Petaluma Blvd S	Payran St
Copeland St	III	0.14	E Washington St	D St
Petaluma River Trail	I	0.37	Lakeville St	E Washington St
SMART Trail	III	--	Entire SMART Corridor	Entire SMART Corridor

Source: *City of Petaluma: Bicycle and Pedestrian Plan: an Appendix to the General Plan 2025*, City of Petaluma, 2008

Transit Facilities

Local, fixed-route bus transit service is provided by the City of Petaluma through its Petaluma Transit Service. Additional regional service is provided by Sonoma County Transit and Golden Gate Transit. The Copeland Transit Mall is located along the east side of Copeland Street across the street from the project's Copeland Street frontage. Table 3 provides a summary of both local and regional transit services that are provided near the project site.

Table 3 – Transit Routes							
Transit Agency Route – Regions Served	**Span of Service**						**Nearest Stop**
	Weekday		**Saturday**		**Sunday**		
	Times	**Headway**	**Times**	**Headway**	**Times**	**Headway**	
Petaluma Transit							
10 – West Petaluma	7:30 AM – 6:30 PM	1 hr					Copeland Transit Mall
11 – Downtown & Eastside Transit Center	6:30 AM – 8:30 PM	30 min	7:30 AM – 8:30 PM	30 min	8:30 AM – 5:30 PM	30 min	Copeland Transit Mall
24 – Southeast Petaluma	6:15 AM – 7:00 PM	30 min-1 hr					Copeland Transit Mall
Sonoma County Transit							
40/53 – Sonoma to Petaluma (commute hours only)	6:30 AM – 7:00 PM	1-1.5 hr					Copeland Transit Mall
44/48/48X/54 – Santa Rosa to Petaluma	5:20 AM – 10:30 PM	15 min-1 hr	7:00 AM – 10:00 PM	1-2 hr	7:00 AM – 10:00 PM	1-2 hr	Copeland Transit Mall
Golden Gate Transit							
74 SB – Santa Rosa to San Francisco	5:00 AM – 10:00 AM	30 min					Petaluma Depot (4th St/C St)
74 NB – San Francisco to Santa Rosa	3:00 PM – 8:30 PM	30 min – 1 hr					Petaluma Depot (4th St/C St)
101/101X SB – Santa Rosa to San Francisco	4:00 AM – 12:00 AM	1 hr	4:00 AM – 12:00 AM	1 hr	4:00 AM – 12:00 AM	1 hr	Copeland Transit Mall
101/101X NB – San Francisco to Santa Rosa	5:20 AM – 2:30 AM	1 hr	6:30 AM – 2:30 AM	1 hr	6:30 AM – 2:30 AM	1 hr	Copeland Transit Mall

Notes: SB = Southbound; NB = Northbound

Two bicycles can be carried on most Petaluma Transit, Sonoma County Transit, and Golden Gate Transit buses. Bike rack space is on a first come, first served basis. Additional bicycles are allowed on the buses at the discretion of the driver.

Petaluma Paratransit is designed to serve the needs of individuals with disabilities within the City and the greater Petaluma area who are unable to independently use fixed-route transit services. Trips can be reserved for travel Monday through Friday, 6:20 a.m. to 7:15 p.m., Saturday, 7:20 a.m. to 5:45 p.m., and Sunday, 8:20 a.m. to 4:45 p.m.

Sonoma-Marin Area Rail Transit (SMART)

The project site is located one block west of the SMART Corridor and the Petaluma downtown station at the historic train station. The SMART commuter rail system currently includes 43 miles of rail corridor and 10 stations from the Sonoma County Airport to Downtown San Rafael. Upon completion, the passenger rail service will extend 70 miles from Cloverdale, at the north end of Sonoma County, to Larkspur where the Golden Gate Ferry connects Marin County with San Francisco. Along with commuter rail service, a multi-use pathway is planned parallel to the rail corridor. The project would be connected to the SMART station via a pedestrian connection across the block east of Copeland Street.

Capacity Analysis

Intersection Level of Service Methodologies

Level of Service (LOS) is used to rank traffic operation on various types of facilities based on traffic volumes and roadway capacity using a series of letter designations ranging from A to F. Generally, Level of Service A represents free flow conditions and Level of Service F represents forced flow or breakdown conditions. A unit of measure that indicates a level of delay generally accompanies the LOS designation.

The study intersections were analyzed using methodologies published in the *Highway Capacity Manual* (HCM), Transportation Research Board, 2010. This source contains methodologies for various types of intersection control, all of which are related to a measurement of delay in average number of seconds per vehicle.

The Levels of Service for the intersections with side street stop controls were analyzed using the "Two-Way Stop-Controlled" intersection capacity method from the HCM. This methodology determines a level of service for each minor turning movement by estimating the level of average delay in seconds per vehicle. Results are presented for individual movements together with the weighted overall average delay for the intersection.

The study intersections that are currently controlled by a traffic signal, or may be in the future, were evaluated using the signalized methodology from the HCM. This methodology is based on factors including traffic volumes, green time for each movement, phasing, whether or not the signals are coordinated, truck traffic, and pedestrian activity. Average stopped delay per vehicle in seconds is used as the basis for evaluation in this LOS methodology. For purposes of this study, delays were calculated using actual signal timing from timing sheets provided by the City of Petaluma and future signal operation was calculated using optimized signal timing. The ranges of delay associated with the various levels of service are indicated in Table 4.

Table 4 – Intersection Level of Service Criteria

LOS	Two-Way Stop-Controlled	Signalized
A	Delay of 0 to 10 seconds. Gaps in traffic are readily available for drivers exiting the minor street.	Delay of 0 to 10 seconds. Most vehicles arrive during the green phase, so do not stop at all.
B	Delay of 10 to 15 seconds. Gaps in traffic are somewhat less readily available than with LOS A, but no queuing occurs on the minor street.	Delay of 10 to 20 seconds. More vehicles stop than with LOS A, but many drivers still do not have to stop.
C	Delay of 15 to 25 seconds. Acceptable gaps in traffic are less frequent, and drivers may approach while another vehicle is already waiting to exit the side street.	Delay of 20 to 35 seconds. The number of vehicles stopping is significant, although many still pass through without stopping.
D	Delay of 25 to 35 seconds. There are fewer acceptable gaps in traffic, and drivers may enter a queue of one or two vehicles on the side street.	Delay of 35 to 55 seconds. The influence of congestion is noticeable, and most vehicles have to stop.
E	Delay of 35 to 50 seconds. Few acceptable gaps in traffic are available, and longer queues may form on the side street.	Delay of 55 to 80 seconds. Most, if not all, vehicles must stop and drivers consider the delay excessive.
F	Delay of more than 50 seconds. Drivers may wait for long periods before there is an acceptable gap in traffic for exiting the side streets, creating long queues.	Delay of more than 80 seconds. Vehicles may wait through more than one cycle to clear the intersection.

Reference: *Highway Capacity Manual,* Transportation Research Board, 2010

Traffic Operation Standards

Given the proximity of the project to high-quality transit, the City has provided direction to evaluate project impacts based on Vehicle Miles Traveled. A VMT baseline was determined for the City using the Sonoma County Transportation Authority model. Generally, the State and Metropolitan Transportation Commission use a threshold of a 15 percent reduction in vehicle-miles traveled per capita (or population) with the project as compared to baseline conditions.

Existing Conditions

The Existing Conditions scenario provides an evaluation of current operation based on existing traffic volumes during the a.m. and p.m. peak periods. This condition does not include project-generated traffic volumes. Volume data was collected in January 2018 while local schools were in session.

Intersection Levels of Service

Under existing conditions, all study intersections operate acceptably at LOS D or better; however, it is noted that the minor street approaches at East D Street/Copeland Street experience high levels of delay during the evening peak hour. The existing traffic volumes are shown in Figure 2. A summary of the intersection level of service calculations is contained in Table 5, and copies of the Level of Service calculations are provided in Appendix B.

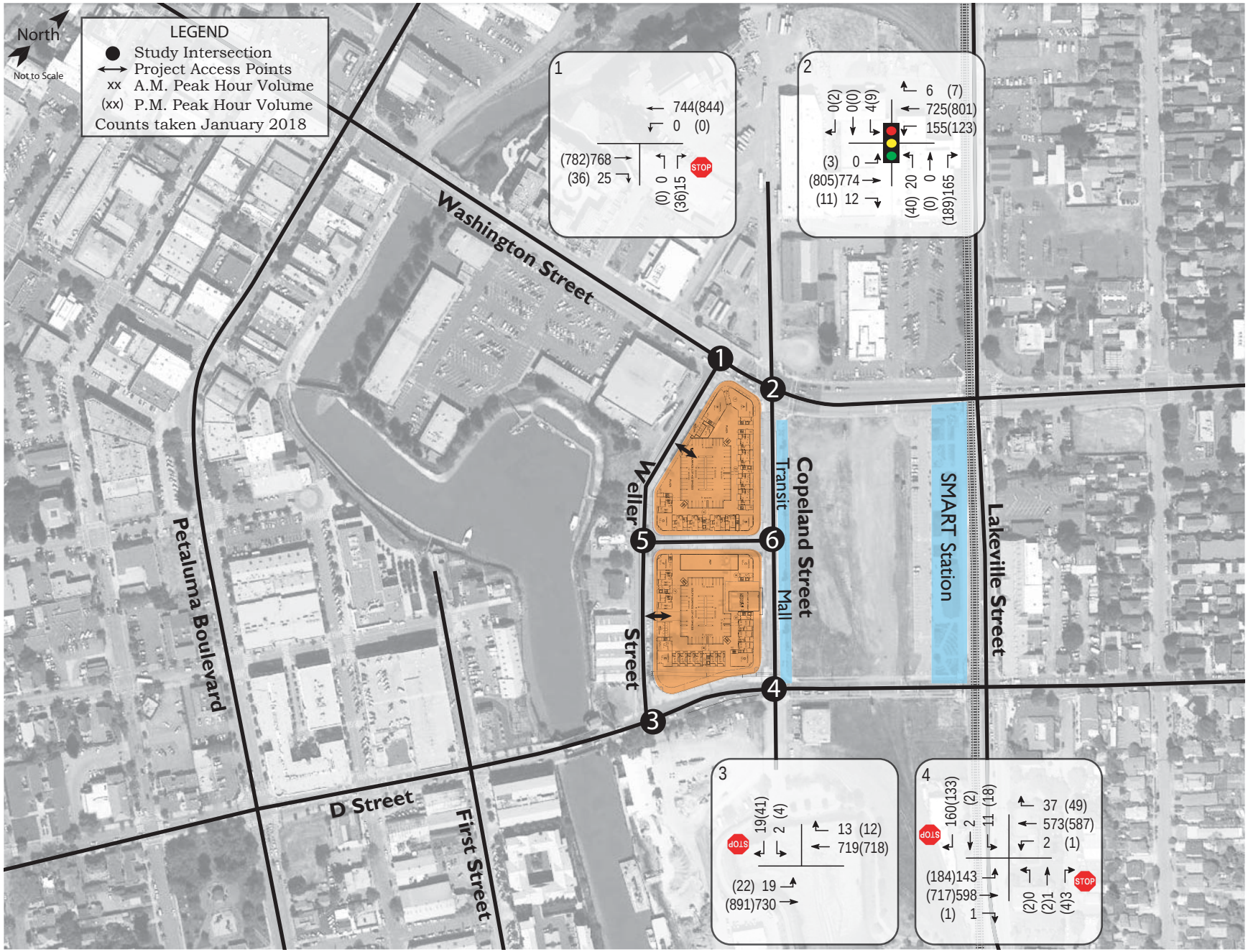
Table 5 – Existing Peak Hour Intersection Levels of Service

Study Intersection ***Approach***	AM Peak		PM Peak	
	Delay	**LOS**	**Delay**	**LOS**
1. East Washington St/Weller St	0.1	A	0.3	A
Weller St Approach	*11.7*	*B*	*12.1*	*B*
2. East Washington St/Copeland St	19.0	B	28.3	C
3. East D St/Weller St	0.4	A	0.6	A
Weller St Approach	*18.2*	*C*	*19.7*	*C*
4. East D St/Copeland St	4.5	A	7.0	A
NB Copeland St Approach	*22.6*	*C*	*61.5*	*F*
SB Copeland St Approach	*31.3*	*D*	*62.1*	*F*

Notes: Delay is measured in average seconds per vehicle; LOS = Level of Service;
Results for minor approaches to two-way stop-controlled intersections are indicated in *italics*; NB = Northbound; SB = Southbound

Future Conditions

The Future Conditions scenario presents a review of the correlation between the project and the *City of Petaluma: General Plan 2025*. The City of Petaluma has developed a Traffic Model for use in evaluating the potential traffic impacts of buildout of the land uses described in the General Plan together with new or improved streets. The General Plan was developed based on a horizon year of 2025; however, due to changes in economic conditions since the General Plan was completed, it is expected that buildout of the General Plan land uses would occur after 2025. Peak hour volumes for the remaining five intersections were developed based on the City's Traffic Model as well as a review of growth at adjacent intersections.



183pet.ai 6/18

Traffic Impact Study for the Haystack Pacifica Project

Figure 2 – Existing Traffic Volumes

In the City's Traffic Model, it was assumed that the site would be developed with 200 multi-family residential units, 10,000 square feet of retail and 6,000 square feet of light industrial uses. While the proposed project would deviate slightly from this assumption, it was determined that the traffic that would be generated by the proposed project is generally consistent with what was assumed for the site in the City's Traffic Model.

Within the study area, the *Central Petaluma Specific Plan* called for a traffic signal at the intersection of East D Street/Copeland Street with additional turn lanes. For the purposes of this study, the intersection was evaluated under Future Conditions with the existing traffic control and lane configurations. Based on the level of service results, the need for the planned improvements were determined.

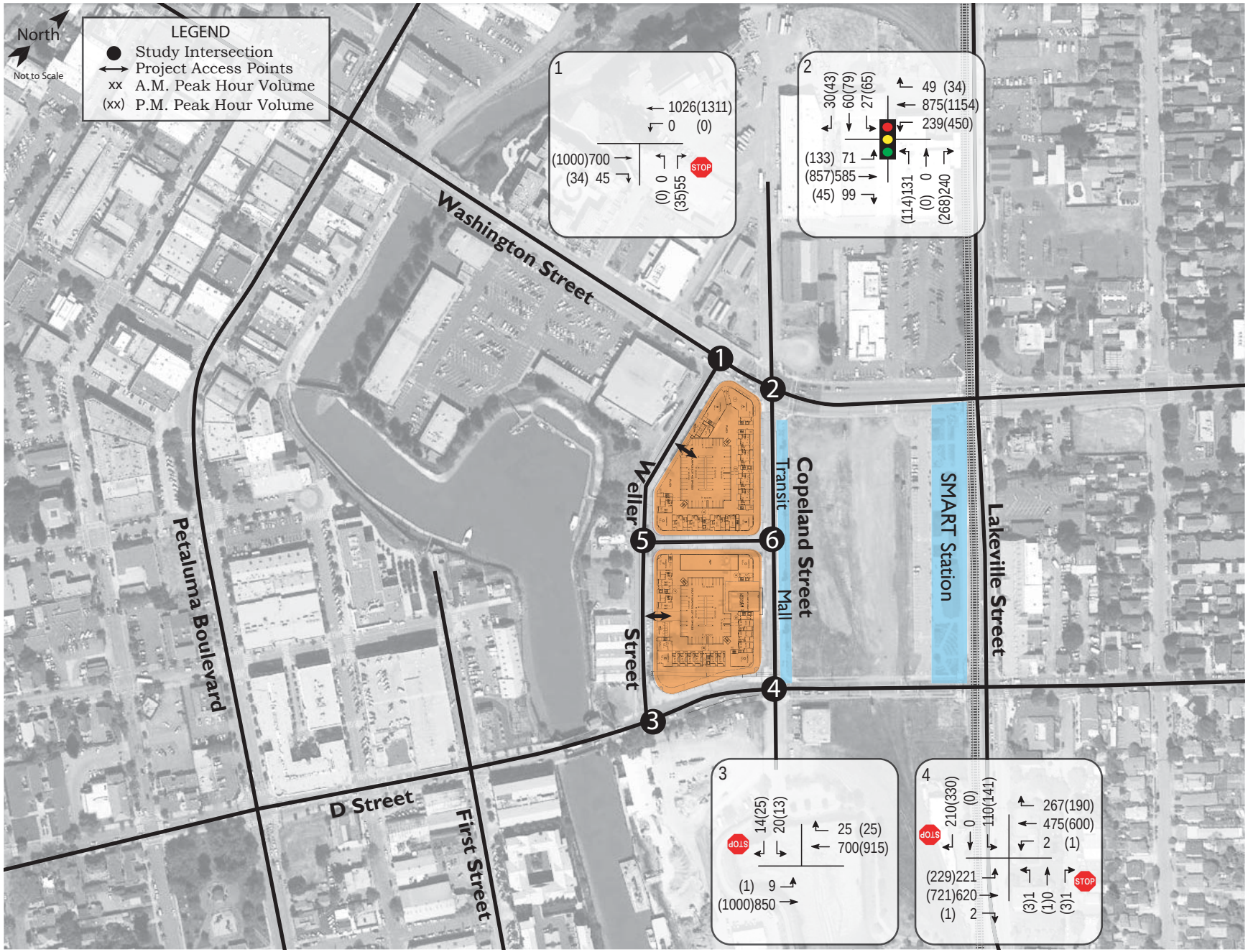
Future Intersection Operations

Under Future conditions without the project, it is expected that all of the study intersections will operate acceptably at LOS D or better with the exception of East D Street/Copeland Street. This intersection has been identified for future signalization in the *Central Petaluma Specific Plan.* If signalized, East D Street/Copeland Street would operate acceptably under future conditions. (See further discussion under Traffic Signal Warrants.) Future operating conditions are summarized in Table 6, Future volumes are shown in Figure 3, and calculations are provided in Appendix B.

Table 6 – Future Peak Hour Intersection Levels of Service

Study Intersection ***Approach***	AM Peak		PM Peak	
	Delay	**LOS**	**Delay**	**LOS**
1. East Washington St/Weller St	0.3	A	0.2	A
Weller St Approach	*11.5*	*B*	*12.9*	*B*
2. East Washington St/Copeland St	23.6	C	40.6	D
3. East D St/Weller St	0.7	A	0.8	A
Weller St Approach	*31.8*	*D*	*39.4*	*E*
4. East D St/Copeland St	**120.0**	**F**	******	**F**
NB Copeland St Approach	*75.6*	*F*	****	*F*
SB Copeland St Approach	****	*F*	****	*F*
Signalized	*16.2*	*B*	*25.5*	*C*

Notes: Delay is measured in average seconds per vehicle; LOS = Level of Service; **Bold** text = deficient operation; Results for minor approaches to two-way stop-controlled intersections are indicated in *italics;* ** = delay greater than 120 seconds; Shaded cells = conditions with recommended improvements; NB = Northbound; SB = Southbound



183pet.ai 6/18

Traffic Impact Study for the Haystack Pacifica Project

Figure 3 – Future Traffic Volumes

Project Traffic Impacts Analysis

Project Description

The proposed mixed-use development consists of 24,855 square feet of commercial space and 178 apartments units. Vehicle access to the site would be obtained via two driveways on Weller Street. The development would include installation of an internal street, bisecting the site and connecting Weller Street to Copeland Street. The proposed project site plan is shown in Figure 4.

Vehicle Trip Generation

The anticipated vehicle trip generation for the proposed project was estimated using multi-variable regression equations published by the Institute of Transportation Engineers (ITE) in *Trip Generation Manual*, 10th Edition, 2017. The trip generation potential of the project as planned was developed using the regression analysis for "Mid-Rise Residential with 1st-Floor Commercial" (LU #231) projects located in dense multi-use urban sites, as this type of site is representative of the study area. This area type is located just outside the Central Business District (CBD) and includes buildings with little or no setback from the sidewalk.

