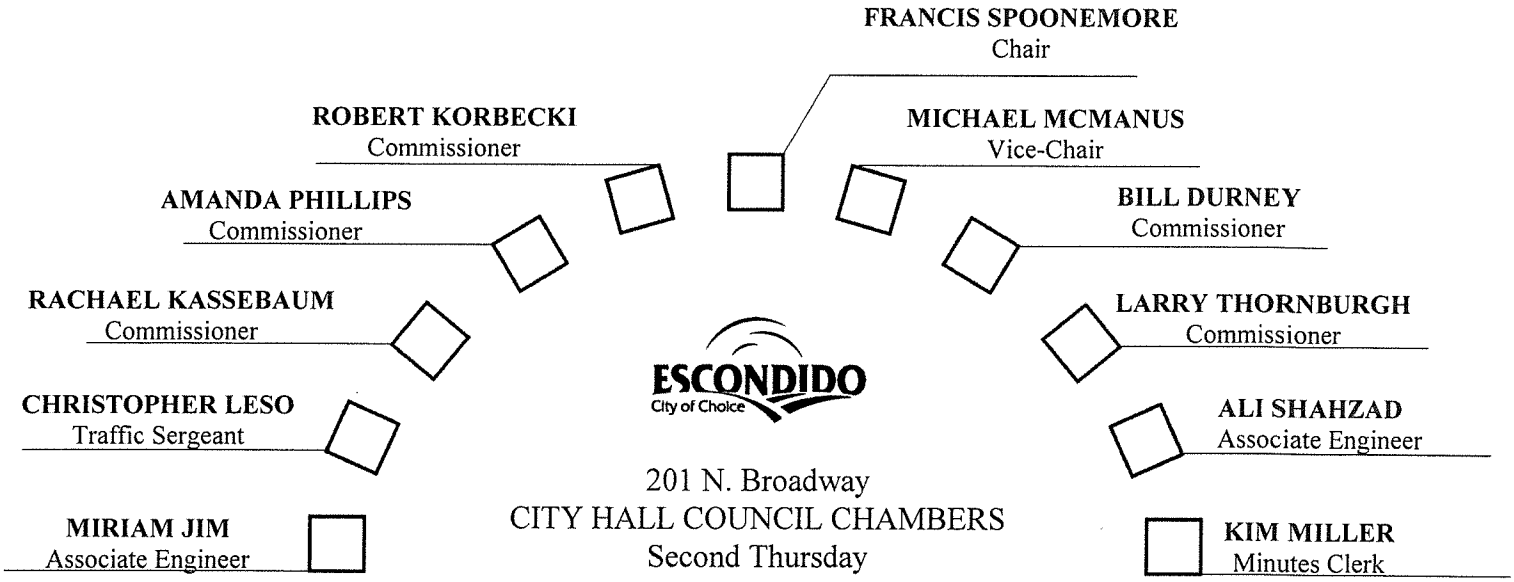
CITY OF ESCONDIDO

Transportation & Community Safety Commission



201 N. Broadway
CITY HALL COUNCIL CHAMBERS
Second Thursday
3:00 p.m.

AGENDA
January 9th, 2020

A. FLAG SALUTE

B. ROLL CALL AND DETERMINATION OF QUORUM

C. ORAL COMMUNICATIONS* (At this time, members of the public are encouraged to speak to the Commission concerning items not already on this agenda. A time limit of three [3] minutes per speaker and a total time allotment of fifteen [15] minutes will be observed.)

The Brown Act provides an opportunity for the members of the public to directly address the Commission on any item of interest to the public, before or during the Commission's consideration of the item. If you wish to speak regarding an agenda item, please fill out a speaker's slip and give it to the minute's clerk who will forward it to the Chairman.

If you wish to speak concerning an item not on the agenda, you may do so under "Oral Communications" which is listed on the agenda.

The City of Escondido recognizes its obligation to provide equal access to public meetings to those qualified individuals with disabilities. Please contact the Human Resources Department (839-4643) with any requests for reasonable accommodation, to include sign language interpreter, at least twenty-four (24) hours prior to the meeting.

D. APPROVAL OF MINUTES OF OCTOBER 10th, 2019 MEETING

E. CONSENT ITEMS – None.

F. NEW BUSINESS

1. Traffic Signal Permitted Protected Left Turn Phasing (PPLT)

   Source: Staff

   Recommendation: Discussion and Recommendation

   Previous action: None

2. Annual Report on Audible Pedestrian Signals (APS) Citywide

   Source: Staff

   Recommendation: Note and File

   Previous action: Commission review and approval

3. Traffic Signal and HAWK Warrant and Crosswalk Treatment for Creek Trail Crossings at Rose Street and Midway Drive

   Source: Staff

   Recommendation: Approval

   Previous action: None

G. OLD BUSINESS

1. An overview of various projects involving the City.

   Source: Staff

Written or verbal reports may be presented on the following topics:

a. Traffic Signals in Design: Felicita/Escondido Blvd LTP signal modification – Design complete, part of ATP Fund project. Two new signals: Country Club Ln/Gary Ln and Country Club Ln/Nutmeg St (The Villages). Signal Modifications: El Norte Pkwy/Country Club Ln and El Norte Pkwy/Nutmeg St. (The Villages) El Norte/E. Lincoln Avenue (Henry's Ranch), Juniper St/17th Ave. protected LT phasing (part of ATP Fund project).

b. Traffic Signals - Under Construction: Hotel Traffic Signal on La Terraza Blvd. El Norte/Bike Path crossing near bridge over flood control channel with Bridge widening. Gateway Project adjacent to Transit Center two (2) pedestrian crossing signals. Signal Mod. at California Trust Bank on Quince/Valley for Left Turn.

c. FY19/20 TMPL Project Updates

H. SCHOOL AREA SAFETY

a. Del Dios Academy – Bond Improvements. Signing/Striping design for 9th Avenue reviewed. New loading zone on 9th Avenue during school construction requested by EUSD.
b. Mission Middle School – Bond Improvements. Changes to traffic pattern due to school construction.
c. San Pasqual High School – Discussed with Principal regarding pick-up and drop-off on Mary Lane. New no stopping during school hour's signage will be installed on Mary Lane and roadways around school frontage.
d. Central Elementary School – Discussed with Principal, safety concerns at crosswalks on Broadway and Maple. Potential future TMPL project. Pedestrian crossing signage improvements around the school are being installed by the City.
e. Farr Elementary School – Discussed with Principal and PD regarding parking and pick-up/drop-off issues. Loading zone on Farr was converted to parking.
f. Oak Hill Elementary School – Request for pedestrian improvements at Rose Street and Oak Hill Drive intersection. Potential future TMPL project.

I. COUNCIL ACTION* (A briefing on recent Council actions on Commission related items.)
   a. NONE

J. ORAL COMMUNICATIONS* (At this time, members of the public are encouraged to speak to the Commission.)

K. TRANSPORTATION COMMISSIONERS* (Commissioners may bring up questions or items for future discussion.)

L. ADJOURNMENT

*In order for the Transportation Commission to take action or conclude discussion, an item must appear on the agenda which is posted 72 hours in advance of the meeting. Therefore, all items brought up under the categories marked with an asterisk (*) can have no action. Such items can be referred to staff or scheduled for a future agenda.

AVAILABILITY OF SUPPLEMENTAL MATERIALS AFTER AGENDA POSTING: Any supplemental writings or documents provided to the Commission regarding any item on this agenda will be made available for public inspection in the Engineering Office located at 201 N. Broadway during normal business hours, or in the Council Chambers while the meeting is in session.

CITY OF ESCONDIDO

MINUTES OF THE REGULAR MEETING OF THE TRANSPORTATION AND COMMUNITY SAFETY COMMISSION

October 10, 2019

The regular meeting of the Escondido Transportation and Community Safety Commission was called to order at 3:02 p.m., Thursday, October 10, 2019 by Chair Spoonemore, in the City Council Chambers, 201 North Broadway, Escondido, California.

Commissioners present: Chair Spoonemore, Vice Chair McManus, Commissioner Kassebaum, Commissioner Phillips, Commissioner Durney, Commissioner Korbecki and Commissioner Thornburg.

Staff present: Julie Procopio, Director of Engineering Services; Owen Tunnell, Assistant City Engineer; Ali Shahzad, Associate Engineer/Traffic Division; Miriam Jim, Associate Engineer; and Zack Beck, City Clerk.

Oral Communications:
None

Consent Items:
None

Action:

Minutes:
Moved by Commissioner Thornburgh, Seconded by Commissioner Kassebaum, to approve the minutes of the July 11, 2019 meeting. Motion carried unanimously.

New Business:
1. Traffic Signal and Left Turn Phasing Priority List (TSPL)
Ali Shahzad provided a presentation regarding the Traffic Signal and Left Turn Phasing Priority List (TSPL).

Action: Motion to approve staff member recommendation by Commissioner Thornburgh, Seconded by Commissioner Durney, Motion carried unanimously.

2. Speed Surveys – Various locations citywide
Action: Motion to approve staff member recommendation by Commissioner Thornburgh, Seconded by Commissioner Kassebaum, Motion carried unanimously.

Old Business

1. An overview of various projects involving the City.
Source: Staff
Ali Shahzad provided an overview on traffic signals in design, traffic signals under construction and traffic signals that have been completed.

School Area Safety:

Ali Shahzad, Amanda Phillips and Miriam Jim provided information related to school area safety at Del Dios Academy, Mission Middle School, San Pasqual High School and Central Elementary.

Council Action:
None

Oral Communications:
None

Transportation Commissioners:
None

Adjournment
Motion by Commissioner Durney, Seconded by Vice Chair McManus to adjourn the meeting at 3:38 p.m. Motion carried unanimously.

Ali Shahzad, Associate Engineer

for Zachary Beck, Minutes Clerk

ESCONDIDO
City of Choice

CITY OF ESCONDIDO

TRANSPORTATION and
COMMUNITY SAFETY COMMISSION

Commission Report of: January 9th, 2020 **Item No.: F1**

Location: Various locations Citywide

Initiated By: City Council

Subject: Protected/Permitted Left Turn Phasing (PPLT) – Follow-Up from October 2019 meeting of the Left Turn Priority List (LTPL).

OVERVIEW: That the Transportation Commission discuss, analyze and make final recommendations for the evaluation of the top three (3) ranked intersections listed in the Engineering and Traffic Study, dated October 14, 2019, to determine if protected/permissive left-turn (PPLT) phasing is a viable option compared to protected-only left-turn phasing.

BACKGROUND – TRAFFIC SIGNAL PRIORITY LIST and PROTECTED PERMITTED LEFT TURN PHASING.

Every five or so years the Traffic Engineering staff compiles an updated priority list for potential traffic signal projects. This list is reviewed and evaluated by the Transportation Commission. The recommendations of the commission are forwarded to the City Council for their consideration and adoption. The priority list is then used to determine which projects will be funded from the current and future capital budgets.

At the October 2019 TCSC, the priority list of new traffic signals and traffic signal modifications was recommended by the commission.

This report is intended to evaluate the feasibility of Protected-Permissive left turns at the three intersections, listed in Table 1, in the Engineering and Traffic Study.

TABLE 1 – LEFT TURN PHASE RANKED INTERSECTIONS

Rank	Study Intersection	Existing Traffic Control	Recommended Improvement
Left Turn Phase Ranked List			
1	Bear Valley Parkway / Mary Lane	Signalized	Install left turn phasing on east and west approach
2	Metcalf Street / Mission Avenue	Signalized	Install left turn phasing on all approaches
3	Quince Street / Washington Avenue	Signalized	Install left turn phasing on all approaches

As Protected Left Turn Phasing reduces the green time for through movements, to use Permissive Protected Left turn Phasing must be explored first per the CA-MUTCD 2014 Edition Revision 4 dated: March 29, 2019. Figure 4D-11 below.

"4.2.3 Protected-Permissive Left-Turn phasing is defined by the Federal Highway Administration as follows:

A combination of protected and permissive left-turn phasing is referred to as protected-permissive left-turn (PPLT) operation. This phasing pattern is illustrated in Figure 2. A typical signal head and associated signing arrangement that implements protected-permissive phasing is shown below;

Figure 4D-11. Typical Position and Arrangements of Shared Signal Faces for Protected/Permissive Mode Left Turns

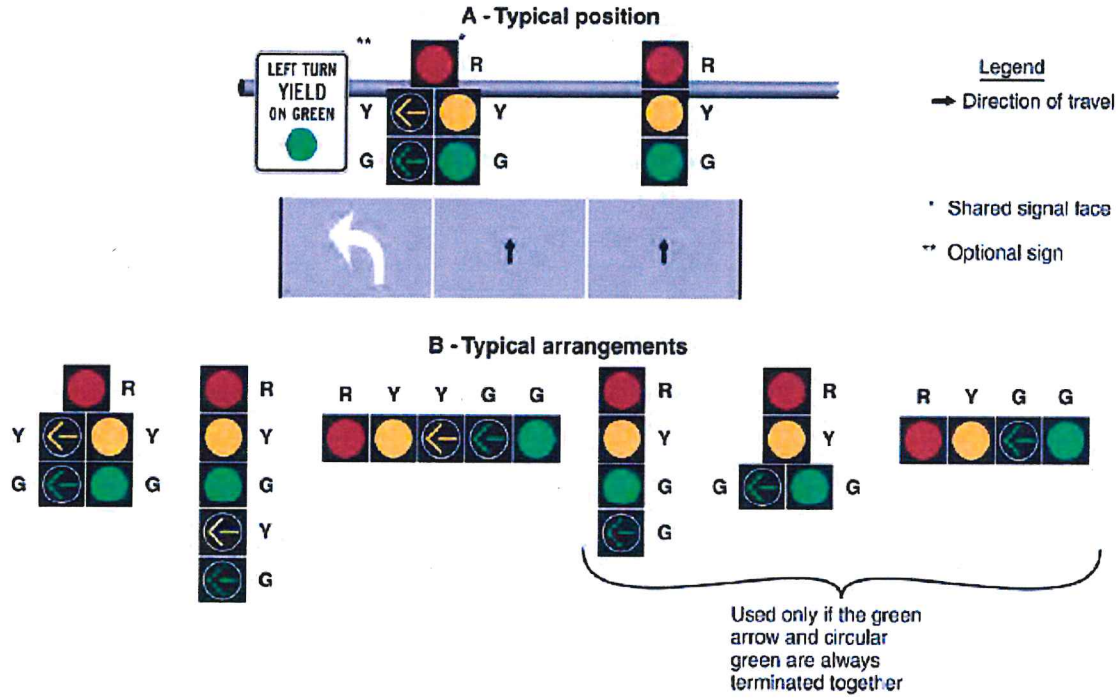
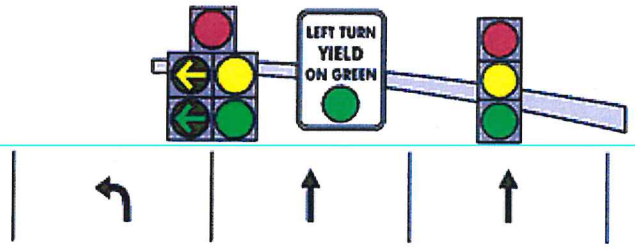
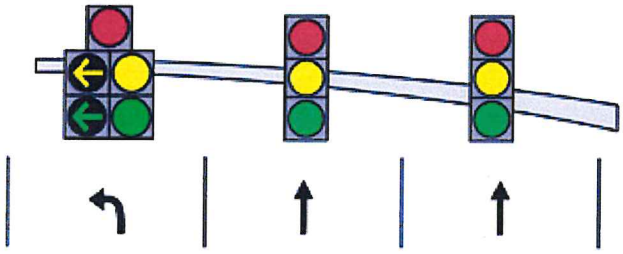


Figure 2. Typical phasing diagram for protected-permissive left-turn phasing.



