



**AGENDA SUMMARY  
TRAFFIC COMMISSION MEETING  
MONDAY, MAY 23, 2016  
6:00 P.M.  
ARROYO GRANDE CITY COUNCIL CHAMBERS  
215 E. BRANCH STREET, ARROYO GRANDE**

**1. CALL TO ORDER**

**2. ROLL CALL**

**3. FLAG SALUTE**

**4. COMMUNITY COMMENTS AND SUGGESTIONS**

This public comment period is an invitation to members of the community to present issues, thoughts, or suggestions on matters not scheduled on this agenda. Comments should be limited to those matters that are within the jurisdiction of the Parks and Recreation Commission. The Brown Act restricts the Commission from taking formal action on matters not published on the agenda.

**5. CONSENT AGENDA**

**5.a. Approval Of Minutes**

Documents: [Action minutes 3-28-16.pdf](#)

**6. BUSINESS ITEMS**

**6.a. Consideration Of East Branch Street Streetscaping Preliminary Alternatives**

Documents: [E. Branch Streetscaping.pdf](#)

**6.b. Consideration Of The Le Point And Crown Hill Neighborhood Circulation**

Documents: [Le Point and Crown Hill Neighborhood Circulation.pdf](#)

**6.c. Consideration Of Sight Distance Needs At The Intersection Of Deer Trail Circle At Equestrian Way**

Documents: [Sight Distance Deer Trail Circle at Equestrian.pdf](#)

**7. DISCUSSION ITEMS**

**8. COMMISSION COMMUNICATIONS**

Correspondence/Comments as presented by the Commission.

**9. ADJOURNMENT**

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## ACTION MINUTES

### SPECIAL MEETING OF THE TRAFFIC COMMISSION MONDAY, MARCH 28, 2016 COUNCIL CHAMBERS, 215 E. BRANCH STREET ARROYO GRANDE, CA

1. **CALL TO ORDER**

Vice Chair Carson called the meeting to order at 6:03 p.m.

2. **ROLL CALL**

Traffic Commissioners: Commissioner Susan Henslin;  
Commissioner Kenneth Price;  
Vice Chair Jim Carson; and  
Chair Steven Ross arrived at 6:15 p.m.

Commissioners absent:

Staff present: Matt Horn, City Engineer;  
Geoff English, Director of Public Works;  
Kevin McBride, Police Commander; and  
Jane Covert-Lannon, Office Assistant II.

3. **PLEDGE OF ALLEGIANCE**

Vice Chair Carson led the pledge of allegiance.

4. **COMMUNITY COMMENTS AND SUGGESTIONS**

Vice Chair Carson opened the Community Comments and Suggestions.

Hearing no public comment, Vice Chair Carson closed the Community Comments and Suggestions.

5. **CONSENT AGENDA**

5.a. **Approval of Minutes**

**ACTION:** Vice Chair Carson moved to approve the minutes of the November 16, 2015 regular meeting. Commissioner Price seconded the motion and the minutes were accepted on a voice vote.

**AYES:** Carson, Price

**NOES:** None

**ABSENT:**

6. **BUSINESS ITEMS**

6.a **CONSIDERATION OF TRAFFIC CALMING WORK ON CALIFORNIA STREET.**

**Recommended Action:** It is recommended that the Traffic Commission:

1. Direct staff to meet with Lucia Mar Unified School District to review data obtained and request discussion, outreach and education of student drivers;
2. Direct staff to post Speed Limits on California Street.
3. Direct staff to increase Speed Limit enforcement on California Street; and
4. Direct staff to obtain additional vehicle speed data once all activities above are complete and return to the Traffic Commission with the results of this work effort.

City Engineer, Matt Horn gave the staff presentation to the Commissioners.

Vice Chair Carson opened the public comment on this item and the following person spoke:

Kristi Dibbern – California Street: She asked that the addition of a crosswalk at the end of the street be considered. She said that for the kids crossing the street it is very dangerous without one.

Meg Rodriguez – California Street: She said that there is only one street light on the

Upon hearing no further public comment, Vice Chair Carson closed the public comment on this item.

Let the record show that Chair Ross arrived at 6:15 p.m.

**ACTION:** Chair Ross made a motion to agree with all of the staff recommendations and to come back with an estimate for sidewalks, striping and new design suggestions.

**AYES:** Ross, Price, Henslin, Carson

**NOES:** None

**ABSENT:**

6.b **CONSIDERATION OF REMOVAL OF A MARKED PEDESTRIAN CROSSWALK ON VALLEY ROAD AT TIGER TAIL DRIVE**

**Recommended Action:** It is recommended that the Commission advise the City Council to remove the marked crosswalk on Valley Road at Tiger Tail Drive.

Matt Horn, City Engineer, gave the staff presentation to the Commissioners.

Chair Ross opened the public comment.

Upon hearing no comments, Chair Ross closed the public comment.

**ACTION:** Vice Chair Carson made a motion to advise the City Council to remove the marked crosswalk on Valley Road at Tiger Tail Drive, put in the ADA ramps and not re-install a marked crosswalk.

**AYES:** Carson, Price, Henslin, Ross

**NOES:** None

**ABSENT:**

**6.c. CONSIDERATION OF LOADING AND UNLOADING ZONE ON VALLEY ROAD  
ADJACENT TO ARROYO GRANDE HIGH SCHOOL.**

**Recommended Action:** It is recommended that the Traffic Commission advise the City Council to allow portions of Valley Road to be used for loading and unloading.

Matt Horn, City Engineer, gave the staff presentation to the Commissioners.

Chair Ross opened the public comment.

Upon hearing no further comments, Chair Ross closed public comment.

**ACTION:** Commissioner Price made a motion to advise the City Council to allow portions of Valley Road to be used for loading and unloading. The motion was seconded by Vice Chair Carson and the motion passed on the following vote:

**AYES:** Price, Carson, Henslin, Ross

**NOES:** None

**ABSENT:**

**6.d. CONSIDERATION OF DRAFT NEIGHBORHOOD TRAFFIC CALMING GUIDELINES**

**Recommended Action:** It is recommended that the Traffic Commission:

1. Review and direct staff to implement any required changes to the Draft Neighborhood Traffic Calming guidelines; and
2. Recommend that the City Council adopt Neighborhood Traffic Calming Guidelines.

Matt Horn, City Engineer, gave the staff presentation to the Commissioners.

Chair Ross opened the public comment.

Upon hearing no comments, Chair Ross closed the public comment.

**ACTION:** Vice Chair Carson made a motion to recommend to the City Council to adopt the Traffic Calming Guidelines with the addition of neighborhood circles. Commissioner Price seconded the motion and it passed on the following vote:

**AYES:** Carson, Price, Henslin, Ross  
**NOES:** None  
**ABSENT:**

**7. DISCUSSION ITEMS**

Matt Horn, City Engineer said that he hopes to bring forward on the April agenda the following:

1. Paulding circulation work review.
2. Review of East Branch Streetscaping

**8. COMMISSION COMMUNICATIONS**

**9. ADJOURNMENT**

Chair Ross adjourned the meeting at 7:11 p.m.

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**Steven Ross, Chair**

**ATTEST:**

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**Jane Covert-Lannon  
Office Assistant II**

(Approved at TC Mtg: )



## MEMORANDUM

**TO:** TRAFFIC COMMISSION

**FROM:** TERESA MCCLISH, COMMUNITY DEVELOPMENT DIRECTOR

**BY:** MATT HORN, CITY ENGINEER

**SUBJECT:** CONSIDERATION OF EAST BRANCH STREET STREETSCAPING PRELIMINARY ALTERNATIVES

**DATE:** MAY 23, 2016

**RECOMMENDATION:**

It is recommended that the Traffic Commission review the project alternatives for the East Branch Streetscaping project and advise City Council on the preferred alternative.

**IMPACT ON FINANCIAL AND PERSONNEL RESOURCES:**

The East Branch Streetscaping project is funded by City Sales Tax Funds as well as a Congestion Mitigation and Air Quality (CMAQ) grant as follows:

<b>East Branch Streetscaping Project Funding Table</b>						
	<b>FY 15-16</b>	<b>FY 16-17</b>	<b>FY 17-18</b>	<b>FY 18-19</b>	<b>FY 19-20</b>	<b>Total</b>
Sales Tax Fund	\$ 70,000	\$ 97,600	-	-	-	<b>\$ 70,000</b>
CMAQ	-	\$ 390,400	-	-	-	<b>\$ 390,400</b>
<b>Total</b>	<b>\$ 70,000</b>	<b>\$ 488,000</b>	-	-	-	<b>\$ 558,000</b>

**BACKGROUND:**

The East Branch Streetscaping project is considered the "Phase 2" of previous village streetscaping work that was completed on East Branch Street between Bridge Street and North Mason Street. This project will continue the village amenities installed by the "Phase 1" project on East Branch Street between North Mason Street and Paulding Circle.

The City successfully competed and obtained grants funds administered by the San Luis Council of Governments (SLOCOG) with grant matching funds provided by the Sales Tax Fund.

# **CONSIDERATION OF PRELIMINARY ALTERNATIVES FOR THE EAST BRANCH STREET STREETSCAPING PROJECT**

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On August 13, 2015 the City solicited proposals from the on-call civil engineering consultants for the design and construction document preparation of the project. Omni-Means was selected to complete this work and on September 14, 2015, the City entered into a Contract with Omni-Means to complete.

A stakeholder group was established consisting of local business owners, a member of the City's advisory Boards and Commissions. Stakeholder meetings were held on:

1. November 19, 2015;
2. January 14, 2016;
3. April 5, 2016; and
4. May 13, 2016

For review and advisement on this project.

## **ANALYSIS OF ISSUES:**

East Branch Street, from Mason Street to approximately Crown Hill Street, is part of the City's core Village area, but does not contain any of the streetscape elements that exist in the western portion of the Village.

East Branch Street is classified as a "Highway/Arterial" on the City's General Plan Circulation Element Map and defined within the Circulation Element Policy CT1-3 as "State Highway 227 or Minor Arterial Streets - 2 to 4 lanes with or without median/turn lane: State or City controlled access, on-street parking optional; includes bike lanes, sidewalks, some transit and other design features: 64' - 104' right of way." The posted speed limit on East Branch Street is 25 MPH west of Crown Hill Street and 30 MPH east of Crown Hill Street.

Two conceptual plans have been developed, with Alternative 1 (See Attachment 1 - Figure A-1) representing maximizing Class II bicycle lanes and Alternative 2 (See Attachment 1 - Figure A-2) which attempts to retain as much existing on-street parking as is practical.

During development of the preliminary pavement delineation alternatives, on-street parking was evaluated for conformance with city standards. Four (4) spaces were identified to be non-standard, primarily due to close proximity to the approach side of commercial driveways. City Standard 7410 requires 20 feet in front of the leading edge of commercial driveways.

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E. Branch St. Segment	Type	Existing	Alternative 1		Alternative 2	
		# Spaces	# Spaces	Difference	# Spaces	Difference
Mason Street to Crown Hill Street	Std	20	13	(7)	19	(1)
	Non-Std	2	0	(2)	0	(2)
Crown Hill Street to Le Point Terrace	Std	9	0	(9)	7	(2)
	Non-Std	1	0	(1)	0	(1)
Le Point Terrace to Garden Street	Std	22	15	(7)	22	(0)
	Non-Std	1	0	(1)	0	(1)
<b>Total</b>	Std	51	28	(23)	48	(3)
	<u>Non-Std</u>	<u>4</u>	<u>0</u>	<u>(4)</u>	<u>0</u>	<u>(4)</u>
	<b>Total:</b>	<b>55</b>	<b>28</b>	<b>(27)</b>	<b>48</b>	<b>(7)</b>

Lane widths: The cross section configurations and lane widths for the existing condition and two alternatives are presented in the table below.