Traffic associated with a mixed-use development, such as the proposed project, has several different trip components. Some trips are made without leaving the site as residents of the mid-rise apartments could patronize the commercial uses. Additionally, due to the proximity to the Copeland Transit Mall, the SMART rail station and Downtown Petaluma, some site residents, employees and visitors may choose to walk, bicycle or use transit to reach their destination. The regression equations developed by ITE used to estimate the project's trip generation are based on various studies conducting for similar land uses located in similar settings; therefore, the trip reduction rates are already incorporated into the equations. The proposed project is expected to generate an average of 76 a.m. peak hour trips and 95 p.m. peak hour trips, as summarized in Table 7.

Table 7 – Trip Generation Summary

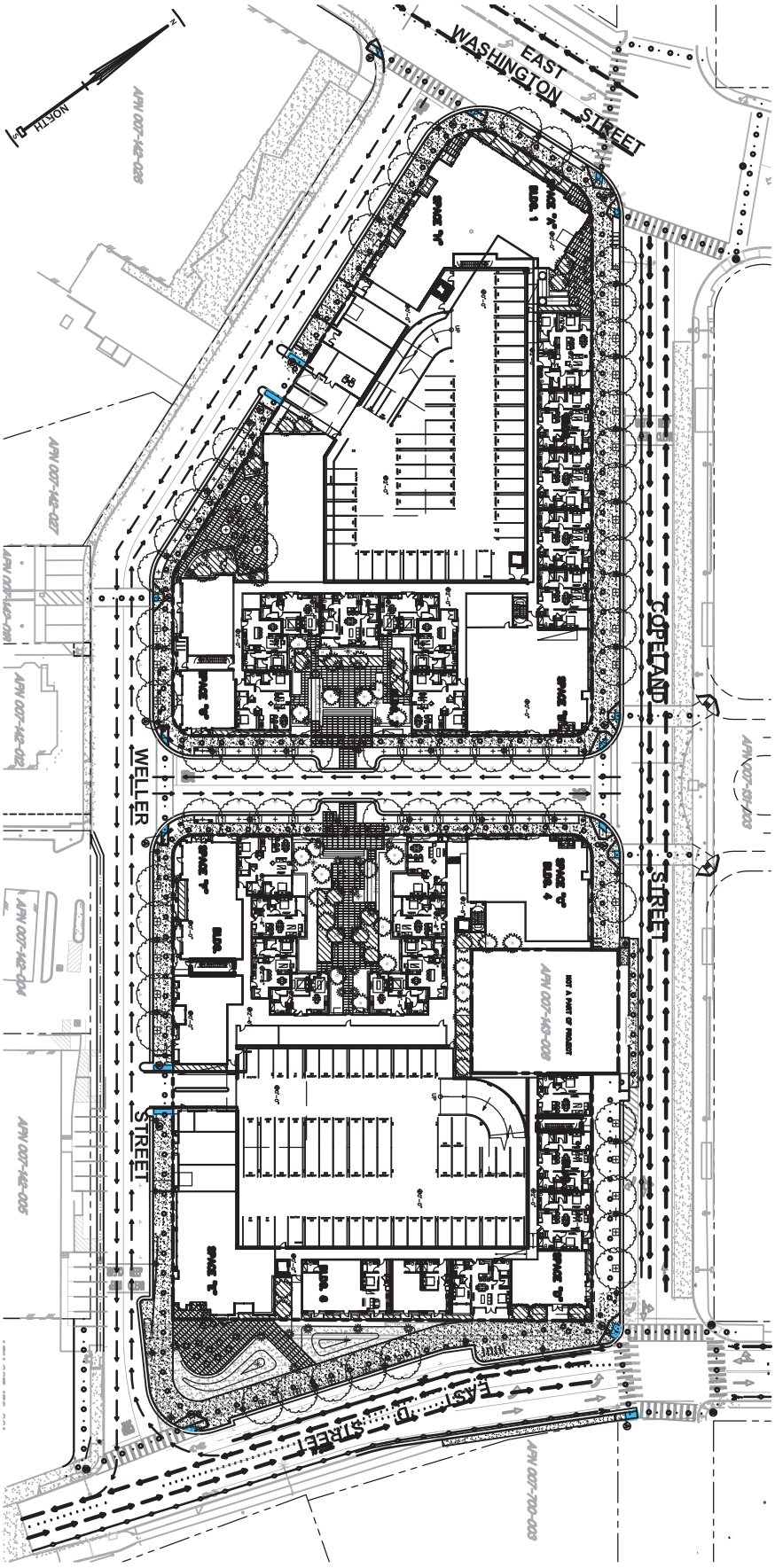
Land Use	Units	Daily		AM Peak Hour				PM Peak Hour			
		Rate	Trips	Rate	Trips	In	Out	Rate	Trips	In	Out
Proposed											
Mid-Rise Residential with 1st-Floor Commercial [1]	178 ou		732		76	21	55		95	67	29
Total Trip Generation			**732**		**76**	**21**	**55**		**95**	**67**	**29**

Note: ou = occupied units

[1] A regression equation for daily trips is not provided in *Trip Generation Manual*. Daily trips were calculated using the linear daily trip generation rate for Mid-Rise Residential with 1st-Floor Commercial (LU #231), and adjusted based on the ratio of p.m. peak hour rates

Trip Distribution

The patterns used to allocate new commercial and residential project trips to the street network were based on the adjacent roadway network, likely origin/destination points and current traffic patterns. The proposed trip distribution pattern is consistent with the assumptions applied in a previous analysis completed for the site (*Haystack Mixed-Use Project Traffic Impact Study*, 2009). The resulting project traffic volumes are shown on Figure 5. The proposed distribution assumptions are summarized in Table 8.

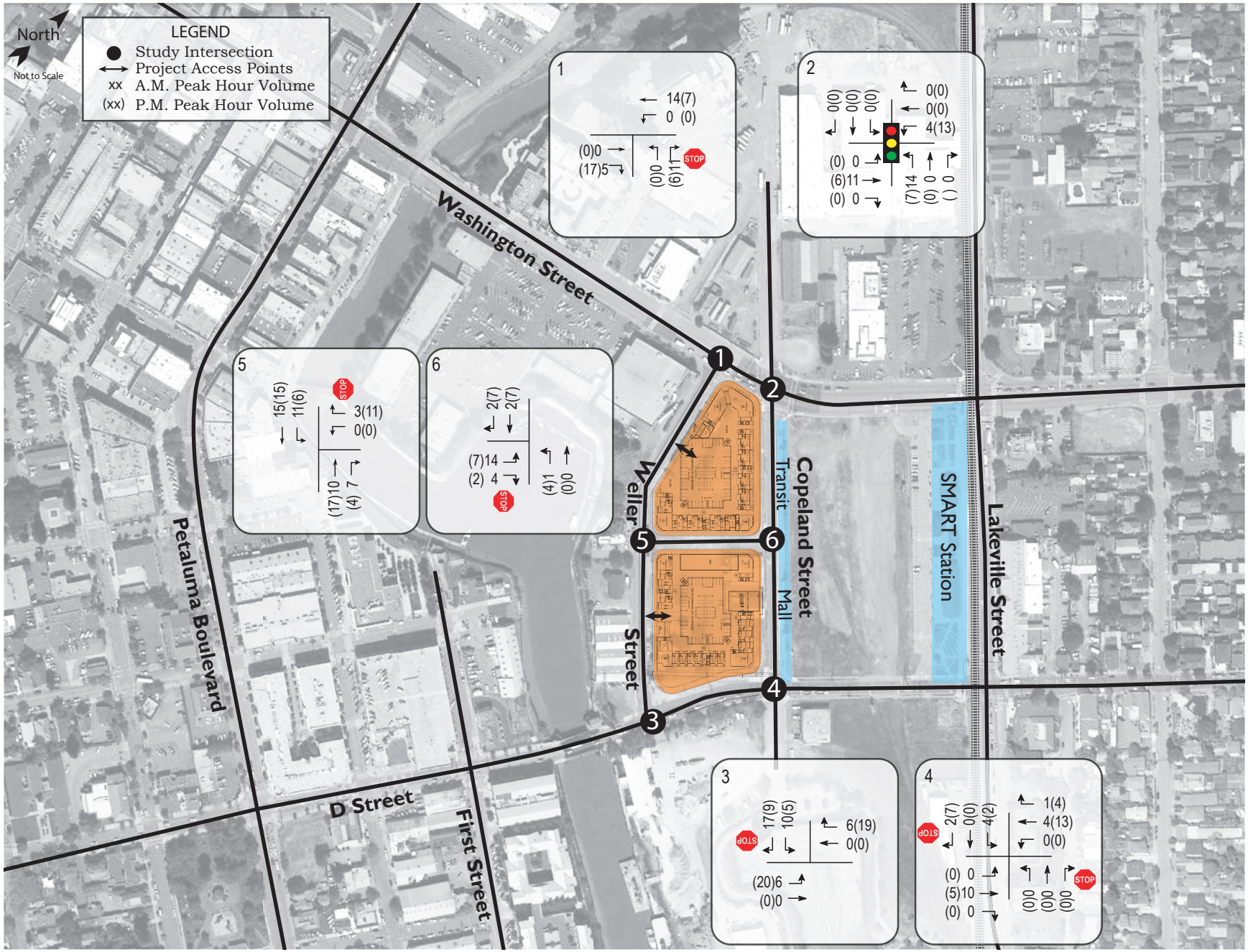


Source: BDE Architecture 2/18

183pet.ai 5/18

Traffic Impact Study for the Haystack Pacifica Project

Figure 4 – Site Plan



183pet.ai 6/18

Traffic Impact Study for the Haystack Pacifica Project

Figure 5 – Project Traffic Volumes

Table 8 – Trip Distribution Assumptions		
Origin/Destination	**Commercial Distribution**	**Residential Distribution**
East Washington St (East of Copeland St)	20%	35%
East Washington St (West of Weller St)	25%	25%
East D St (East of Copeland St)	25%	23%
East D St (West of Weller St)	30%	17%
TOTAL	**100%**	**100%**

Vehicle Miles Traveled

Vehicle miles traveled as a result of the project were calculated by multiplying the estimated number of trips and the average trip distance for the Traffic Analysis Zone (TAZ) in which the project is located. Average trip distances are published by SCTA in the County Model. The calculated daily VMT for the project is 2,340 miles. As stated in the Proposed CEQA Guideline Section 15064.3, subdivision (b)(1), projects that include a mix of residential, retail, and office that are located within half-a-mile of an existing major transit stop or an existing stop along a high-quality transit corridor will have a less-than-significant impact on VMT.

Finding – The project is located directly adjacent to the Copeland Transit Mall and a quarter-mile from the Petaluma SMART Station and, therefore, presumed to have a less-than-significant impact on vehicle miles traveled.

Intersection Operation

Existing plus Project Conditions

Upon the addition of project-related traffic to the Existing volumes, the study intersections are expected to continue to operate acceptably with a marginal change in average delay. It is noted that while the intersection of East D Street/Copeland Street is expected to experience a high level of side-street delay, the intersection is projected to operate acceptably. The need for a traffic signal at East D Street/Copeland Street is discussed later in this section. These results are summarized in Table 9.

Table 9 – Existing and Existing plus Project Peak Hour Intersection Levels of Service									
Study Intersection ***Approach***		**Existing Conditions**				**Existing plus Project**			
		AM Peak		**PM Peak**		**AM Peak**		**PM Peak**	
		Delay	**LOS**	**Delay**	**LOS**	**Delay**	**LOS**	**Delay**	**LOS**
1.	East Washington St/Weller St	0.1	A	0.3	A	0.2	A	0.3	A
	Weller St Approach	*11.7*	*B*	*12.1*	*B*	*11.9*	*B*	*12.3*	*B*
2.	East Washington St/Copeland St	19.0	B	28.3	C	19.6	B	28.3	C
3.	East D St/Weller St	0.4	A	0.6	A	1.0	A	1.1	A
	Weller St Approach	*18.2*	*C*	*19.7*	*C*	*27.2*	*D*	*26.3*	*D*
4.	East D St/Copeland St	4.5	A	7.0	A	5.5	A	8.8	A
	NB Copeland St Approach	*22.6*	*C*	*61.5*	*F*	*22.9*	*C*	*65.3*	*F*
	SB Copeland St Approach	*31.3*	*D*	*62.1*	*F*	*39.2*	*E*	*79.3*	*F*
5.	Weller St/Internal St	Project-only intersection				1.0	A	1.2	A
	WB Internal St Approach					*8.6*	*A*	*8.6*	*A*
6.	Copeland St/Internal St	Project-only intersection				0.5	A	0.3	A
	EB Internal St Approach					*10.6*	*B*	*10.7*	*B*

Notes: Delay is measured in average seconds per vehicle; LOS = Level of Service; Results for minor approaches to two-way stop-controlled intersections are indicated in *italics;* NB = Northbound; SB = Southbound; EB = Eastbound; WB = Westbound

With the addition of project-related traffic volumes, average delays during the p.m. peak hour at the intersection of East Washington Street/Copeland Street remain unchanged under Existing plus Project conditions. While this is counter-intuitive, this condition occurs when a project adds trips to movements that have delays that are below the intersection average, resulting in a better balance between approaches. The project adds traffic that will result in slightly increased delays on some of the intersection's individual movements, but these increases are offset by the addition of traffic to delays that are lower than the average for the intersection as a whole. In the case of this particular project, the intersection's overall delay that is calculated using the weighted averages of individual movements ultimately remains unchanged. The conclusion could incorrectly be drawn that the project has no effect on operation based on this data alone; however, it is more appropriate to conclude that the project trips are expected to make use of excess capacity, so drivers will experience little, if any, change in conditions at this intersection as a result of the project.

Finding – The study intersections are expected to continue operating acceptably at the same levels of service upon the addition of project-generated traffic to existing volumes.

Future plus Project Conditions

Upon the addition of project-generated traffic to the anticipated Future volumes, the study intersection of East D Street/Copeland Street is expected to continue operating unacceptably, with all other study intersections operating acceptably. The Future plus Project operating conditions are summarized in Table 10.

Table 10 – Future and Future plus Project Peak Hour Intersection Levels of Service									
Study Intersection ***Approach***		**Future Conditions**				**Future plus Project**			
		AM Peak		**PM Peak**		**AM Peak**		**PM Peak**	
		Delay	**LOS**	**Delay**	**LOS**	**Delay**	**LOS**	**Delay**	**LOS**
1.	East Washington St/Weller St	0.3	A	0.2	A	0.4	A	0.2	A
	Weller St Approach	*11.5*	*B*	*12.9*	*B*	*11.6*	*B*	*13.1*	*B*
2.	East Washington St/Copeland St	23.6	C	40.6	D	23.8	C	41.1	D
3.	East D St/Weller St	0.7	A	0.8	A	1.4	A	1.4	A
	Weller St Approach	*31.8*	*D*	*39.4*	*E*	*34.7*	*D*	*51.7*	*F*
4.	East D St/Copeland St	**120.0**	**F**	**	**F**	**130.3**	**F**	**	**F**
	NB Copeland St Approach	*75.6*	*F*	**	*F*	*78.5*	*F*	**	*F*
	SB Copeland St Approach	**	*F*	**	*F*	**	*F*	**	*F*
	Signalized	*16.2*	*B*	*25.5*	*C*	16.5	B	27.6	C
5.	Weller St/Internal St	Project-only intersection				0.8	A	1.2	A
	WB Internal St Approach					*8.5*	*A*	*8.6*	*A*
6.	Copeland St/Internal St	Project-only intersection				0.3	A	0.2	A
	EB Internal St Approach					*15.7*	*C*	*17.5*	*C*

Notes: Delay is measured in average seconds per vehicle; LOS = Level of Service; **Bold** text = deficient operation; * Unacceptable operation is considered significant and unavoidable in the City's General Plan; Results for minor approaches to two-way stop-controlled intersections are indicated in *italics;* ** = delay greater than 120 seconds; NB = Northbound; SB = Southbound; EB = Eastbound; WB = Westbound; Shaded cells = conditions with recommended improvements

The intersection of D Street/Copeland Street has been identified for future signalization in the *Central Petaluma Specific Plan*. If signalized, and with the addition of project-generated traffic, East D Street/Copeland Street would operate acceptably under future conditions. From the analysis it was determined that the most appropriate lane configuration for future conditions includes exclusive left-turn lanes on all approaches with shared through/right turn lanes. Prior to development of the property on the south side of East D Street, the southbound Copeland Street approach could include a shared left-turn/through lane and an exclusive right-turn lane to better serve traffic. After development on the south side, the approach would need to be restriped with an exclusive left-turn lane for better signal optimization. Also, based on a review of left-turn lane queuing from the intersection operational analysis, the eastbound D Street approach should provide a minimum of 100 feet of storage. (The *Central Petaluma Specific Plan* calls for a left-turn lane extending the length of the block.)

Recommendation – It is recommended that the project applicant pay a proportional share of the cost of signalization of East D Street/Copeland Street, as discussed in the next section. Based on the intersection operational analysis with a traffic signal, the eastbound left-turn lane on East D Street should include 100 feet of storage.

Signalization of East D Street/Copeland Street

The *Central Petaluma Specific Plan* identifies the intersection of D Street/Copeland Street for future signalization. The proposed project is located within the Specific Plan area, immediately adjacent to D Street/Copeland Street. Therefore, the project's contribution to the need for a signal was considered.

Intersection Operations

Overall, the intersection of East D Street/Copeland Street currently operates acceptably. However, it is noted that the northbound and southbound Copeland Street approaches experience high levels of delay during the evening peak period. The intersection would continue to operate acceptably overall with the addition of project-generated traffic.

Under future conditions, the intersection is expected to operate unacceptably at LOS F overall, with excessive delays on the Copeland Street approaches as well as the East D Street left-turn movements. With the addition of project-generated traffic, the intersection would continue to operate unacceptably, with increased delay. If signalized, the intersection is projected to operate acceptably at LOS C or better under both Future and Future plus Project conditions.

Traffic Signal Warrants

A signal warrant analysis was performed to determine need for a traffic signal at D Street/Copeland Street. Chapter 4C of the *California Manual on Uniform Traffic Control Devices for Streets and Highways* (CA-MUTCD) provides guidance on when a traffic signal should be considered. There are eight different warrants, or criteria, presented. Warrant 3, which is the peak-hour warrant, was applied to this analysis, which is described as follows:

Warrant 3, which is often the first warrant to be met, has a notice that this signal warrant shall be applied only in unusual cases, such as office complexes, manufacturing plants, industrial complexes, or high-occupancy vehicle facilities that attract or discharge large numbers of vehicles over a short time. Under the Peak Hour Warrant the need for a traffic control signal shall be considered if an engineering study finds that the criteria in either of the following two categories are met:

A. If all three of the following conditions exist for the same one hour (any four consecutive 15-minute periods) of an average day:

    1. The total stopped time delay experienced by the 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
    2. The volume on the same minor-street approach (one direction only) equals or exceeds 100 vehicles per hour for one moving lane of traffic or 150 vehicles per hour for two moving lanes, and
    3. The total entering volume serviced during the hour equals or exceeds 650 vehicles per hour for intersections with three approaches or 800 vehicles per hour for intersections with four or more approaches.

B. The plotted point representing the vehicles per hour on the major street (total of both approaches) and the corresponding vehicles per hour on the higher-volume minor-street approach (one direction only) for one hour (any four consecutive 15-minute periods) of an average day falls above the applicable curve in Figure 4C-3 for the existing combination of approach lanes.

For the purposes of this study, Warrant 3, the Peak Hour volume warrant, which determines the need for traffic control based on the highest volume hour of the day, was used as an initial indication of traffic control needs. The use of this signal warrant is common practice for planning studies. Other warrants, which are more generally applicable to existing traffic issues, require collection of traffic volumes for the highest four or eight hours of the day, review of the collision history, and evaluation of the system surrounding the location. Since Warrant 3 is intended primarily to be used in areas with a disproportionately high level of peak hour traffic volumes, satisfying the warrant does not in and of itself necessarily indicate that an intersection should be signalized. Instead, Warrant 3 is used as a metric in combination with peak hour traffic operations and a review of traffic characteristics to determine if an intersection should be signalized.