(a) Protected-permissive left-turn phasing using a five-section head located directly above the lane line that separates the exclusive through and exclusive left-turn lane, along with an accompanying sign.



(b) Protected-permissive left-turn phasing using a five-section signal head located directly above the exclusive left-turn lane.

Possible signal head and signing arrangement for protected-permissive left-turn phasing.

Discussion:

Observed improvements in signal progression and efficiency combined with driver acceptance have led to expanded usage of PPLT over the years. PPLT signals offer numerous advantages when compared to "protected-only" operation. These advantages are associated with both protected-permissive and lead-lag operation. They include the following:

- Average delay per left-turn vehicle is reduced.
- Protected green arrow time is reduced.
- There is potential to omit a protected left-turn phase.
- Arterial progression can be improved, particularly when special signal head treatments are used to allow lead-lag phasing.

Some disadvantages include the following:

- The permissive phase increases the potential for vehicle-vehicle and vehicle-pedestrian conflicts.
- There is a limited ability to use lead-lag phase sequences unless special signal head treatments are used (see below).
- This signal phasing is not widely used and may warrant additional signage and/or education.

The signal head design varies based on the specific phasing used. Shown on page 4 is an example of signal phasing.

This assessment evaluated the feasibility of PPLT phasing at each of the three intersections based on criteria such as accident data, roadway conditions and vehicle-pedestrian conflicts. The delay and level of service (LOS) associated with PPLT phasing compared to protected-only left-turn phasing has also been evaluated. The consultant's report is outlined as follows:

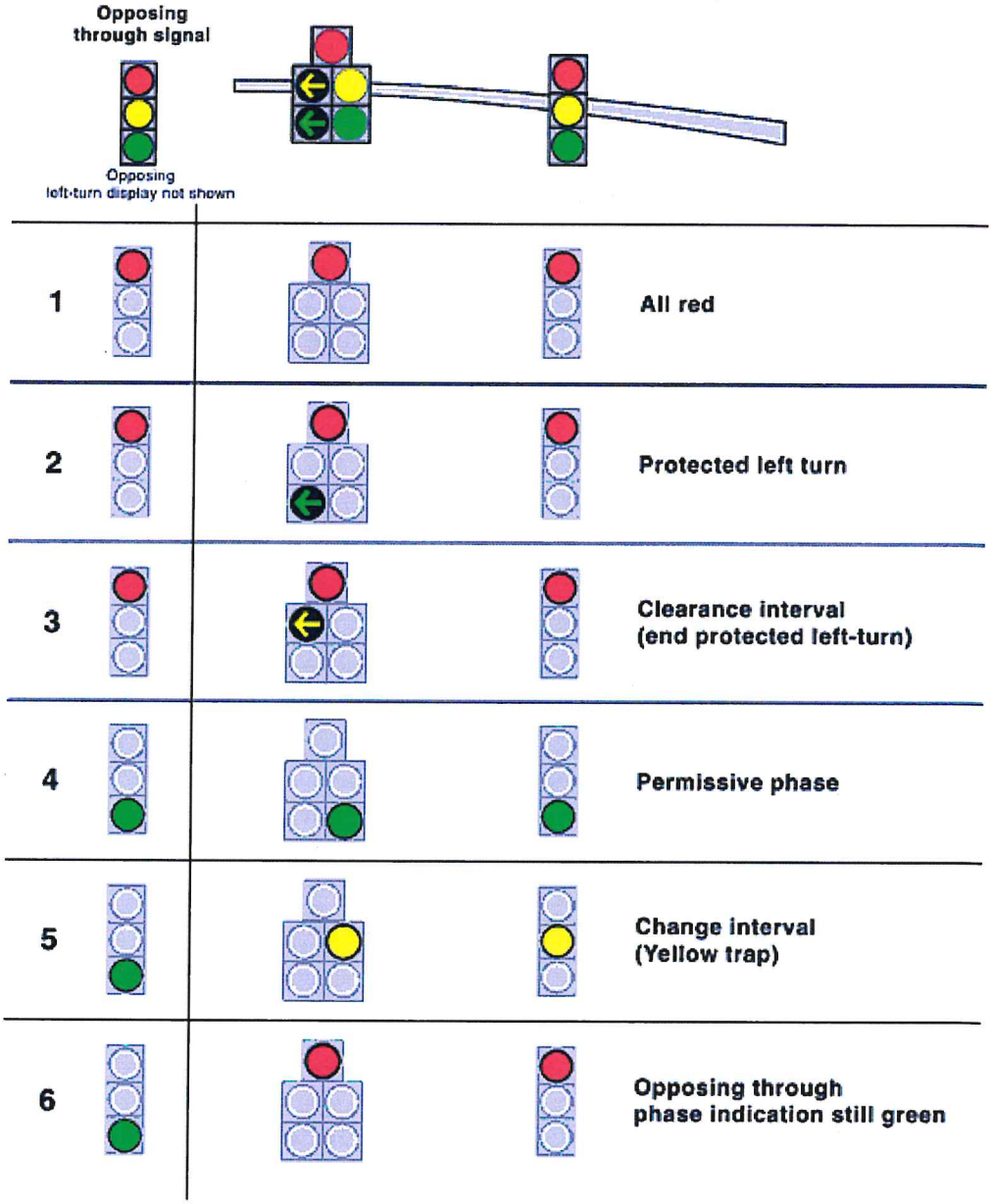
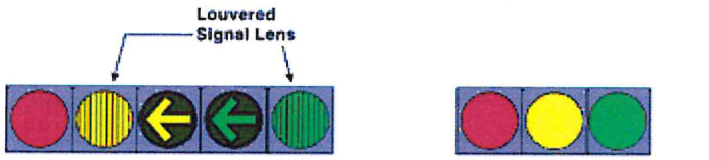


Illustration of the yellow trap.[3]



The protected-permissive left-turn display known as "Dallas display" uses louvers to restrict visibility of the left-turn display to adjacent lanes.[49]

Protected/Permissive Left Turn Phasing Criteria

The Left Turn Phasing Memorandum dated February 6, 1992 prepared by the San Diego Regional Traffic Engineer Council (SANTEC) was used to determine the feasibility of PPLT phasing at the top three (3) ranked intersections listed in Table 1. The SANTEC document suggests that PPLT phasing should be installed prior to a protected-only left-turn phase.. The purpose of this section is to determine if PPLT phasing is appropriate at any of the three (3) locations.

According to SANTEC's Left-Turn Phase – Protected/Permissive Criteria (Section D), a PPLT phase should be considered when the following two conditions are met:

Condition A - Left-turn phase is warranted, and
Condition B - Protected-only left-turn phase criteria are not satisfied.

Condition A is met for the top three (3) ranked intersections for all approaches to the intersections per the Engineering and Traffic Study.

Condition B is based on "Section C" of the SANTEC Left Turn Phasing Memorandum which includes the criteria under which protected-permissive left turn phasing would not be appropriate:

1.) The accident warrant was satisfied, and the protected/permissive operation did not reduce accidents on the approach during the initial six months to 12 months of operation.
THIS CRITERIA DOES NOT APPLY AS THERE IS NO PROTECTED/PERMISSIVE IN EFFECT.

2.) There were four or more accidents involving a left turning vehicle from the approach in a one-year period and the approach has a protected/permissive left-turn phase operation.
THIS CRITERIA APPLIES AND USED IN THIS EVALUATION.

3.) There are two or more left-turn lanes on the approach.
THIS CRITERIA DOES NOT APPLY SINCE ALL 3 INTERSECTIONS ONLY HAVE 1 LEFT-TURN LANE.

4.) Inadequate sight distance caused by curvature in roadway or similar geometric restrictions.
THIS CRITERIA APPLIES AND USED IN THIS EVALUATION.

5.) A leading left-turn movement opposite a lagging left-turn phase operation.
THIS CRITERIA DOES NOT APPLY TO THE TOP 3 INTERSECTIONS SINCE THERE IS CURRENTLY NO LEAD-LAG LEFT TURN PHASE OPERATION.

Only criteria 2 and 4 are applicable to determine if protected-only left-turn phasing is recommended at the top three (3) intersections. Criteria 2 is based on the number of left-turn related accidents in a one-year period and if the approach has PPLT phasing. In this analysis, the PPLT phasing portion of Criteria 2 was not considered since left-turn related accidents are most likely occurring during the "permissive"

portion of the PPLT phase which is no different than what happens under the current permissive phasing. Therefore, the accident data for criteria 2 was evaluated.

This assessment assumes that Condition B is met if 1 of the 5 criteria is satisfied. **Table 2** below summarizes the results of the two criteria relevant at all three locations to determine if Condition B is met.

TABLE 2 – SANTEC PROTECTED ONLY LEFT-TURN PHASE – CONDITION B CRITERIA

Protected Only Left-Turn Phase Criteria (Condition B)	Condition Met? (Yes/No)	Protected Only Left-Turn Phase Criteria Satisfied or Not Satisfied?	Consider PPLT Phasing?
BEAR VALLEY PARKWAY / MARY LANE			
NORTH-SOUTH APPROACH			
Four or more accidents involving a left-turning vehicle from the approach in a one-year period?	No	Not Satisfied	**Yes**
Inadequate sight distance caused by curvature in roadway or similar geometric restrictions?	No		
EAST-WEST APPROACH			
Four or more accidents involving a left-turning vehicle from the approach in a one-year period?	No	Not Satisfied	**Yes**
Inadequate sight distance caused by curvature in roadway or similar geometric restrictions?	No		
METCALF STREET / MISSION AVENUE			
NORTH-SOUTH APPROACH			
Four or more accidents involving a left-turning vehicle from the approach in a one-year period?	No	Not Satisfied	**Yes**
Inadequate sight distance caused by curvature in roadway or similar geometric restrictions?	No		
EAST-WEST APPROACH			
Four or more accidents involving a left-turning vehicle from the approach in a one-year period?	No	Not Satisfied	**Yes**
Inadequate sight distance caused by curvature in roadway or similar geometric restrictions?	No		
QUINCE STREET / WASHINGTON AVENUE			
NORTH-SOUTH APPROACH			
Four or more accidents involving a left-turning vehicle from the approach in a one-year period?	YES	Satisfied	No
Inadequate sight distance caused by curvature in roadway or similar geometric restrictions?	No		
EAST-WEST APPROACH			
Four or more accidents involving a left-turning vehicle from the approach in a one-year period?	YES	Satisfied	No
Inadequate sight distance caused by curvature in roadway or similar geometric restrictions?	No		

Note: SANTEC Left-Turn Phase – Protected-Only Criteria #2 and 4.

As shown in **Table 2**, the intersections of Bear Valley Parkway/Mary Lane and Metcalf Street/Mission Avenue did not satisfy the protected-only left-turn criteria. Therefore, Conditions A & B are met for these two locations. As such, PPLT phasing were considered at both of these locations.

The intersection of Quince Street/Washington Avenue satisfies only Condition A and not Condition B. Therefore, PPLT phasing should not be considered at this location.

Pedestrian and Bicycle Conflicts With Left Turning Vehicles

In addition to evaluating the SANTEC criteria for PPLT phasing, pedestrian and bicycle activity was also evaluated and considered in the final assessment of PPLT phasing at all three locations. The permissive phase increases the potential for vehicle-pedestrian conflicts and vehicle-bicycle conflicts. **Table 3** summarizes the pedestrian and bicycle activity compared to vehicles turning left creating potential conflicts at each location.

TABLE 3 – PEDESTRIAN & BICYCLE ACTIVITY AT RANKED INTERSECTIONS

Study Intersection		Vehicle Left Turn Volumes		Pedestrian Peak Hour Volumes		Bicycle Peak Hour Volumes	
North-South	East-West	North-South	East-West	North-South	East-West	North-South	East-West
Bear Valley Pkwy	Mary Lane	AM = 87 PM = 70	AM = 245 PM = 141	AM = 459 PM = 274	AM = 459 PM = 274	No Data Available	No Data Available
Metcalf Street	Mission Ave	AM = 238 PM = 176	AM = 196 PM = 72	AM = 5 PM = 4	AM = 1 PM = 4	AM = 1 PM = 6	AM = 5 PM = 3
Quince Street	Washington Ave	AM = 135 PM = 157	AM = 100 PM = 81	AM = 26 PM = 17	AM = 15 PM = 32	AM = 1 PM = 6	AM = 12 PM = 11

At Bear Valley Parkway/Mary Lane, there is a high volume of pedestrian traffic, primarily students at San Pasqual High School located on the southeast corner of the intersection. There are 459 total pedestrians in the AM peak hour and 274 total pedestrians in the PM peak hour crossing at this intersection. In the morning, large groups of students (50 to 60) exit the Breeze Rapid bus that stops along the west side of Bear Valley Parkway north of Mary Lane. The students then walk south crossing Mary Lane towards Fire Station #4 and then cross Bear Valley Parkway to enter the school campus. With the high school located adjacent to the intersection, the potential for vehicle-pedestrian conflicts is considered high. Therefore, PPLT phasing at Bear Valley Parkway and Mary Lane is not recommended due to the potential conflicts between vehicles and pedestrians which are primarily high school students.