E. Branch St. Segment	Facility	Existing	Alt 1	Alt 2
Mason Street to Crown Hill Street	WB Parking	8 feet	8 feet <sup>1</sup>	8 feet
	WB Bike	Shared	6 feet	Shared
	WB Lane	12 feet	11 feet	12 feet
	Center Lane	12 feet	11 feet	12 feet
	EB Lane	12 feet	11 feet	12 feet
	EB Bike	Shared	5 feet	Shared
	EB Parking	8 feet	8 feet <sup>1</sup>	8 feet
Crown Hill Street to Le Point Terrace	WB Parking	None	None	None
	WB Bike	5.22 feet	6 feet	Shared
	WB Lane	11.5 feet	11.5 feet	14 feet
	Center Lane	11 feet	12 feet	11 feet
	EB Lane	11.8 feet	11.5 feet	14 feet
	EB Bike	Shared	6 feet	Shared
	EB Parking	8 feet	None	8 feet
Le Point Terrace to Garden Street	WB Parking	9' to 14'	8 feet <sup>1</sup>	8' to 13'
	WB Bike	6 feet <sup>1</sup>	6 feet	6 feet <sup>1</sup>
	WB Lane	12 feet	12 feet	12 feet
	Center Lane	0' to 7'	0' to 11.5'	0' to 7'
	EB Lane	12 feet	12 feet	12 feet
	EB Bike	Shared	5 feet	5 feet <sup>1</sup>
	EB Parking	8 feet <sup>1</sup>	None	8 feet <sup>1</sup>

<sup>1</sup>Not provided on entire segment, see Figures A-1 and A-2

**CONSIDERATION OF PRELIMINARY ALTERNATIVES FOR THE EAST BRANCH STREET STREETSCAPING PROJECT**  
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Note the Alternative 2 shared lane width of 12 feet from Mason Street to Crown Hill Street is below the recommended minimum of 14 feet, however is consistent with the existing lane configuration in the downtown Village as well as the City's Adopted Bicycle and Trails Master Plan.

Implementation of Bicycle and Trails Master Plan: Chapter 4 "Implementation" of the Master Plan identifies East Branch Street as the first two priorities for improvements as follows. Relevant pages of the Master Plan are attached.

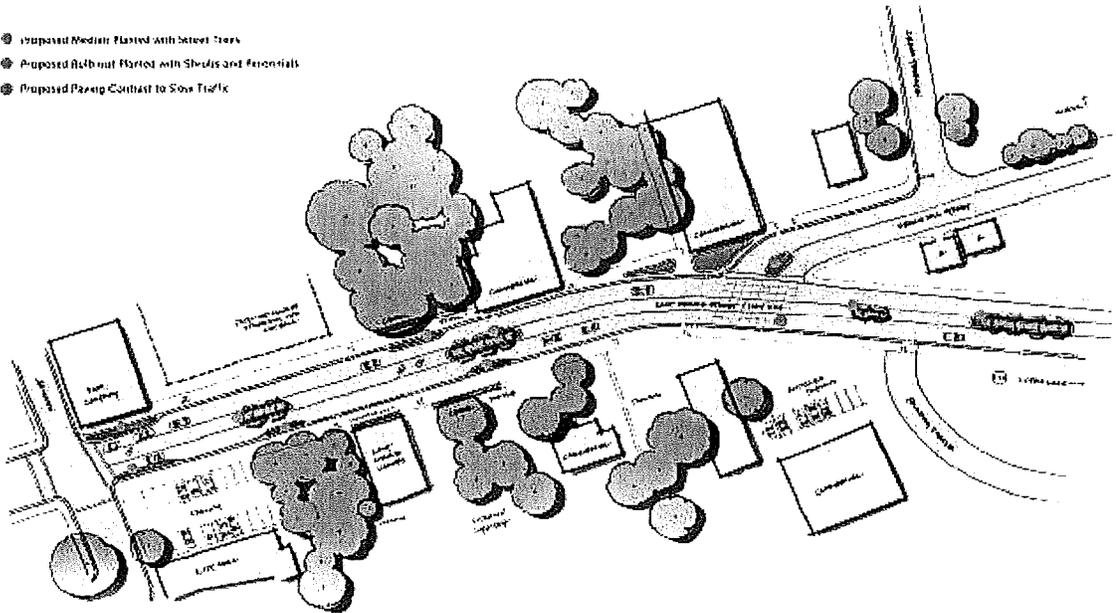
- Priority 1: Install Class II Bike Lanes from Paulding Middle School to Le Point Terrace
- Priority 2: Install Class III Bicycle Shared Use markings and signage on West Branch Street/East Branch Street from Traffic Way to Le Point Terrace
- Priority 3: Install Class III Bike Route signage on East Grand Ave/West Branch Street from El Camino Real to Traffic Way

A portion of the Priority 1 improvements have been completed, with Class II bicycle lanes installed between Le Point Terrace and the reconstructed Paulding retaining wall on the north side of East Branch Street. Portions of the Priority 2 improvements are included with the East Branch Streetscaping Project's Alternative 2 (See Attachment 1 - Figure A-2).

Figure 1 (below) illustrates an early concept of the project corridor and shows numerous landscaped medians. However, existing traffic volumes during the start and ending timeframe for Paulding Middle School creates queuing in both the eastbound two-way left turn lane approaching Crown Hill Street and in the westbound left turn lane approaching Mason Street. The two raised medians between Mason Street and Crown Hill Street shown in the figure below would result in insufficient storage for the existing volumes and cause queued vehicles to block the through lanes during the peak travel times. These medians were therefore removed from consideration.

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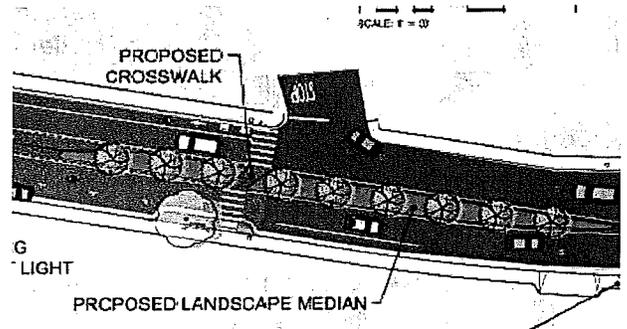
- Proposed Median Planted with Street Trees
- Proposed Right Turn Lanes with Shoulders and Pedestrians
- Proposed Parking Contrast to Solve Traffic



OCTOBER 16, 2015 DWY 

Figure 1: Initial Streetscaping Concept

An evaluation of turning movements at existing streets and driveways was also performed and it was determined that the medians shown on either side of Paulding Circle in Figure 1 would present problems for left turns into and out of Paulding Circle.



Turning movement volumes at Le Point Terrace: Traffic counts for the Crown Hill Street neighborhood were taken in early June 2015 while school was still in session. The existing traffic volumes at the intersection of Le Point Terrace and East Branch Street are very low, particularly left turns into and out of Le Point Terrace (11 vehicles during the AM peak hour and 2 vehicles during the PM peak hour<sup>1</sup>). The intersection of Crown Hill Street and East Branch Street provides a nearby alternative with better sight distance and a receiving two-way left turn lane on East Branch Street. An opportunity therefore exists to limit the access at Le Point Terrace to right-in/right-out, provide a pedestrian crosswalk with refuge through a landscaped median, and provide a gateway opportunity to the Village as approached from the east.

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STREET STREETSCAPING PROJECT  
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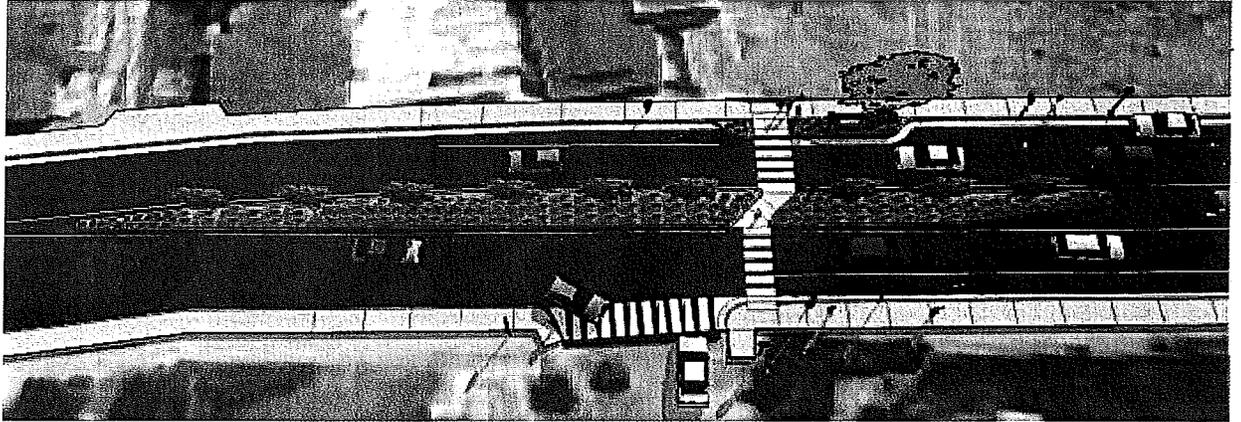


Figure 2: Rendering of Possible Landscaped Median and Crosswalk at Le Point Terrace (Viewed from North)

**Concurrence**

During the project development process, four stakeholder meetings were completed in order to request input on design alternatives. Based on these meetings and input received, the alternatives were modified. Finally, the stakeholders group was asked to provide direction on the preferred alternative for this project, Alternative 1 which provides superior bicycle facilities but reduces available parking or Alternative 2 which provides more parking and bicycle facilities in compliance with the City's adopted Bicycle and Trails Master Plan. After review and consideration, the stakeholders group finally determined that Alternative 2 provided the better balance of competing needs.

On May 2, 2016 the Architectural Review Committee reviewed this project and concurred with the stakeholder's selection of Alternative 2 as the preferred alternative.

**ALTERNATIVES:**

The following alternatives are provided for the Commission's consideration:

- Approve staff's recommendation;
- Do not approve staff's recommendation;
- Provide alternate direction

**PUBLIC NOTICE AND COMMENT:**

The Agenda for this meeting was posted in front of City Hall and on the City's website on Friday, May 20, 2016.