The peak hour volume criteria, Warrant 3, is satisfied for the intersection of East D Street/Copeland Street for all study scenarios, both without and with the addition of project-generated traffic. The calculations are provided in Appendix C.

Design Complexities

Given the current right-of-way constraints, power lines and future lanes on D Street, the design of a traffic signal at East D Street/Copeland Street will require design exceptions for pole placement.

Proportional Share

Since signalization of the intersection of East D Street/Copeland Street would be necessary to achieve acceptable operations under Future Conditions and since the peak hour traffic signal warrant is satisfied under Future Conditions, it is recommended that the proposed project pay a proportional share of the cost of signalizing the intersection.

The proportional share is based on the ratio of project-generated traffic compared to projected overall growth in traffic at the intersection. It is estimated that the project would contribute 5.4 percent of future traffic growth, and therefore should contribute 5.4 percent of the traffic signal cost. The proportional share calculations are provided in Appendix D.

Recommendation – It is recommended that the project applicant pay a proportional-share of 5.4 percent of the cost of installing a traffic signal at the intersection of D Street/Copeland Street.

Access and Circulation

The on-site parking lots would be accessed by two driveways on Weller Street. One is to be located approximately 190 feet south of East Washington Street and the other 220 feet north of East D Street. The proposed internal street, or "transverse street" would provide connectivity between Weller Street and Copeland Street. This internal street is consistent with the on-site circulation envisioned in the *Petaluma SMART Rail Station Areas: TOD Master Plan* and is planned to continue through the parcel to the east to connect to the SMART station.

Turn Lane Warrants

The need for left-turn and right-turn lanes at the proposed Internal Street intersections with Weller Street and Copeland Street was evaluated based on criteria contained in the *Intersection Channelization Design Guide*, NCHRP Report No. 279, Transportation Research Board, 1985, as well as a more recent update of the methodology developed by the Washington State Department of Transportation. The NCHRP report references a methodology developed by M. D. Harmelink that includes equations that can be applied to expected or actual traffic volumes in order to determine the need for a left-turn pocket based on safety issues. It was determined that under worst-case Future plus Project conditions, dedicated turn lanes would not be warranted on either Weller Street or Copeland Street at their intersections with the Internal Street. The left-turn warrant calculations are provided in Appendix E. Since traffic conditions at the project driveways would be similar to the conditions at these Internal Street intersections, it is expected that neither right-turn nor left-turn lanes would be necessary at the two project driveways.

Sight Distance

At unsignalized intersections and driveways, a substantially clear line of sight should be maintained between the driver of a vehicle waiting at the crossroad and the driver of an approaching vehicle. Adequate time must be provided for the waiting vehicle to either cross, turn left, or turn right, without requiring the through traffic to radically alter their speed. Setback for the driver on the crossroad shall be a minimum of 15 feet, measured from the edge of the traveled way.

Sight distance along Copeland Street and Weller Street at the transverse road and the two driveways on Weller Street was evaluated based on sight distance criteria contained in the *Highway Design Manual* published by Caltrans. The recommended sight distance at intersections of public streets is based on corner sight distances, which uses the approach travel speed as the basis for determining the recommended sight distance, while stopping sight distance is used at private driveway approaches to a public roadway. The stopping sight distance needed for a following driver to stop if there is a vehicle waiting to turn into a side street or driveway is evaluated based on stopping sight distance criterion and the approach speed on the major street.

Sight distance at the intersections of Copeland Street/Transverse Street and Weller Street/Transverse Street as well as the two project driveways along Weller Street were electronically measured on the site plan. Based on a design speed of 25 miles per hour, the minimum corner sight distance is 275 feet at the transverse street intersections, while the stopping sight distance needed is 150 feet at all locations evaluated.

The minimum required stopping sight distances were met at the two project driveways, as well as the intersections of the transverse street with Copeland Street and Weller Street. Corner sight distances were met to the right and left of the transverse street at Copeland Street, and to the left on Weller Street. Corner sight distance was not met to the right at Weller Street, due to the horizontal curve along the roadway and the location of the building to the north of the transverse street limiting sight lines for motorists turning left onto Weller Street. Landscaping should be kept trimmed back to allow for proper sight lines at all of the locations. It is recommended that southbound left turns from the transverse street onto Weller Street be prohibited.

Finding – Stopping sight distances are expected to be adequate at the transverse street intersections with Weller Street and Copeland Street, as well as at the two project driveways on Weller Street. The minimum corner sight distances would be met at Copeland Street/Transverse Street in both directions, and at Weller Street/Transverse Street for vehicles making westbound right turns. Minimum corner sight distance would not be met for westbound left-turning vehicles at Weller Street/Transverse Street.

Recommendation – Landscaping should be maintained and trimmed back to allow for unobstructed sight lines. Westbound left turns from the transverse street onto Weller Street should be prohibited.

Interaction with Copeland Street Transit Mall

The proposed project frontage along Copeland Street would be across the street from the Copeland Transit Mall. Consideration was therefore given to the proposed project's impact on bus activity and pedestrian crossings. The frequent bus maneuvers on Copeland Street, combined with the increase in pedestrian and bicycle activity, will have a calming effect on traffic on Copeland Street, resulting in reduced speeds and capacity. With the calming effect, it is expected that the future p.m. peak hour volumes of approximately 525 southbound and 400 northbound vehicles would be adequately accommodated on Copeland Street. The mixed-use aspect of the proposed development will help reinforce that Copeland Street is intended to as a low-speed, multimodal-focused "complete street," therefore, the proposed project would not be expected to adversely affect safety and could, in fact, contribute to conditions more in keeping with the City's desired character for the area.

Alternative Modes

Pedestrian Facilities

Sidewalks

Given the proximity to the site of the Transit Mall, SMART station, downtown, shopping facilities, and restaurants, it is likely that some project patrons and employees will walk, bicycle, and/or utilize transit to travel to and from the project site. Development of the project would include installation of continuous sidewalks along the entire project frontage. This improvement will provide access to the project site, and will also provide a general benefit by closing an existing gap in sidewalks along the north side of Weller Street. Furthermore, the development of the Internal Street will provide a direct route between Downtown Petaluma and the Copeland Transit Mall and SMART Station, benefiting all pedestrians along that route. Wayfinding signage should be provided in the area to direct pedestrians to the SMART station, Copeland Transit Mall, Downtown, and other points of interest.

Crosswalks

Currently there are no marked crosswalks at the Weller Street intersections with Washington Street and D Street. There is an existing uncontrolled midblock crosswalk without any enhancements on Weller Street between Washington Street and D Street which is in close proximity to the future intersection with Transverse Street. Ladder crosswalks are included in the project plans across Weller Street at its intersections with East Washington Street and East D Street. The existing midblock crosswalk is shown on the plans at its currently location, approximately 100 feet north of the intersection with Transverse Street.

Recommendation – The existing midblock crosswalk on Weller Street should be removed with a new ladder-style crosswalk installed on the north leg of the Weller Street/Transverse Street intersection. Pedestrian warning signs and Rectangular Rapid Flashing Beacons (RRFB) or similar warning features should be provided.

On Copeland Street, standard marked crosswalks are provided at the signalized intersection with East Washington Street and the unsignalized intersection with East D Street. Midblock between East Washington Street and East D Street, there are two uncontrolled crosswalks on Copeland Street at the transit mall. The northern midblock crosswalk is supplemented with in-roadway warning lights. The project plans indicate the standard crosswalks at the intersection of Copeland Street/East D Street will be replaced with ladder crosswalks across Copeland Street and continental crosswalks across East D Street. Existing crosswalks across the north and south Copeland Street legs at the transverse street would be restriped. A standard crosswalk would be installed on the transverse street leg at Copeland Street.

Recommendation – Given the level of pedestrian activity anticipated at the intersection of Copeland Street/Transverse Street, pedestrian crossing signs and additional crossing enhancements should be provided on Copeland Street either in the form of curb bulb-outs and/or the installation of a Rectangular Rapid Flashing Beacons (RRFB).

Transverse Street and Mid-Block Crosswalk

The proposed project would include the creation of a street bisecting the site, a transverse street that would connect Weller Street with Copeland Street. The street would be frequented by both bicyclists and pedestrians. A mid-block crosswalk with curb extensions or "bulb-outs" on both sides of the internal street would be provided. Increased pedestrian activity is expected along the street as it would serve those walking to access residential, retail, and the SMART station. The crosswalk would facilitate pedestrian crossings across the internal street and minimize the number of pedestrians crossing at undesignated locations. To provide an additional traffic calming

effect and improve comfort for pedestrians, it is recommended that colored pavement be installed for the midblock crosswalk on the transverse street. The bulb-outs should not necessarily interfere with bicycle travel as the street will have low vehicle volumes traveling at a similar speed to the bicycles. The bulb-outs will help to maintain those slow speeds while creating shorter crossing distance for pedestrians.

Finding – With the proposed installation of continuous sidewalks along the project frontage, as well as the recommended crosswalk modifications and additions, there would be continuous pedestrian facilities between the site and the Copeland Transit Mall, Petaluma SMART Station and Downtown Petaluma.

Recommendation – The applicant should install colored pavement or other similar traffic calming enhancements to the midblock crosswalk on the Transverse Street. Stamped concrete should be avoided given the potential for bicycle activity.

Wayfinding

Since the project is located in close proximity to the downtown and to the Transit Mall and the SMART Station, it would be expected that pedestrian and bicycles in and around the project may be in route to these destinations. Wayfinding signage should be provided to assist these users in locating key destinations.

Recommendation – Wayfinding signage designed to be viewable by pedestrians and bicyclists should be installed to direct users to points of interest such as Downtown and to transit connection points such as the transit mall and SMART. The signage should be located on either end of the Transverse Street, at the two project corners with East D Street and the two project corners with East Washington Street.

Bicycle Facilities

Lanes and Routes

In the *City of Petaluma: Bicycle and Pedestrian Plan*, both Copeland Street and Washington Street along the project frontage are identified for future designation as Class III bicycle routes. Since Class III bicycle routes do not include dedicated on-street bicycle facilities, development of the proposed project is not expected to impact the future implementation of this bicycle route. East D Street, along the project facility is identified in the *City of Petaluma: Bicycle and Pedestrian Plan* for future installation of Class II bicycle lanes. Therefore, frontage improvements along East D Street should be completed in a manner that would not impede future installation of bicycle lanes and would provide adequate width for the bike lanes to be striped at such time as the striping can be installed on adjacent segments.

Given the proximity of the site to the Copeland Transit Mall and SMART station, it is reasonable to assume bicyclists will use the transverse street, Weller Street, and Copeland Street. As indicated on the site plan, Class III bike routes would be designated on Copeland Street, Weller Street, and the transverse street. Shared lane bike markings or "sharrows" should be installed along Copeland Street and, if desired by the City, along Weller Street. The "sharrows" could be enhanced with the addition of a green painted background. The colored pavement or stamped concrete enhancements to the transverse street would serve to indicate a shared street, and the segment should be indicated as a Class III bike route through the use of signage.

The site plan indicates Class II bike lanes would be installed along East D Street between Copeland Street and Weller Street as directed by the *City of Petaluma: Bicycle and Pedestrian Plan*. Consideration was given to Class IV two-way separated bicycle facilities along East D Street. Typically, Class IV separated bike facilities are appropriate on longer sections of streets where vehicle traffic volumes are high and speeds are high, whereas this segment of East D Street has a posted speed limit of 25 miles per hour. Due to the right-of-way constraints at the existing East D Street Bridge over the Petaluma River, bicycle facilities are provided via the bridge deck itself, or bicyclists may walk their bikes on the sidewalk. To the east, the East D Street right-of-way is dedicated to additional lanes for added vehicle capacity. From a crossing perspective, the two-way separated bike facility would result in additional

crossing maneuvers being made by bicyclists in order to access the two-way separated facility, and would require additional crossbikes, or bicycle crosswalks, across East D Street at Weller Street. Given the proximity of the bridge, vehicles travelling in the eastbound direction that yield to a bicycle crossing at the crossbike may result in queuing spillback issues, with vehicles queuing into the drawbridge area. Two-way separated bike facilities for the extent of one or two blocks would provide an inconsistent network of bicycle facilities with physical separations within a small area along the same street, which could be problematic for motorists to interpret and interact with correctly.

Consideration was also given to one-way Class IV facilities along East D Street between Copeland Street and Weller Street. This type of facility would include on-street bike lanes located between the curb and the on-street parking. If the City desires to provide this type of Class IV protected bike lane, the sidewalk "bump-out" section just west of Copeland Street will need to be redesigned to allow for a smoother bike lane transition from the eastern section where there is no on-street parking to the western section where there will be on-street parking.

Finding – The project's site plans include Class II bike lanes on D Street between Copeland Street and Weller Street as directed by the *City of Petaluma: Bicycle and Pedestrian Plan*, therefore, it is consistent with the City's current policy.

Recommendation – The project applicant should install shared lane bike markings or "sharrows" along Copeland Street and, if desired by the City, along Weller Street, and the markings could be enhanced through the use of a green painted background. Bike route signage should be installed on the transverse street. Stamped concrete should be avoided on the transverse street given the potential for bicycle activity. Wayfinding signage should be installed throughout the area to direct bicyclists to points of interest and transit connections.

Bicycle Storage

The Petaluma Zoning Code requires that bicycle parking be provided at a rate of 10 percent of automobile parking spaces required. The project will provide 197 automobile parking spaces, therefore a minimum of 20 bicycle parking spaces should be provided. The site would include development of more than 10,000 square feet of commercial space, and the Zoning Code requires installation of one employee shower to supplement bicycle facilities. However, because the commercial space will be spread out among several smaller buildings, a single shared shower facility may not be appropriate.

Recommendation – Frontage improvements along East D Street should be designed in a manner that would accommodate future installation of planned bicycle lanes.

Recommendation – A minimum of 20 bicycle parking spaces shall be provided. Some type of protected bike parking should be available for employees. Also, some convenient bike parking should be available near retail businesses and restaurants.

Transit

The proposed project would be located in close proximity to both existing and planned local and regional transit routes. With the implementation of recommended pedestrian improvements, continuous pedestrian facilities will connect project site residents, employees and customers with these transit services. Locations within the project site are expected to be no more than one-quarter of a mile of walking distance from the SMART station, and even closer to the Copeland Transit Mall. In general, a walking distance of one-quarter of a mile or less is considered to be desirable in encouraging transit use and maximizing pedestrian access to transit facilities. The proximity to transit services, as well as the variety of both local and regional transit services, is expected to make transit a viable and attractive option to residents, employees, and visitors to the proposed project.

Finding – Transit facilities serving the project site are expected to be adequate.

Conclusions and Recommendations

Conclusions

- The intersection of East D Street/Copeland Street had a collision rate higher than the statewide average for similar facilities. It appears likely that this is generally due to the congested nature of this location.
- Currently, all study intersections operate acceptably during the a.m. and p.m. peak hours.
- Under Future conditions, the study intersections are expected to operate acceptably, except East D Street/Copeland Street, which has been identified for future signalization in the *Central Petaluma Specific Plan*; if signalized, the intersection would operate acceptably.
- The proposed project would generate approximately 732 daily trips, of which 76 trips would be generated during the a.m. peak hour and 95 trips would be generated during the p.m. peak hour.
- The project is expected to result in 43 percent fewer vehicle miles travelled per capita as compared to typical VMT per capita for Sonoma County.
- With the addition of project-generated traffic, the study intersections are expected to continue operating acceptable under Existing and Future project conditions. The East D Street/Copeland Street side street approaches would operate deficiently, though the intersection would operate acceptably overall.
- Stopping and corner sight distances are expected to be adequate at the transverse street intersections with Weller Street and Copeland Street, as well as at the two project driveways on Weller Street, except the minimum corner sight distance would not be met for westbound left-turning vehicles at Weller Street/Transverse Street.
- Left-turn and/or right-turn lanes are not warranted at either of the proposed new internal street intersections or the project driveways.
- With the implementation of the recommended improvements, pedestrian, bicycle and transit facilities are expected to adequately serve the project site.
- The project's site plans include Class II bike lanes on D Street between Copeland Street and Weller Street as directed by the *City of Petaluma: Bicycle and Pedestrian Plan*, therefore, it is consistent with the City's current policy.

Recommendations

- Since the proposed project would contribute to the need for installation of a traffic signal at East D Street/Copeland Street, it is recommended that the project applicant pay a proportional share equal to 5.4 percent of the cost of installation.
- The eastbound East D Street approach at Copeland Street should provide a minimum of 100 feet of left-turn lane storage.
- Given the current right-of-way constraints, power lines and future lanes on D Street, the design of a traffic signal at East D Street/Copeland Street may require design exceptions for pole placement.

- Landscaping should be maintained and trimmed back to allow for unobstructed sight lines. Westbound left turns from the transverse street onto Weller Street should be prohibited.

- The applicant should install colored pavement or other similar traffic calming enhancements to the midblock crosswalk on the Transverse Street. Stamped concrete should be avoided given the potential for bicycle activity.

- The project applicant should install shared bike lane markings or "sharrows", which could be enhanced with green painted backgrounds, along Copeland Street and, if desired by the City, along Weller Street.

- The applicant should install wayfinding signage for pedestrians and bicycles to indicate transit connections and points of interest.

- A minimum of 20 bicycle parking spaces should be provided on-site.