At Quince Street/Washington Avenue, the potential for vehicle-pedestrian conflicts is high. For example, in the AM peak hour, there are 135 vehicles turning left conflicting with 26 pedestrians. This translates to 1 pedestrian for every 5 vehicles turning left. Due to the high volume of pedestrians and bicyclists at this intersection and Condition B is satisfied, PPLT phasing is not recommended at the intersection of Quince Street/Washington Avenue.

PPLT is recommended is at Metcalf Street/Mission Avenue. Conditions A and B are met based on the SANTEC criteria for determining the feasibility of PPLT phasing. In addition, the vehicle-pedestrian and vehicle-bicycle conflicts at this intersection are considered low (e.g. 1 pedestrian for every 48 vehicles turning left during the AM peak hour).

Protected/Permissive Left Turn Phasing Analysis

PPLT phasing was analyzed in Synchro at Metcalf Street/Mission Avenue. **Table 4** shows the results of the PPLT phasing analysis and compares the PPLT phasing to the protected-only phasing. As shown in the table, the delays increase from the existing condition when adding the protected-only left-turn phase operation.

TABLE 4 – INTERSECTION ANALYSIS COMPARISON

Study Intersection		Existing Conditions		Existing With Adding Protected-Only Left Turn Phasing		Existing With Adding PPLT Phasing	
North-South	East-West	AM	PM	AM	PM	AM	PM
		Delay - LOS	Delay - LOS	Delay - LOS	Delay – LOS	Delay – LOS	Delay - LOS
Metcalf Street	Mission Avenue	31.0 – C	22.3 – C	31.4 – C	34.1 – C	31.1 - C	33.4 - C

As shown in Table 4, the PPLT phasing reduces the overall delay at the intersection compared to the Protected-Only Left-Turn Phasing. During the AM peak hour, the delay is reduced by 0.3 seconds (31.4 – 31.1) and by 0.7 seconds (34.1 – 33.4) in the PM peak hour. While this reduction in delay is not significant, it is expected that the reduction in delay will be greater during off-peak hours when there is less conflicting through traffic.

Pilot Program:

As PPLT is not widely used in Northern San Diego County and this would be the first signal of this type in Escondido, a pilot program is recommended. It it recommended that the PPLT signal be monitored and evaluated for one year following its installation so that the suitability for Escondido can be confirmed.

Conclusion

The top three (3) ranked intersections were evaluated to determine the feasibility of PPLT phasing. Below is a brief summary of each intersection related to the feasibility of PPLT.

Bear Valley Parkway/Mary Lane – Using the SANTEC criteria, PPLT phasing was initially considered since Conditions A and B were met. However, San Pasqual High School is located adjacent to this intersection and the potential for vehicle-pedestrian conflicts is high. **Therefore, PPLT Phasing is not recommended at any approach.**

Metcalf Street/Mission Avenue – Using the SANTEC criteria, PPLT phasing was considered since Conditions A and B were met. The potential vehicle-pedestrian and vehicle-bicycle conflicts at this location are low. **Therefore, PPLT phasing should be considered at all approaches.**
Quince Street/Washington Avenue – Using the SANTEC criteria, PPLT phasing was not considered since Condition A was met, but Condition B was not met. In addition, vehicle-pedestrian and vehicle-bicycle conflicts were relatively high at Quince Street/Washington Avenue. **Therefore, PPLT phasing is not recommended at any approach.**

RECOMMENDATIONS: We recommend that the Commission review the Protected Permissive Left Turn analysis and make a recommendation for approval of PPLT at the intersection of Metcalf and Mission to the City Council as a pilot project to be evaluated for a minimum of one year following installation.

NECESSARY COUNCIL ACTION:

The Traffic Signal Priority List and Left Turn Phasing Priority List, and the PPLT pilot recommendation at the intersection of Metcalf and Mission as reviewed and approved by the Transportation Commission recommendations will be presented to the City Council for their consideration and approval.

Prepared by:

Ali M. Shahzad, PE (Traffic)
Associate Engineer/Traffic Division

Reviewed by:

Owen Tunnel, PE (Civil)
Assistant City Engineer

Approved by:

Julie Procopio, PE (Civil)
Director of Engineering Services/City Engineer

Attachments: Michael Baker Tech Memo with SANTEC Memo

Michael Baker
INTERNATIONAL

December 11, 2019

Ali Shahzad
Associate Traffic Engineer
City of Escondido Engineering Services
201 N. Broadway
Escondido, California 92025

Subject: Protected/Permissive Left Turn Phasing Assessment

Introduction

Michael Baker International (Michael Baker) evaluated the top 3 ranked intersections listed in the *Engineering and Traffic Study* finalized on October 14, 2019 to determine if protected/permissive left-turn (PPLT) phasing is a viable option compared to protected-only left-turn phasing. Protected-only left-turn phasing was assumed at each approach to these three intersections, listed in **Table 1**, in the *Engineering and Traffic Study*.

Table 1 – Left Turn Phase Ranked Intersections

Rank	Study Intersection	Existing Traffic Control	Recommended Improvement
Left Turn Phase Ranked List			
1	Bear Valley Parkway / Mary Lane	Signalized	Install left turn phasing on east and west approach
2	Metcalf Street / Mission Avenue	Signalized	Install left turn phasing on all approaches
3	Quince Street / Washington Avenue	Signalized	Install left turn phasing on all approaches

PPLT signal phasing offers a few advantages when compared to protected-only left-turn operations. The main benefit is that the average delay per left-turning vehicle is typically reduced and the green time dedicated to the protected left turn phase is reduced. Disadvantages of PPLT signals include the potential for an increase in vehicle-vehicle and vehicle-pedestrian conflicts and the limited ability to use lead-lag phase sequences.

This assessment first determined the feasibility of PPLT phasing at each of the three intersections based on criteria such as accident data, roadway conditions and vehicle-pedestrian conflicts. Michael Baker then analyzed the intersections in Synchro 10 to determine the delay and level of service (LOS) associated with PPLT phasing compared to protected-only left-turn phasing.

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Protected/Permissive Left Turn Phasing Criteria

The *Left Turn Phasing Memorandum* dated February 6, 1992 prepared by the San Diego Regional Traffic Engineer Council (SANTEC) was used to determine the feasibility of PPLT phasing at the top 3 ranked intersections listed in Table 1. The SANTEC document suggests that PPLT phasing should be installed prior to a protected-only left-turn phase. However, the top 3 ranked intersections currently operate with either protected-only or permissive-only left-turn phasing. The purpose of this section is to determine if PPLT phasing is appropriate at any of the 3 locations.

According to SANTEC's Left-Turn Phase – Protected/Permissive Criteria (Section D), a PPLT phase should be considered when the following two conditions are met:

Condition A - Left-turn phase is warranted, and
Condition B - Protected-only left-turn phase criteria are not satisfied.

Condition A is met for the top 3 ranked intersections for all approaches to the intersections per the *Engineering and Traffic Study*.

Condition B is based on "Section C" of the SANTEC *Left Turn Phasing Memorandum* which includes the following criteria:

1.) *The accident warrant was satisfied, and the protected/permissive operation did not reduce accidents on the approach during the initial six months to 12 months of operation.*
THIS CRITERIA DOES NOT APPLY TO THE TOP 3 INTERSECTIONS SINCE AN ACCIDENT WARRANT WAS NOT CONDUCTED AND THERE IS NO PROTECTED/PERMISSIVE OPERATION TO SURVEY THE POTENTIAL REDUCTION IN ACCIDENTS.

2.) *There were four or more accidents involving a left turning vehicle from the approach in a one-year period and the approach has a protected/permissive left-turn phase operation.*
THIS CRITERIA APPLIES AND USED IN THIS EVALUATION.

3.) *There are two or more left-turn lanes on the approach.*
THIS CRITERIA DOES NOT APPLY SINCE ALL 3 INTERSECTIONS ONLY HAVE 1 LEFT-TURN LANE.

4.) *Inadequate sight distance caused by curvature in roadway or similar geometric restrictions.*
THIS CRITERIA APPLIES AND USED IN THIS EVALUATION.

5.) *A leading left-turn movement opposite a lagging left-turn phase operation.*
THIS CRITERIA DOES NOT APPLY TO THE TOP 3 INTERSECTIONS SINCE THERE IS CURRENTLY NO LEAD-LAG LEFT TURN PHASE OPERATION.

Only criteria 2 and 4 were used to determine if protected-only left-turn phasing is satisfied at the top 3 intersections. Criteria 2 is based on the number of left-turn related accidents in a one-year period and if the approach has PPLT phasing. In this analysis, the PPLT phasing portion of Criteria 2 was not considered since left-turn related accidents are most likely occurring during the "permissive" portion of the PPLT phase which is no different than what happens today with the current phasing. Therefore, only the accident portion of criteria 2 was used.

This assessment assumes that Condition B is met if 1 of the 5 criteria is satisfied. **Table 2** below summarizes the results of the two criteria relevant at all three locations to determine if Condition B is met.

Table 2 – SANTEC Protected Only Left-Turn Phase – Condition B Criteria

Protected Only Left-Turn Phase Criteria (Condition B)	Condition Met? (Yes/No)	Protected Only Left-Turn Phase Criteria Satisfied or Not Satisfied?	Consider PPLT Phasing?
BEAR VALLEY PARKWAY / MARY LANE			
NORTH-SOUTH APPROACH			
Four or more accidents involving a left-turning vehicle from the approach in a one-year period?	No	Not Satisfied	**Yes**
Inadequate sight distance caused by curvature in roadway or similar geometric restrictions?	No		
EAST-WEST APPROACH			
Four or more accidents involving a left-turning vehicle from the approach in a one-year period?	No	Not Satisfied	**Yes**
Inadequate sight distance caused by curvature in roadway or similar geometric restrictions?	No		
METCALF STREET / MISSION AVENUE			
NORTH-SOUTH APPROACH			
Four or more accidents involving a left-turning vehicle from the approach in a one-year period?	No	Not Satisfied	**Yes**
Inadequate sight distance caused by curvature in roadway or similar geometric restrictions?	No		
EAST-WEST APPROACH			
Four or more accidents involving a left-turning vehicle from the approach in a one-year period?	No	Not Satisfied	**Yes**
Inadequate sight distance caused by curvature in roadway or similar geometric restrictions?	No		
QUINCE STREET / WASHINGTON AVENUE			
NORTH-SOUTH APPROACH			
Four or more accidents involving a left-turning vehicle from the approach in a one-year period?	YES	Satisfied	No
Inadequate sight distance caused by curvature in roadway or similar geometric restrictions?	No		
EAST-WEST APPROACH			
Four or more accidents involving a left-turning vehicle from the approach in a one-year period?	YES	Satisfied	No
Inadequate sight distance caused by curvature in roadway or similar geometric restrictions?	No		

Note: SANTEC Left-Turn Phase – Protected-Only Criteria #2 and 4.

As shown in **Table 2**, the intersections of Bear Valley Parkway/Mary Lane and Metcalf Street/Mission Avenue did not satisfy the protected-only left-turn criteria. Therefore, Conditions A & B are met for these two locations. As such, PPLT phasing were considered at both of these locations.

The intersection of Quince Street/Washington Avenue satisfies only Condition A and not Condition B. Therefore, PPLT phasing should not be considered at this location.

Pedestrian and Bicycle Conflicts With Left Turning Vehicles

In addition to evaluating the SANTEC criteria for PPLT phasing, pedestrian and bicycle activity was also evaluated and considered in the final assessment of PPLT phasing at all three locations. The permissive phase increases the potential for vehicle-pedestrian conflicts and vehicle-bicycle conflicts.

Table 3 summarizes the pedestrian and bicycle activity compared to vehicles turning left creating potential conflicts at each location.

Table 3 – Pedestrian & Bicycle Activity at Ranked Intersections

Study Intersection		Vehicle Left Turn Volumes		Pedestrian Peak Hour Volumes		Bicycle Peak Hour Volumes	
North-South	East-West	North-South	East-West	North-South	East-West	North-South	East-West
Bear Valley Pkwy	Mary Lane	AM = 87 PM = 70	AM = 245 PM = 141	AM = 459 PM = 274	AM = 459 PM = 274	No Data Available	No Data Available
Metcalf Street	Mission Ave	AM = 238 PM = 176	AM = 196 PM = 72	AM = 5 PM = 4	AM = 1 PM = 4	AM = 1 PM = 6	AM = 5 PM = 3
Quince Street	Washington Ave	AM = 135 PM = 157	AM = 100 PM = 81	AM = 26 PM = 17	AM = 15 PM = 32	AM = 1 PM = 6	AM = 12 PM = 11

At Bear Valley Parkway/Mary Lane, there is a high volume of pedestrian traffic, primarily students at San Pasqual High School located on the southeast corner of the intersection. There are 459 total pedestrians in the AM peak hour and 274 total pedestrians in the PM peak hour crossing at this intersection. In the morning, large groups of students (50 to 60) exit the Breeze Rapid bus that stops along the west side of Bear Valley Parkway north of Mary Lane. The students then walk south crossing Mary Lane towards Fire Station #4 and then cross Bear Valley Parkway to enter the school campus. With the high school located adjacent to the intersection, the potential for vehicle-pedestrian conflicts is considered high. Therefore, PPLT phasing at Bear Valley Parkway and Mary Lane is not recommended due to the potential conflicts between vehicles and pedestrians which are primarily high school students.

At Quince Street/Washington Avenue, the potential for vehicle-pedestrian conflicts is high. For example, in the AM peak hour, there are 135 vehicles turning left conflicting with 26 pedestrians. This translates to 1 pedestrian for every 5 vehicles turning left. Due to the high volume of pedestrians and bicyclists at this intersection and Condition B is satisfied, PPLT phasing is not recommended at the intersection of Quince Street/Washington Avenue.

The only intersection where PPLT is recommended is at Metcalf Street/Mission Avenue. Conditions A and B are met based on the SANTEC criteria for determining the feasibility of PPLT phasing. In addition, the vehicle-pedestrian and vehicle-bicycle conflicts at this intersection are considered low (e.g. 1 pedestrian for every 48 vehicles turning left during the AM peak hour).