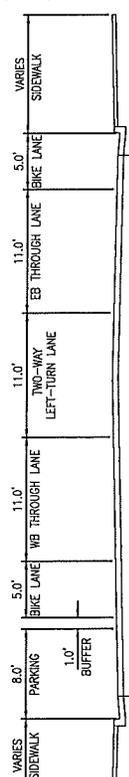
**Attachments:**

1. Figures A-1 and A-2
2. Letter from Lucia Mar Unified School District Safe Routes Coordinator

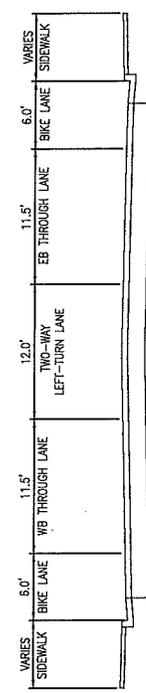
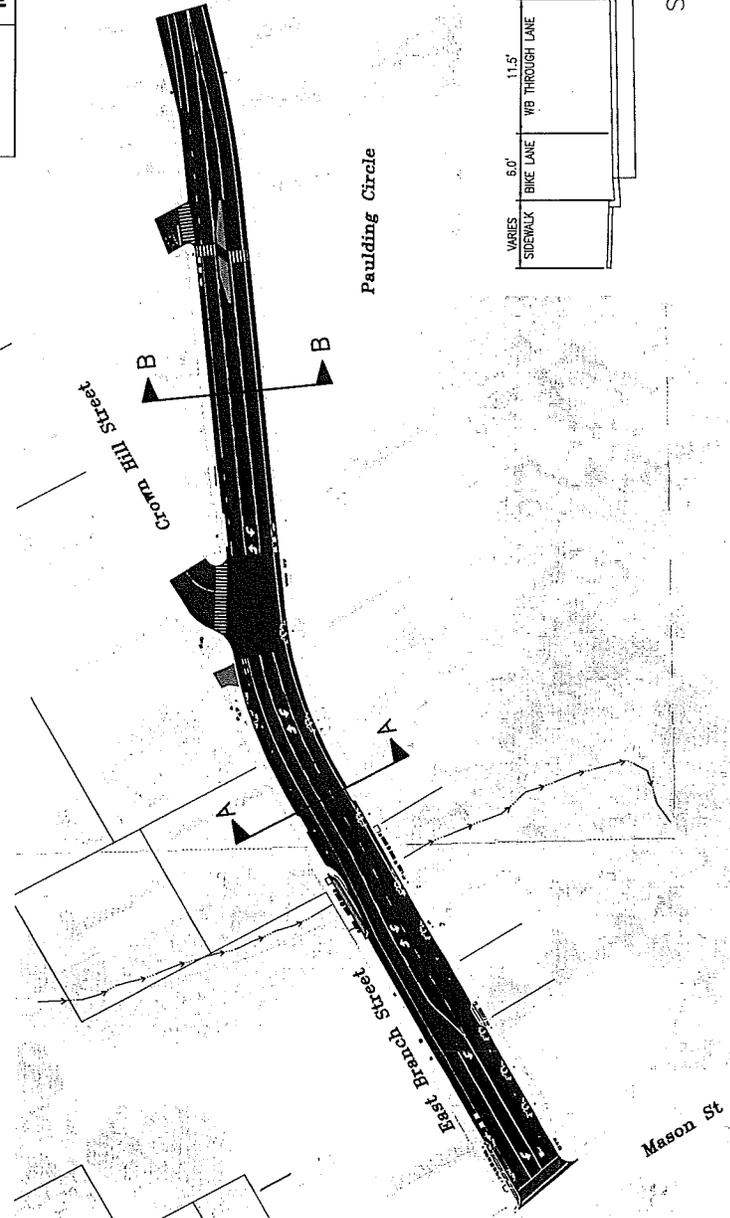
# Attachment 1 Alternative 1

ON-STREET PARKING IMPACTS

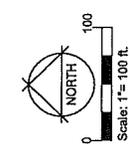
E. Branch St. Segment	Type	Existing		Alternative 1		Alternative 2	
		# Spaces	# Difference	# Spaces	# Difference	# Spaces	# Difference
Mason Street to Crown Hill Street	Sid	20	(7)	13	(7)	19	(1)
Crown Hill Street to Le Point Terrace	Non-Sid	2	(2)	0	(2)	0	(2)
Le Point Terrace to Garden Street	Sid	9	(9)	0	(9)	7	(2)
	Non-Sid	1	(1)	0	(1)	0	(1)
	Sid	22	(7)	15	(7)	22	(0)
	Non-Sid	1	(1)	0	(1)	0	(1)
<b>Total</b>	Sid	51	(23)	28	(23)	48	(3)
	Non-Sid	4	(4)	0	(4)	0	(4)
	<b>Total:</b>	55	(27)	28	(27)	48	(7)



SECTION A-A  
NTS



SECTION B-B  
NTS



## EAST BRANCH STREETSCAPE DESIGN

Arroyo Grande, California

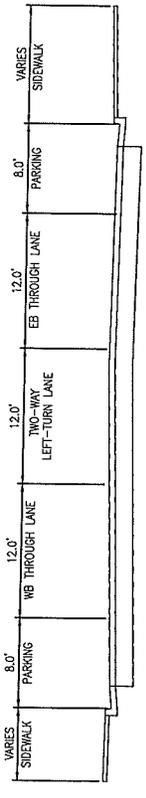


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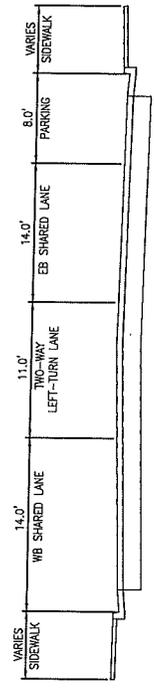
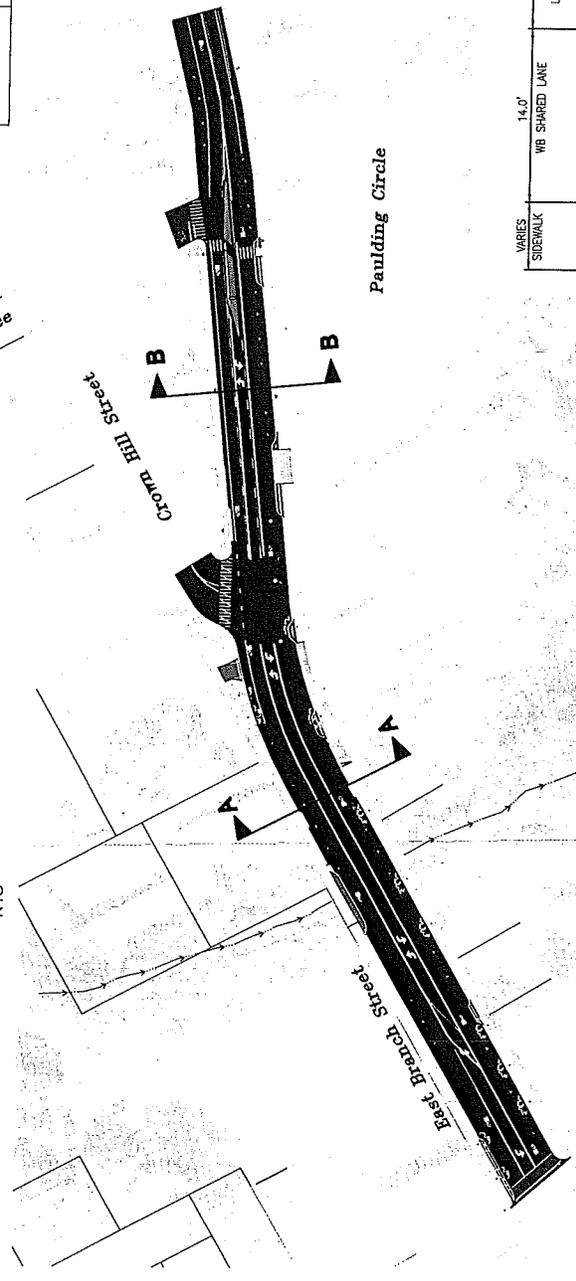
Attachment 1  
**Alternative 2**

ON-STREET PARKING IMPACTS

E Branch St Segment	Type	Existing		Alternative 1		Alternative 2	
		# Spaces	# Spaces	# Spaces	Difference	# Spaces	Difference
Mason Street to Crown Hill Street	Std Non-Std	20	13	(7)	19	(1)	
Crown Hill Street to Le Point Terrace	Std Non-Std	9	0	(9)	7	(2)	
Le Point Terrace to Garfield Street	Std Non-Std	22	15	(7)	22	(0)	
<b>Total</b>	Std Non-Std	51	28	(23)	46	(5)	
	<b>Total:</b>	4	28	(24)	46	(4)	



SECTION A-A  
 NTS



SECTION B-B  
 NTS



**EAST BRANCH STREETSCAPE DESIGN**

Arroyo Grande, California



omni.means  
 ENGINEERING SOLUTIONS

May 17, 2016  
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**Lucia Mar Unified School District**

602 Orchard Avenue, #602  
Arroyo Grande, Ca. 93420

Dear City of Arroyo Grande,

As the Lucia Mar Unified School District Safe Routes Coordinator, I am writing a letter in support of Alternative 1 for the East Branch Streetscaping Design. This alternative, while not perfect, would provide valuable space on a very congested road for our students who walk or bike to school. At Lucia Mar Unified School District we take the safety of our students very seriously. By law we are responsible for the safety of students from the time they leave their homes to get to school to the time they arrive home after school. Not all students going to Paulding or Arroyo Grande High School have the ability to be driven to school. By necessity some students either have to walk or ride a bike. Alternative 1 would provide better safety for those students. The bike lanes, while not protected, do provide clear delineation of space for both vehicles and cyclists. The chances of conflict between the two modes of transport would be minimized (i.e. cyclists not getting "doored" by motorists who are getting out of their cars). At some sites at bike safety instruction is provided during PE, but all students are novice bike riders due to their ages. The bike lanes in the Alternative 1 plan would minimize the mixing of cyclists and motor vehicles and thus potentially reduce the risk of student injury while riding to and from school.

In the opinion of the school district please adopt the Alternative 1 plan on the East Branch Streetscaping Design.

Thank you,

Jim Dececco

Safe Routes Coordinator

Lucia Mar Unified School District





## MEMORANDUM

**TO:** TRAFFIC COMMISSION

**FROM:** TERESA MCCLISH, COMMUNITY DEVELOPMENT DIRECTOR

**BY:** MATT HORN, CITY ENGINEER

**SUBJECT:** CONSIDERATION OF THE LE POINT AND CROWN HILL  
NEIGHBORHOOD CIRCULATION

**DATE:** MAY 23, 2016

### RECOMMENDATION:

It is recommended that the Traffic Commission:

1. Receive the Le Point and Crown Hill Neighborhood Circulation information;
2. Receive the East Branch Street/Huasna Road/Corbett Canyon Road/Stanley Avenue/Crown Hill Street Roundabout information;
3. Receive community input;
4. Direct staff to include intersection improvements at of East Branch Street/Huasna Road/Corbett Canyon Road/Stanley Avenue/Crown Hill Street in the City's Circulation Element of the General Plan; and
5. Direct staff to prepare a Capital Improvement Plan Funding Request during the next project cycle for intersection improvements to East Branch Street/Huasna Road/Corbett Canyon Road/Stanley Avenue/Crown Hill Street.

### IMPACT ON FINANCIAL AND PERSONNEL RESOURCES:

No fiscal impacts will be incurred by this action.

### BACKGROUND:

On October 12, 2014, and January 26, 2015 the Traffic Commission reviewed Neighborhood Traffic concerns in the Le Point Street at McKinley Street area. After review, the Traffic Commission directed the preparation of a Neighborhood Circulation Study. On April 28, 2015, the City Council reviewed the Neighborhood Traffic concerns in the Le Point Street at McKinley Street area and concurred with the Traffic Commission's advisement.

The subject neighborhood of Le Point Street and Crown Hill is located in the Crown Hill Addition 1 Tract and Le Point Addition/Tract. The neighborhood is comprised of single family homes and also includes Paulding Middle School.

The study area is shown below. Concurrent to the circulation study, a Cal Poly student working on a Senior Project completed an intersection analysis of the East Branch

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CIRCULATION  
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Street/Huasna Road/Corbett Canyon Road/Stanley Avenue/Crown Hill Street for consideration of the feasibility of installation of a roundabout.