Study Participants and References

Study Participants

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Appendix A

Collision Rate Calculations

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Intersection Collision Rate Calculations

Haystack Project TIS

Intersection # 1: East Washington Street & Weller Street

Date of Count: Wednesday, January 10, 2018

Number of Collisions: 2
Number of Injuries: 1
Number of Fatalities: 0
ADT: 17000
Start Date: September 1, 2012
End Date: August 31, 2017
Number of Years: 5

Intersection Type: Tee
Control Type: Stop & Yield Controls
Area: Urban

$$\text{collision rate} = \frac{\text{Number of Collisions} \times 1 \text{ Million}}{\text{ADT} \times 365 \text{ Days per Year} \times \text{Number of Years}}$$

$$\text{collision rate} = \frac{2 \times 1{,}000{,}000}{17{,}000 \times 365 \times 5}$$

	Collision Rate	Fatality Rate	Injury Rate
Study Intersection	**0.06 c/mve**	**0.0%**	**50.0%**
Statewide Average*	**0.18 c/mve**	**0.7%**	**36.4%**

ADT = average daily total vehicles entering intersection
c/mve = collisions per million vehicles entering intersection
* 2013 Collision Data on California State Highways, Caltrans

Intersection # 2: East Washington Street & Copeland Street

Date of Count: Wednesday, January 10, 2018

Number of Collisions: 4
Number of Injuries: 1
Number of Fatalities: 0
ADT: 19900
Start Date: September 1, 2012
End Date: August 31, 2017
Number of Years: 5

Intersection Type: Four-Legged
Control Type: Signals
Area: Urban

$$\text{collision rate} = \frac{\text{Number of Collisions} \times 1 \text{ Million}}{\text{ADT} \times 365 \text{ Days per Year} \times \text{Number of Years}}$$

$$\text{collision rate} = \frac{4 \times 1{,}000{,}000}{19{,}900 \times 365 \times 5}$$

	Collision Rate	Fatality Rate	Injury Rate
Study Intersection	**0.11 c/mve**	**0.0%**	**25.0%**
Statewide Average*	**0.27 c/mve**	**0.4%**	**41.9%**

ADT = average daily total vehicles entering intersection
c/mve = collisions per million vehicles entering intersection
* 2013 Collision Data on California State Highways, Caltrans

Intersection Collision Rate Calculaions

Haystack Project TIS

Intersection # 3: East D Street & Weller Street

Date of Count: Wednesday, January 10, 2018

Number of Collisions: 6
Number of Injuries: 2
Number of Fatalities: 0
ADT: 16900
Start Date: September 1, 2012
End Date: August 31, 2017
Number of Years: 5

Intersection Type: Tee
Control Type: Stop & Yield Controls
Area: Urban

$$\text{collision rate} = \frac{\text{Number of Collisions x 1 Million}}{\text{ADT x 365 Days per Year x Number of Years}}$$

$$\text{collision rate} = \frac{6 \times 1{,}000{,}000}{16{,}900 \times 365 \times 5}$$

	Collision Rate	Fatality Rate	Injury Rate
Study Intersection	**0.19 c/mve**	**0.0%**	**33.3%**
Statewide Average*	**0.18 c/mve**	**0.7%**	**36.4%**

ADT = average daily total vehicles entering intersection
c/mve = collisions per million vehicles entering intersection
* 2013 Collision Data on California State Highways, Caltrans

Intersection # 4: East D Street & Copeland Street

Date of Count: Wednesday, January 10, 2018

Number of Collisions: 13
Number of Injuries: 3
Number of Fatalities: 0
ADT: 17000
Start Date: September 1, 2012
End Date: August 31, 2017
Number of Years: 5

Intersection Type: Four-Legged
Control Type: Stop & Yield Controls
Area: Urban

$$\text{collision rate} = \frac{\text{Number of Collisions x 1 Million}}{\text{ADT x 365 Days per Year x Number of Years}}$$

$$\text{collision rate} = \frac{13 \times 1{,}000{,}000}{17{,}000 \times 365 \times 5}$$

	Collision Rate	Fatality Rate	Injury Rate
Study Intersection	**0.42 c/mve**	**0.0%**	**23.1%**
Statewide Average*	**0.15 c/mve**	**1.0%**	**41.9%**

ADT = average daily total vehicles entering intersection
c/mve = collisions per million vehicles entering intersection
* 2013 Collision Data on California State Highways, Caltrans

Appendix B

Intersection Level of Service Calculations

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Intersection	
Int Delay, s/veh	0.1

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	768	25	0	744	0	15
Future Vol, veh/h	768	25	0	744	0	15
Conflicting Peds, #/hr	0	9	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	91	91	91	91	91	91
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	844	27	0	818	0	16

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	-	-	-	445
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	3.32
Pot Cap-1 Maneuver	-	-	0	-	0	561
Stage 1	-	-	0	-	0	-
Stage 2	-	-	0	-	0	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	-	-	-	557
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	11.7
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBT
Capacity (veh/h)	557	-	-	-
HCM Lane V/C Ratio	0.03	-	-	-
HCM Control Delay (s)	11.7	-	-	-
HCM Lane LOS	B	-	-	-
HCM 95th %tile Q(veh)	0.1	-	-	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	774	12	155	725	6	20	0	165	4	0	0
Future Volume (veh/h)	0	774	12	155	725	6	20	0	165	4	0	0
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.97	1.00		0.98	0.99		0.99	0.99		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
Adj Sat Flow, veh/h/ln	1863	1684	1900	1863	1640	1900	1863	1863	1900	1900	1863	1900
Adj Flow Rate, veh/h	0	860	12	172	806	7	22	0	27	4	0	0
Adj No. of Lanes	1	2	0	1	2	0	1	1	0	0	1	0
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	2	13	13	2	16	16	2	2	2	2	2	2
Cap, veh/h	2	1332	19	647	2589	22	199	0	143	168	0	0
Arrive On Green	0.00	0.41	0.41	0.36	0.82	0.82	0.09	0.00	0.09	0.09	0.00	0.00
Sat Flow, veh/h	1774	3229	45	1774	3164	27	1399	0	1568	1128	0	0
Grp Volume(v), veh/h	0	426	446	172	397	416	22	0	27	4	0	0
Grp Sat Flow(s),veh/h/ln	1774	1600	1674	1774	1558	1634	1399	0	1568	1128	0	0
Q Serve(g_s), s	0.0	23.9	23.9	7.6	7.0	7.0	0.0	0.0	1.8	0.3	0.0	0.0
Cycle Q Clear(g_c), s	0.0	23.9	23.9	7.6	7.0	7.0	1.3	0.0	1.8	2.1	0.0	0.0
Prop In Lane	1.00		0.03	1.00		0.02	1.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	2	660	691	647	1275	1337	199	0	143	168	0	0
V/C Ratio(X)	0.00	0.65	0.65	0.27	0.31	0.31	0.11	0.00	0.19	0.02	0.00	0.00
Avail Cap(c_a), veh/h	63	660	691	647	1275	1337	475	0	452	434	0	0
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)	0.00	1.00	1.00	0.88	0.88	0.88	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	0.0	26.3	26.3	25.0	2.5	2.5	46.8	0.0	47.0	48.0	0.0	0.0
Incr Delay (d2), s/veh	0.0	4.8	4.6	0.1	0.6	0.5	0.2	0.0	0.5	0.0	0.0	0.0
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	0.0	11.4	11.9	3.7	3.2	3.3	0.6	0.0	0.8	0.1	0.0	0.0
LnGrp Delay(d),s/veh	0.0	31.2	31.0	25.1	3.0	3.0	47.0	0.0	47.5	48.0	0.0	0.0
LnGrp LOS		C	C	C	A	A	D		D	D		
Approach Vol, veh/h		872			985			49			4	
Approach Delay, s/veh		31.1			6.9			47.3			48.0	
Approach LOS		C			A			D			D	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	45.9	50.8		15.3	0.0	96.7		15.3
Change Period (Y+Rc), s	5.0	4.6		5.1	4.0	* 5		* 5.1
Max Green Setting (Gmax), s	19.0	46.2		32.1	4.0	* 62		* 32
Max Q Clear Time (g_c+I1), s	9.6	25.9		4.1	0.0	9.0		3.8
Green Ext Time (p_c), s	0.2	8.2		0.0	0.0	10.1		0.1

Intersection Summary	
HCM 2010 Ctrl Delay	19.0
HCM 2010 LOS	B

Notes

Intersection	
Int Delay, s/veh	0.4

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	19	730	719	13	2	19
Future Vol, veh/h	19	730	719	13	2	19
Conflicting Peds, #/hr	0	0	0	11	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	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	21	811	799	14	2	21

Major/Minor	Major1			Major2		Minor2	
Conflicting Flow All	824	0	-	0	1670	817	
Stage 1	-	-	-	-	817	-	
Stage 2	-	-	-	-	853	-	
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	806	-	-	-	106	376	
Stage 1	-	-	-	-	434	-	
Stage 2	-	-	-	-	418	-	
Platoon blocked, %		-	-	-			
Mov Cap-1 Maneuver	799	-	-	-	99	373	
Mov Cap-2 Maneuver	-	-	-	-	99	-	
Stage 1	-	-	-	-	409	-	
Stage 2	-	-	-	-	414	-	

Approach	EB	WB	SB
HCM Control Delay, s	0.2	0	18.2
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	799	-	-	-	295
HCM Lane V/C Ratio	0.026	-	-	-	0.079
HCM Control Delay (s)	9.6	0	-	-	18.2
HCM Lane LOS	A	A	-	-	C
HCM 95th %tile Q(veh)	0.1	-	-	-	0.3

Intersection	
Int Delay, s/veh	4.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	143	598	1	2	573	37	0	1	3	11	2	160
Future Vol, veh/h	143	598	1	2	573	37	0	1	3	11	2	160
Conflicting Peds, #/hr	17	0	6	6	0	17	1	0	11	11	0	1
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	60	-	-	-	-	-	-	-	-	-	-	-
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	155	650	1	2	623	40	0	1	3	12	2	174

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	680	0	0	657	0	0	1703	1651	668	1638	1631	661
Stage 1	-	-	-	-	-	-	967	967	-	664	664	-
Stage 2	-	-	-	-	-	-	736	684	-	974	967	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
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	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	912	-	-	931	-	-	72	99	458	80	101	462
Stage 1	-	-	-	-	-	-	306	333	-	450	458	-
Stage 2	-	-	-	-	-	-	411	449	-	303	333	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	899	-	-	926	-	-	38	80	452	66	82	455
Mov Cap-2 Maneuver	-	-	-	-	-	-	38	80	-	66	82	-
Stage 1	-	-	-	-	-	-	252	274	-	367	450	-
Stage 2	-	-	-	-	-	-	252	441	-	246	274	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	1.9	0	22.6	31.3
HCM LOS			C	D

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	209	899	-	-	926	-	-	319
HCM Lane V/C Ratio	0.021	0.173	-	-	0.002	-	-	0.589
HCM Control Delay (s)	22.6	9.8	-	-	8.9	0	-	31.3
HCM Lane LOS	C	A	-	-	A	A	-	D
HCM 95th %tile Q(veh)	0.1	0.6	-	-	0	-	-	3.5

Intersection	
Int Delay, s/veh	0.3

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	782	36	0	844	0	36
Future Vol, veh/h	782	36	0	844	0	36
Conflicting Peds, #/hr	0	11	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	850	39	0	917	0	39

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	-	-	-	456
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	3.32
Pot Cap-1 Maneuver	-	-	0	-	0	551
Stage 1	-	-	0	-	0	-
Stage 2	-	-	0	-	0	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	-	-	-	546
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	12.1
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBT
Capacity (veh/h)	546	-	-	-
HCM Lane V/C Ratio	0.072	-	-	-
HCM Control Delay (s)	12.1	-	-	-
HCM Lane LOS	B	-	-	-
HCM 95th %tile Q(veh)	0.2	-	-	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	3	805	11	123	801	7	40	0	189	9	0	2
Future Volume (veh/h)	3	805	11	123	801	7	40	0	189	9	0	2
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.96	1.00		0.97	0.99		0.99	0.99		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
Adj Sat Flow, veh/h/ln	1863	1793	1900	1863	1698	1900	1863	1863	1900	1900	1863	1900
Adj Flow Rate, veh/h	3	885	12	135	880	7	44	0	62	10	0	0
Adj No. of Lanes	1	2	0	1	2	0	1	1	0	0	1	0
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Percent Heavy Veh, %	2	6	6	2	12	12	2	2	2	2	2	2
Cap, veh/h	6	1111	15	809	2559	20	217	0	161	145	0	0
Arrive On Green	0.00	0.32	0.32	0.46	0.78	0.78	0.10	0.00	0.10	0.10	0.00	0.00
Sat Flow, veh/h	1774	3440	47	1774	3279	26	1399	0	1565	846	0	0
Grp Volume(v), veh/h	3	438	459	135	433	454	44	0	62	10	0	0
Grp Sat Flow(s),veh/h/ln	1774	1704	1783	1774	1613	1692	1399	0	1565	846	0	0
Q Serve(g_s), s	0.2	29.1	29.1	5.6	10.0	10.0	0.0	0.0	4.6	0.9	0.0	0.0
Cycle Q Clear(g_c), s	0.2	29.1	29.1	5.6	10.0	10.0	2.9	0.0	4.6	5.5	0.0	0.0
Prop In Lane	1.00		0.03	1.00		0.02	1.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	6	550	576	809	1259	1321	217	0	161	145	0	0
V/C Ratio(X)	0.53	0.80	0.80	0.17	0.34	0.34	0.20	0.00	0.39	0.07	0.00	0.00
Avail Cap(c_a), veh/h	129	747	782	809	1259	1321	447	0	418	360	0	0
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	1.00	1.00	0.85	0.85	0.85	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	61.7	38.3	38.3	19.9	4.1	4.1	51.2	0.0	52.0	54.5	0.0	0.0
Incr Delay (d2), s/veh	26.2	11.4	10.9	0.0	0.6	0.6	0.3	0.0	1.1	0.1	0.0	0.0
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	0.1	15.4	16.0	2.7	4.6	4.8	1.4	0.0	2.0	0.3	0.0	0.0
LnGrp Delay(d),s/veh	87.9	49.7	49.2	19.9	4.7	4.7	51.5	0.0	53.1	54.7	0.0	0.0
LnGrp LOS	F	D	D	B	A	A	D		D	D		
Approach Vol, veh/h		900			1022			106			10	
Approach Delay, s/veh		49.6			6.7			52.5			54.7	
Approach LOS		D			A			D			D	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	61.5	44.6		17.8	4.4	101.8		17.8
Change Period (Y+Rc), s	5.0	4.6		5.1	4.0	* 5		* 5.1
Max Green Setting (Gmax), s	22.0	54.4		32.9	9.0	* 68		* 33
Max Q Clear Time (g_c+I1), s	7.6	31.1		7.5	2.2	12.0		6.6
Green Ext Time (p_c), s	0.1	9.0		0.0	0.0	11.5		0.4

Intersection Summary	
HCM 2010 Ctrl Delay	28.3
HCM 2010 LOS	C

Notes

Intersection	
Int Delay, s/veh	0.6

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	22	891	718	12	4	41
Future Vol, veh/h	22	891	718	12	4	41
Conflicting Peds, #/hr	0	0	0	15	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	94	94	94	94	94	94
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	23	948	764	13	4	44

Major/Minor	Major1			Major2		
Conflicting Flow All	792	0	-	0	1780	786
Stage 1	-	-	-	-	786	-
Stage 2	-	-	-	-	994	-
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	829	-	-	-	90	392
Stage 1	-	-	-	-	449	-
Stage 2	-	-	-	-	358	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	819	-	-	-	83	387
Mov Cap-2 Maneuver	-	-	-	-	83	-
Stage 1	-	-	-	-	418	-
Stage 2	-	-	-	-	354	-

Approach	EB	WB	SB
HCM Control Delay, s	0.2	0	19.7
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	819	-	-	-	292
HCM Lane V/C Ratio	0.029	-	-	-	0.164
HCM Control Delay (s)	9.5	0	-	-	19.7
HCM Lane LOS	A	A	-	-	C
HCM 95th %tile Q(veh)	0.1	-	-	-	0.6

Intersection	
Int Delay, s/veh	7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	184	717	1	1	587	49	2	2	4	18	2	133
Future Vol, veh/h	184	717	1	1	587	49	2	2	4	18	2	133
Conflicting Peds, #/hr	25	0	2	2	0	25	5	0	8	8	0	5
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	60	-	-	-	-	-	-	-	-	-	-	-
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	194	755	1	1	618	52	2	2	4	19	2	140

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	695	0	0	758	0	0	1868	1843	766	1826	1817	674
Stage 1	-	-	-	-	-	-	1146	1146	-	671	671	-
Stage 2	-	-	-	-	-	-	722	697	-	1155	1146	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
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	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	901	-	-	853	-	-	55	75	403	59	78	455
Stage 1	-	-	-	-	-	-	242	274	-	446	455	-
Stage 2	-	-	-	-	-	-	418	443	-	240	274	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	882	-	-	852	-	-	30	57	400	46	59	444
Mov Cap-2 Maneuver	-	-	-	-	-	-	30	57	-	46	59	-
Stage 1	-	-	-	-	-	-	189	213	-	341	445	-
Stage 2	-	-	-	-	-	-	283	433	-	182	213	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	2.1	0	61.5	62.1
HCM LOS			F	F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	72	882	-	-	852	-	-	211
HCM Lane V/C Ratio	0.117	0.22	-	-	0.001	-	-	0.763
HCM Control Delay (s)	61.5	10.2	-	-	9.2	0	-	62.1
HCM Lane LOS	F	B	-	-	A	A	-	F
HCM 95th %tile Q(veh)	0.4	0.8	-	-	0	-	-	5.3

HCM 2010 TWSC
1: Weller St. & East Washington St. 03/22/2018

Intersection	
Int Delay, s/veh	0.3

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	700	45	0	1026	0	55
Future Vol, veh/h	700	45	0	1026	0	55
Conflicting Peds, #/hr	0	9	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	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	700	45	0	1026	0	55

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	-	-	-	382
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	3.32
Pot Cap-1 Maneuver	-	-	0	-	0	616
Stage 1	-	-	0	-	0	-
Stage 2	-	-	0	-	0	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	-	-	-	611
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

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

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBT
Capacity (veh/h)	611	-	-	-
HCM Lane V/C Ratio	0.09	-	-	-
HCM Control Delay (s)	11.5	-	-	-
HCM Lane LOS	B	-	-	-
HCM 95th %tile Q(veh)	0.3	-	-	-

HCM 2010 Signalized Intersection Summary
2: Copeland St. & East Washington St. 03/22/2018

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	71	585	99	239	875	49	131	0	240	27	60	30
Future Volume (veh/h)	71	585	99	239	875	49	131	0	240	27	60	30
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.96	1.00		0.98	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
Adj Sat Flow, veh/h/ln	1863	1705	1900	1863	1648	1900	1863	1863	1900	1900	1863	1900
Adj Flow Rate, veh/h	71	585	99	239	875	49	131	0	240	27	60	30
Adj No. of Lanes	1	2	0	1	2	0	1	1	0	0	1	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	13	13	2	16	16	2	2	2	2	2	2
Cap, veh/h	91	732	124	609	1680	94	298	0	324	86	157	62
Arrive On Green	0.05	0.27	0.27	0.34	0.56	0.56	0.21	0.00	0.21	0.21	0.21	0.21
Sat Flow, veh/h	1774	2756	465	1774	3011	169	1298	0	1576	110	765	302
Grp Volume(v), veh/h	71	343	341	239	455	469	131	0	240	117	0	0
Grp Sat Flow(s),veh/h/ln	1774	1620	1601	1774	1566	1614	1298	0	1576	1177	0	0
Q Serve(g_s), s	2.8	13.8	13.9	7.2	12.7	12.7	0.2	0.0	10.0	0.4	0.0	0.0
Cycle Q Clear(g_c), s	2.8	13.8	13.9	7.2	12.7	12.7	10.6	0.0	10.0	10.3	0.0	0.0
Prop In Lane	1.00		0.29	1.00		0.10	1.00		1.00	0.23		0.26
Lane Grp Cap(c), veh/h	91	431	425	609	873	900	298	0	324	305	0	0
V/C Ratio(X)	0.78	0.80	0.80	0.39	0.52	0.52	0.44	0.00	0.74	0.38	0.00	0.00
Avail Cap(c_a), veh/h	152	486	480	609	873	900	550	0	631	608	0	0
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	1.00	1.00	0.68	0.68	0.68	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	32.8	23.9	24.0	17.5	9.6	9.6	26.4	0.0	26.1	23.8	0.0	0.0
Incr Delay (d2), s/veh	5.5	14.2	14.7	0.1	1.5	1.5	0.8	0.0	2.5	0.6	0.0	0.0
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	1.5	7.8	7.9	3.5	5.8	6.0	2.5	0.0	4.6	2.0	0.0	0.0
LnGrp Delay(d),s/veh	38.3	38.2	38.6	17.6	11.2	11.1	27.1	0.0	28.6	24.4	0.0	0.0
LnGrp LOS	D	D	D	B	B	B	C		C	C		
Approach Vol, veh/h		755			1163			371			117	
Approach Delay, s/veh		38.4			12.5			28.1			24.4	
Approach LOS		D			B			C			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	29.0	22.6		18.4	7.6	44.0		18.4
Change Period (Y+Rc), s	5.0	4.0		4.0	4.0	* 5		4.0
Max Green Setting (Gmax), s	8.0	21.0		28.0	6.0	* 24		28.0
Max Q Clear Time (g_c+I1), s	9.2	15.9		12.3	4.8	14.7		12.6
Green Ext Time (p_c), s	0.0	2.5		0.4	0.0	5.2		1.5

Intersection Summary	
HCM 2010 Ctrl Delay	23.6
HCM 2010 LOS	C

Notes

Intersection	
Int Delay, s/veh	0.7

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	9	850	700	25	20	14
Future Vol, veh/h	9	850	700	25	20	14
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	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	9	850	700	25	20	14

Major/Minor	Major1			Major2		Minor2	
Conflicting Flow All	725	0	-	0	1581	713	
Stage 1	-	-	-	-	713	-	
Stage 2	-	-	-	-	868	-	
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	878	-	-	-	120	432	
Stage 1	-	-	-	-	486	-	
Stage 2	-	-	-	-	411	-	
Platoon blocked, %		-	-	-			
Mov Cap-1 Maneuver	878	-	-	-	118	432	
Mov Cap-2 Maneuver	-	-	-	-	118	-	
Stage 1	-	-	-	-	477	-	
Stage 2	-	-	-	-	411	-	

Approach	EB	WB	SB
HCM Control Delay, s	0.1	0	31.8
HCM LOS			D

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	878	-	-	-	168
HCM Lane V/C Ratio	0.01	-	-	-	0.202
HCM Control Delay (s)	9.1	0	-	-	31.8
HCM Lane LOS	A	A	-	-	D
HCM 95th %tile Q(veh)	0	-	-	-	0.7

Intersection	
Int Delay, s/veh	120

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	221	620	2	2	475	267	1	0	1	110	0	210
Future Vol, veh/h	221	620	2	2	475	267	1	0	1	110	0	210
Conflicting Peds, #/hr	17	0	6	6	0	17	1	0	11	11	0	1
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	60	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	221	620	2	2	475	267	1	0	1	110	0	210

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	759	0	0	628	0	0	1788	1832	638	1705	1700	627
Stage 1	-	-	-	-	-	-	1069	1069	-	630	630	-
Stage 2	-	-	-	-	-	-	719	763	-	1075	1070	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
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	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	852	-	-	954	-	-	63	76	477	~ 72	92	484
Stage 1	-	-	-	-	-	-	268	298	-	470	475	-
Stage 2	-	-	-	-	-	-	420	413	-	266	298	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	840	-	-	949	-	-	28	55	470	~ 56	66	477
Mov Cap-2 Maneuver	-	-	-	-	-	-	28	55	-	~ 56	66	-
Stage 1	-	-	-	-	-	-	196	218	-	341	466	-
Stage 2	-	-	-	-	-	-	234	406	-	194	218	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	2.8	0	75.6	$ 708.1
HCM LOS			F	F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	53	840	-	-	949	-	-	133
HCM Lane V/C Ratio	0.038	0.263	-	-	0.002	-	-	2.406
HCM Control Delay (s)	75.6	10.8	-	-	8.8	0	-	$ 708.1
HCM Lane LOS	F	B	-	-	A	A	-	F
HCM 95th %tile Q(veh)	0.1	1.1	-	-	0	-	-	27.7

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

HCM 2010 Signalized Intersection Summary
4: Copeland St. & East D St.