Protected/Permissive Left Turn Phasing Analysis

PPLT phasing was analyzed in Synchro at Metcalf Street/Mission Avenue. **Table 4** shows the results of the PPLT phasing analysis and compares the PPLT phasing to the protected-only phasing. As shown in

the table, the delays increase from the existing condition when adding the protected-only left-turn phase operation.

Table 4 – Intersection Analysis Comparison

Study Intersection		Existing Conditions		Existing With Adding Protected-Only Left Turn Phasing		Existing With Adding PPLT Phasing	
North-South	East-West	AM	PM	AM	PM	AM	PM
		Delay - LOS	Delay - LOS	Delay - LOS	Delay – LOS	Delay – LOS	Delay - LOS
Metcalf Street	Mission Avenue	31.0 – C	22.3 – C	31.4 – C	34.1 – C	31.1 - C	33.4 - C

As shown in Table 4, the PPLT phasing reduces the overall delay at the intersection compared to the Existing Condition With Protected-Only Left-Turn Phasing. During the AM peak hour, the delay is reduced by 0.3 seconds (31.4 – 31.1) and by 0.7 seconds (34.1 – 33.4) in the PM peak hour.

Conclusion

The top 3 ranked intersections were evaluated to determine the feasibility of PPLT phasing. Below is a brief summary of each intersection related to the feasibility of PPLT.

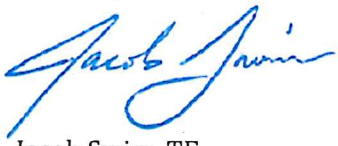
Bear Valley Parkway/Mary Lane – Using the SANTEC criteria, PPLT phasing was initially considered since Conditions A and B were met. However, San Pasqual High School is located adjacent to this intersection and the potential for vehicle-pedestrian conflicts is high. **Therefore, PPLT Phasing should NOT be considered at any approach.**

Metcalf Street/Mission Avenue – Using the SANTEC criteria, PPLT phasing was considered since Conditions A and B were met. The potential vehicle-pedestrian and vehicle-bicycle conflicts at this location are low. **Therefore, PPLT phasing should be considered at all approaches.**

Quince Street/Washington Avenue – Using the SANTEC criteria, PPLT phasing was not considered since Condition A was met, but Condition B was not met. In addition, vehicle-pedestrian and vehicle-bicycle conflicts were relatively high at Quince Street/Washington Avenue. **Therefore, PPLT phasing should NOT be considered at any approach.**

If you have any questions pertaining to the analysis results summarized in this memo, please call me at (858) 810-1444.

Sincerely,



Jacob Swim, TE
Transportation Planner
Michael Baker International

Michael Baker
INTERNATIONAL

Attachment A
SANTEC Left Turn Phasing Guidelines

MEMORANDUM

TO: SANTEC Members

FROM: Left Turn Phasing Committee

DATE: February 6, 1992

SUBJECT: Left Turn Phasing

The San Diego Regional Traffic Engineer Council (SANTEC) formed a committee to investigate the feasibility of Permitted/Protected Left Turn (PPLT) phasing and, if appropriate, to develop uniform guidelines and standards for San Diego County. Members of the committee conducted the following tasks:

1. Reviewed several reports from throughout the country, evaluating the effectiveness of Permitted/Protected Left Turn phasing.

2. Conducted field review of the intersection of Grand/Las Posas in San Marcos to observe the operation of the existing Permitted/Protected Left Turn phasing at the intersection.

3. Held several meetings and discussions between committee members to discuss the issues and to formulate uniform guidelines and standards for the County.

Following is a summary of the committee's findings and recommendations for the implementation of PPLT in San Diego County.

A. RESEARCH SUMMARY:

1. While PPLT phasing has been used successfully throughout the United States, only San Marcos (one signal), San Diego (two signals), and Chula Vista (two signals) have used this type of operation in San Diego County.

2. Most reports evaluating the effectiveness of left turn phasing indicate that significant vehicle delay savings can be realized with PPLT phasing compared to fully protected left turn phasing.

3. Left turn accident rates with PPLT phasing are comparable to those experienced under normal two-phase operation.

4. A driver education program as well as media exposure are needed in order to inform drivers of the operation of PPLT phasing prior to implementation in San Diego County.

5. Significant public acceptance and support was encountered when PPLT phasing was introduced in new areas.

6. Cluster signal heads on mast arms appear to be more advantageous than vertical heads.

7. Advisory signs appear unnecessary except in cases that show unusual motorist confusion or hazard.

8. The implementation of lead versus lag PPLT phasing should be reviewed on a case by case basis with consideration given to accidents, volumes, and progression. The provision of lag PPLT (permitted/protected) appears to be more advantageous.

B. LEFT-TURN PHASE GUIDELINES:

Since the use of separate phases for left turns will generally increase the overall delay at signalized intersections, the committee believes that it should only be used when alternate means cannot be utilized and when the conditions listed in this section exist. The committee also recommends that PPLT phasing should be used when left turn phasing is warranted and the protected-only left turn phase criteria (see Section C) is not satisfied. This approach is consistent with the current regional emphasis on improving air quality by reducing delay and increasing the efficiency of the traffic operation at signalized intersections.

With that in mind, prior to consideration of left-turn phasing, the following remedial actions or geometric changes should be investigated and implemented where practical:

1. Changes in pavement markings to improve visibility of approaching traffic from the left turn approach.

2. Adding a left-turn lane on the approach if none exists.

3. Restricting left turns from the approach if no left turn lane exists and alternate routes are available to the left turning vehicles.

For consideration of a left-turn phase on any one approach, two or more of the following six conditions (volume, right turns, U-turns, delay, accident, or speed) should be satisfied prior to the installation of a left-turn phase on said approach (each left turn movement at an intersection should be reviewed separately):

I — Volumes

This left-turn phase condition is satisfied when the following criteria are met:

a) left turning vehicles exceed 150 vehicles per hour on the approach for more than two hours of an average day;

and b) the product of left turning vehicles per hour on the approach and conflicting through vehicles per hour on the opposite approach exceeds 125,000 on a six-lane roadway, 100,000 on a four-lane roadway, or 50,000 on a two-lane roadway for more than two hours of an average day;

and c) the left turn volume on the approach exceeds two (2) vehicles per cycle still waiting at the end of the green phase during the peak hour.

II — Right-Turns

This left-turn phase condition is satisfied when the following criteria are met:

a) right-turn volume on the conflicting approach exceeds 350 vehicles per hour in the peak hour;

and b) left-turn volume on the approach exceeds 150 vehicles per hour in the peak hour.

III — U-Turns

This left-turn phase condition is satisfied when the following criteria are met:

a) U-turn volume on the approach exceeds 50 vehicles per hour in the peak hour;

and b) U-turn volume on the approach is greater than 30 percent of the traffic movement from that lane.

IV — Delay

This left-turn phase condition is satisfied when the following criteria are met:

a) left turn delay of 2.0 vehicle-hours or more occurs on the approach in a peak hour on a critical approach;

and b) average left turning vehicle delay on the approach exceeds 35 seconds in the peak hour;

and c) left turn volume on the approach exceeds two vehicles per cycle during the peak hour.

V — Accident

This left-turn phase condition is satisfied when the following criteria are met:

a) There were four or more left turn accidents involving left turning vehicles from the approach in a one-year period:

and b) There were six or more left-turn accidents involving left turning vehicles from the approach in a two-year period.

VI — Speed

This left-turn phase condition is satisfied when the following criterion is met:

a) The 85th percentile speed of opposing vehicles to the approach exceeds 45 mph on a four-lane roadway or 40 mph on a six-lane roadway.

C. LEFT-TURN PHASE — PROTECTED-ONLY CRITERIA:

If a left-turn phase is warranted, the following criteria should be considered to evaluate when a protected-only left-turn phase operation should be used:

1. The accident warrant was satisfied and the protected/permissive operation did not reduce accidents on the approach during the initial six months to 12 months of operation.

2. There were four or more accidents involving a left turning vehicle from the approach in a one-year period and the approach has a protected/permissive left-turn phase operation.

3. There are two or more left-turn lanes on the approach.

4. Inadequate sight distance caused by curvature in roadway or similar geometric restrictions.

5. A leading left-turn movement opposite a lagging left-turn phase operation.

D. LEFT-TURN PHASE — PROTECTED/PERMISSIVE CRITERIA:

When a left turn phase is warranted and the protected-only left-turn phase criteria is not satisfied, a Protected/Permissive Left Turn phase should be installed.

E. REMOVAL OF LEFT TURN PHASE:

When an existing left-turn phase does not satisfy two or more of the above left-turn phase warrants, it should be removed from operation.

When a protected-only left-turn phase is found to be unnecessary using the above protected-only criteria, it should be changed to a Protected/Permissive Left Turn operation.

F. TRAFFIC OPERATION GUIDELINES:

1. If the Protected/Permissive Left Turn phase volume is less than 50 vehicles per hour for any 12 hours of an average day, a time delay may be applied to the detection from the left-turn lane. The time delay should be equal to the longest cycle length used at the location of the left turn phase based upon a detection length of not less than 40 feet. When the detection length is less than 40 feet, no time delay should be applied to the detection.

2. Five-section cluster signal heads should be utilized on mast arms.

3. The location of the cluster head should be aligned with the 8" white line delineating the left turn pocket.

G. IMPLEMENTATION PLAN:

The committee recommends the following:

1. Adopt the left turn phasing guidelines listed previously for use in San Diego County.

2. Discuss with SANDAG the potential of including the provision of Protected/Permitted left turn phasing as a Transportation Control Measure (TCM).

3. Identify funding sources for implementation of Protected/Permitted Left Turn Phasing.

4. Initiate a demonstration project to include concurrent installation of Protected/Permitted Left Turn phasing in each city and the County.

5. In conjunction with item four above, conduct a public relation campaign to educate drivers on the PPLT operation.

6. Contact the Department of Motor Vehicles and request that training on the PPLT phasing operation be included in their manual.

GF:js

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	10	356	56	186	855	10	224	52	44	14	113	85
Future Volume (veh/h)	10	356	56	186	855	10	224	52	44	14	113	85
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.99	1.00		0.97	1.00		0.99	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	11	400	63	221	1018	12	320	74	63	17	140	105
Peak Hour Factor	0.89	0.89	0.89	0.84	0.84	0.84	0.70	0.70	0.70	0.81	0.81	0.81
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	137	610	95	381	1095	13	519	386	329	589	363	272
Arrive On Green	0.01	0.20	0.20	0.12	0.30	0.30	0.07	0.42	0.42	0.02	0.37	0.37
Sat Flow, veh/h	1781	3075	480	1781	3596	42	1781	927	789	1781	992	744
Grp Volume(v), veh/h	11	230	233	221	503	527	320	0	137	17	0	245
Grp Sat Flow(s),veh/h/ln	1781	1777	1778	1781	1777	1861	1781	0	1715	1781	0	1736
Q Serve(g_s), s	0.4	8.9	9.1	7.0	20.6	20.6	5.3	0.0	3.8	0.4	0.0	7.8
Cycle Q Clear(g_c), s	0.4	8.9	9.1	7.0	20.6	20.6	5.3	0.0	3.8	0.4	0.0	7.8
Prop In Lane	1.00		0.27	1.00		0.02	1.00		0.46	1.00		0.43
Lane Grp Cap(c), veh/h	137	353	353	381	541	567	519	0	715	589	0	635
V/C Ratio(X)	0.08	0.65	0.66	0.58	0.93	0.93	0.62	0.00	0.19	0.03	0.00	0.39
Avail Cap(c_a), veh/h	238	415	415	424	545	571	519	0	715	680	0	635
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	0.72	0.72	0.72	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	24.5	27.7	27.7	19.4	25.3	25.3	17.5	0.0	13.9	14.3	0.0	17.6
Incr Delay (d2), s/veh	0.2	2.4	2.6	1.2	17.7	17.1	2.2	0.0	0.6	0.0	0.0	1.8
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	0.2	3.8	3.8	2.7	10.5	10.9	2.2	0.0	1.5	0.2	0.0	3.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	24.8	30.0	30.3	20.6	43.0	42.4	19.7	0.0	14.5	14.3	0.0	19.3
LnGrp LOS	C	C	C	C	D	D	B	A	B	B	A	B
Approach Vol, veh/h		474			1251			457			262	
Approach Delay, s/veh		30.0			38.8			18.1			19.0	
Approach LOS		C			D			B			B	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	13.2	19.9	9.5	32.4	5.2	27.8	5.7	36.2
Change Period (Y+Rc), s	* 4.2	5.0	* 4.2	5.0	* 4.2	5.0	* 4.2	5.0
Max Green Setting (Gmax), s	* 11	17.5	* 5.3	23.0	* 5.3	23.0	* 5.3	23.0
Max Q Clear Time (g_c+I1), s	9.0	11.1	7.3	9.8	2.4	22.6	2.4	5.8
Green Ext Time (p_c), s	0.1	1.1	0.0	0.9	0.0	0.2	0.0	0.5