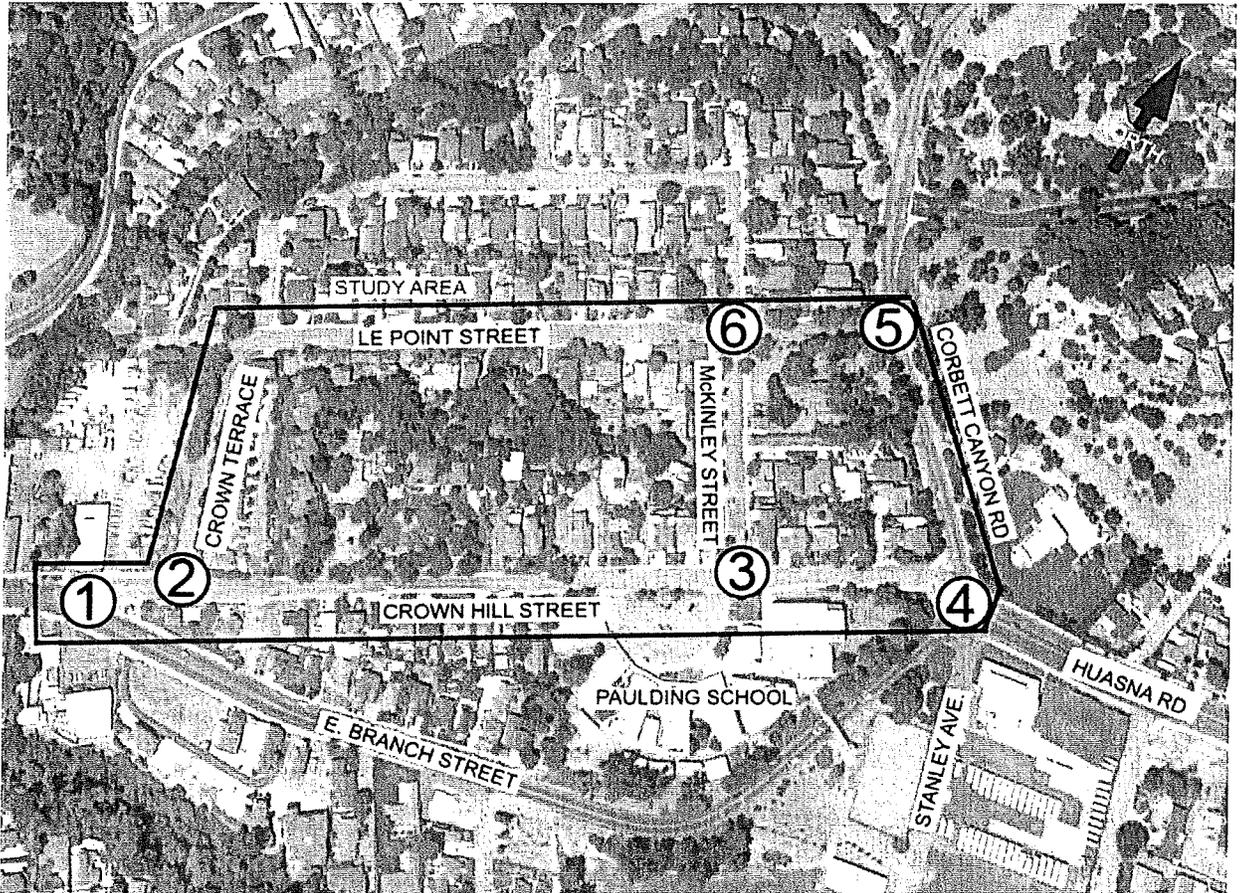


Figure of Neighborhood Circulation Study Area

The neighborhood circulation study was completed in July 2015. This analysis indicated that analyzed changes in the circulation patterns, discussed later in the report, to the Le Point and Crown Hill Neighborhood result in increased traffic through an adjacent intersection at East Branch Street/Huasna Road/Corbett Canyon Road/Stanley Avenue/Crown Hill Street intersection decreased that intersection's performance below policy levels which is Level of Service (LOS) C.

**ANALYSIS OF ISSUES:**

The following potential changes or scenarios to Le Point and Crown Hill Neighborhood circulation were considered:

1. Restore one-way westbound (inbound) access to Crown Hill Street from the intersection at East Branch Street/Huasna Road/Corbett Canyon Road/Stanley Avenue/Crown Hill Street. Additionally, a minor variation of this scenario included

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- the analysis that limits direction of travel on Le Point Street from Corbett Canyon Road to McKinley Street to eastbound only.
2. Convert Crown Terrace between Le Point Street and Crown Hill Street to one-way southbound vehicular traffic.
  3. Consider various options to convert other neighborhood streets to one-way couplets to discourage "cut-through" traffic.

Prior to analyzing any scenarios, the existing level of services at the neighborhood intersections were evaluated and shown below.

**TABLE 1:  
EXISTING INTERSECTION LOS**

#	Intersection	Control Type <sup>1,2</sup>	Target LOS	AM Peak Hour			PM Peak Hour		
				Delay	LOS	Warrant Met? <sup>3</sup>	Delay	LOS	Warrant Met? <sup>3</sup>
1	Crown Hill Street / Crown Terrace	TWSC	C	11.2	B	-	8.5	A	-
2	Crown Hill Street / Le Point Terrace	TWSC	C	13.2	B	-	8.5	A	-
3	Crown Hill Street / McKinley Street	TWSC	C	9.8	A	-	8.4	A	-
4	East Branch Street / Huasna Road / Corbett Canyon Road / Stanley Avenue	AWSC	C	13.4	B	-	18.6	C	-
5	Le Point Street / Corbett Canyon Rd	TWSC	C	14.9	B	-	11.5	B	-
6	Le Point Street / McKinley Street	AWSC	C	8.4	A	-	7.1	A	-

**Notes:**

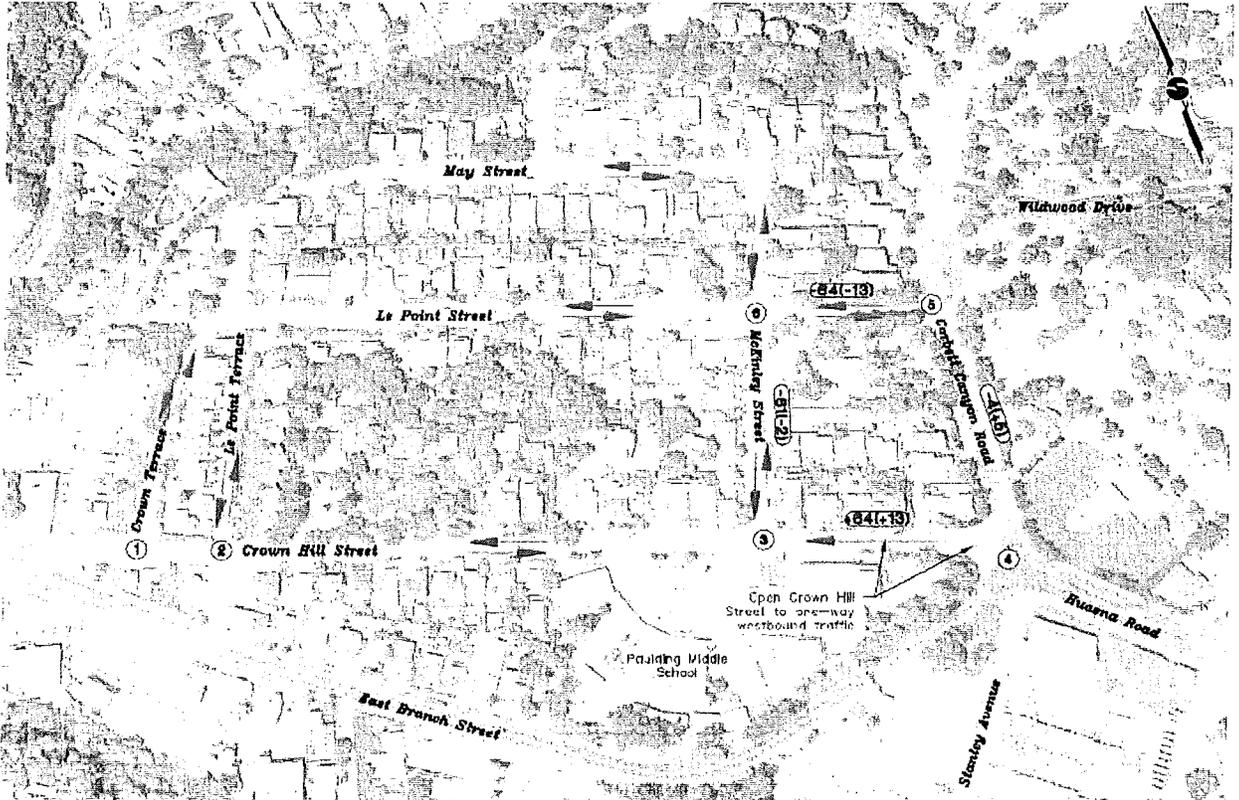
1. AWSC = All Way Stop Control; TWSC = Two Way Stop Control; RNDBT = Roundabout
2. LOS = Delay based on worst minor street approach for TWSC, avg of all approaches for AWSC, Signal, RNDBT
3. Warrant = Based on California MUTCD Warrant 3

The existing Level of Service (LOS) of all intersection meets minimum policy levels of operation, LOS C, without any improvements or modifications.

**Scenario 1**

Scenario 1 proposes to open Crown Hill Street at the intersection of East Branch Street / Stanley Avenue / Huasna Road / Corbett Canyon Road / Crown Hill Street. Traffic flow on Crown Hill would be restricted to one-way westbound (inbound) traffic between Huasna Road and McKinley Street. By adding another point of access from Corbett Canyon Road, traffic on Le Point Street would be reduced with the traffic volumes being more evenly distributed. It is estimated that 64 trips would divert from Le Point Street and use Crown Hill Street inbound during the AM peak hour and 13 trips during the PM peak hour.

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Display showing potential changes of scenario 1

**TABLE 2:  
SCENARIO 1 INTERSECTION LOS**

#	Intersection	Control Type <sup>1,2</sup>	Target LOS	AM Peak Hour			PM Peak Hour		
				Delay	LOS	Warrant Met? <sup>3</sup>	Delay	LOS	Warrant Met? <sup>3</sup>
1	Crown Hill Street / Crown Terrace	TWSC	C	11.2	B	-	8.5	A	-
2	Crown Hill Street / Le Point Terrace	TWSC	C	13.1	B	-	8.5	A	-
3	Crown Hill Street / McKinley Street	TWSC	C	9.0	A	-	8.4	A	-
4	East Branch Street / Huasna Road / Corbett Canyon Road / Stanley Avenue	AWSC	C	17.2	C	-	30.5	D	-
5	Le Point Street / Corbett Canyon Rd	TWSC	C	13.8	B	-	11.4	B	-
6	Le Point Street / McKinley Street	AWSC	C	7.8	A	-	7.0	A	-

**Notes:**

1. AWSC = All Way Stop Control; TWSC = Two Way Stop Control; RNDBT = Roundabout
2. LOS = Delay based on worst minor street approach for TWSC, avg of all approaches for AWSC, Signal, RNDBT
3. Warrant = Based on California MUTCD Warrant 3