03/23/2018

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	221	620	2	2	475	267	1	0	1	110	0	210
Future Volume (veh/h)	221	620	2	2	475	267	1	0	1	110	0	210
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.96	1.00		0.96	0.99		0.97	0.97		0.97
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
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1900	1863	1863	1900	1863	1863	1900
Adj Flow Rate, veh/h	221	620	2	2	475	267	1	0	1	110	0	210
Adj No. of Lanes	1	1	0	1	1	0	1	1	0	1	1	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	363	1064	3	424	535	301	220	0	309	409	0	309
Arrive On Green	0.09	0.57	0.57	0.00	0.49	0.49	0.20	0.00	0.20	0.20	0.00	0.20
Sat Flow, veh/h	1774	1855	6	1774	1102	620	1151	0	1540	1372	0	1540
Grp Volume(v), veh/h	221	0	622	2	0	742	1	0	1	110	0	210
Grp Sat Flow(s),veh/h/ln	1774	0	1861	1774	0	1722	1151	0	1540	1372	0	1540
Q Serve(g_s), s	3.0	0.0	11.5	0.0	0.0	20.9	0.0	0.0	0.0	3.7	0.0	6.8
Cycle Q Clear(g_c), s	3.0	0.0	11.5	0.0	0.0	20.9	6.8	0.0	0.0	3.8	0.0	6.8
Prop In Lane	1.00		0.00	1.00		0.36	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	363	0	1068	424	0	836	220	0	309	409	0	309
V/C Ratio(X)	0.61	0.00	0.58	0.00	0.00	0.89	0.00	0.00	0.00	0.27	0.00	0.68
Avail Cap(c_a), veh/h	401	0	1109	552	0	961	353	0	487	567	0	487
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	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	11.1	0.0	7.3	7.5	0.0	12.5	23.0	0.0	17.2	18.7	0.0	19.9
Incr Delay (d2), s/veh	2.3	0.0	0.7	0.0	0.0	9.2	0.0	0.0	0.0	0.3	0.0	2.6
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	1.9	0.0	6.1	0.0	0.0	11.8	0.0	0.0	0.0	1.4	0.0	3.1
LnGrp Delay(d),s/veh	13.4	0.0	8.1	7.5	0.0	21.7	23.0	0.0	17.2	19.0	0.0	22.5
LnGrp LOS	B		A	A		C	C		B	B		C
Approach Vol, veh/h		843			744			2			320	
Approach Delay, s/veh		9.5			21.7			20.1			21.3	
Approach LOS		A			C			C			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2	3	4		6	7	8
Phs Duration (G+Y+Rc), s		14.8	4.1	34.8		14.8	8.8	30.1
Change Period (Y+Rc), s		4.0	4.0	4.0		4.0	4.0	4.0
Max Green Setting (Gmax), s		17.0	4.0	32.0		17.0	6.0	30.0
Max Q Clear Time (g_c+I1), s		8.8	2.0	13.5		8.8	5.0	22.9
Green Ext Time (p_c), s		0.0	0.0	4.3		1.1	0.1	3.2

Intersection Summary	
HCM 2010 Ctrl Delay	16.2
HCM 2010 LOS	B

HCM 2010 TWSC
1: Weller St. & East Washington St.

03/22/2018

Intersection	
Int Delay, s/veh	0.2

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	1000	34	0	1311	0	35
Future Vol, veh/h	1000	34	0	1311	0	35
Conflicting Peds, #/hr	0	11	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	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	1000	34	0	1311	0	35

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	-	-	-	528
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	3.32
Pot Cap-1 Maneuver	-	-	0	-	0	495
Stage 1	-	-	0	-	0	-
Stage 2	-	-	0	-	0	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	-	-	-	490
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	12.9
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBT
Capacity (veh/h)	490	-	-	-
HCM Lane V/C Ratio	0.071	-	-	-
HCM Control Delay (s)	12.9	-	-	-
HCM Lane LOS	B	-	-	-
HCM 95th %tile Q(veh)	0.2	-	-	-

HCM 2010 Signalized Intersection Summary
2: Copeland St. & East Washington St.

03/22/2018

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	133	857	45	450	1154	34	114	0	268	65	79	43
Future Volume (veh/h)	133	857	45	450	1154	34	114	0	268	65	79	43
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.96	1.00		0.96	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
Adj Sat Flow, veh/h/ln	1863	1796	1900	1863	1701	1900	1863	1863	1900	1900	1863	1900
Adj Flow Rate, veh/h	133	857	45	450	1154	34	114	0	268	65	79	43
Adj No. of Lanes	1	2	0	1	2	0	1	1	0	0	1	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	6	6	2	12	12	2	2	2	2	2	2
Cap, veh/h	329	877	46	585	1317	39	283	0	408	108	123	53
Arrive On Green	0.19	0.27	0.27	0.33	0.41	0.41	0.26	0.00	0.26	0.26	0.26	0.26
Sat Flow, veh/h	1774	3289	173	1774	3201	94	1261	0	1576	209	474	204
Grp Volume(v), veh/h	133	444	458	450	582	606	114	0	268	187	0	0
Grp Sat Flow(s),veh/h/ln	1774	1706	1756	1774	1616	1679	1261	0	1576	888	0	0
Q Serve(g_s), s	5.9	23.3	23.3	20.5	29.9	29.9	0.0	0.0	13.7	6.6	0.0	0.0
Cycle Q Clear(g_c), s	5.9	23.3	23.3	20.5	29.9	29.9	12.8	0.0	13.7	20.3	0.0	0.0
Prop In Lane	1.00		0.10	1.00		0.06	1.00		1.00	0.35		0.23
Lane Grp Cap(c), veh/h	329	455	468	585	665	691	283	0	408	284	0	0
V/C Ratio(X)	0.40	0.98	0.98	0.77	0.88	0.88	0.40	0.00	0.66	0.66	0.00	0.00
Avail Cap(c_a), veh/h	329	455	468	585	700	728	376	0	525	392	0	0
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	1.00	1.00	0.23	0.23	0.23	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	32.3	32.7	32.7	27.1	24.4	24.4	29.4	0.0	29.8	32.8	0.0	0.0
Incr Delay (d2), s/veh	0.3	36.8	36.3	1.3	4.0	3.9	0.7	0.0	1.5	1.9	0.0	0.0
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	2.9	15.5	15.9	10.2	14.0	14.5	2.6	0.0	6.1	4.6	0.0	0.0
LnGrp Delay(d),s/veh	32.6	69.6	69.0	28.4	28.4	28.3	30.1	0.0	31.3	34.8	0.0	0.0
LnGrp LOS	C	E	E	C	C	C	C		C	C		
Approach Vol, veh/h		1035			1638			382			187	
Approach Delay, s/veh		64.6			28.4			30.9			34.8	
Approach LOS		E			C			C			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	34.7	28.0		27.3	21.7	41.0		27.3
Change Period (Y+Rc), s	5.0	4.0		4.0	5.0	* 4		4.0
Max Green Setting (Gmax), s	23.0	24.0		30.0	9.0	* 39		30.0
Max Q Clear Time (g_c+I1), s	22.5	25.3		22.3	7.9	31.9		15.7
Green Ext Time (p_c), s	0.1	0.0		0.5	0.0	5.1		1.6

Intersection Summary	
HCM 2010 Ctrl Delay	40.6
HCM 2010 LOS	D

Notes

HCM 2010 TWSC
3: East D St. & Weller St.

03/22/2018

Intersection	
Int Delay, s/veh	0.8

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	1	1000	915	25	13	25
Future Vol, veh/h	1	1000	915	25	13	25
Conflicting Peds, #/hr	0	0	0	15	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	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	1	1000	915	25	13	25

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	955	0	-	0	1945	943
Stage 1	-	-	-	-	943	-
Stage 2	-	-	-	-	1002	-
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	720	-	-	-	71	318
Stage 1	-	-	-	-	379	-
Stage 2	-	-	-	-	355	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	711	-	-	-	69	314
Mov Cap-2 Maneuver	-	-	-	-	69	-
Stage 1	-	-	-	-	373	-
Stage 2	-	-	-	-	351	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	39.4
HCM LOS			E

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	711	-	-	-	142
HCM Lane V/C Ratio	0.001	-	-	-	0.268
HCM Control Delay (s)	10.1	0	-	-	39.4
HCM Lane LOS	B	A	-	-	E
HCM 95th %tile Q(veh)	0	-	-	-	1

Intersection	
Int Delay, s/veh	357.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	229	721	1	1	600	190	3	1	3	141	0	330
Future Vol, veh/h	229	721	1	1	600	190	3	1	3	141	0	330
Conflicting Peds, #/hr	25	0	2	2	0	25	5	0	8	8	0	5
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	60	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	229	721	1	1	600	190	3	1	3	141	0	330

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	815	0	0	724	0	0	2049	1999	732	1912	1904	725
Stage 1	-	-	-	-	-	-	1182	1182	-	722	722	-
Stage 2	-	-	-	-	-	-	867	817	-	1190	1182	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
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	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	812	-	-	879	-	-	41	60	421	~ 52	69	425
Stage 1	-	-	-	-	-	-	231	263	-	418	431	-
Stage 2	-	-	-	-	-	-	348	390	-	229	263	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	795	-	-	878	-	-	6	42	417	~ 38	48	414
Mov Cap-2 Maneuver	-	-	-	-	-	-	6	42	-	~ 38	48	-
Stage 1	-	-	-	-	-	-	164	187	-	291	421	-
Stage 2	-	-	-	-	-	-	70	381	-	160	187	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	2.7	0	$ 457.2	$ 1670.8
HCM LOS			F	F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	13	795	-	-	878	-	-	104
HCM Lane V/C Ratio	0.538	0.288	-	-	0.001	-	-	4.529
HCM Control Delay (s)	$ 457.2	11.3	-	-	9.1	0		$ 1670.8
HCM Lane LOS	F	B	-	-	A	A	-	F
HCM 95th %tile Q(veh)	1.3	1.2	-	-	0	-	-	49.4

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

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	229	721	1	1	600	190	3	1	3	141	0	330
Future Volume (veh/h)	229	721	1	1	600	190	3	1	3	141	0	330
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.96	1.00		0.95	0.99		0.99	0.99		0.98
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
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1900	1863	1863	1900	1863	1863	1900
Adj Flow Rate, veh/h	229	721	1	1	600	190	3	1	3	141	0	330
Adj No. of Lanes	1	1	0	1	1	0	1	1	0	1	1	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	309	1052	1	328	638	202	155	99	297	450	0	378
Arrive On Green	0.09	0.57	0.57	0.00	0.48	0.48	0.24	0.24	0.24	0.24	0.00	0.24
Sat Flow, veh/h	1774	1860	3	1774	1336	423	1039	408	1224	1393	0	1557
Grp Volume(v), veh/h	229	0	722	1	0	790	3	0	4	141	0	330
Grp Sat Flow(s),veh/h/ln	1774	0	1862	1774	0	1760	1039	0	1632	1393	0	1557
Q Serve(g_s), s	3.7	0.0	17.3	0.0	0.0	26.8	0.2	0.0	0.1	5.4	0.0	12.8
Cycle Q Clear(g_c), s	3.7	0.0	17.3	0.0	0.0	26.8	13.0	0.0	0.1	5.5	0.0	12.8
Prop In Lane	1.00		0.00	1.00		0.24	1.00		0.75	1.00		1.00
Lane Grp Cap(c), veh/h	309	0	1054	328	0	839	155	0	396	450	0	378
V/C Ratio(X)	0.74	0.00	0.69	0.00	0.00	0.94	0.02	0.00	0.01	0.31	0.00	0.87
Avail Cap(c_a), veh/h	318	0	1054	438	0	866	167	0	415	465	0	395
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	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	13.7	0.0	9.7	9.7	0.0	15.6	29.2	0.0	18.1	20.2	0.0	22.9
Incr Delay (d2), s/veh	8.8	0.0	1.9	0.0	0.0	17.7	0.0	0.0	0.0	0.4	0.0	18.4
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	2.8	0.0	9.4	0.0	0.0	17.1	0.1	0.0	0.1	2.1	0.0	7.4
LnGrp Delay(d),s/veh	22.5	0.0	11.6	9.7	0.0	33.3	29.2	0.0	18.1	20.6	0.0	41.3
LnGrp LOS	C		B	A		C	C		B	C		D
Approach Vol, veh/h		951			791			7			471	
Approach Delay, s/veh		14.2			33.3			22.9			35.1	
Approach LOS		B			C			C			D	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2	3	4		6	7	8
Phs Duration (G+Y+Rc), s		19.3	4.1	39.6		19.3	9.7	34.1
Change Period (Y+Rc), s		4.0	4.0	4.0		4.0	4.0	4.0
Max Green Setting (Gmax), s		16.0	4.0	33.0		16.0	6.0	31.0
Max Q Clear Time (g_c+I1), s		15.0	2.0	19.3		14.8	5.7	28.8
Green Ext Time (p_c), s		0.0	0.0	4.5		0.3	0.0	1.2

Intersection Summary	
HCM 2010 Ctrl Delay	25.5
HCM 2010 LOS	C

HCM 2010 TWSC
1: Weller St. & East Washington St. 03/20/2019

Intersection	
Int Delay, s/veh	0.2

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	768	30	0	758	0	26
Future Vol, veh/h	768	30	0	758	0	26
Conflicting Peds, #/hr	0	9	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	91	91	91	91	91	91
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	844	33	0	833	0	29

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	-	-	-	448
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	3.32
Pot Cap-1 Maneuver	-	-	0	-	0	558
Stage 1	-	-	0	-	0	-
Stage 2	-	-	0	-	0	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	-	-	-	554
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	11.9
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBT
Capacity (veh/h)	554	-	-	-
HCM Lane V/C Ratio	0.052	-	-	-
HCM Control Delay (s)	11.9	-	-	-
HCM Lane LOS	B	-	-	-
HCM 95th %tile Q(veh)	0.2	-	-	-

HCM 2010 Signalized Intersection Summary
2: Copeland St. & East Washington St. 03/20/2019

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	785	12	159	725	6	34	0	165	4	0	0
Future Volume (veh/h)	0	785	12	159	725	6	34	0	165	4	0	0
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.97	1.00		0.98	0.99		0.99	0.99		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
Adj Sat Flow, veh/h/ln	1863	1684	1900	1863	1640	1900	1863	1863	1900	1900	1863	1900
Adj Flow Rate, veh/h	0	872	12	177	806	7	38	0	27	4	0	0
Adj No. of Lanes	1	2	0	1	2	0	1	1	0	0	1	0
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	2	13	13	2	16	16	2	2	2	2	2	2
Cap, veh/h	2	1332	18	636	2570	22	208	0	153	176	0	0
Arrive On Green	0.00	0.41	0.41	0.36	0.81	0.81	0.10	0.00	0.10	0.10	0.00	0.00
Sat Flow, veh/h	1774	3229	44	1774	3164	27	1400	0	1569	1145	0	0
Grp Volume(v), veh/h	0	432	452	177	397	416	38	0	27	4	0	0
Grp Sat Flow(s),veh/h/ln	1774	1600	1674	1774	1558	1634	1400	0	1569	1145	0	0
Q Serve(g_s), s	0.0	24.3	24.3	8.0	7.2	7.2	0.2	0.0	1.8	0.3	0.0	0.0
Cycle Q Clear(g_c), s	0.0	24.3	24.3	8.0	7.2	7.2	2.3	0.0	1.8	2.1	0.0	0.0
Prop In Lane	1.00		0.03	1.00		0.02	1.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	2	660	691	636	1265	1327	208	0	153	176	0	0
V/C Ratio(X)	0.00	0.65	0.65	0.28	0.31	0.31	0.18	0.00	0.18	0.02	0.00	0.00
Avail Cap(c_a), veh/h	63	660	691	636	1265	1327	475	0	452	434	0	0
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)	0.00	1.00	1.00	0.88	0.88	0.88	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	0.0	26.5	26.5	25.6	2.7	2.7	46.6	0.0	46.4	47.3	0.0	0.0
Incr Delay (d2), s/veh	0.0	5.0	4.8	0.1	0.6	0.5	0.3	0.0	0.4	0.0	0.0	0.0
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	0.0	11.6	12.1	3.9	3.2	3.3	1.1	0.0	0.8	0.1	0.0	0.0
LnGrp Delay(d),s/veh	0.0	31.5	31.3	25.7	3.2	3.2	46.9	0.0	46.8	47.4	0.0	0.0
LnGrp LOS		C	C	C	A	A	D		D	D		
Approach Vol, veh/h		884			990			65			4	
Approach Delay, s/veh		31.4			7.2			46.9			47.4	
Approach LOS		C			A			D			D	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	45.2	50.8		16.0	0.0	96.0		16.0
Change Period (Y+Rc), s	5.0	4.6		5.1	4.0	* 5		* 5.1
Max Green Setting (Gmax), s	19.0	46.2		32.1	4.0	* 62		* 32
Max Q Clear Time (g_c+I1), s	10.0	26.3		4.1	0.0	9.2		4.3
Green Ext Time (p_c), s	0.2	8.2		0.0	0.0	10.1		0.2

Intersection Summary	
HCM 2010 Ctrl Delay	19.6
HCM 2010 LOS	B

Notes

Intersection	
Int Delay, s/veh	1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	25	730	719	19	12	36
Future Vol, veh/h	25	730	719	19	12	36
Conflicting Peds, #/hr	0	0	0	11	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	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	28	811	799	21	13	40