Intersection Summary	
HCM 6th Ctrl Delay	31.1
HCM 6th LOS	C

Notes

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

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

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	28	971	117	44	474	15	160	42	69	16	37	38
Future Volume (veh/h)	28	971	117	44	474	15	160	42	69	16	37	38
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		0.97	1.00		0.98	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	31	1067	129	50	539	17	225	59	97	21	47	49
Peak Hour Factor	0.91	0.91	0.91	0.88	0.88	0.88	0.71	0.71	0.71	0.78	0.78	0.78
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	352	1145	138	175	1301	41	571	230	379	496	268	279
Arrive On Green	0.03	0.35	0.35	0.04	0.36	0.36	0.07	0.37	0.37	0.02	0.32	0.32
Sat Flow, veh/h	1781	3263	394	1781	3603	114	1781	630	1035	1781	837	873
Grp Volume(v), veh/h	31	611	585	50	279	277	225	0	156	21	0	96
Grp Sat Flow(s),veh/h/ln	1781	1870	1787	1781	1870	1846	1781	0	1664	1781	0	1709
Q Serve(g_s), s	0.9	26.5	26.5	1.5	9.4	9.5	5.8	0.0	5.5	0.7	0.0	3.4
Cycle Q Clear(g_c), s	0.9	26.5	26.5	1.5	9.4	9.5	5.8	0.0	5.5	0.7	0.0	3.4
Prop In Lane	1.00		0.22	1.00		0.06	1.00		0.62	1.00		0.51
Lane Grp Cap(c), veh/h	352	656	627	175	675	667	571	0	609	496	0	547
V/C Ratio(X)	0.09	0.93	0.93	0.29	0.41	0.41	0.39	0.00	0.26	0.04	0.00	0.18
Avail Cap(c_a), veh/h	418	668	638	216	675	667	571	0	609	567	0	547
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	0.75	0.75	0.75	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	16.8	26.3	26.3	20.7	20.2	20.2	17.7	0.0	18.6	18.3	0.0	20.6
Incr Delay (d2), s/veh	0.1	19.5	20.6	0.7	0.2	0.2	0.4	0.0	1.0	0.0	0.0	0.7
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	0.4	14.3	13.9	0.6	3.8	3.8	2.9	0.0	2.2	0.3	0.0	1.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	16.9	45.8	46.9	21.3	20.4	20.4	18.1	0.0	19.6	18.4	0.0	21.3
LnGrp LOS	B	D	D	C	C	C	B	A	B	B	A	C
Approach Vol, veh/h		1227			606			381			117	
Approach Delay, s/veh		45.6			20.5			18.8			20.7	
Approach LOS		D			C			B			C	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	7.6	34.5	10.0	31.9	6.8	35.3	6.1	35.8
Change Period (Y+Rc), s	* 4.2	5.0	* 4.2	5.0	* 4.2	5.0	* 4.2	5.0
Max Green Setting (Gmax), s	* 5.4	30.0	* 5.8	22.4	* 5.7	29.7	* 5.3	24.9
Max Q Clear Time (g_c+I1), s	3.5	28.5	7.8	5.4	2.9	11.5	2.7	7.5
Green Ext Time (p_c), s	0.0	0.9	0.0	0.3	0.0	2.3	0.0	0.6

Intersection Summary	
HCM 6th Ctrl Delay	33.4
HCM 6th LOS	C

Notes

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

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

ESCONDIDO
City of Choice

CITY OF ESCONDIDO

TRANSPORTATION and
COMMUNITY SAFETY COMMISSION

Commission Report of January 9th, 2020 **Item No.: F2**

Location: Citywide

Initiated By: City Staff

Subject: Annual Report on Audible Pedestrian Signals (APS) Citywide

Background:

The City of Escondido Policy on the use of audible (accessible) pedestrian signals was adopted and made part of Traffic Engineering Policies in September, 2005. Initiated by the City's ADA Committee, the policy allows qualified individuals or groups to make a request for an audible signal, and requires the Committee to decide whether the request is appropriate, and whether the ADA Budget will allow for the audible signal to be installed. In January, 2019 this policy was revised to include guidelines for prioritization of these requests.

In 2019, City of Escondido received requests for Accessible Pedestrian Signals (APS) at six signalized intersections within the City. Based on the guidelines, intersections were scored using the Prioritization Tool. The preliminary score was calculated and the relative priority of the requested intersection as compared to other requested intersections was determined. The Request List was updated quarterly and used to request funding for design and construction of APS.

Prioritization, funding and installations:

Installations were funded as part of a construction or maintenance project, with ADA Transition Plan Funding or with TCSC/TMPL Funding.

In 2018, APS was installed in 4 intersections

- Centre City Pkwy & W Mission Ave
- N Escondido Blvd & W Lincoln Ave
- N Broadway & W Lincoln Ave
- N Broadway & Sheridan Ave
- E Valley Pkwy & Lake Wohlford Rd

In 2019, The City of Escondido's ADA Transition Funding allowed adding APS at two (2) intersections. Based on adopted guidelines, the highest ranking locations were South Escondido Blvd at 15th Avenue and El Norte Parkway at Morning View Dr. In addition, the intersection of Centre City Parkway at El Norte Parkway was selected to be funded with 2019/20 TMPL funding.

New HSIP signal projects included installation of APS at Valley Parkway at Date St, and at El Norte Parkway at Fig Street. In addition, two new signals were added with Missing Link project that include APS.

2019 installations (8):

- South Escondido Blvd & 15th Ave (ADA funding)
- El Norte Pkwy & Morning View Dr (ADA funding)
- Centre City Pkwy &El Norte Pkwy (TMPL funding)
- Valley Pkwy & Date St (new HSIP signal)
- El Norte Pkwy & Fig St (new HSIP signal)
- 17th St & Encino Dr (new signal)
- N Broadway & Grape Day Park Pedestrian crossing (Missing Link project)
- N Broadway & Woodward Ave (Missing Link project)

Requests for Priority list, 2020 funding and future installations

In 2020, the City of Escondido's ADA Transition Funding will allow adding APS at one (1) intersection. Potential new APS requests will be scored using the Prioritization Tool and the relative priority of the requested intersection as compared to previously requested intersections will be determined. This updated Priority List will be used to request funding for design and construction of APS.

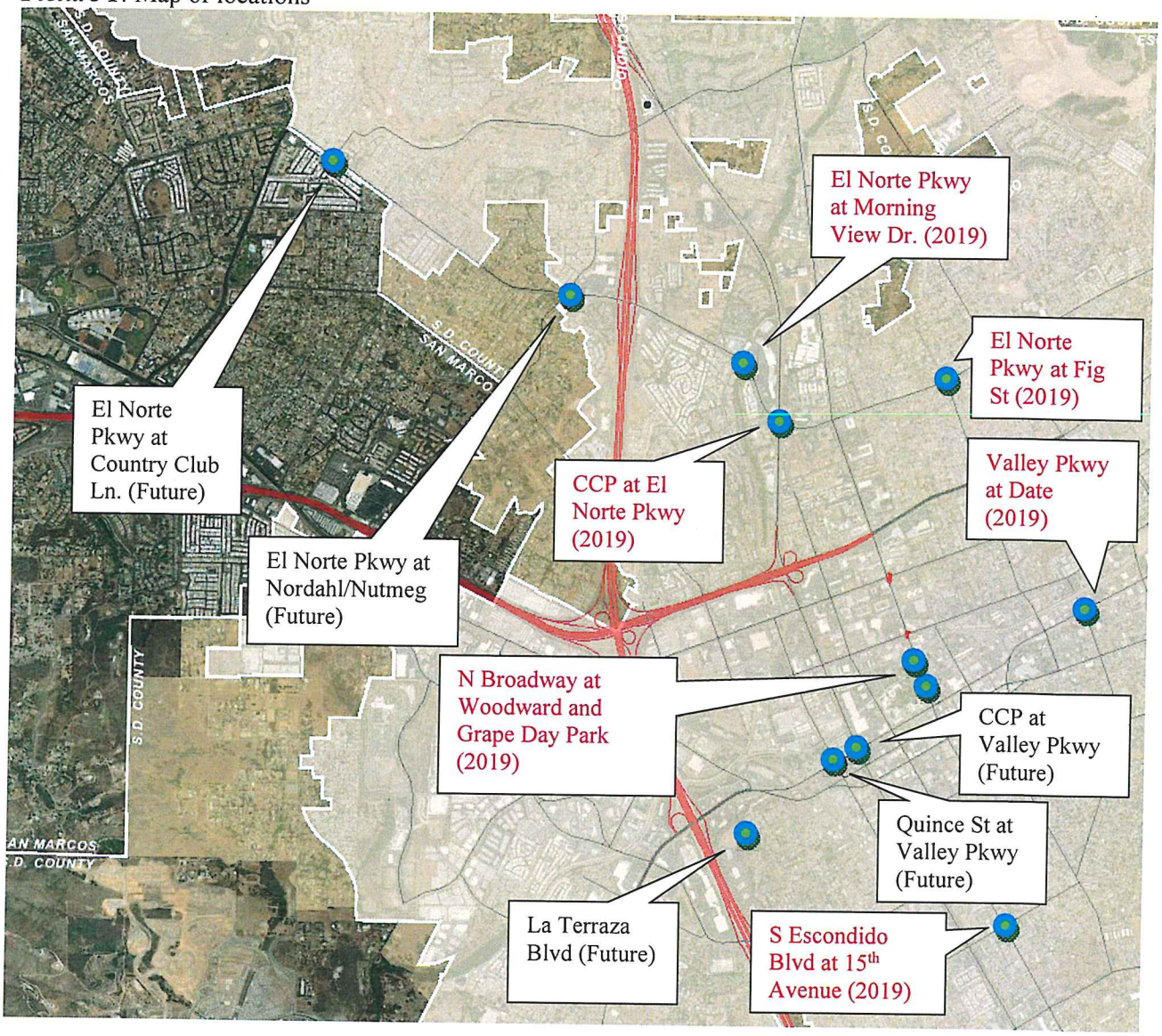
Currently there are three (3) remaining requests for previously evaluated and scored locations (Staff Report TCSC 04/2019):

- Centre City Pkwy & Valley Pkwy (1 request) was evaluated to score a total of 46 points. At this location developer has been conditioned to make improvements which include the addition of APS. Estimated construction in 2021.
- El Norte Pkwy & Country Club Ln (2 requests) was evaluated to score the total of 45 points. At this location, signal modification by developer will include installation of APS.
- El Norte Pkwy & Nordahl Rd/North Nutmeg St (1 request) was evaluated to score the total of 42 points. At this location, signal modification by developer will include installation of APS.

The status of the above projects will be evaluated in June 2020, to determine if they should be included in the FY 20/21 TMPL list or for ADA transition plan funding.

Future installations are planned for La Terraza Blvd at Spring Hill Suites (new signal 2020), Quince St at Valley Pkwy (signal modification project) and El Norte Pkwy at Citrus Ave (signal modification project).

Picture 1: Map of locations



Necessary Council Action:

None.

Respectfully submitted,

Prepared by:

Ali M. Shahzad, PE (Traffic)/ Virpi Kuukka-Ruotsalainen
Associate Engineer/Traffic Division

Reviewed by:

Owen Tunnell, PE (Civil)
Assistant City Engineer

Approved by:

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Director of Engineering Services/City Engineer

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CITY OF ESCONDIDO

TRANSPORTATION and
COMMUNITY SAFETY COMMISSION

Commission Report of January 9th, 2020 **Item No.: F3**

Location: Citywide

Initiated By: City Staff

Subject: Traffic Signal and HAWK Warrant and Crosswalk Treatment for Creek Trail Crossings at Rose Street and Midway Drive

Background

For the past several years, the City has actively pursued the extension and improvement of the Escondido Creek Trail. Earlier this year, the Missing Link project was completed, installing a Class IV Cycle Track, and filling the gap in the Creek Trail between the Escondido Transit Center and Broadway. The City also awarded a contract in June 2019 to construct a signalized pedestrian crossing at the El Norte Parkway Creek Trail Crossing.

Escondido Creek Trail Bike Path Improvements – project focuses on 2.5 miles of the Escondido Creek Trail between Juniper Street and Citrus Avenue. In the Escondido Creek Trail Master Plan (2012), pedestrian crosswalks were planned for these locations. Since the acceptance of the Creek Trail Master Plan, the City has adopted a Traffic Management Toolbox as well as a revised City of Escondido Crosswalk Policy (Traffic Policy #4). These new standards allow for innovative traffic calming and traffic safety measures in addition to those discussed in the Master Plan, including pedestrian activated rapid flashing beacons, high visibility crosswalks, pedestrian refuges, and pedestrian signals.

The City applied for an Active Transportation Program (ATP) Grant for the Creek Trail Bike Path Crossing Improvement Project and was awarded in the amount of $1,632,000 for design and construction of the project in 2018. This Creek Trail Crossing Project will provide appropriate pedestrian crosswalk treatments at seven creek trail crossings, at Juniper Street, Hickory Street, Fig Street, Harding Street, Rose Street, Midway Drive, and Citrus Avenue. Figure 1 shows the seven crossing locations included in the project. The pedestrian crosswalk treatments according to City's Crosswalk Policy would include RRFB, pedestrian signals, lighting, signage, striping, and pedestrian ramps as necessary. In addition, missing segments of sidewalk will be constructed at Midway Street and Citrus Avenue crossings. The Project will result in a fully connected trail extending through Escondido's urban core from the Transit Center to the eastern City limits nearly five (5) miles away. Further, the Escondido Creek Trail connects to the Inland Rail Trail, which SANDAG expects to ultimately connect Escondido with the beaches of Oceanside that are 21-miles away.

A Request for Proposals (RFP) for the design of the project was published and proposals were received in July 2019. Consultant has been selected and is in contract with the City to performed the design of the project.

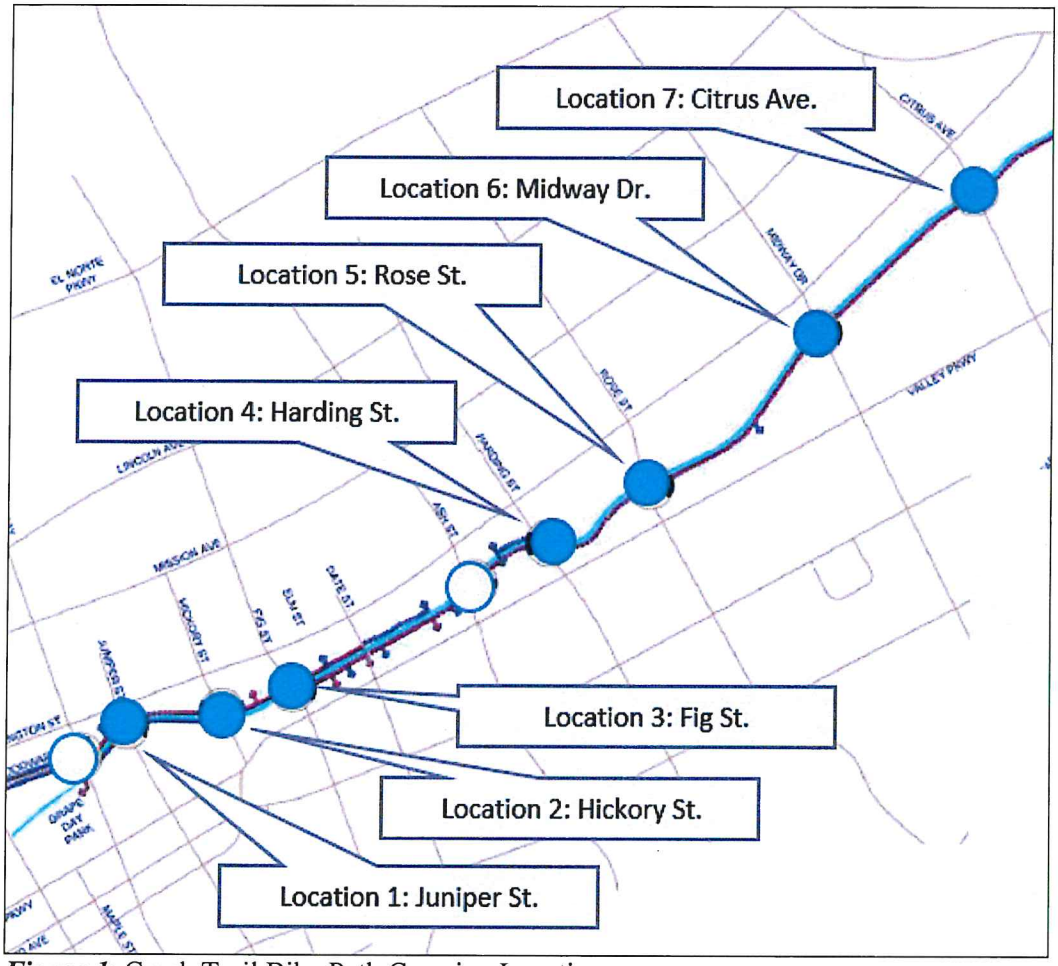


Figure 1: Creek Trail Bike Path Crossing Locations.