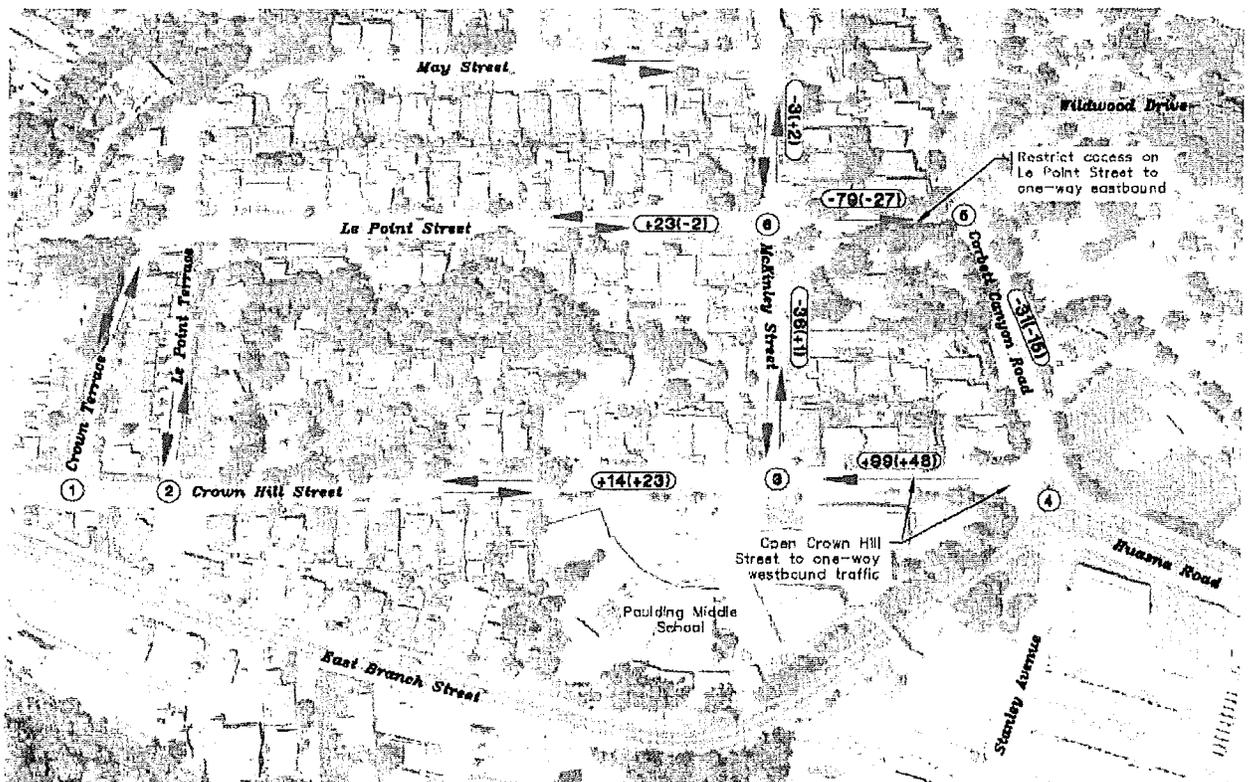
The LOS of East Branch Street/Huasna Road/Corbett Canyon Road/Stanley Avenue degrade below policy LOS with Scenario 1 circulation modifications using existing vehicle

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volumes and modeled changes in vehicle distribution. During the AM peak hour the increase is calculated to be 3.8 seconds with LOS decreasing from B to C. During the PM peak hour the increase is calculated to be 11.9 seconds with LOS decreasing from C to D. The cause of the added delay is attributed to added traffic at the intersection as well as the opening of Crown Hill Street to westbound (inbound) traffic introduces new conflict movements at the intersection. The existing intersection has 18 conflicting movements, increasing to 38 conflicting movements under this scenario. An intersection with more conflict points will generally experience added delay and operate at a lower LOS given the same volume of traffic.

Scenario 1A

Scenario 1A is identical to Scenario 1 except that Traffic on Le Point Street between McKinley Street is modified from two-way traffic flow to one-way eastbound traffic flow.



Display showing potential changes of Scenario 1A

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**TABLE 3:  
SCENARIO 1A INTERSECTION LOS**

#	Intersection	Control Type <sup>1,2</sup>	Target LOS	AM Peak Hour			PM Peak Hour		
				Delay	LOS	Warrant Met? <sup>3</sup>	Delay	LOS	Warrant Met? <sup>3</sup>
1	Crown Hill Street / Crown Terrace	TWSC	C	11.2	B	-	8.5	A	-
2	Crown Hill Street / Le Point Terrace	TWSC	C	13.1	B	-	8.5	A	-
3	Crown Hill Street / McKinley Street	TWSC	C	10.7	B	-	8.6	A	-
4	East Branch Street / Huasna Road / Corbett Canyon Road / Stanley Avenue	AWSC	C	20.9	C	-	31.8	D	-
5	Le Point Street / Corbett Canyon Rd	TWSC	C	13.8	B	-	11.4	B	-
6	Le Point Street / McKinley Street	AWSC	C	8.2	A	-	7.1	A	-

**Notes:**

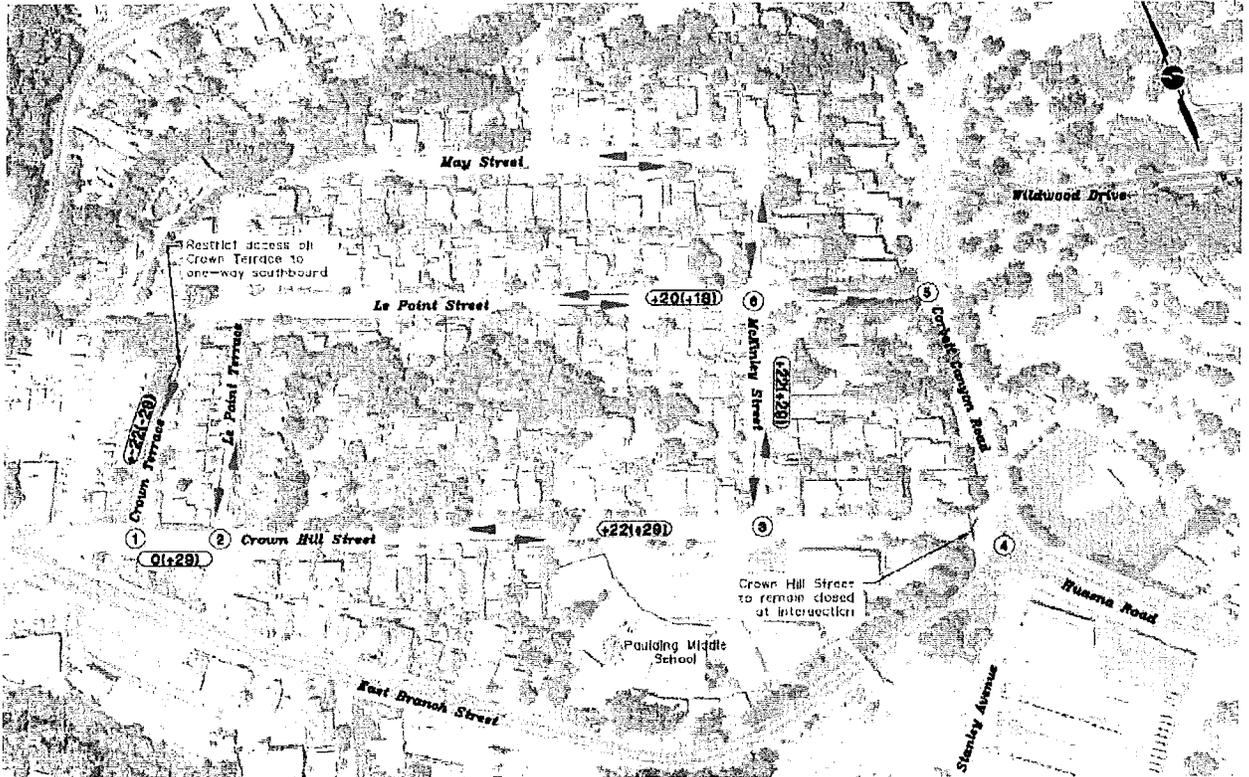
1. AWSC = All Way Stop Control; TWSC = Two Way Stop Control; RNDBT = Roundabout
2. LOS = Delay based on worst minor street approach for TWSC, avg of all approaches for AWSC, Signal, RNDBT
3. Warrant = Based on California MUTCD Warrant 3

Similar to Scenario 1, Scenario 1A further impacts the intersection of East Branch Street/Huasna Road/Corbett Canyon Road/Stanley Avenue degrading the LOS at this intersection slightly below the LOS anticipated with Scenario 1.

**Scenario 2**

Scenario 2 proposes to restrict access on Crown Hill Terrace to one-way southbound travel only between Le Point Street and Crown Hill Street. This scenario keeps Crown Hill Street closed at the intersection with Corbett Canyon Road/Huasna Road/Stanley Avenue/East Branch Street. By reducing the access at Crown Terrace to southbound only, northbound traffic would be required to continue up Crown Hill Street and use McKinley Street, which increases vehicular volumes in front of Paulding Middle School. The redistributed peak hour vehicle trips on Crown Hill and McKinley streets is estimated at 22 trips for the AM Peak and 29 trips for the PM peak hour. The resulting LOS conditions are summarized below in Table 4 and are considered insignificant.

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Display showing potential changes of scenario 2

**TABLE 4:  
SCENARIO 2 INTERSECTION LOS**

#	Intersection	Control Type <sup>1,2</sup>	Target LOS	AM Peak Hour			PM Peak Hour		
				Delay	LOS	Warrant Met? <sup>3</sup>	Delay	LOS	Warrant Met? <sup>3</sup>
1	Crown Hill Street / Crown Terrace	TWSC	C	10.9	B	-	8.5	A	-
2	Crown Hill Street / Le Point Terrace	TWSC	C	11.7	B	-	8.7	A	-
3	Crown Hill Street / McKinley Street	TWSC	C	10.2	B	-	8.4	A	-
4	East Branch Street / Huasna Road / Corbett Canyon Road / Stanley Avenue	AWSC	C	13.4	B	-	18.6	C	-
5	Le Point Street / Corbett Canyon Rd	TWSC	C	14.9	B	-	11.5	B	-
6	Le Point Street / McKinley Street	AWSC	C	8.8	A	-	7.3	A	-

Notes:

1. AWSC = All Way Stop Control; TWSC = Two Way Stop Control; RNDDBT = Roundabout

2. LOS = Delay based on worst minor street approach for TWSC, avg of all approaches for AWSC, Signal, RNDDBT

3. Warrant = Based on California MUTCD Warrant 3

As shown in Table 4 above, the study intersections are projected to operate at LOS C or better during both the AM and PM peak hours. The intersection of East Branch