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	831	0	-	0	1688	821
Stage 1	-	-	-	-	821	-
Stage 2	-	-	-	-	867	-
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	801	-	-	-	103	374
Stage 1	-	-	-	-	432	-
Stage 2	-	-	-	-	411	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	794	-	-	-	95	371
Mov Cap-2 Maneuver	-	-	-	-	95	-
Stage 1	-	-	-	-	401	-
Stage 2	-	-	-	-	407	-

Approach	EB	WB	SB
HCM Control Delay, s	0.3	0	27.2
HCM LOS			D

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	794	-	-	-	215
HCM Lane V/C Ratio	0.035	-	-	-	0.248
HCM Control Delay (s)	9.7	0	-	-	27.2
HCM Lane LOS	A	A	-	-	D
HCM 95th %tile Q(veh)	0.1	-	-	-	0.9

Intersection	
Int Delay, s/veh	5.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	143	608	1	2	577	38	0	1	3	15	2	162
Future Vol, veh/h	143	608	1	2	577	38	0	1	3	15	2	162
Conflicting Peds, #/hr	17	0	6	6	0	17	1	0	11	11	0	1
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	60	-	-	-	-	-	-	-	-	-	-	-
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	155	661	1	2	627	41	0	1	3	16	2	176

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	685	0	0	668	0	0	1720	1667	679	1654	1647	666
Stage 1	-	-	-	-	-	-	978	978	-	669	669	-
Stage 2	-	-	-	-	-	-	742	689	-	985	978	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
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	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	908	-	-	922	-	-	70	96	452	78	99	459
Stage 1	-	-	-	-	-	-	301	329	-	447	456	-
Stage 2	-	-	-	-	-	-	408	446	-	299	329	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	895	-	-	917	-	-	36	78	446	65	80	452
Mov Cap-2 Maneuver	-	-	-	-	-	-	36	78	-	65	80	-
Stage 1	-	-	-	-	-	-	248	271	-	364	448	-
Stage 2	-	-	-	-	-	-	247	438	-	242	271	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	1.9	0	22.9	39.2
HCM LOS			C	E

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	205	895	-	-	917	-	-	291
HCM Lane V/C Ratio	0.021	0.174	-	-	0.002	-	-	0.669
HCM Control Delay (s)	22.9	9.9	-	-	8.9	0	-	39.2
HCM Lane LOS	C	A	-	-	A	A	-	E
HCM 95th %tile Q(veh)	0.1	0.6	-	-	0	-	-	4.4

Intersection	
Int Delay, s/veh	1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	3	44	7	11	40
Future Vol, veh/h	0	3	44	7	11	40
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	0	3	48	8	12	43

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	119	52	0	0	56	0
Stage 1	52	-	-	-	-	-
Stage 2	67	-	-	-	-	-
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	877	1016	-	-	1549	-
Stage 1	970	-	-	-	-	-
Stage 2	956	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	870	1016	-	-	1549	-
Mov Cap-2 Maneuver	870	-	-	-	-	-
Stage 1	962	-	-	-	-	-
Stage 2	956	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	8.6	0	1.6
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	1016	1549	-
HCM Lane V/C Ratio	-	-	0.003	0.008	-
HCM Control Delay (s)	-	-	8.6	7.3	0
HCM Lane LOS	-	-	A	A	A
HCM 95th %tile Q(veh)	-	-	0	0	-

Intersection	
Int Delay, s/veh	0.5

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	14	4	1	180	169	2
Future Vol, veh/h	14	4	1	180	169	2
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	15	4	1	196	184	2

Major/Minor	Minor2			Major1		Major2
Conflicting Flow All	383	185	186	0	-	0
Stage 1	185	-	-	-	-	-
Stage 2	198	-	-	-	-	-
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	620	857	1388	-	-	-
Stage 1	847	-	-	-	-	-
Stage 2	835	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	619	857	1388	-	-	-
Mov Cap-2 Maneuver	619	-	-	-	-	-
Stage 1	846	-	-	-	-	-
Stage 2	835	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	10.6	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1388	-	660	-	-
HCM Lane V/C Ratio	0.001	-	0.03	-	-
HCM Control Delay (s)	7.6	0	10.6	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0	-	0.1	-	-

Intersection	
Int Delay, s/veh	0.3

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	782	53	0	851	0	42
Future Vol, veh/h	782	53	0	851	0	42
Conflicting Peds, #/hr	0	11	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	850	58	0	925	0	46

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	-	-	-	465
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	3.32
Pot Cap-1 Maneuver	-	-	0	-	0	544
Stage 1	-	-	0	-	0	-
Stage 2	-	-	0	-	0	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	-	-	-	539
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	12.3
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBT
Capacity (veh/h)	539	-	-	-
HCM Lane V/C Ratio	0.085	-	-	-
HCM Control Delay (s)	12.3	-	-	-
HCM Lane LOS	B	-	-	-
HCM 95th %tile Q(veh)	0.3	-	-	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	3	811	11	136	801	7	47	0	189	9	0	2
Future Volume (veh/h)	3	811	11	136	801	7	47	0	189	9	0	2
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.96	1.00		0.97	0.99		0.99	0.99		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
Adj Sat Flow, veh/h/ln	1863	1793	1900	1863	1698	1900	1863	1863	1900	1900	1863	1900
Adj Flow Rate, veh/h	3	891	12	149	880	7	52	0	62	10	0	0
Adj No. of Lanes	1	2	0	1	2	0	1	1	0	0	1	0
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Percent Heavy Veh, %	2	6	6	2	12	12	2	2	2	2	2	2
Cap, veh/h	6	1117	15	805	2558	20	218	0	161	145	0	0
Arrive On Green	0.00	0.32	0.32	0.45	0.78	0.78	0.10	0.00	0.10	0.10	0.00	0.00
Sat Flow, veh/h	1774	3440	46	1774	3279	26	1399	0	1565	847	0	0
Grp Volume(v), veh/h	3	441	462	149	433	454	52	0	62	10	0	0
Grp Sat Flow(s),veh/h/ln	1774	1704	1783	1774	1613	1692	1399	0	1565	847	0	0
Q Serve(g_s), s	0.2	29.3	29.3	6.2	10.0	10.0	0.0	0.0	4.6	0.9	0.0	0.0
Cycle Q Clear(g_c), s	0.2	29.3	29.3	6.2	10.0	10.0	3.4	0.0	4.6	5.5	0.0	0.0
Prop In Lane	1.00		0.03	1.00		0.02	1.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	6	553	579	805	1258	1320	218	0	161	145	0	0
V/C Ratio(X)	0.53	0.80	0.80	0.19	0.34	0.34	0.24	0.00	0.38	0.07	0.00	0.00
Avail Cap(c_a), veh/h	129	747	782	805	1258	1320	447	0	418	360	0	0
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	1.00	1.00	0.85	0.85	0.85	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	61.7	38.2	38.2	20.2	4.1	4.1	51.4	0.0	52.0	54.5	0.0	0.0
Incr Delay (d2), s/veh	26.2	11.4	10.9	0.0	0.6	0.6	0.4	0.0	1.1	0.1	0.0	0.0
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	0.1	15.5	16.1	3.0	4.6	4.8	1.7	0.0	2.0	0.3	0.0	0.0
LnGrp Delay(d),s/veh	87.9	49.6	49.1	20.2	4.7	4.7	51.8	0.0	53.1	54.7	0.0	0.0
LnGrp LOS	F	D	D	C	A	A	D		D	D		
Approach Vol, veh/h		906			1036			114			10	
Approach Delay, s/veh		49.5			6.9			52.5			54.7	
Approach LOS		D			A			D			D	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	61.3	44.9		17.9	4.4	101.7		17.9
Change Period (Y+Rc), s	5.0	4.6		5.1	4.0	* 5		* 5.1
Max Green Setting (Gmax), s	22.0	54.4		32.9	9.0	* 68		* 33
Max Q Clear Time (g_c+I1), s	8.2	31.3		7.5	2.2	12.0		6.6
Green Ext Time (p_c), s	0.2	9.0		0.0	0.0	11.5		0.4

Intersection Summary	
HCM 2010 Ctrl Delay	28.3
HCM 2010 LOS	C

Notes

Intersection	
Int Delay, s/veh	1.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	42	891	718	31	9	50
Future Vol, veh/h	42	891	718	31	9	50
Conflicting Peds, #/hr	0	0	0	15	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	94	94	94	94	94	94
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	45	948	764	33	10	53

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	812	0	-	0	1834	796
Stage 1	-	-	-	-	796	-
Stage 2	-	-	-	-	1038	-
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	814	-	-	-	84	387
Stage 1	-	-	-	-	444	-
Stage 2	-	-	-	-	341	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	804	-	-	-	72	382
Mov Cap-2 Maneuver	-	-	-	-	72	-
Stage 1	-	-	-	-	387	-
Stage 2	-	-	-	-	337	-

Approach	EB	WB	SB
HCM Control Delay, s	0.4	0	26.3
HCM LOS			D

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	804	-	-	-	231
HCM Lane V/C Ratio	0.056	-	-	-	0.272
HCM Control Delay (s)	9.7	0	-	-	26.3
HCM Lane LOS	A	A	-	-	D
HCM 95th %tile Q(veh)	0.2	-	-	-	1.1

Intersection	
Int Delay, s/veh	8.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	184	722	1	1	600	53	2	2	4	20	2	140
Future Vol, veh/h	184	722	1	1	600	53	2	2	4	20	2	140
Conflicting Peds, #/hr	25	0	2	2	0	25	5	0	8	8	0	5
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	60	-	-	-	-	-	-	-	-	-	-	-
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	194	760	1	1	632	56	2	2	4	21	2	147

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	713	0	0	763	0	0	1893	1866	771	1847	1838	690
Stage 1	-	-	-	-	-	-	1151	1151	-	687	687	-
Stage 2	-	-	-	-	-	-	742	715	-	1160	1151	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
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	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	887	-	-	850	-	-	53	73	400	57	76	445
Stage 1	-	-	-	-	-	-	241	272	-	437	447	-
Stage 2	-	-	-	-	-	-	408	434	-	238	272	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	869	-	-	849	-	-	28	55	397	44	58	434
Mov Cap-2 Maneuver	-	-	-	-	-	-	28	55	-	44	58	-
Stage 1	-	-	-	-	-	-	187	211	-	333	437	-
Stage 2	-	-	-	-	-	-	267	424	-	180	211	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	2.1	0	65.3	79.3
HCM LOS			F	F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	68	869	-	-	849	-	-	200
HCM Lane V/C Ratio	0.124	0.223	-	-	0.001	-	-	0.853
HCM Control Delay (s)	65.3	10.3	-	-	9.2	0	-	79.3
HCM Lane LOS	F	B	-	-	A	A	-	F
HCM 95th %tile Q(veh)	0.4	0.9	-	-	0	-	-	6.4

Intersection	
Int Delay, s/veh	1.2

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	11	49	4	6	51
Future Vol, veh/h	0	11	49	4	6	51
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	0	12	53	4	7	55

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	124	55	0	0	57	0
Stage 1	55	-	-	-	-	-
Stage 2	69	-	-	-	-	-
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	871	1012	-	-	1547	-
Stage 1	968	-	-	-	-	-
Stage 2	954	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	867	1012	-	-	1547	-
Mov Cap-2 Maneuver	867	-	-	-	-	-
Stage 1	963	-	-	-	-	-
Stage 2	954	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	8.6	0	0.8
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	1012	1547	-
HCM Lane V/C Ratio	-	-	0.012	0.004	-
HCM Control Delay (s)	-	-	8.6	7.3	0
HCM Lane LOS	-	-	A	A	A
HCM 95th %tile Q(veh)	-	-	0	0	-

Intersection	
Int Delay, s/veh	0.3

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	7	2	4	235	141	7
Future Vol, veh/h	7	2	4	235	141	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	8	2	4	255	153	8

Major/Minor	Minor2			Major1		Major2	
Conflicting Flow All	420	157	161	0	-	0	
Stage 1	157	-	-	-	-	-	
Stage 2	263	-	-	-	-	-	
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	590	889	1418	-	-	-	
Stage 1	871	-	-	-	-	-	
Stage 2	781	-	-	-	-	-	
Platoon blocked, %				-	-	-	
Mov Cap-1 Maneuver	588	889	1418	-	-	-	
Mov Cap-2 Maneuver	588	-	-	-	-	-	
Stage 1	868	-	-	-	-	-	
Stage 2	781	-	-	-	-	-	

Approach	EB	NB	SB
HCM Control Delay, s	10.7	0.1	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1418	-	636	-	-
HCM Lane V/C Ratio	0.003	-	0.015	-	-
HCM Control Delay (s)	7.5	0	10.7	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0	-	0	-	-

Intersection	
Int Delay, s/veh	0.4

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	700	50	0	1040	0	66
Future Vol, veh/h	700	50	0	1040	0	66
Conflicting Peds, #/hr	0	9	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	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	700	50	0	1040	0	66

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	-	-	-	384
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	3.32
Pot Cap-1 Maneuver	-	-	0	-	0	614
Stage 1	-	-	0	-	0	-
Stage 2	-	-	0	-	0	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	-	-	-	609
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	11.6
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBT
Capacity (veh/h)	609	-	-	-
HCM Lane V/C Ratio	0.108	-	-	-
HCM Control Delay (s)	11.6	-	-	-
HCM Lane LOS	B	-	-	-
HCM 95th %tile Q(veh)	0.4	-	-	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	71	596	99	243	875	49	145	0	240	27	60	30
Future Volume (veh/h)	71	596	99	243	875	49	145	0	240	27	60	30
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.96	1.00		0.98	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
Adj Sat Flow, veh/h/ln	1863	1705	1900	1863	1648	1900	1863	1863	1900	1900	1863	1900
Adj Flow Rate, veh/h	71	596	99	243	875	49	145	0	240	27	60	30
Adj No. of Lanes	1	2	0	1	2	0	1	1	0	0	1	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	13	13	2	16	16	2	2	2	2	2	2
Cap, veh/h	91	741	123	589	1654	93	311	0	337	90	167	67
Arrive On Green	0.05	0.27	0.27	0.33	0.55	0.55	0.21	0.00	0.21	0.21	0.21	0.21
Sat Flow, veh/h	1774	2764	458	1774	3011	169	1298	0	1577	123	779	311
Grp Volume(v), veh/h	71	349	346	243	455	469	145	0	240	117	0	0
Grp Sat Flow(s),veh/h/ln	1774	1620	1602	1774	1566	1614	1298	0	1577	1213	0	0
Q Serve(g_s), s	2.8	14.0	14.1	7.4	12.9	12.9	1.0	0.0	9.9	0.3	0.0	0.0
Cycle Q Clear(g_c), s	2.8	14.0	14.1	7.4	12.9	12.9	11.2	0.0	9.9	10.2	0.0	0.0
Prop In Lane	1.00		0.29	1.00		0.10	1.00		1.00	0.23		0.26
Lane Grp Cap(c), veh/h	91	434	429	589	860	886	311	0	337	323	0	0
V/C Ratio(X)	0.78	0.80	0.81	0.41	0.53	0.53	0.47	0.00	0.71	0.36	0.00	0.00
Avail Cap(c_a), veh/h	152	486	481	589	860	886	552	0	631	613	0	0
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	1.00	1.00	0.68	0.68	0.68	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	32.8	23.9	23.9	18.1	10.0	10.0	26.2	0.0	25.5	23.3	0.0	0.0
Incr Delay (d2), s/veh	5.5	14.5	15.0	0.1	1.6	1.5	0.8	0.0	2.1	0.5	0.0	0.0
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	1.5	8.0	8.0	3.7	5.9	6.1	2.7	0.0	4.5	1.9	0.0	0.0
LnGrp Delay(d),s/veh	38.3	38.4	38.9	18.2	11.6	11.6	27.1	0.0	27.6	23.8	0.0	0.0
LnGrp LOS	D	D	D	B	B	B	C		C	C		
Approach Vol, veh/h		766			1167			385			117	
Approach Delay, s/veh		38.6			13.0			27.4			23.8	
Approach LOS		D			B			C			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	28.3	22.8		19.0	7.6	43.4		19.0
Change Period (Y+Rc), s	5.0	4.0		4.0	4.0	* 5		4.0
Max Green Setting (Gmax), s	8.0	21.0		28.0	6.0	* 24		28.0
Max Q Clear Time (g_c+I1), s	9.4	16.1		12.2	4.8	14.9		13.2
Green Ext Time (p_c), s	0.0	2.4		0.4	0.0	5.1		1.5

Intersection Summary	
HCM 2010 Ctrl Delay	23.8
HCM 2010 LOS	C

Notes

Intersection	
Int Delay, s/veh	1.4

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	15	850	700	31	30	31
Future Vol, veh/h	15	850	700	31	30	31
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	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	15	850	700	31	30	31

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	731	0	-	0	1596	716
Stage 1	-	-	-	-	716	-
Stage 2	-	-	-	-	880	-
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	873	-	-	-	117	430
Stage 1	-	-	-	-	484	-
Stage 2	-	-	-	-	406	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	873	-	-	-	113	430
Mov Cap-2 Maneuver	-	-	-	-	113	-
Stage 1	-	-	-	-	468	-
Stage 2	-	-	-	-	406	-

Approach	EB	WB	SB
HCM Control Delay, s	0.2	0	34.7
HCM LOS			D

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	873	-	-	-	181
HCM Lane V/C Ratio	0.017	-	-	-	0.337
HCM Control Delay (s)	9.2	0	-	-	34.7
HCM Lane LOS	A	A	-	-	D
HCM 95th %tile Q(veh)	0.1	-	-	-	1.4

Intersection	
Int Delay, s/veh	130.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	221	630	2	2	479	268	1	0	1	114	0	212
Future Vol, veh/h	221	630	2	2	479	268	1	0	1	114	0	212
Conflicting Peds, #/hr	17	0	6	6	0	17	1	0	11	11	0	1
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	60	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	221	630	2	2	479	268	1	0	1	114	0	212

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	764	0	0	638	0	0	1803	1847	648	1719	1714	631
Stage 1	-	-	-	-	-	-	1079	1079	-	634	634	-
Stage 2	-	-	-	-	-	-	724	768	-	1085	1080	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
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	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	849	-	-	946	-	-	62	75	470	~ 71	90	481
Stage 1	-	-	-	-	-	-	264	295	-	467	473	-
Stage 2	-	-	-	-	-	-	417	411	-	262	294	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	837	-	-	941	-	-	27	54	463	~ 55	65	474
Mov Cap-2 Maneuver	-	-	-	-	-	-	27	54	-	~ 55	65	-
Stage 1	-	-	-	-	-	-	193	216	-	339	464	-
Stage 2	-	-	-	-	-	-	229	404	-	191	215	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	2.8	0	78.5	$ 763.6
HCM LOS			F	F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	51	837	-	-	941	-	-	129
HCM Lane V/C Ratio	0.039	0.264	-	-	0.002	-	-	2.527
HCM Control Delay (s)	78.5	10.8	-	-	8.8	0	-	$ 763.6
HCM Lane LOS	F	B	-	-	A	A	-	F
HCM 95th %tile Q(veh)	0.1	1.1	-	-	0	-	-	28.9

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

HCM 2010 Signalized Intersection Summary
4: Copeland St. & East D St.