City of Escondido Crosswalk Policy

The updated City of Escondido Crosswalk Policy (**Attachment 1**) was approved by the TCSC on January 14, 2016, and revisions to the Policy were approved by TCSC at its July 13, 2017 meeting. The Policy provides guidelines on mid-block crosswalk warrants and descriptions on evaluation of the appropriate treatments for crosswalks based on roadway characteristics such as cross section, Average Daily Traffic (ADT), and speed limits. City of Escondido Crosswalk Policy Treatment Matrix is shown in **Table 1**.

Table 1: City of Escondido Crosswalk Policy Treatment Matrix

ADT / Cross Section	<1500	1500 - 5000	5000-12000	>12000
Two-lane roads (without TWLTL)	Std.	Std. + RRFB	Std. + RRFB + one from (A)	(D)
Two-lane roads (with TWLTL)	Std. one measure from (B)	For SL< 35 Std. + RRFB For SL≥ 35 Std. + RRFB + one measure from (B)	Std. + RRFB + one measure from (B)	(D)
Four Lanes or more	N/A	Std. + RRFB + one measure from (C)	For SL < 35 Std. + RRFB + one measure from (C) For SL ≥35 Measure (D)	Signal or HAWK

SL: *Speed Limit of the roadway*
RRFB: *Rectangular Rapid Flashing Beacons, or other approved flashing beacon.*
Std.*: Advanced yield line with Yield Here to Pedestrians (R1-5) sign, Pedestrian Crossing Warning Sign (W11-2) with diagonal arrow (W16-7p) signs, High Visibility Crosswalk*

Measures:
A = Raised Crosswalk, Traffic Calming Treatment, or Speed Radar Feedback Signs,
B = Raised Crosswalk, Speed Radar Feedback Signs or Pedestrian Refuge Islands
C = Road Diet, Raised Crosswalk, Speed Radar Feedback Signs, or Pedestrian Refuge Islands
D = Traffic Signal or Hawk if CAMUTCD warrants are met, or Horizontal Deflection Calming Treatment with RRFB. Calming Treatment can include Pedestrian Refuge and Bulb-outs, Road Diet, Roundabouts

For each of the seven Creek Trail crossing locations, traffic data was compiled for determining appropriate crossing treatments per City's Crosswalk Policy. The Average Daily Traffic (ADT) volumes for both vehicles and pedestrians at each crossing location were collected for four consecutive days (Thursday to Sunday). The average ADT of the four days' data was used for the crosswalk treatment evaluations. **Table 2** summarizes the traffic data collected and roadway information for the seven crossing locations. This data was then applied to the Crosswalk Policy Treatment Matrix to identify the appropriate level of crosswalk enhancement recommended by the Crosswalk Policy. **Table 3** presents the required treatments for the seven crossing locations.

Per City's Crosswalk Policy, standard crosswalk striping and signage enhancements would be required at all locations. In addition, Juniper Street and Hickory Street would require RRFB. Fig Street would require a RRFB plus one additional treatment from measure (A); Citrus Avenue and Harding Street would require a RRFB plus one additional treatment from measure (B). At Rose Street and Midway Drive, measure (D) can consist of a Traffic Signal, Hawk or Horizontal Deflection Calming Treatment. The Horizontal Calming Treatments may include Pedestrian Refuge and Bulb-outs, Road Diet or Roundabouts.

Table 2: Creek Trail Bike Path Crossings Data Summary

Bikeway Crossing Data						
Crossing	**Average Daily Traffic**	**Travel Lanes**	**Pedestrian ADT**	**Pedestrian Peak Hour**	**Distance to next signal (feet)**	**Speed Limit**
Juniper	2,330	2 lanes	606	69	190'	25
Hickory	4,120	2 lanes	757	102	480'	30
Fig	7,340	2 lanes	858	108	400'	30
Harding	6,980	4 lanes* + TWLTL	566	59	420'	35
Rose	12,850	2 lanes	475	89	425'	30
Midway	13,850	2 lanes + TWLTL	360	58	400'	35
Citrus	9,510	2 lanes + TWLTL	323	79	580'	35

* Existing number of lanes. The project will reduce the number of lanes on Harding St from 4 lanes to 2 lanes as a Road Diet treatment.

Table 3: Creek Trail Crossing Treatments

ADT / Cross Section	<1500	1500 - 5000	5000-12000	>12000
Two-lane roads (without TWLTL)			**Fig St** Std. + RRFB + (A)	
Two-lane roads (with TWLTL)		**Juniper St** For SL< 35 Std. + RRFB **Hickory St** For SL< 35 Std. + RRFB	**Harding St** [1] Std. + RRFB + (B) **Citrus Ave** Std. + RRFB + (B)	**Rose St** (D) **Midway** (D)

SL: *Speed Limit of the roadway*
RRFB: *Rectangular Rapid Flashing Beacons, or other approved flashing beacon.*
Std.: *Advanced yield line with Yield Here to Pedestrians (R1-5) sign, Pedestrian Crossing Warning Sign (W11-2) with diagonal arrow (W16-7p) signs, High Visibility Crosswalk*

Measures:
A = Raised Crosswalk, Traffic Calming Treatment, or Speed Radar Feedback Signs,
B = Raised Crosswalk, Speed Radar Feedback Signs or Pedestrian Refuge Islands
C = Road Diet, Raised Crosswalk, Speed Radar Feedback Signs, or Pedestrian Refuge Islands
D = Traffic Signal or Hawk if CAMUTCD warrants are met, or Horizontal Deflection Calming Treatment with RRFB. Calming Treatment can include Pedestrian Refuge and Bulb-outs, Road Diet, Roundabouts

Notes:
(1) The project will reduce the number of lanes on Harding St between Washington St and Valley Pkwy from 4 lanes to 2 lanes as a Road Diet treatment. The roadway treatment shown is with the lane reduction on Harding St.

Traffic Signal and HAWK Warrant Studies

Based on the crosswalk treatment evaluation, the crossings at Rose Street and Midway Drive would require treatments from Measure (D), that requires a traffic signal or HAWK be installed if the associated CAMUTCD warrants are met. Otherwise horizontal deflection traffic calming treatment with RRFB should be provided.

CAMUTCD includes nine traffic signal warrants for evaluation based on factors related to existing intersection operation and safety including opposing traffic volumes, collision history, roadway network system, and pedestrian volumes. Unlike a typical intersection with different opposing vehicular movements, the one traffic movement conflict at a pedestrian crossing location is pedestrians crossing the street, therefore majority of the traffic signal warrants provided are not applicable. Traffic Signal Warrant 4 – Pedestrian Volume is the relevant warrant for pedestrian crossings, which considers vehicular and pedestrian volumes at the peak hour and for four different hours of the day, as well as the distance to the nearest traffic signal which provides crossing opportunity. This warrant was performed for Rose Street and Midway Drive crossings.

CAMUTCD presents guidelines on the evaluation of the need for a HAWK at a pedestrian crossing location. This evaluation considers the number of pedestrians crossing the street, the conflicting vehicular traffic on the street, and the length of the crossing. HAWK warrant study was also performed for the two crossings at Rose Street and Midway Drive.

The warrant analysis results for Rose Street and Midway Drive are presented below and the warrant analysis spreadsheets are presented in **Attachment 2**.

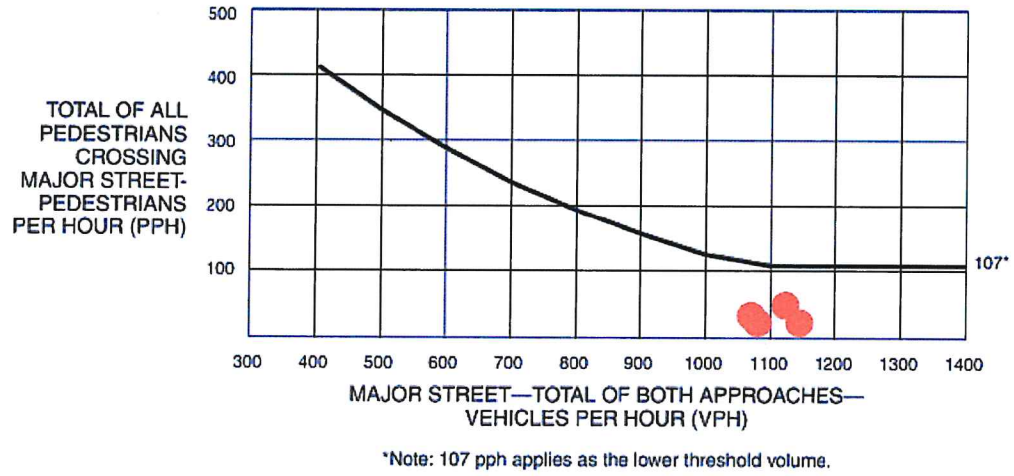
Rose Street Crossing

Rose Street is a two-lane Collector Rd with ADT of 12,800 vehicles and a speed limit of 30 mph. On-street parking is not allowed. Land use is both residential and commercial. Washington Park and Pool are located north of the crossing.

Traffic Signal Warrant 4: Pedestrian Volumes - NOT WARRANTED

This warrant would not be met because the plotted points of the vehicular and pedestrian volumes for the peak hour and for any four hours of the day all fell below the curves provided in CAMUTCD. See **Figure 2**.

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



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

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

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

Figure 2: Rose Street crossing does not meet traffic signal warrant.

HAWK Warrant - NOT WARRANTED

HAWK warrant analysis showed that while Rose Street carries enough vehicular traffic, the pedestrian volume threshold was not achieved to warrant a HAWK with the existing roadway width or crossing length of 38 feet. The plotted point based on vehicular and pedestrian volumes on the graph in **Figure 3** fell on the left side of the crossing length curve of 38 feet (L=38'). To meet the HAWK warrant with the existing roadway width, the plotted point would require to fall to the right of the L=38' curve, which means either a significant increase in pedestrian/bike volumes from latent demand (approximately 100 more pedestrians) or an increase in traffic volume is needed (approximately 20% more in traffic volume).

Because both the traffic signal and HAWK warrants would not be met at Rose Street, per City's Crosswalk Policy, horizontal deflection calming treatment with RRFB should be installed instead. It is recommended that standard signage and striping enhancement, RRFB, and a traffic calming treatment be installed at Rose

Street crossing. Traffic calming treatments, consistent with the City's Traffic Management Toolbox, would include median refuge island, mountable median that allows trucks to maneuver over, bulb-outs or curb extension at crossing, narrowing lanes by striping edge lines, and installing bike lanes. The appropriate treatment measure would be evaluated for Rose Street crossing during project design. It is also recommended that if widening of Rose Street should happen in the future, then a need for a HAWK or traffic signal will be re-evaluated.

Figure 4F-1. Guidelines for the Installation of Pedestrian Hybrid Beacons on Low-Speed Roadways

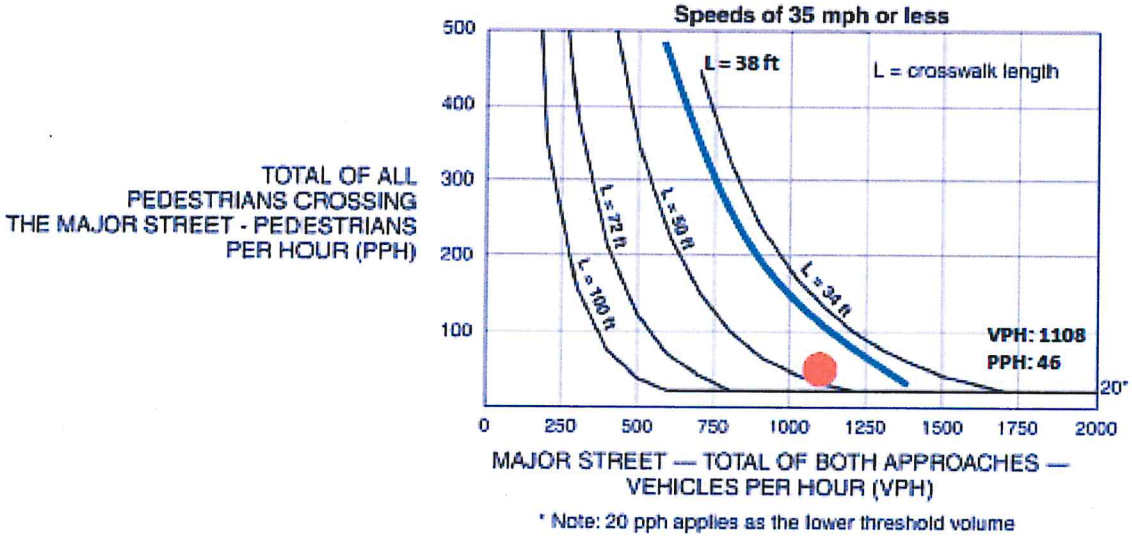


Figure 3: Rose Street crossing does not meet Hawk warrant.