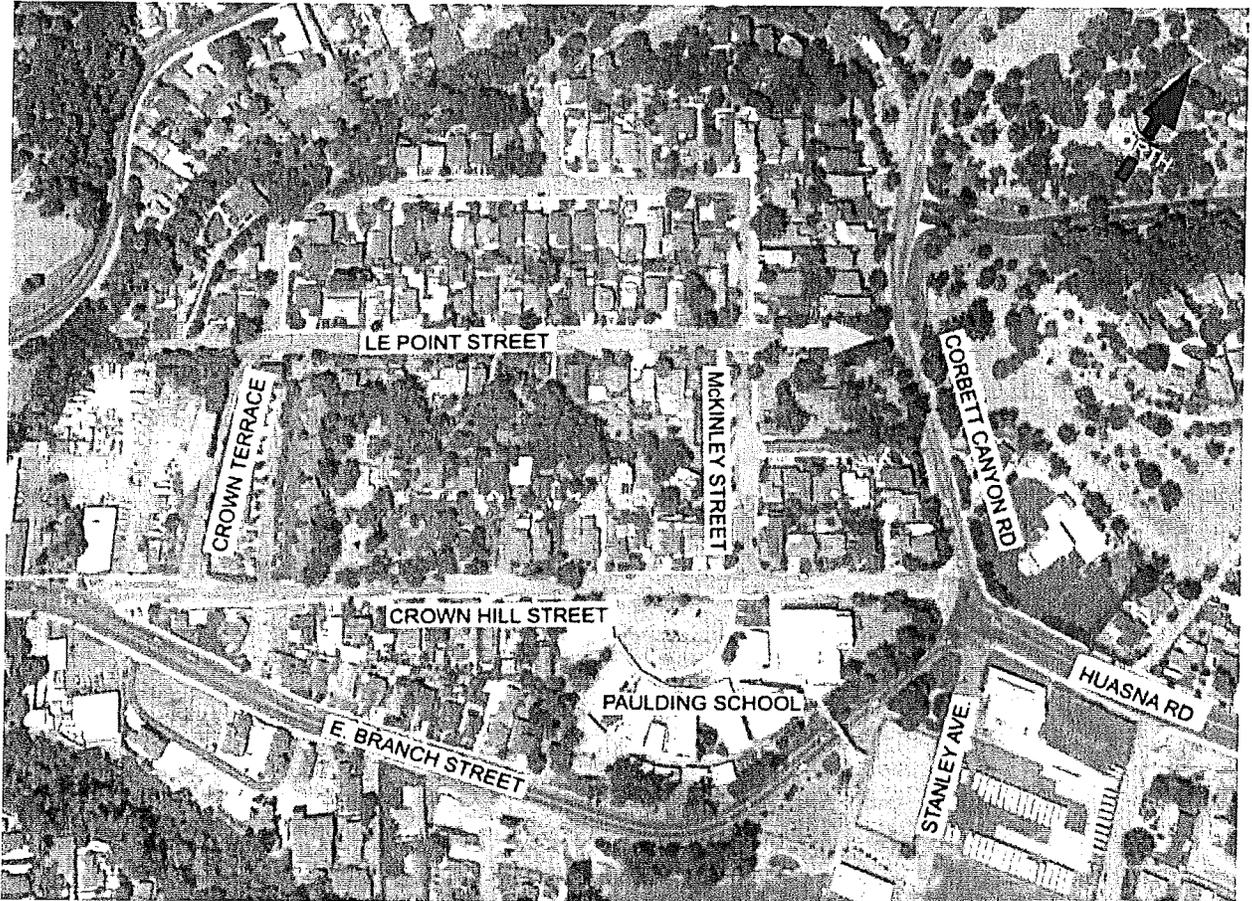
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Street/Huasna Road/Corbett Canyon Road/Stanley Avenue/Crown Hill Street is unchanged compared to the existing condition. Though Scenario 2 is projected to operate at acceptable LOS with negligible change compared to the existing conditions, it does however result in out-of-direction travel required for the residents of Le Point Street west of McKinley Street. Vehicles traveling to homes at the west end of Le Point Street are required to travel approximately 2,500 feet in this scenario compared to a travel distance of 450 feet in the existing condition.

Scenario 3

Scenario 3 converts several neighborhood streets to one-way streets as well as proposes to open Crown Hill Street at the intersection of East Branch Street/Stanley Avenue/Huasna Road/Corbett Canyon Road/Crown Hill Street. Traffic flow would be restricted to one-way westbound (inbound) traffic on Crown Hill Street between the intersection of East Branch Street/Huasna Road/Corbett Canyon Road/Stanley Avenue/Crown Hill Street and McKinley Street. McKinley Street would be restricted to one-way northbound traffic between the intersections of Le Point Street and Crown Hill Street. Le Point Street would be restricted to one-way westbound traffic between Crown Terrace and McKinley Street and one-way eastbound between McKinley Street and Corbett Canyon Road. Crown Terrace would also be converted to a one-way southbound street. Crown Hill Street and Le Point Street would act as east-west one-way couplets, and Crown Terrace and McKinley Street would act as north-south one-way couplets.

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Display showing potential changes of scenario 3

**TABLE 5:  
SCENARIO 3 INTERSECTION LOS**

#	Intersection	Control Type <sup>1,2</sup>	Target LOS	AM Peak Hour			PM Peak Hour		
				Delay	LOS	Warrant Met? <sup>3</sup>	Delay	LOS	Warrant Met? <sup>3</sup>
1	Crown Hill Street / Crown Terrace	TWSC	C	12.0	B	-	8.6	A	-
2	Crown Hill Street / Le Point Terrace	TWSC	C	12.0	B	-	8.4	A	-
3	Crown Hill Street / McKinley Street	TWSC	C	16.1	C	-	9.7	A	-
4	East Branch Street / Huasna Road / Corbett Canyon Road / Stanley Avenue	AWSC	C	22.0	C	-	40.2	E	-
5	Le Point Street / Corbett Canyon Rd	TWSC	C	12.3	B	-	12.2	B	-
6	Le Point Street / McKinley Street	AWSC	C	22.2	C	-	7.7	A	-

As can be seen above, the AM peak hour redistribution has the greatest potential to impact the neighborhood. During the morning drop-off at Paulding Middle School, trips

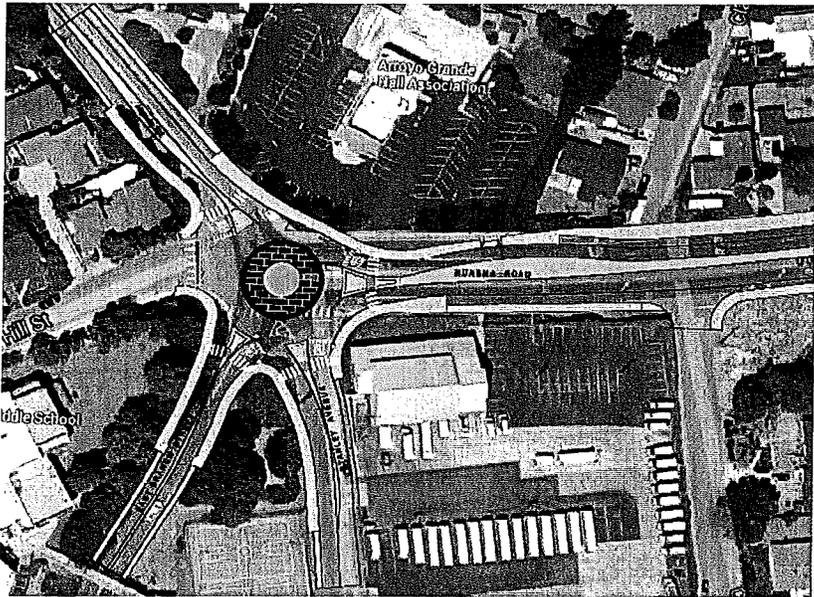
**CONSIDERATION OF THE LE POINT AND CROWN HILL NEIGHBORHOOD  
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that would normally return westbound on Crown Hill Street after dropping off their children would be required to use McKinley Street, Le Point Street, Crown Terrace, and finally Crown Hill Street to return to East Branch Street westbound. The collected traffic data indicates that there are 213 existing trips westbound on Crown Hill Street during the AM peak hour, consisting of approximately 147 return trips from the school. Converting this segment of road to one-way diverts these trips to McKinley Street, Le Point Street, Crown Terrace to East Branch Street a distance of about 2,200 feet. The distance on Crown Hill Street from Paulding Middle School to Crown Terrace is approximately 950 feet, so this scenario would result in up to 1,250 feet of out-of-direction travel. There are also 44 residences along the longer route which would experience elevated traffic volumes while 18 residences along Crown Hill Street between Crown Terrace and McKinley Street would see a decreased traffic. This scenario also results in greater demand on the intersection of East Branch Street/Huasna Road/Corbett Canyon Road/Stanley Avenue/Crown Hill Street decreasing the LOS of the intersection to E during the PM peak hour.

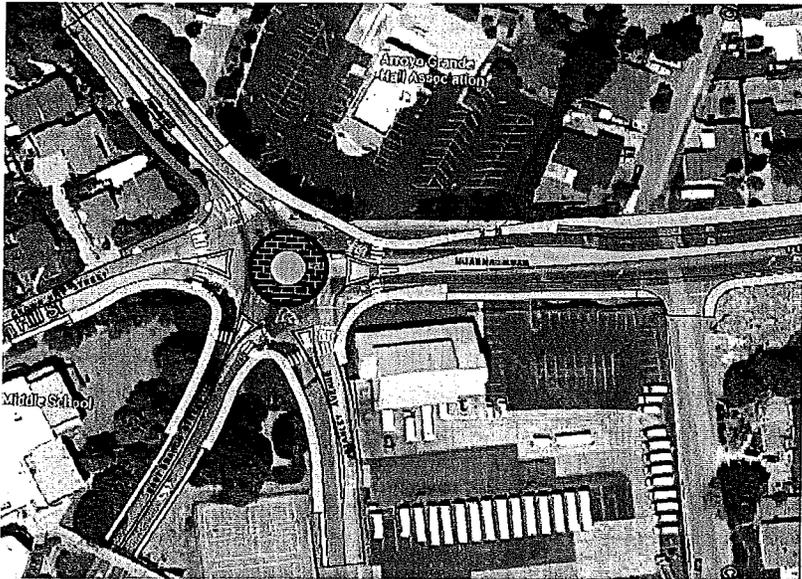
Intersection of East Branch Street/Huasna Road/Corbett Canyon Road/Stanley Avenue  
/Crown Hill Street

In order to implement Scenario 1, 1A or 3 improvements must be completed to the intersection of East Branch Street/Huasna Road/Corbett Canyon Road/Stanley Avenue/Crown Hill Street to increase performance. Due to the intersections existing layout, signalization of the intersection would be challenging due to the need for additional roadway width to accommodate turning movements. The existing layout, does allow for roundabout installation. Based on the 2010 recommendations from the Institute of Transportation Studies at the University of California at Berkley, that study recommended the installation of a roundabout at the intersection of East Branch Street/Huasna Road/Corbett Canyon Road/Stanley Avenue/Crown Hill Street. Further academic analysis was completed by a student enrolled at Cal Poly providing the schematic design with anticipated LOS. The roundabout was analyzed keeping Crown Hill closed as well as opening Crown Hill to two-way traffic.

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Display showing Alternative A that keeps  
Crown Hill Closed at Huasna/Corbett Canyon



Display showing Alternative B that opens  
Crown Hill Closed at Huasna/Corbett Canyon

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Level of Service

TABLE 4: Existing Plus Project Intersection Level of Service							
		Existing		Existing Plus Alternative A		Existing Plus Alternative B	
		Delay <sup>1</sup>	LOS	Delay <sup>1</sup>	LOS	Delay <sup>1</sup>	LOS
Highway 227	AM	14.1	B	8.2	A	9.4	A
	PM	16.3	C	9.3	A	9.7	A
Huasna Road	AM	16.7	C	8.5	A	8.5	A
	PM	12.8	B	7.6	A	7.6	A
E. Branch Street	AM	22.4	C	7.0	A	7.5	A
	PM	34.0	D	9.5	A	9.6	A
Stanley Avenue	AM	10.8	B	5.6	A	5.6	A
	PM	11.0	B	6.9	A	6.9	A
Crown Hill Road	AM	N / A		N / A		6.0	A
	PM	N / A		N / A		6.2	A
Overall Performance	AM	18.0	C	7.8	A	8.2	A
	PM	23.0	C	8.9	A	8.6	A

1. HCM 2010 average control delay in seconds per vehicle.

As shown above, the intersection improvements provide a superior level of services and will provide the necessary operational capacity to implement any necessary circulation changes to the Le Point Street / McKinley neighborhoods. Pedestrian facilities are enhanced with additional sidewalk area and decreased roadway crossing distances. Bicycles safety is improved due to slower vehicles speeds and revised traffic patterns.