03/20/2019

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	221	630	2	2	479	268	1	0	1	114	0	212
Future Volume (veh/h)	221	630	2	2	479	268	1	0	1	114	0	212
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.96	1.00		0.96	0.99		0.97	0.97		0.97
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
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1900	1863	1863	1900	1863	1863	1900
Adj Flow Rate, veh/h	221	630	2	2	479	268	1	0	1	114	0	212
Adj No. of Lanes	1	1	0	1	1	0	1	1	0	1	1	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	359	1066	3	417	538	301	218	0	311	409	0	311
Arrive On Green	0.09	0.57	0.57	0.00	0.49	0.49	0.20	0.00	0.20	0.20	0.00	0.20
Sat Flow, veh/h	1774	1856	6	1774	1104	618	1149	0	1540	1372	0	1540
Grp Volume(v), veh/h	221	0	632	2	0	747	1	0	1	114	0	212
Grp Sat Flow(s),veh/h/ln	1774	0	1861	1774	0	1722	1149	0	1540	1372	0	1540
Q Serve(g_s), s	3.0	0.0	11.8	0.0	0.0	21.3	0.0	0.0	0.0	3.9	0.0	6.9
Cycle Q Clear(g_c), s	3.0	0.0	11.8	0.0	0.0	21.3	6.9	0.0	0.0	3.9	0.0	6.9
Prop In Lane	1.00		0.00	1.00		0.36	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	359	0	1069	417	0	838	218	0	311	409	0	311
V/C Ratio(X)	0.62	0.00	0.59	0.00	0.00	0.89	0.00	0.00	0.00	0.28	0.00	0.68
Avail Cap(c_a), veh/h	396	0	1101	545	0	955	348	0	484	563	0	484
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	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	11.3	0.0	7.4	7.5	0.0	12.6	23.2	0.0	17.3	18.8	0.0	20.0
Incr Delay (d2), s/veh	2.4	0.0	0.8	0.0	0.0	9.7	0.0	0.0	0.0	0.4	0.0	2.6
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	2.0	0.0	6.2	0.0	0.0	12.2	0.0	0.0	0.0	1.5	0.0	3.1
LnGrp Delay(d),s/veh	13.7	0.0	8.2	7.5	0.0	22.3	23.2	0.0	17.3	19.2	0.0	22.6
LnGrp LOS	B		A	A		C	C		B	B		C
Approach Vol, veh/h		853			749			2			326	
Approach Delay, s/veh		9.6			22.2			20.2			21.4	
Approach LOS		A			C			C			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2	3	4		6	7	8
Phs Duration (G+Y+Rc), s		14.9	4.1	35.1		14.9	8.9	30.3
Change Period (Y+Rc), s		4.0	4.0	4.0		4.0	4.0	4.0
Max Green Setting (Gmax), s		17.0	4.0	32.0		17.0	6.0	30.0
Max Q Clear Time (g_c+I1), s		8.9	2.0	13.8		8.9	5.0	23.3
Green Ext Time (p_c), s		0.0	0.0	4.4		1.1	0.1	3.1

Intersection Summary	
HCM 2010 Ctrl Delay	16.5
HCM 2010 LOS	B

HCM 2010 TWSC
5: Weller St. & Internal Street

03/20/2019

Intersection	
Int Delay, s/veh	0.8

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	3	44	7	11	60
Future Vol, veh/h	0	3	44	7	11	60
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	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	3	44	7	11	60

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	130	48	0	0	51	0
Stage 1	48	-	-	-	-	-
Stage 2	82	-	-	-	-	-
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	864	1021	-	-	1555	-
Stage 1	974	-	-	-	-	-
Stage 2	941	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	858	1021	-	-	1555	-
Mov Cap-2 Maneuver	858	-	-	-	-	-
Stage 1	967	-	-	-	-	-
Stage 2	941	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	8.5	0	1.1
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	1021	1555	-
HCM Lane V/C Ratio	-	-	0.003	0.007	-
HCM Control Delay (s)	-	-	8.5	7.3	0
HCM Lane LOS	-	-	A	A	A
HCM 95th %tile Q(veh)	-	-	0	0	-

Intersection	
Int Delay, s/veh	0.3

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	14	4	1	488	400	2
Future Vol, veh/h	14	4	1	488	400	2
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	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	14	4	1	488	400	2

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	891	401	402	0	-	0
Stage 1	401	-	-	-	-	-
Stage 2	490	-	-	-	-	-
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	313	649	1157	-	-	-
Stage 1	676	-	-	-	-	-
Stage 2	616	-	-	-	-	-
Platoon blocked, %					-	-
Mov Cap-1 Maneuver	313	649	1157	-	-	-
Mov Cap-2 Maneuver	313	-	-	-	-	-
Stage 1	675	-	-	-	-	-
Stage 2	616	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	15.7	0	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1157	-	354	-	-
HCM Lane V/C Ratio	0.001	-	0.051	-	-
HCM Control Delay (s)	8.1	0	15.7	-	-
HCM Lane LOS	A	A	C	-	-
HCM 95th %tile Q(veh)	0	-	0.2	-	-

Intersection	
Int Delay, s/veh	0.2

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	1000	51	0	1318	0	41
Future Vol, veh/h	1000	51	0	1318	0	41
Conflicting Peds, #/hr	0	11	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	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	1000	51	0	1318	0	41

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	-	-	-	537
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	3.32
Pot Cap-1 Maneuver	-	-	0	-	0	488
Stage 1	-	-	0	-	0	-
Stage 2	-	-	0	-	0	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	-	-	-	484
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

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

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBT
Capacity (veh/h)	484	-	-	-
HCM Lane V/C Ratio	0.085	-	-	-
HCM Control Delay (s)	13.1	-	-	-
HCM Lane LOS	B	-	-	-
HCM 95th %tile Q(veh)	0.3	-	-	-

HCM 2010 Signalized Intersection Summary
2: Copeland St. & East Washington St.

03/20/2019

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	133	863	45	463	1154	34	121	0	268	65	79	43
Future Volume (veh/h)	133	863	45	463	1154	34	121	0	268	65	79	43
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.96	1.00		0.96	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
Adj Sat Flow, veh/h/ln	1863	1796	1900	1863	1701	1900	1863	1863	1900	1900	1863	1900
Adj Flow Rate, veh/h	133	863	45	463	1154	34	121	0	268	65	79	43
Adj No. of Lanes	1	2	0	1	2	0	1	1	0	0	1	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	6	6	2	12	12	2	2	2	2	2	2
Cap, veh/h	329	878	46	585	1317	39	283	0	408	108	123	53
Arrive On Green	0.19	0.27	0.27	0.33	0.41	0.41	0.26	0.00	0.26	0.26	0.26	0.26
Sat Flow, veh/h	1774	3291	172	1774	3201	94	1261	0	1576	209	474	204
Grp Volume(v), veh/h	133	447	461	463	582	606	121	0	268	187	0	0
Grp Sat Flow(s),veh/h/ln	1774	1706	1756	1774	1616	1679	1261	0	1576	888	0	0
Q Serve(g_s), s	5.9	23.5	23.5	21.3	29.9	29.9	0.0	0.0	13.7	6.6	0.0	0.0
Cycle Q Clear(g_c), s	5.9	23.5	23.5	21.3	29.9	29.9	13.7	0.0	13.7	20.3	0.0	0.0
Prop In Lane	1.00		0.10	1.00		0.06	1.00		1.00	0.35		0.23
Lane Grp Cap(c), veh/h	329	455	468	585	665	691	283	0	408	284	0	0
V/C Ratio(X)	0.40	0.98	0.98	0.79	0.88	0.88	0.43	0.00	0.66	0.66	0.00	0.00
Avail Cap(c_a), veh/h	329	455	468	585	700	728	376	0	525	392	0	0
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	1.00	1.00	0.23	0.23	0.23	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	32.3	32.8	32.8	27.3	24.4	24.4	29.8	0.0	29.8	32.8	0.0	0.0
Incr Delay (d2), s/veh	0.3	38.3	37.7	1.6	4.0	3.9	0.8	0.0	1.5	1.9	0.0	0.0
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	2.9	15.9	16.3	10.7	14.0	14.5	2.7	0.0	6.1	4.6	0.0	0.0
LnGrp Delay(d),s/veh	32.6	71.1	70.5	28.9	28.4	28.3	30.6	0.0	31.3	34.8	0.0	0.0
LnGrp LOS	C	E	E	C	C	C	C		C	C		
Approach Vol, veh/h		1041			1651			389			187	
Approach Delay, s/veh		65.9			28.5			31.0			34.8	
Approach LOS		E			C			C			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	34.7	28.0		27.3	21.7	41.0		27.3
Change Period (Y+Rc), s	5.0	4.0		4.0	5.0	* 4		4.0
Max Green Setting (Gmax), s	23.0	24.0		30.0	9.0	* 39		30.0
Max Q Clear Time (g_c+I1), s	23.3	25.5		22.3	7.9	31.9		15.7
Green Ext Time (p_c), s	0.0	0.0		0.5	0.0	5.1		1.6

Intersection Summary	
HCM 2010 Ctrl Delay	41.1
HCM 2010 LOS	D

Notes

HCM 2010 TWSC
3: East D St. & Weller St.

03/20/2019

Intersection	
Int Delay, s/veh	1.4

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	21	1000	915	44	18	34
Future Vol, veh/h	21	1000	915	44	18	34
Conflicting Peds, #/hr	0	0	0	15	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	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	21	1000	915	44	18	34

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	974	0	-	0	1994	952
Stage 1	-	-	-	-	952	-
Stage 2	-	-	-	-	1042	-
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	708	-	-	-	66	315
Stage 1	-	-	-	-	375	-
Stage 2	-	-	-	-	340	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	699	-	-	-	60	311
Mov Cap-2 Maneuver	-	-	-	-	60	-
Stage 1	-	-	-	-	345	-
Stage 2	-	-	-	-	336	-

Approach	EB	WB	SB
HCM Control Delay, s	0.2	0	51.7
HCM LOS			F

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	699	-	-	-	127
HCM Lane V/C Ratio	0.03	-	-	-	0.409
HCM Control Delay (s)	10.3	0	-	-	51.7
HCM Lane LOS	B	A	-	-	F
HCM 95th %tile Q(veh)	0.1	-	-	-	1.8

Intersection	
Int Delay, s/veh	376.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	229	726	1	1	613	194	3	1	3	143	0	337
Future Vol, veh/h	229	726	1	1	613	194	3	1	3	143	0	337
Conflicting Peds, #/hr	25	0	2	2	0	25	5	0	8	8	0	5
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	60	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	229	726	1	1	613	194	3	1	3	143	0	337

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	832	0	0	729	0	0	2073	2021	737	1932	1924	740
Stage 1	-	-	-	-	-	-	1187	1187	-	737	737	-
Stage 2	-	-	-	-	-	-	886	834	-	1195	1187	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
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	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	801	-	-	875	-	-	40	58	418	~ 50	67	417
Stage 1	-	-	-	-	-	-	230	262	-	410	425	-
Stage 2	-	-	-	-	-	-	339	383	-	227	262	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	784	-	-	874	-	-	5	40	415	~ 37	46	407
Mov Cap-2 Maneuver	-	-	-	-	-	-	5	40	-	~ 37	46	-
Stage 1	-	-	-	-	-	-	163	185	-	284	415	-
Stage 2	-	-	-	-	-	-	58	374	-	158	185	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	2.7	0	$ 567.3	$ 1751.6
HCM LOS			F	F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	11	784	-	-	874	-	-	102
HCM Lane V/C Ratio	0.636	0.292	-	-	0.001	-	-	4.706
HCM Control Delay (s)	$ 567.3	11.5	-	-	9.1	0		$ 1751.6
HCM Lane LOS	F	B	-	-	A	A	-	F
HCM 95th %tile Q(veh)	1.4	1.2	-	-	0	-	-	50.8

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

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	229	726	1	1	613	194	3	1	3	143	0	337
Future Volume (veh/h)	229	726	1	1	613	194	3	1	3	143	0	337
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.96	1.00		0.95	0.99		0.99	0.99		0.98
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
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1900	1863	1863	1900	1863	1863	1900
Adj Flow Rate, veh/h	229	726	1	1	613	194	3	1	3	143	0	337
Adj No. of Lanes	1	1	0	1	1	0	1	1	0	1	1	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	297	1055	1	325	641	203	149	100	299	450	0	380
Arrive On Green	0.09	0.57	0.57	0.00	0.48	0.48	0.24	0.24	0.24	0.24	0.00	0.24
Sat Flow, veh/h	1774	1860	3	1774	1337	423	1033	408	1224	1393	0	1557
Grp Volume(v), veh/h	229	0	727	1	0	807	3	0	4	143	0	337
Grp Sat Flow(s),veh/h/ln	1774	0	1862	1774	0	1760	1033	0	1632	1393	0	1557
Q Serve(g_s), s	3.8	0.0	17.7	0.0	0.0	28.2	0.2	0.0	0.1	5.6	0.0	13.4
Cycle Q Clear(g_c), s	3.8	0.0	17.7	0.0	0.0	28.2	13.5	0.0	0.1	5.7	0.0	13.4
Prop In Lane	1.00		0.00	1.00		0.24	1.00		0.75	1.00		1.00
Lane Grp Cap(c), veh/h	297	0	1057	325	0	844	149	0	398	450	0	380
V/C Ratio(X)	0.77	0.00	0.69	0.00	0.00	0.96	0.02	0.00	0.01	0.32	0.00	0.89
Avail Cap(c_a), veh/h	305	0	1057	433	0	852	155	0	408	458	0	389
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	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	14.1	0.0	9.8	9.8	0.0	16.0	29.9	0.0	18.3	20.5	0.0	23.4
Incr Delay (d2), s/veh	11.3	0.0	1.9	0.0	0.0	20.9	0.1	0.0	0.0	0.4	0.0	20.8
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	3.0	0.0	9.4	0.0	0.0	18.3	0.1	0.0	0.1	2.2	0.0	7.9
LnGrp Delay(d),s/veh	25.4	0.0	11.7	9.8	0.0	36.9	29.9	0.0	18.4	20.9	0.0	44.2
LnGrp LOS	C		B	A		D	C		B	C		D
Approach Vol, veh/h		956			808			7			480	
Approach Delay, s/veh		15.0			36.9			23.3			37.2	
Approach LOS		B			D			C			D	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2	3	4		6	7	8
Phs Duration (G+Y+Rc), s		19.6	4.1	40.3		19.6	9.7	34.7
Change Period (Y+Rc), s		4.0	4.0	4.0		4.0	4.0	4.0
Max Green Setting (Gmax), s		16.0	4.0	33.0		16.0	6.0	31.0
Max Q Clear Time (g_c+I1), s		15.5	2.0	19.7		15.4	5.8	30.2
Green Ext Time (p_c), s		0.0	0.0	4.5		0.2	0.0	0.5

Intersection Summary		
HCM 2010 Ctrl Delay		27.6
HCM 2010 LOS		C

Intersection	
Int Delay, s/veh	1.2

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	11	43	4	6	49
Future Vol, veh/h	0	11	43	4	6	49
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	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	11	43	4	6	49

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	106	45	0	0	47	0
Stage 1	45	-	-	-	-	-
Stage 2	61	-	-	-	-	-
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	892	1025	-	-	1560	-
Stage 1	977	-	-	-	-	-
Stage 2	962	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	888	1025	-	-	1560	-
Mov Cap-2 Maneuver	888	-	-	-	-	-
Stage 1	973	-	-	-	-	-
Stage 2	962	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	8.6	0	0.8
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	1025	1560	-
HCM Lane V/C Ratio	-	-	0.011	0.004	-
HCM Control Delay (s)	-	-	8.6	7.3	0
HCM Lane LOS	-	-	A	A	A
HCM 95th %tile Q(veh)	-	-	0	0	-

Intersection	
Int Delay, s/veh	0.2

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	7	2	4	420	581	7
Future Vol, veh/h	7	2	4	420	581	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	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	7	2	4	420	581	7

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1013	585	588	0	-	0
Stage 1	585	-	-	-	-	-
Stage 2	428	-	-	-	-	-
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	265	511	987	-	-	-
Stage 1	557	-	-	-	-	-
Stage 2	657	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	264	511	987	-	-	-
Mov Cap-2 Maneuver	264	-	-	-	-	-
Stage 1	554	-	-	-	-	-
Stage 2	657	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	17.5	0.1	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	987	-	296	-	-
HCM Lane V/C Ratio	0.004	-	0.03	-	-
HCM Control Delay (s)	8.7	0	17.5	-	-
HCM Lane LOS	A	A	C	-	-
HCM 95th %tile Q(veh)	0	-	0.1	-	-

Appendix C

Signal Warrants

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Warrant 3: Peak-Hour Volumes and Delay

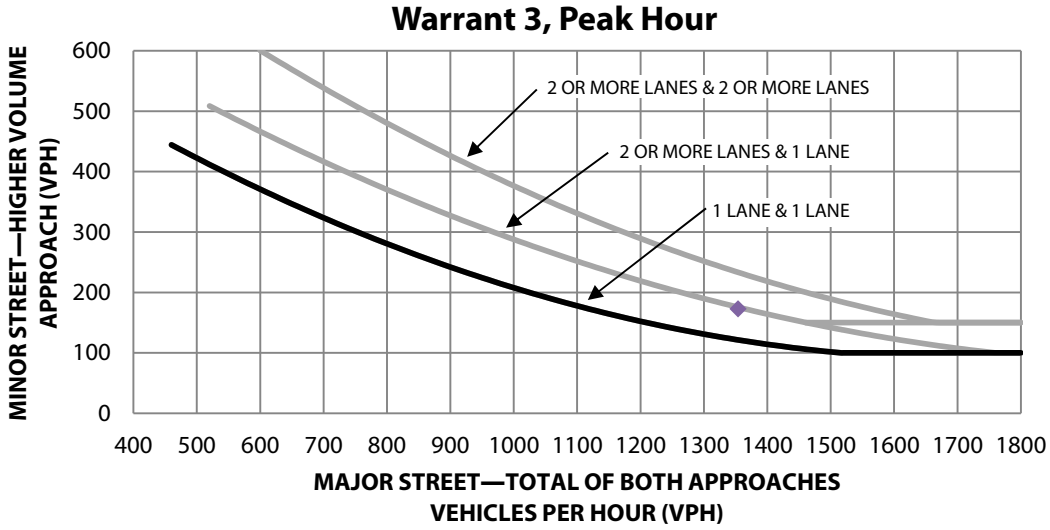
City of Petaluma
D Street & Copeland Street

PET183

	Major Street	Minor Street
Street Name	D Street	Copeland Street
Direction	E-W	N-S
Number of Lanes	1	1
Approach Speed	25	25

Population less than 10,000? No
Date of Count: Tuesday, September 29, 2015
Scenario: AM Existing

Warrant 3 Met?: Met when either Condition A or B is met	**Yes**
Condition A: Met when conditions A1, A2, and A3 are met	Not Met
Condition A1	Not Met
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	
Minor Approach Delay: 1.5 vehicle-hours	
Condition A2	Met
The volume on the same minor street approach (one direction only) equals or exceeds 100 vph for one moving lane of traffic of 150 vph for two moving lanes	
Minor Approach Volume: 173 vph	
Condition A3	Met
The total entering volume serviced during the hour equals or exceeds 800 vph for intersections with four or more appraches or 650 vph for intersections with three approaches	
Total Entering Volume: 1531 vph	
Condition B	Met
The plotted point falls above the curve	



Warrant 3: Peak-Hour Volumes and Delay

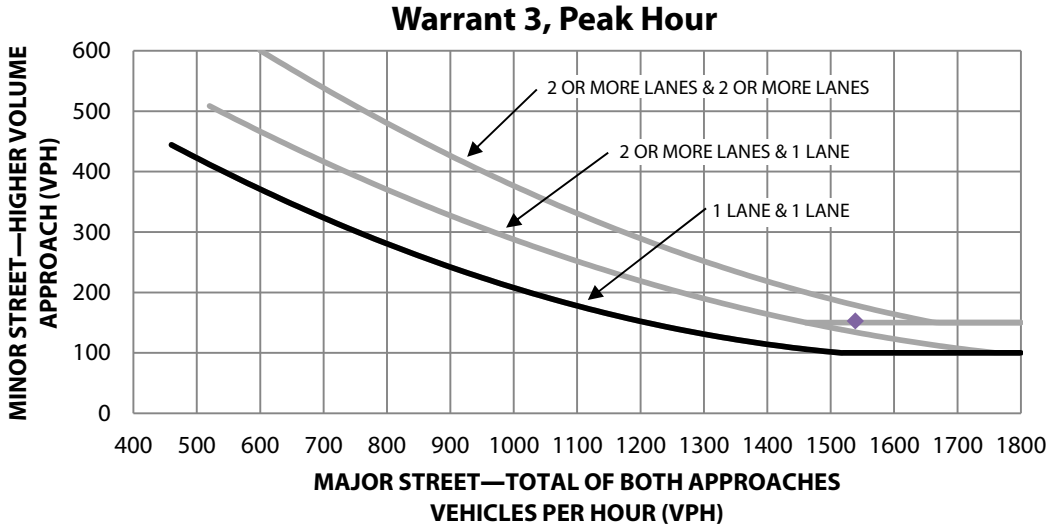
City of Petaluma
D Street & Copeland Street