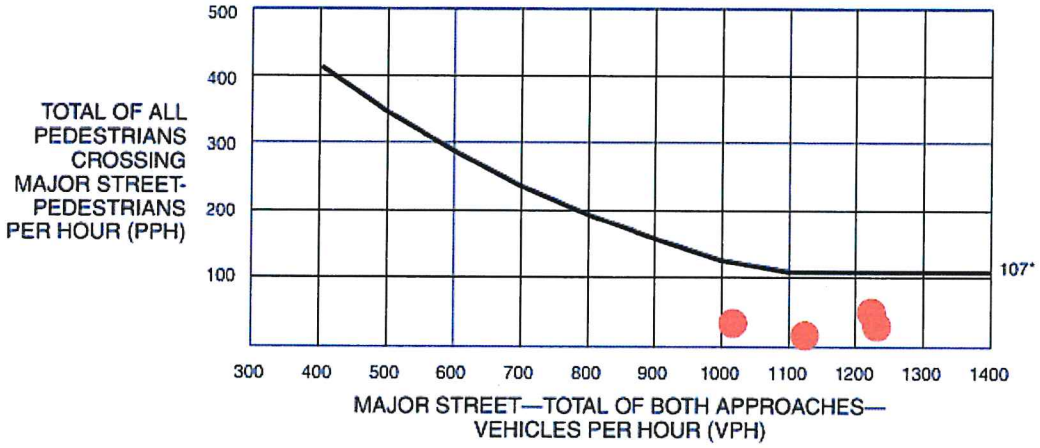
Midway Drive Crossing

Midway Drive is currently striped with two lanes separated with a TWLTL. Land use is commercial and residential in nature and limited on-street parking is allowed. Fire station #2 is located near Valley Parkway and regular bus traffic serves several bus-stops on the segment.

Traffic Signal Warrant 4: Pedestrian Volumes - NOT WARRANTED

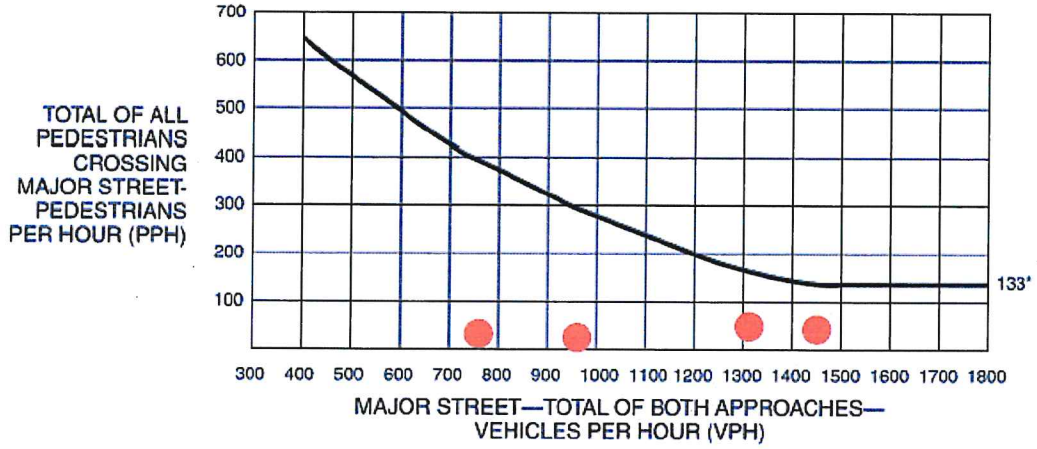
This warrant would not be met because the paring of the vehicular and pedestrian volumes for the peak hour and for any four hours of the day all fell below the curves provided in CAMUTCD. See Figure 4.

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



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

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



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

Figure 4: Midway Drive crossing does not meet traffic signal warrant.

HAWK Warrant - WARRANTED

HAWK warrant analysis showed that based on pedestrian and vehicle volumes the crossing at Midway Drive would meet the CA MUTCD Guidelines for the installation of a HAWK. Figure 5 shows that the plotted vehicular and pedestrian volume point on the graph would fall to the right of the roadway width or crossing length curve of 60 feet (L=60').

It's the City of Escondido's preference and recommendation in this case to install a regular traffic signal in place of a HAWK. This complies with CA MUTCD Section 4F.01 Application of Pedestrian Hybrid Beacons Support: *A conventional traffic control signal operation with a standard signal face displaying green, yellow and red (steady and/or flashing red) indications, at a mid-block crosswalk is an alternative to the pedestrian hybrid beacon (CAMUTCD p. 959)*

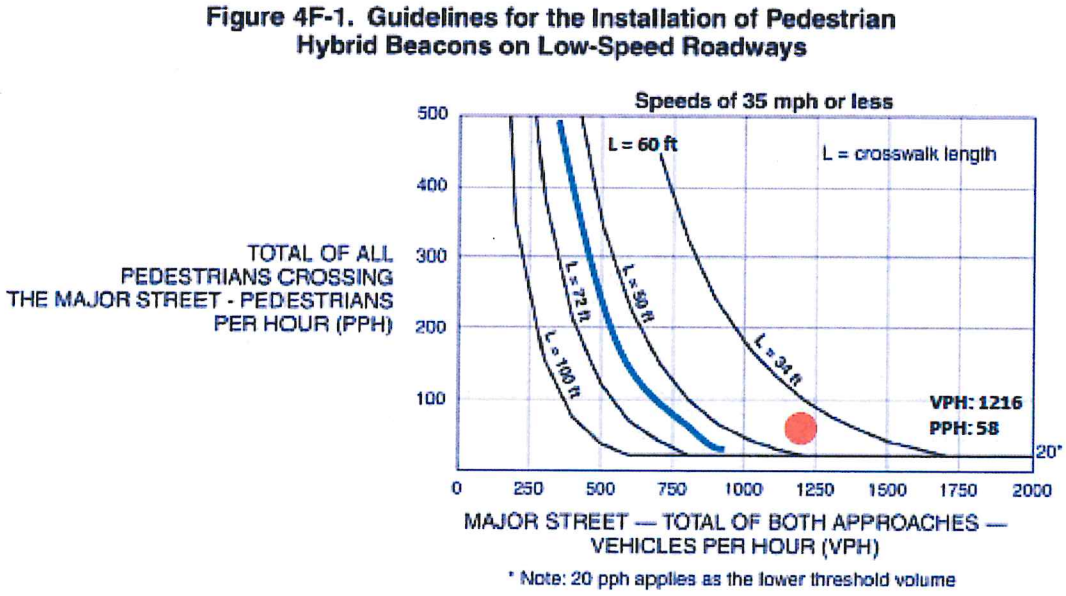


Figure 5: Midway meets warrant for HAWK.

Recommendation: Staff recommends that the Commission approves the traffic signal and HAWK warrant analyses and the proposed crosswalk treatments for Creek Trail crossings at Rose Street and Midway Drive.

Necessary Council Action: None.

Respectfully submitted,

Prepared by:

Miriam Jim, PE (Civil and Traffic)/Virpi Kuukka-Ruotsalainen
Associate Engineer/Engineer I

Reviewed by:

Owen Tunnell, PE (Civil)
Assistant City Engineer

Approved by:

Julie Procopio, PE (Civil)
Director of Engineering Services/City Engineer

Attachments:
Attachment 1: City of Escondido Crosswalk Policy
Attachment 2: Traffic Signal and HAWK Warrant Worksheets

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TRANSPORTATION and
COMMUNITY SAFETY COMMISSION

Commission Report of: July 13th, 2017 **Item No.: F1**

Location: Citywide

Initiated By: Staff

Request: Approval of City of Escondido Updated Crosswalk Policy for Mid-Block Crosswalks

Background:

Chronology:
On July 9, 2015 Transportation and Community Safety Commission was presented with the City of San Diego policy which was approved in June of 2015 and a comparison of it with the City of Escondido Policy, Commission's approval was to proceed with the amendment of the COE Crosswalk Policy.

On October 8, 2015, Transportation and Community Safety Commission approved the "Basic Warrants" and "Points Warrants" Chapters of the new City of Escondido Crosswalk Policy. On January 14, 2016, Transportation and Community Safety Commission approved the new City of Escondido Crosswalk Policy that included Chapter 3 "Crosswalk Treatments".

On January 14, 2016, Transportation and Community Safety Commission approved the new City of Escondido Crosswalk Policy that included Chapter 3 "Crosswalk Treatments".

At the present July 13, 2017, Transportation and Community Safety Commission staff is presenting some changes to the New City of Escondido Crosswalk Policy approved on January 14, 2016. The changes are highlighted in the report for the commissioners.

Discussion & Purpose:

The purpose of the Updated Crosswalk Policy is to finalize City's Crosswalk Policy by revising the Basic Warrant and Treatment Chapters to provide more clarification of the policy. The proposed revisions are based on further evaluation of the requirements and better understanding of applicability of the treatment safety measures for City of Escondido's roadways and public safety needs.

The proposed revisions are:

1). Basic Warrant Chapter: Section 1.1 "Pedestrian Volume Warrant" has been revised to clarify the threshold of 10 more pedestrians applies during the peak pedestrian period. Section 1.5 has been revised to allow for providing lighting in case of inadequate lighting at the proposed crosswalk location.

2). Treatment Chapter: Crosswalk safety measure requirements to specify the Rectangular Rapid Flashing Beacon (RRFB) as a preferred treatment for crosswalks on low to mid-volume roadways. Measure D requiring Signal or HAWK warrant analysis and traffic calming measures has been added to mirror the City of San Diego Policy. The proposed revisions are reflected in the treatments table and measures.

1. Basic Warrants

All of the Basic Warrants must be met in order for an uncontrolled location to be considered for marked crosswalk.

1.1. Pedestrian Volume Warrant

Pedestrian Crossing Volume should be 10 pedestrian per hour or more during the peak pedestrian hour.

1.2. Approach Speed Warrant

The 85th percentile approach speed must be equal to or lower than 40 MPH, unless a HAWK or a pedestrian signal will be installed.

1.3. Nearest Controlled Crossing

The proposed location must be farther than 250 feet from the nearest controlled pedestrian crossing in City of Escondido downtown area and farther than 400 feet from the nearest controlled pedestrian crossing in other areas.

1.4. Visibility Warrant

The motorist must have an unrestricted view of all pedestrians equal or greater than the "Stopping Sight Distance" needed for the 85th percentile speed. Any other sight restrictive features will require special attention.

1.5. Illumination Warrant

The proposed location must have adequate existing lighting or adequate lighting shall be provided prior to the installation of the crosswalk.

1.6. Accessibility Warrant

The proposed location must have existing accessibility to disabled pedestrians or accessibility improvements shall be included as part of the project.

2. Points Warrants

Point warrants are the number of points a location gets along with the Basic Warrants to qualify for a marked crosswalk. A proposed location that meets all the Basic Warrants requires a minimum of 16 points on the Points Warrants to justify an uncontrolled crossing.

2.1. Pedestrian Volume Warrant

No. of Pedestrians (Peak Hour)	Points	Total Available Points
11-30	2	10
31-60	4	
61-90	6	
91-100	8	
Over 100	10	

All effort will be made to count the actual latent demand. However, when not possible to observe and count the latent crossing demand, the counted number of pedestrians will be increased by 30% in the following locations.

- Areas such as commercial areas and high density residential areas
- Where a pedestrian traffic generator exists within 600 feet of the proposed crosswalk
- Other locations with potential latent demand based on engineering judgement

2.2. General Condition Warrant

Condition	Points	Total Available Points
The nearest controlled pedestrian/bicycle crossing is greater than 600 feet from the proposed crosswalk	3	12
The proposed crosswalk will position pedestrians to be seen better by motorists (applicable to uncontrolled intersections only)	2	
An existing bus-stop is located within 100 feet of the proposed crosswalk	2	
The proposed crosswalk will establish a midblock crossing and channelize the flow where pedestrian crossing is spread over a long stretch of road	2	
Other safety related factors	3	

2.3. Gap Time Warrant

Average Number of Vehicular Gaps per Five-Minute Period	Points	Total Available Points
0-0.99	0	8
1-1.99	2	
2-2.99	4	
3-3.99	8	
4-4.99	4	
5-5.99	2	
6 or over	0	

3. Treatments

If a proposed crossing location meets the criteria set by both the Basic and Point warrants, the next step is to evaluate the most appropriate crossing treatment(s) to be installed with the marked crosswalk.

Using paragraphs 09 and 09a of section 3B.18 of the new 2014 CA-MUTCD as a guideline, and also considering City of San Diego proposed treatments for different cross sections, ADTs and speed limits, the following treatment thresholds are proposed to be added to the new City of Escondido Crosswalk Policy.

ADT / Cross Section	<1500	1500 - 5000	5000-12000	>12000
Two-lane roads (without TWLTL)	Std.	Std. + RRFB**	Std. + RRFB ** + one from (A)	D
Two-lane roads (with TWLTL)	Std. one measure from (B)	For SL< 35 Std. + RRFB** For SL≥ 35 Std. + RRFB** + one measure from (B)	Std. + RRFB** + one measure from (B)	D
Four Lanes or more	N/A	Std. + RRFB ** + one measure from (C)	For SL < 35 Std. + RRFB** + one measure from (C) For SL ≥35 Measure D	Signal or HAWK

* SL: Speed Limit of the roadway

** RRFB (Rectangular Rapid Flashing Beacons), or other approved flashing beacon.

Std.: Advanced yield lines with associated Yield Here to Pedestrians (R1-5, R1-5a) signs should be placed 20 to 50 feet in advance of the crosswalk, adequate visibility should be provided by parking prohibitions, pedestrian crossing (W11-2) warning signs with diagonal downward pointing arrow (W16-7p) plaques should be installed at the crosswalk, and a high-visibility crosswalk marking pattern should be used. All Signing and Striping shall comply with CA-MUTCD standards.

MEASURES:

(A)

1. Raised Crosswalk or other traffic calming treatment in accordance with C.O.E. TMPL Guidelines
2. Speed Radar Feedback Signs for both approaches

(B)

1. Raised Crosswalk
2. Speed Radar Feedback Signs for both approaches
3. Pedestrian refuge islands

(C)

1. Road Diet
2 Raised Crosswalk
3. Speed Radar Feedback Signs for both approaches
4 Pedestrian refuge islands

(D) 1. A Traffic Signal is required if the CA MUTCD warrants are met and it is recommended by a traffic engineering study. Otherwise at least one of the following is required.
2. HAWK Hybrid Beacon if the CA MUTCD warrants are met.
3. Horizontal deflection traffic Calming treatment (**) with RRFBs if the City of Escondido's Traffic Calming Guidelines are met to include:

a. Pedestrian refuge islands & Bulbouts
b. Road Diet
c. Roundabouts

(**) Horizontal deflection treatments include, but are not limited to: roundabouts, pedestrian refuge islands, and pedestrian bulb-outs.