Conclusion

No circulation changes are recommended for implementation at this time. The intersection of East Branch Street/Huasna Road/Corbett Canyon Road/Stanley Avenue currently operates at LOS B in the AM peak hour and LOS C in the PM peak hour. The opening of Crown Hill Street at the intersection of East Branch Street/Huasna Road/Corbett Canyon Road/Stanley Avenue adds traffic and introduces another conflict point which is projected to degrade the intersection to LOS. It is therefore recommended that the Traffic Commission:

1. Receive the Le Point and Crown Hill Neighborhood Circulation information;
2. Receive the East Branch Street/Huasna Road/Corbett Canyon Road/Stanley Avenue/Crown Hill Street Roundabout information;
3. Receive community input;

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4. Direct staff to include intersection improvements at of East Branch Street/Huasna Road/Corbett Canyon Road/Stanley Avenue/Crown Hill Street in the City's Circulation Element of the General Plan; and
5. Direct staff to prepare a Capital Improvement Plan Funding Request during the next project cycle for intersection improvements to East Branch Street/Huasna Road/Corbett Canyon Road/Stanley Avenue/Crown Hill Street.

These recommendations will allow for intersection improvements at East Branch Street/Huasna Road/Corbett Canyon Road/Stanley Avenue/Crown Hill Street that will allow for future circulation changes for the neighborhood if the community wishes to pursue these or other alternatives.

**ALTERNATIVES:**

The following alternatives are provided for the Commission's consideration:

- Approve staff's recommendation;
- Do not approve staff's recommendation;
- Provide alternate direction

**PUBLIC NOTICE AND COMMENT:**

The Agenda for this meeting was posted in front of City Hall and on the City's website on Friday, May 20, 2016.

**Attachments:**

1. Circulation Study
2. Huasna/Corbett Canyon/Stanley/East Branch Roundabout Feasibility Study



## Draft Memorandum

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<b>To:</b> City of Arroyo Grande	<b>Date:</b> July 21, 2015
<b>Attn:</b> Matt Horn, P.E.	<b>Project:</b> Crown Hill Neighborhood
<b>From:</b> Nate Stong, P.E.	Traffic Circulation Study
	<b>Job No.:</b> 25-1275-35 (03)
<b>CC:</b> Joe Weiland, P.E., Omni-Means	<b>File No.:</b> C2007MEM001.DOCX

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### Introduction

This memorandum has been prepared by Omni-Means to present the results of a circulation study performed for the Crown Hill Neighborhood in the City of Arroyo Grande. The project area is presented in Figure 1. The City recently installed an all-way stop sign at the intersection of Le Point Street and McKinley Street.

The City contracted with Omni-Means to evaluate the vehicular circulation within the neighborhood with the following potential changes to traffic controls:

1. Restore one-way westbound (inbound) access to Crown Hill Street from the intersection with Corbett Canyon Road/E. Branch Street/Huasna Road/Stanley Avenue.
2. Convert Crown Terrace between Le Point Street and Crown Hill Street to one-way southbound only.
3. Consider various options to convert other neighborhood streets to one-way couplets to discourage anticipated "cut-through" traffic.

There are four points of access into this neighborhood: Le Point Street at Corbett Canyon Road, Crown Hill Street at East Branch Street, Crown Hill Street at Corbett Canyon Road/East Branch Street, and Le Point Terrace at East Branch Street. Currently the first two are the major ingress and egress locations. The five-legged intersection of Corbett Canyon Road/Huasna Road/Stanley Avenue/East Branch Street/Crown Hill Street has a street barricade across the Crown Hill Street approach. Although this location is closed to vehicles, access is still provided for pedestrians and bicycles.

### Data Collection

Weekday traffic counts were collected at the following intersections between 7:00 and 9:00 AM and between 4:00 and 6:00 PM on 6/9/2015; Paulding Middle School was in session during this time.

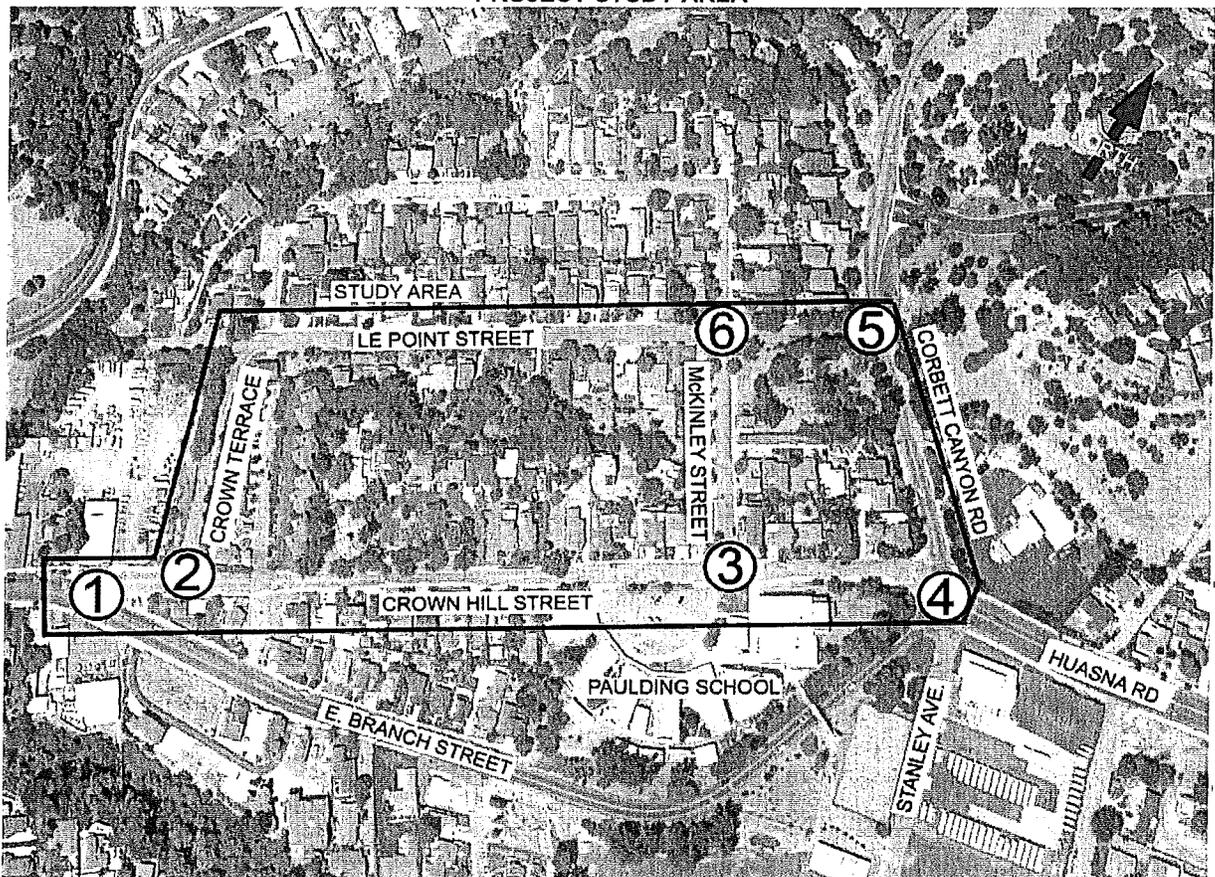
1. Crown Hill Street/Crown Terrace
2. Crown Hill Street/Le Point Terrace
3. Crown Hill Street/McKinley Street
4. E. Branch Street/Corbett Canyon Road / Huasna Road / Stanley Avenue

July 21, 2015

5. Le Point Street/Corbett Canyon Road
6. Le Point Street/McKinley Street

These intersections (identified in Figure 1) were selected in order to calculate the levels of service at these locations, to establish the peak hour amount of inbound and outbound traffic, and to determine the directionality of inbound and outbound traffic. Existing volumes are summarized on Figure 2. The raw traffic count data collected for this project is included in the Appendix.

**FIGURE 1:  
PROJECT STUDY AREA**



### Existing Intersection Levels of Service

Intersection level of service (LOS) for the existing condition was calculated for the six intersections where traffic counts were collected. As presented in Table 1, all study intersections are currently operating at acceptable LOS conditions (C or better) during peak hours.



**TABLE 1:  
EXISTING INTERSECTION LOS**

#	Intersection	Control Type <sup>1,2</sup>	Target LOS	AM Peak Hour			PM Peak Hour		
				Delay	LOS	Warrant Met? <sup>3</sup>	Delay	LOS	Warrant Met? <sup>3</sup>
1	Crown Hill Street / Crown Terrace	TWSC	C	11.2	B	-	8.5	A	-
2	Crown Hill Street / Le Point Terrace	TWSC	C	13.2	B	-	8.5	A	-
3	Crown Hill Street / McKinley Street	TWSC	C	9.8	A	-	8.4	A	-
4	East Branch Street / Huasna Road / Corbett Canyon Road / Stanley Avenue	AWSC	C	13.4	B	-	18.6	C	-
5	Le Point Street / Corbett Canyon Rd	TWSC	C	14.9	B	-	11.5	B	-
6	Le Point Street / McKinley Street	AWSC	C	8.4	A	-	7.1	A	-

Notes:

1. AWSC = All Way Stop Control; TWSC = Two Way Stop Control; RNDBT = Roundabout

2. LOS = Delay based on worst minor street approach for TWSC, avg of all approaches for AWSC, Signal, RNDBT

3. Warrant = Based on California MUTCD Warrant 3

### Scenario 1: Crown Hill Street One-Way from Huasna Road

Scenario 1 proposes to open Crown Hill Street at the intersection of East Branch Street/Stanley Avenue/Huasna Road/Corbett Canyon Road/Crown Hill Street. Traffic flow would be restricted to one-way westbound (inbound) traffic between that intersection and McKinley Street. By adding another point of access off of Corbett Canyon Road, traffic on Le Point Street and at its intersection with McKinley Street would be reduced, and the volumes would be more evenly distributed.

As shown on Figure 2, it is estimated that 64 trips would divert from Le Point Street and utilize Crown Hill Street inbound during the AM peak hour. The resulting LOS conditions are summarized in Table 2.

**TABLE 2:  
SCENARIO 1 INTERSECTION LOS**

#	Intersection	Control Type <sup>1,2</sup>	Target LOS	AM Peak Hour			PM Peak Hour		
				Delay	LOS	Warrant Met? <sup>3</sup>	Delay	LOS	Warrant Met? <sup>3</sup>
1	Crown Hill Street / Crown Terrace	TWSC	C	11.2	B	-	8.5	A	-
2	Crown Hill Street / Le Point Terrace	TWSC	C	13.1	B	-	8.5	A	-
3	Crown Hill Street / McKinley Street	TWSC	C	9.0	A	-	8.4	A	-
4	East Branch Street / Huasna Road / Corbett Canyon Road / Stanley Avenue	AWSC	C	17.2	C	-	30.5	D	-
5	Le Point Street / Corbett Canyon Rd	TWSC	C	13.8	B	-	11.4	B	-
6	Le Point Street / McKinley Street	AWSC	C	7.8	A	-	7.0	A	-

Notes:

1. AWSC = All Way Stop Control; TWSC = Two Way Stop Control; RNDBT = Roundabout

2. LOS = Delay based on worst minor street approach for TWSC, avg of all approaches for AWSC, Signal, RNDBT

3. Warrant = Based on California MUTCD Warrant 3

As shown in Table 2, the study intersections are projected to generally operate at LOS C or better during both the AM and PM peak hours under Scenario #1. However, the delay is



projected to increase by 11.9 seconds for a total of 30.5 seconds at the East Branch Street/Huasna Road/Corbett Canyon Road/Stanley Avenue/Crown Hill Street intersection during PM peak hour, with LOS worsening from C to D. During the AM peak hour the increase is calculated to be 3.8 seconds with LOS decreasing from B to C. The cause of the added delay can be attributed to more than just the added traffic at the intersection. The opening of Crown Hill Street to westbound (inbound) traffic also introduces new conflict movements at the intersection. The existing intersection has 18 conflicting movements, increasing to 38 conflicting movements under this scenario. An intersection with more conflict points will generally experience added delay and operate at a lower LOS given the same volume of traffic.