PET183

	Major Street	Minor Street
Street Name	D Street	Copeland Street
Direction	E-W	N-S
Number of Lanes	1	1
Approach Speed	25	25

Population less than 10,000? No
Date of Count: Tuesday, September 29, 2015
Scenario: PM Existing

Warrant 3 Met?: Met when either Condition A or B is met	**Yes**
Condition A: Met when conditions A1, A2, and A3 are met	Not Met
Condition A1	Not Met
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	
Minor Approach Delay: 2.64 vehicle-hours	
Condition A2	Met
The volume on the same minor street approach (one direction only) equals or exceeds 100 vph for one moving lane of traffic of 150 vph for two moving lanes	
Minor Approach Volume: 153 vph	
Condition A3	Met
The total entering volume serviced during the hour equals or exceeds 800 vph for intersections with four or more appraches or 650 vph for intersections with three approaches	
Total Entering Volume: 1700 vph	
Condition B	Met
The plotted point falls above the curve	



Warrant 3: Peak-Hour Volumes and Delay

City of Petaluma
D Street & Copeland Street

PET183

	Major Street	Minor Street
Street Name	D Street	Copeland Street
Direction	E-W	N-S
Number of Lanes	1	1
Approach Speed	25	25

Population less than 10,000? No
Date of Count: Tuesday, September 29, 2015
Scenario: AM Existing plus Project

Warrant 3 Met?: Met when either Condition A or B is met — **Yes**

Condition A: Met when conditions A1, A2, and A3 are met — Not Met

Condition A1 — Not Met

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

Minor Approach Delay: 1.84 vehicle-hours

Condition A2 — Met

The volume on the same minor street approach (one direction only) equals or exceeds 100 vph for one moving lane of traffic of 150 vph for two moving lanes

Minor Approach Volume: 178 vph

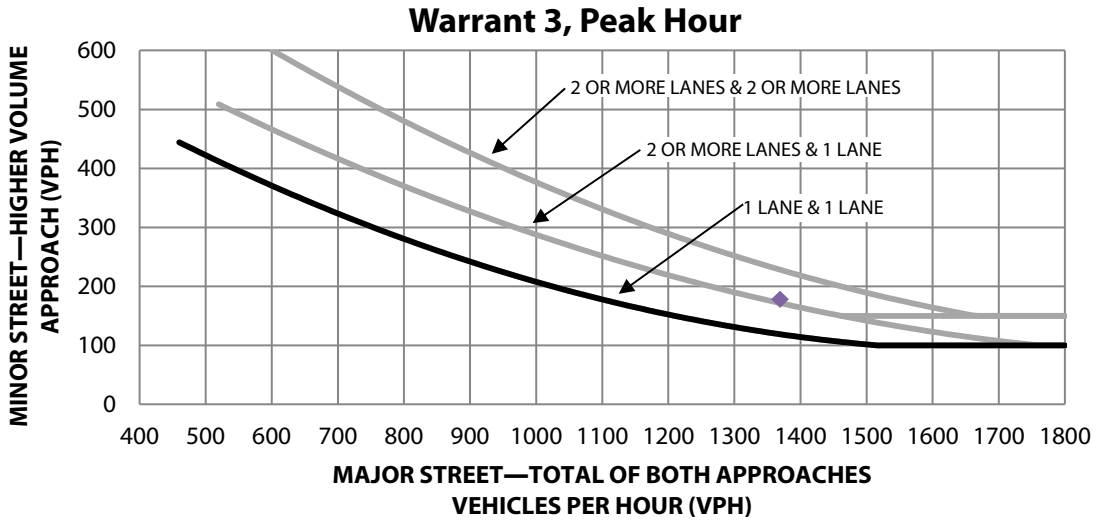
Condition A3 — Met

The total entering volume serviced during the hour equals or exceeds 800 vph for intersections with four or more appraches or 650 vph for intersections with three approaches

Total Entering Volume: 1551 vph

Condition B — Met

The plotted point falls above the curve



Warrant 3: Peak-Hour Volumes and Delay

City of Petaluma
D Street & Copeland Street

PET183

	Major Street	Minor Street
Street Name	D Street	Copeland Street
Direction	E-W	N-S
Number of Lanes	1	1
Approach Speed	25	25

Population less than 10,000? No
Date of Count: Tuesday, September 29, 2015
Scenario: PM Existing plus Project

Warrant 3 Met?: Met when either Condition A or B is met — **Yes**

Condition A: Met when conditions A1, A2, and A3 are met — Not Met

Condition A1 — Not Met

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

Minor Approach Delay: 3.55 vehicle-hours

Condition A2 — Met

The volume on the same minor street approach (one direction only) equals or exceeds 100 vph for one moving lane of traffic of 150 vph for two moving lanes

Minor Approach Volume: 161 vph

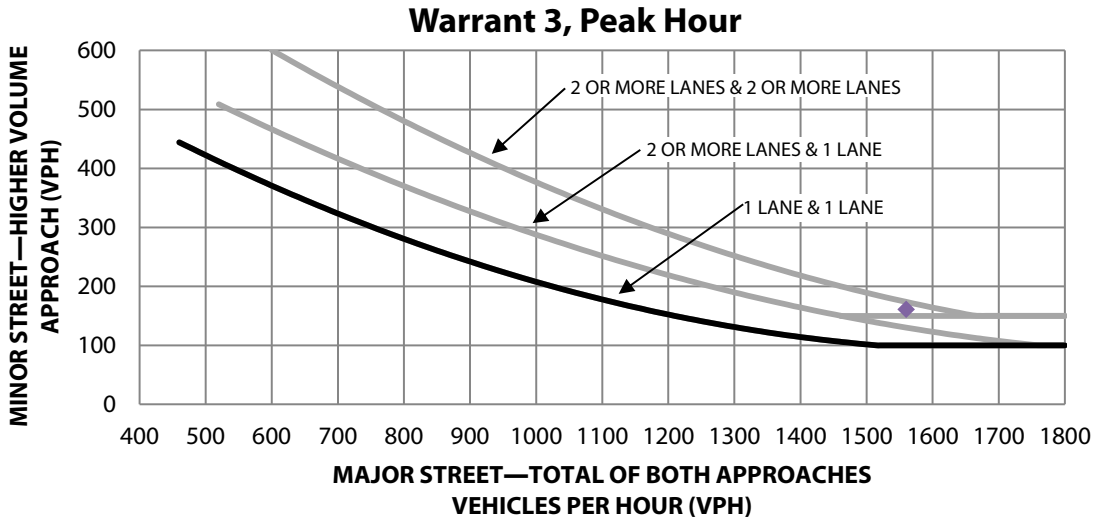
Condition A3 — Met

The total entering volume serviced during the hour equals or exceeds 800 vph for intersections with four or more appraches or 650 vph for intersections with three approaches

Total Entering Volume: 1729 vph

Condition B — Met

The plotted point falls above the curve



Appendix D

Proportional Share Spreadsheet

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Proportional Share Calculations
Haystack Pacifica

	AM	PM
Project Trips (T)	20	29

Total Volume Entering the Intersection of D Street/Copeland Street	AM	PM
Existing	1531	1700
Future Year	1909	2220

Destription of Project Improvement:

Installing traffic signal at intersection of D Street/Copeland Street

Calculation of Project Share

P = T / (TB - TE)
where:
P = Equitable Share
T = Project trips during the affected peak hour
TB = Build-out volumes
TE = Existing volumes

T	20	29	
TB	1909	2220	
TE	1531	1700	**AVERAGE**
P	5.3%	5.6%	**5.4%**

Equitable Share (per Caltrans "Guide for the Preparation of Traffic Impact Studies")

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Appendix E

Turn Lane Warrants

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Turn Lane Warrant Analysis - Tee Intersections

Study Intersection: Weller Street and Internal Street
Study Scenario: Future plus Project AM

Direction of Analysis Street: North/South
Cross Street Intersects: From the East

Weller Street

Northbound Volumes (veh/hr)
Through Volume = 43
Right Turn Volume = 7

Weller Street

Southbound Volumes (veh/hr)
59 = Through Volume
10 = Left Turn Volume

Internal Street

Northbound Speed Limit: 25 mph
Northbound Configuration: 2 Lanes - Undivided

Southbound Speed Limit: 25 mph
Southbound Configuration: 2 Lanes - Undivided

Northbound Right Turn Lane Warrants

1. Check for right turn volume criteria

Thresholds not met, continue to next step

2. Check advance volume threshold criteria for turn lane

Advancing Volume Threshold	AV =	997.6
Advancing Volume	Va =	50
If AV<Va then warrant is met		No

Right Turn Lane Warranted: **NO**

Northbound Right Turn Taper Warrants
(evaluate if right turn lane is unwarranted)

1. Check taper volume criteria

NOT WARRANTED - Less than 20 vehicles

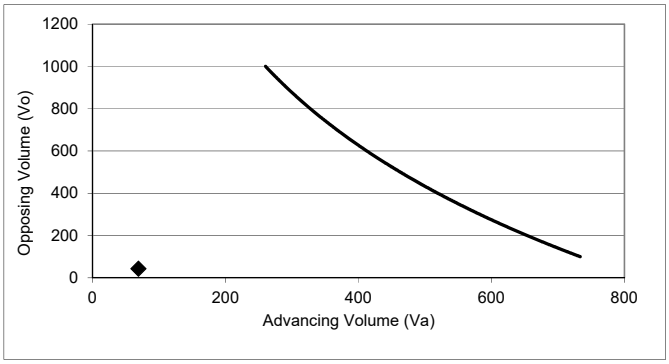
2. Check advance volume threshold criteria for taper

Advancing Volume Threshold	AV =	-
Advancing Volume	Va =	50
If AV<Va then warrant is met		-

Right Turn Taper Warranted: **NO**

Southbound Left Turn Lane Warrants

Percentage Left Turns %lt 14.5 %
Advancing Volume Threshold AV 783 veh/hr
If AV<Va then warrant is met



◆ Study Intersection
Two lane roadway warrant threshold for: 25 mph
Turn lane warranted if point falls to right of warrant threshold line

Left Turn Lane Warranted: **NO**

Methodology based on Washington State Transportation Center Research Report *Method For Prioritizing Intersection Improvements*, January 1997.
The right turn lane and taper analysis is based on work conducted by Cottrell in 1981.
The left turn lane analysis is based on work conducted by M.D. Harmelink in 1967, and modified by Kikuchi and Chakroborty in 1991.

Turn Lane Warrant Analysis - Tee Intersections

Study Intersection: Weller Street and InternalStreet
Study Scenario: Future plus Project PM

Direction of Analysis Street: North/South
Cross Street Intersects: From the East

Weller Street

Northbound Volumes (veh/hr)
Through Volume = 42
Right Turn Volume = 4

Northbound Speed Limit: 25 mph
Northbound Configuration: 2 Lanes - Undivided

Internal Street

Weller Street

Southbound Volumes (veh/hr)
48 = Through Volume
5 = Left Turn Volume

Southbound Speed Limit: 25 mph
Southbound Configuration: 2 Lanes - Undivided

Northbound Right Turn Lane Warrants

1. Check for right turn volume criteria

Thresholds not met, continue to next step

2. Check advance volume threshold criteria for turn lane

Advancing Volume Threshold	AV =	1020.1
Advancing Volume	Va =	46
If AV<Va then warrant is met		No

Right Turn Lane Warranted: **NO**

Northbound Right Turn Taper Warrants
(evaluate if right turn lane is unwarranted)

1. Check taper volume criteria

NOT WARRANTED - Less than 20 vehicles

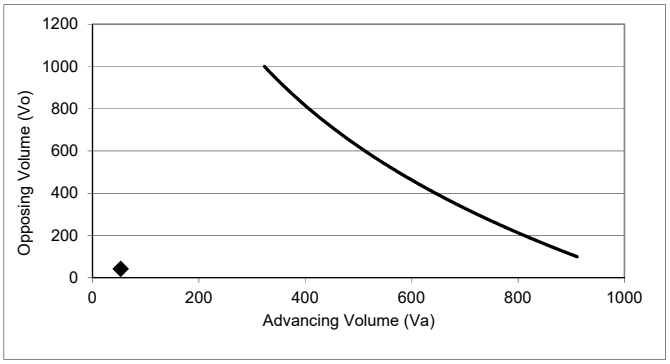
2. Check advance volume threshold criteria for taper

Advancing Volume Threshold	AV =	-
Advancing Volume	Va =	46
If AV<Va then warrant is met		-

Right Turn Taper Warranted: **NO**

Southbound Left Turn Lane Warrants

Percentage Left Turns %lt 9.4 %
Advancing Volume Threshold AV 974 veh/hr
If AV<Va then warrant is met



◆ Study Intersection
Two lane roadway warrant threshold for: 25 mph
Turn lane warranted if point falls to right of warrant threshold line

Left Turn Lane Warranted: **NO**

Methodology based on Washington State Transportation Center Research Report *Method For Prioritizing Intersection Improvements*, January 1997.
The right turn lane and taper analysis is based on work conducted by Cottrell in 1981.
The left turn lane analysis is based on work conducted by M.D. Harmelink in 1967, and modified by Kikuchi and Chakroborty in 1991.

Turn Lane Warrant Analysis - Tee Intersections

Study Intersection: Copeland Street and Internal Street
Study Scenario: Future plus Project AM

Direction of Analysis Street: North/South
Cross Street Intersects: From the West

Weller Street

Southbound Volumes (veh/hr)
Through Volume = 400
Right Turn Volume = 2

Southbound Speed Limit: 25 mph
Southbound Configuration: 2 Lanes - Undivided

Internal Street

Weller Street

Northbound Volumes (veh/hr)
488 = Through Volume
1 = Left Turn Volume

Northbound Speed Limit: 25 mph
Northbound Configuration: 2 Lanes - Undivided

Southbound Right Turn Lane Warrants

1. Check for right turn volume criteria

Thresholds not met, continue to next step

2. Check advance volume threshold criteria for turn lane

Advancing Volume Threshold	AV =	1035.1
Advancing Volume	Va =	402
If AV<Va then warrant is met		No

Right Turn Lane Warranted: **NO**

Southbound Right Turn Taper Warrants
(evaluate if right turn lane is unwarranted)

1. Check taper volume criteria

NOT WARRANTED - Less than 20 vehicles

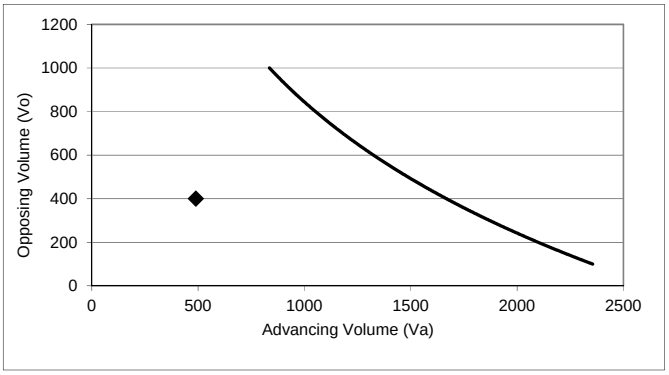
2. Check advance volume threshold criteria for taper

Advancing Volume Threshold	AV =	-
Advancing Volume	Va =	402
If AV<Va then warrant is met		-

Right Turn Taper Warranted: **NO**

Northbound Left Turn Lane Warrants

Percentage Left Turns %lt 0.2 %
Advancing Volume Threshold AV 1667 veh/hr
If AV<Va then warrant is met



◆ Study Intersection
Two lane roadway warrant threshold for: 25 mph
Turn lane warranted if point falls to right of warrant threshold line

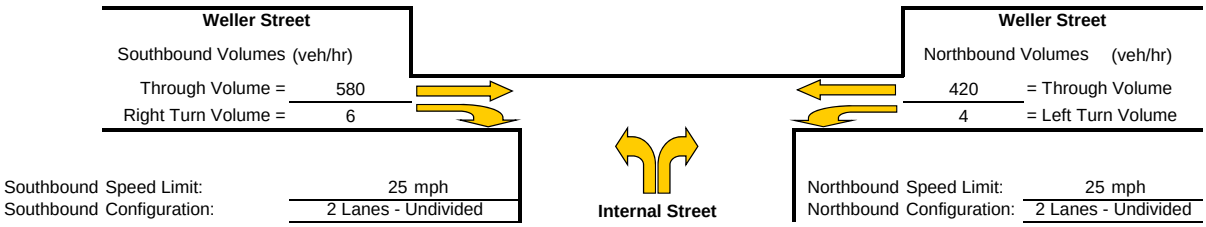
Left Turn Lane Warranted: **NO**

Methodology based on Washington State Transportation Center Research Report *Method For Prioritizing Intersection Improvements* , January 1997.
The right turn lane and taper analysis is based on work conducted by Cottrell in 1981.
The left turn lane analysis is based on work conducted by M.D. Harmelink in 1967, and modified by Kikuchi and Chakroborty in 1991.

Turn Lane Warrant Analysis - Tee Intersections

Study Intersection: Copeland Street and Internal Street
Study Scenario: Future plus Project PM

Direction of Analysis Street: North/South
Cross Street Intersects: From the West



Southbound Speed Limit: 25 mph
Southbound Configuration: 2 Lanes - Undivided

Northbound Speed Limit: 25 mph
Northbound Configuration: 2 Lanes - Undivided

Southbound Right Turn Lane Warrants

1. Check for right turn volume criteria

Thresholds not met, continue to next step

2. Check advance volume threshold criteria for turn lane

Advancing Volume Threshold	AV =	1005.1
Advancing Volume	Va =	586
If AV<Va then warrant is met		No

Right Turn Lane Warranted: **NO**

Southbound Right Turn Taper Warrants
(evaluate if right turn lane is unwarranted)

1. Check taper volume criteria

NOT WARRANTED - Less than 20 vehicles

2. Check advance volume threshold criteria for taper

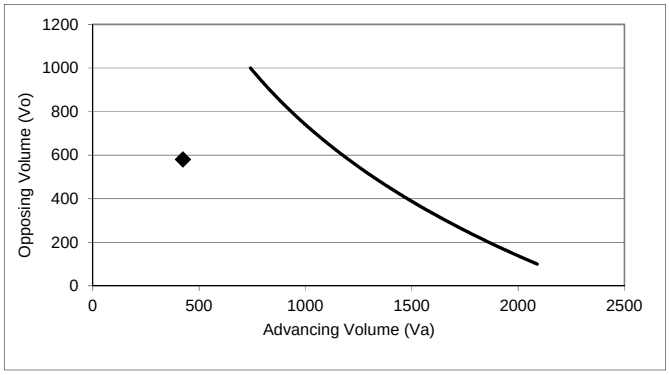
Advancing Volume Threshold	AV =	-
Advancing Volume	Va =	586
If AV<Va then warrant is met		-

Right Turn Taper Warranted: **NO**

Northbound Left Turn Lane Warrants

Percentage Left Turns	%lt	0.9 %
Advancing Volume Threshold	AV	1203 veh/hr

If AV<Va then warrant is met



◆ Study Intersection
Two lane roadway warrant threshold for: 25 mph
Turn lane warranted if point falls to right of warrant threshold line

Left Turn Lane Warranted: **NO**

Methodology based on Washington State Transportation Center Research Report *Method For Prioritizing Intersection Improvements* , January 1997.
The right turn lane and taper analysis is based on work conducted by Cottrell in 1981.
The left turn lane analysis is based on work conducted by M.D. Harmelink in 1967, and modified by Kikuchi and Chakroborty in 1991.