City of Escondido: Rose Street

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

WARRANT 4 - Pedestrian Volume
(Parts 1 and 2 Must Be Satisfied) SATISFIED YES ☐ NO ■

Part 1 (Parts A or B must be satisfied)

A.

Hours - - ->	Friday 15:00	Friday 16:00	Friday 17:00	Friday 18:00
Vehicles per hour for any 4 hours	1088	1108	1153	1076
Pedestrians per hour for any 4 hours	22	46	30	34

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

B.

Hours - - ->	Thursday 17:00	Friday 17:00	Saturday 13:00	Sunday 11:00
Vehicles per hour for any 1 hour	1100	1153	1006	854
Pedestrians per hour for any 1 hour	32	30	26	43

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

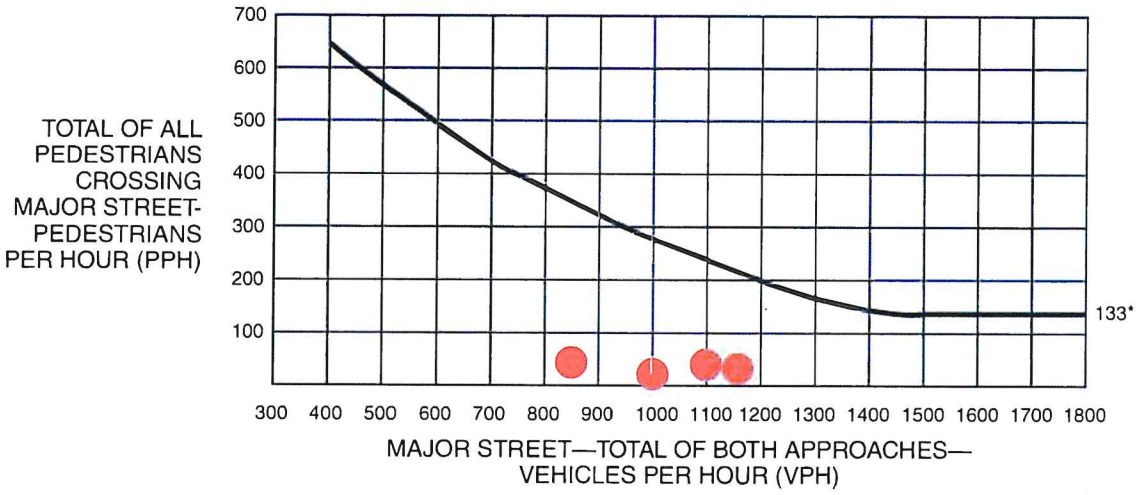
Part 2 SATISFIED YES ■ NO ☐

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

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

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

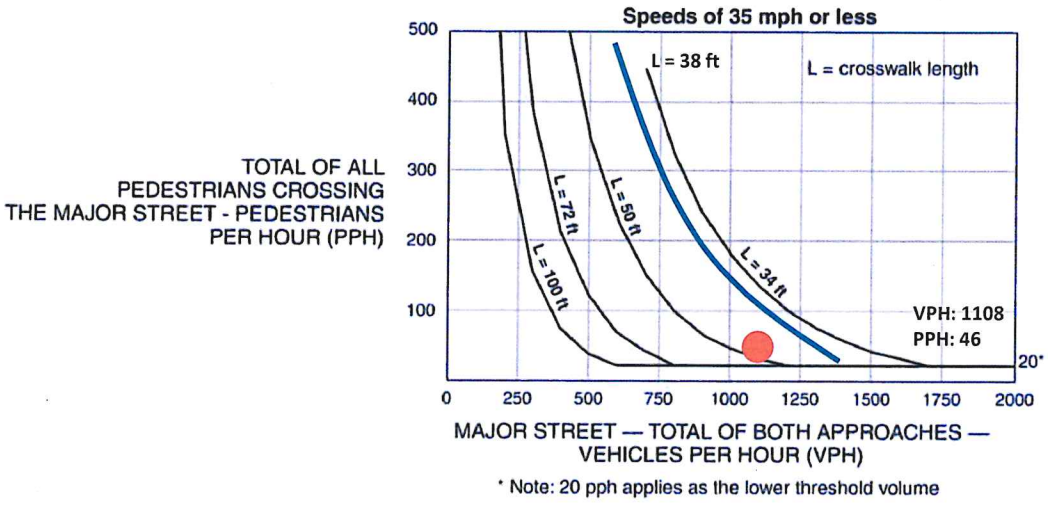
Figure 4C-7. Warrant 4, Pedestrian Peak Hour



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

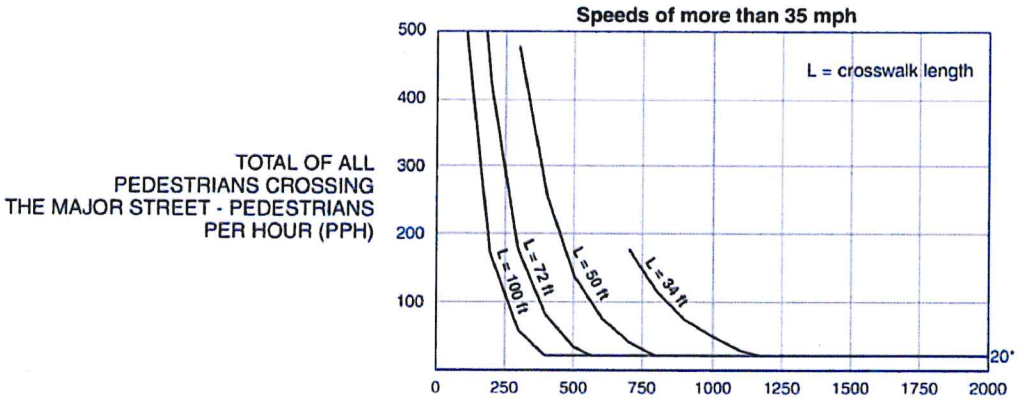
Attachment 2 - Traffic Signal and HAWK Warrant Worksheets

Figure 4F-1. Guidelines for the Installation of Pedestrian Hybrid Beacons on Low-Speed Roadways



* Note: 20 pph applies as the lower threshold volume

Figure 4F-2. Guidelines for the Installation of Pedestrian Hybrid Beacons on High-Speed Roadways



* Note: 20 pph applies as the lower threshold volume

Attachment 2 - Traffic Signal and HAWK Warrant Worksheets

City of Escondido: Midway Drive

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

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

SATISFIED YES ☐ NO ■

Part 1 (Parts A or B must be satisfied)

A.

Hours - - ->	Thursday 16:00	Thursday 17:00	Thursday 18:00	Thursday 19:00
Vehicles per hour for any 4 hours	1114	1230	1216	1017
Pedestrians per hour for any 4 hours	19	30	58	37

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

B.

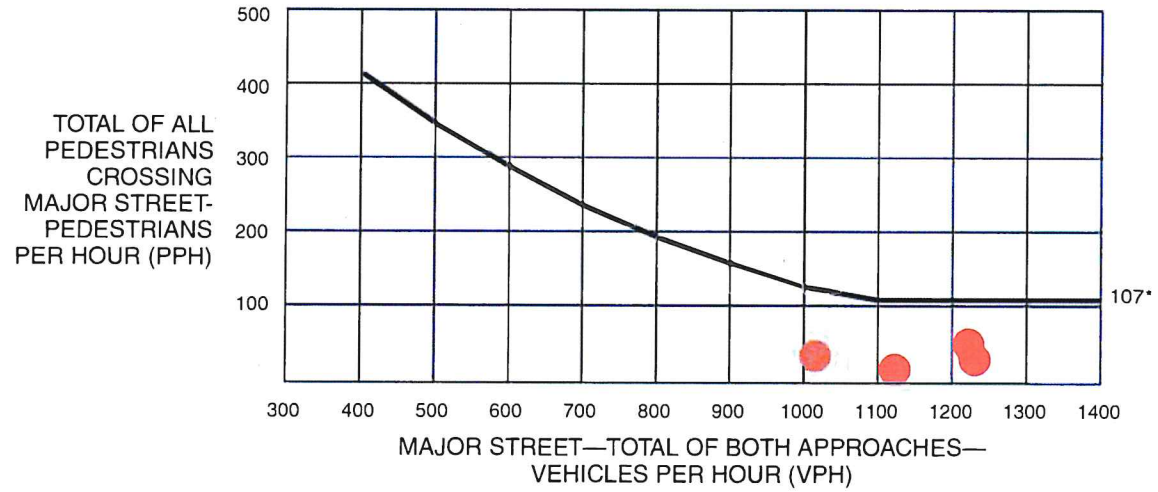
Hours - - ->	Thursday 07:00	Friday 07:00	Saturday 12:00	Sunday 14:00
Vehicles per hour for any 1 hour	1362	1301	966	774
Pedestrians per hour for any 1 hour	32	36	25	28

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

Part 2 **SATISFIED YES ■ NO ☐**

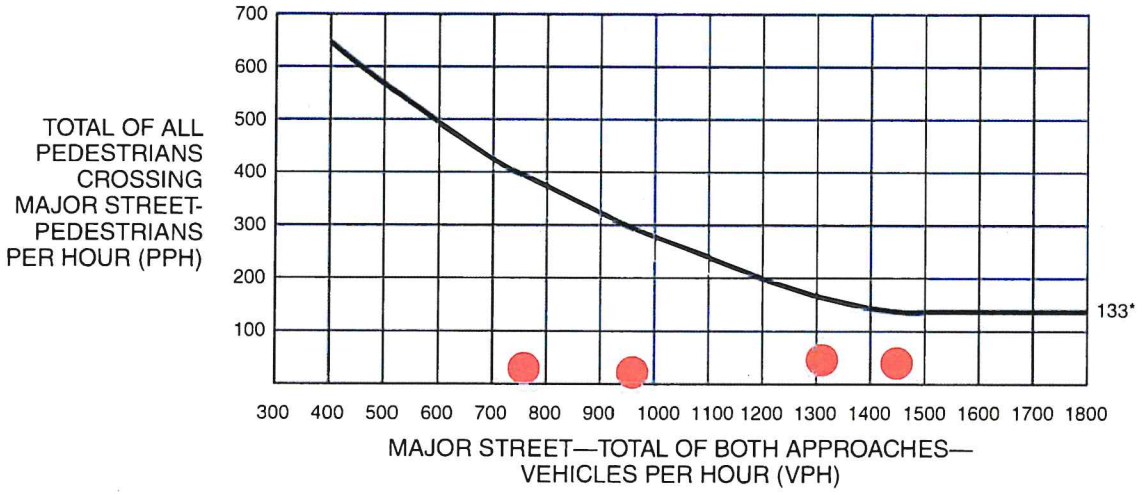
AND, The distance to the nearest traffic signal along the major street is greater than 300 ft	Yes ■ No ☐
OR, The proposed traffic signal will not restrict progressive traffic flow along the major street.	Yes ■ No ☐

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



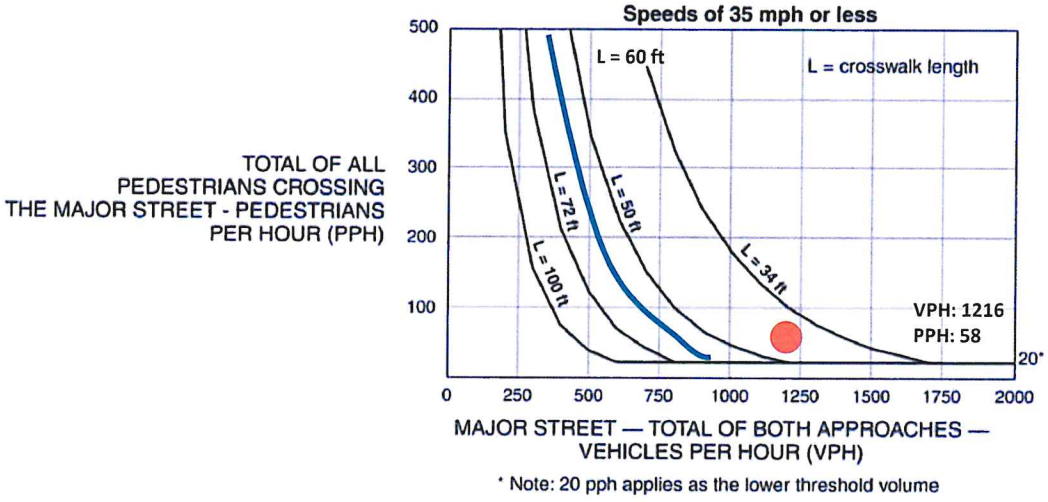
*Note: 107 pph applies as the lower threshold volume.

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



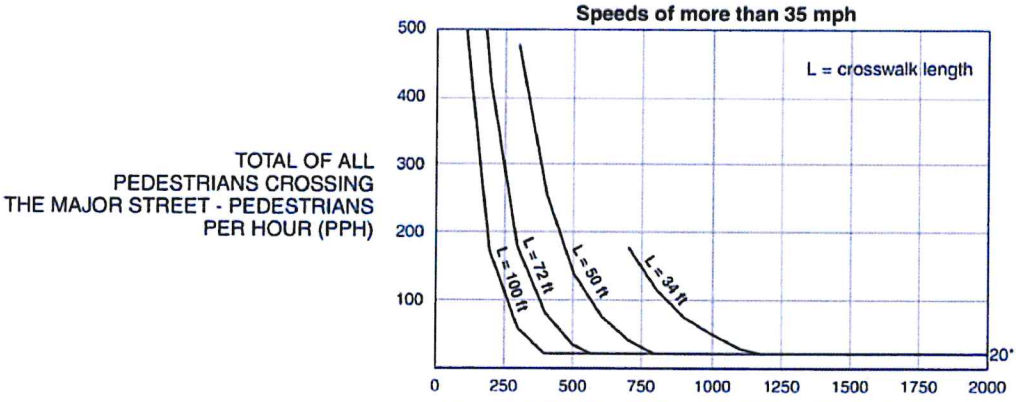
*Note: 133 pph applies as the lower threshold volume.

Figure 4F-1. Guidelines for the Installation of Pedestrian Hybrid Beacons on Low-Speed Roadways



* Note: 20 pph applies as the lower threshold volume

Figure 4F-2. Guidelines for the Installation of Pedestrian Hybrid Beacons on High-Speed Roadways



* Note: 20 pph applies as the lower threshold volume