The intersection of Crown Hill Street/McKinley Street (Intersection #3) is projected to improve slightly by 0.8 seconds in the AM peak hour due to the shift in traffic from the side street stop leg of McKinley Street to Crown Hill Street which doesn't have stop control. The change in traffic patterns at this intersection may warrant an all-way stop, not due to traffic volumes but potentially to "control vehicle/pedestrian conflicts near locations that generate high pedestrian volumes,"<sup>1</sup> namely Paulding Middle School. An engineering study of the intersection should be performed prior to opening Crown Hill Street to traffic from the East Branch Street/Huasna Road/Corbett Canyon Road/Stanley Avenue intersection.

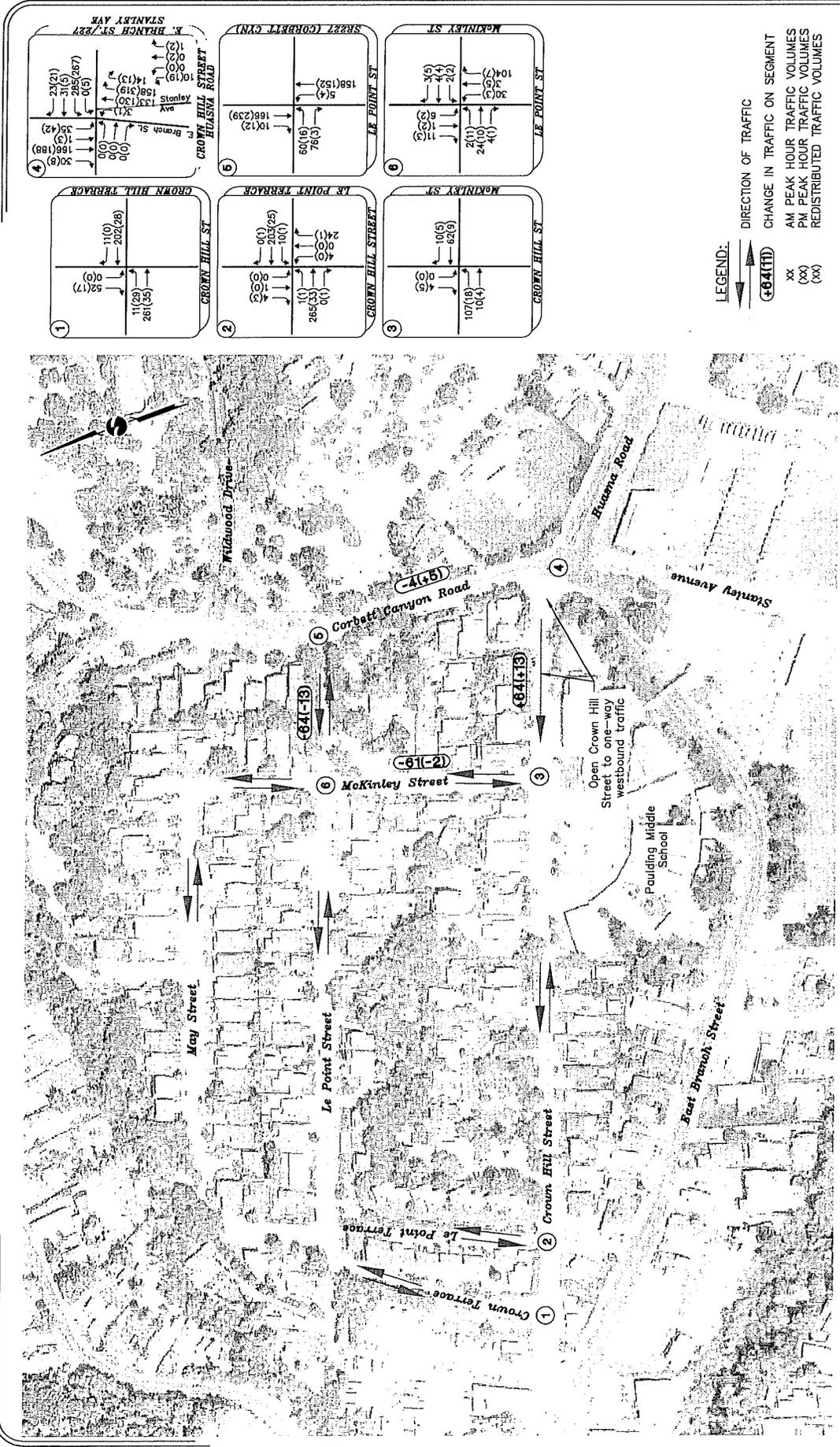
Finally, the remaining study intersections are projected to experience no changes in overall LOS. However, most show a slight reduction in delay which results in less time waiting at each intersection.

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<sup>1</sup> Section 2B.07, Option B, California Manual on Uniform Traffic Control Devices, 2014 Edition.







Crown Hill Area Circulation Study

# Scenario #1 Peak Hour Traffic Volumes

Figure No. 3

## Scenario 1A: Crown Hill Street / Le Point Street Couplet

Similar to Scenario 1, Scenario 1A proposes to open Crown Hill Street at the intersection of East Branch Street/Stanley Avenue/Huasna Road/Corbett Canyon Road/Crown Hill Street. Traffic flow on Crown Hill Street would be restricted to one-way westbound (inbound) traffic between that intersection and McKinley Street. Scenario #1A would also restrict Le Point Street to one-way eastbound (outbound) traffic between McKinley Street and Corbett Canyon Road. These two streets would complement one another by acting as a one-way couplet.

Sight distance is limited at the intersection of Le Point Street and McKinley Street primarily due to a vertical curve on Le Point Street just east of McKinley Street. This curve limits the sight distance on McKinley Street to westbound vehicles approaching from Corbett Canyon Road. Restricting traffic on the eastern Le Point Street leg to one-way would reduce the vehicular volume on this leg and potentially improve the safety of this intersection by eliminating the westbound traffic approaching McKinley Street.

The redistributed volumes are illustrated on Figure 4, with a greater number of trips utilizing Crown Hill Street westbound (inbound) due to Le Point Street limited to one-way in the eastbound (outbound) direction only. The resulting LOS conditions are summarized in Table 3.

TABLE 3:  
SCENARIO 1A INTERSECTION LOS

#	Intersection	Control Type <sup>1,2</sup>	Target LOS	AM Peak Hour			PM Peak Hour		
				Delay	LOS	Warrant Met? <sup>3</sup>	Delay	LOS	Warrant Met? <sup>3</sup>
1	Crown Hill Street / Crown Terrace	TWSC	C	11.2	B	-	8.5	A	-
2	Crown Hill Street / Le Point Terrace	TWSC	C	13.1	B	-	8.5	A	-
3	Crown Hill Street / McKinley Street	TWSC	C	10.7	B	-	8.6	A	-
4	<b>East Branch Street / Huasna Road / Corbett Canyon Road / Stanley Avenue</b>	<b>AWSC</b>	<b>C</b>	<b>20.9</b>	<b>C</b>	<b>-</b>	<b>31.8</b>	<b>D</b>	<b>-</b>
5	Le Point Street / Corbett Canyon Rd	TWSC	C	13.8	B	-	11.4	B	-
6	Le Point Street / McKinley Street	AWSC	C	8.2	A	-	7.1	A	-

Notes:

1. AWSC = All Way Stop Control; TWSC = Two Way Stop Control; RNDDBT = Roundabout
2. LOS = Delay based on worst minor street approach for TWSC, avg of all approaches for AWSC, Signal, RNDDBT
3. Warrant = Based on California MUTCD Warrant 3

As shown in Table 3, the study intersections are projected to continue to generally operate at LOS C or better during both the AM and PM peak hours. Though the peak hour LOS at Intersection #4 is the same as reported with Scenario #1, intersection delay is projected to increase during both peak hours. This increase in delay can be attributed to Intersection #4 providing the only inbound access to the neighborhood from Huasna Road or Corbett Canyon Road.

As stated prior, an engineering study at the intersection of Crown Hill Street/McKinley Street is recommended prior to opening Crown Hill Street to traffic from the east.





## Scenario 2: Convert Crown Hill Terrace to One-Way

Scenario 2 proposes to restrict access on Crown Hill Terrace to southbound only between Le Point Street and Crown Hill Street. In this scenario, Crown Hill Street would remain closed at its intersection with Corbett Canyon Road/Huasna Road/Stanley Avenue/East Branch Street.

By reducing the access at Crown Terrace to southbound only, northbound traffic would be redistributed to McKinley Street, which would increase vehicular volumes in front of Paulding Middle School. The redistributed peak hour vehicle trips are illustrated on Figure 5, and as can be seen the increase on Crown Hill Street and McKinley Street is estimated to be 22 trips in the AM peak hour and 29 trips in the PM peak hour. The resulting LOS conditions are summarized in Table 4.

**TABLE 4:  
SCENARIO 2 INTERSECTION LOS**

#	Intersection	Control Type <sup>1,2</sup>	Target LOS	AM Peak Hour			PM Peak Hour		
				Delay	LOS	Warrant Met? <sup>3</sup>	Delay	LOS	Warrant Met? <sup>3</sup>
1	Crown Hill Street / Crown Terrace	TWSC	C	10.9	B	-	8.5	A	-
2	Crown Hill Street / Le Point Terrace	TWSC	C	11.7	B	-	8.7	A	-
3	Crown Hill Street / McKinley Street	TWSC	C	10.2	B	-	8.4	A	-
4	East Branch Street / Huasna Road / Corbett Canyon Road / Stanley Avenue	AWSC	C	13.4	B	-	18.6	C	-
5	Le Point Street / Corbett Canyon Rd	TWSC	C	14.9	B	-	11.5	B	-
6	Le Point Street / McKinley Street	AWSC	C	8.8	A	-	7.3	A	-

*Notes:*

<sup>1</sup>. AWSC = All Way Stop Control; TWSC = Two Way Stop Control; RNDBT = Roundabout

<sup>2</sup>. LOS = Delay based on worst minor street approach for TWSC, avg of all approaches for AWSC, Signal, RNDBT

<sup>3</sup>. Warrant = Based on California MUTCD Warrant 3

As shown in Table 4, the study intersections are projected to operate at LOS C or better during both the AM and PM peak hours. The intersection of East Branch Street/Huasna Road/Corbett Canyon Road/Stanley Avenue/Crown Hill Street is unchanged compared to the existing condition.

Though Scenario 2 is projected to operate at acceptable LOS with negligible change compared to the existing conditions, it does however result in out-of-direction travel required for the residents of Le Point Street west of McKinley Street. In the worst case for the homes at the west end of Le Point Street, the out-of-direction travel distance is approximately 2,500 feet compared to a distance of 450 feet if allowed to utilize Crown Terrace northbound. Scenario 2 would also result in additional traffic on McKinley Street south of Le Point Street and on Crown Hill Street west of McKinley Street. This results in additional vehicles through the neighborhood and across the middle school within these segments.



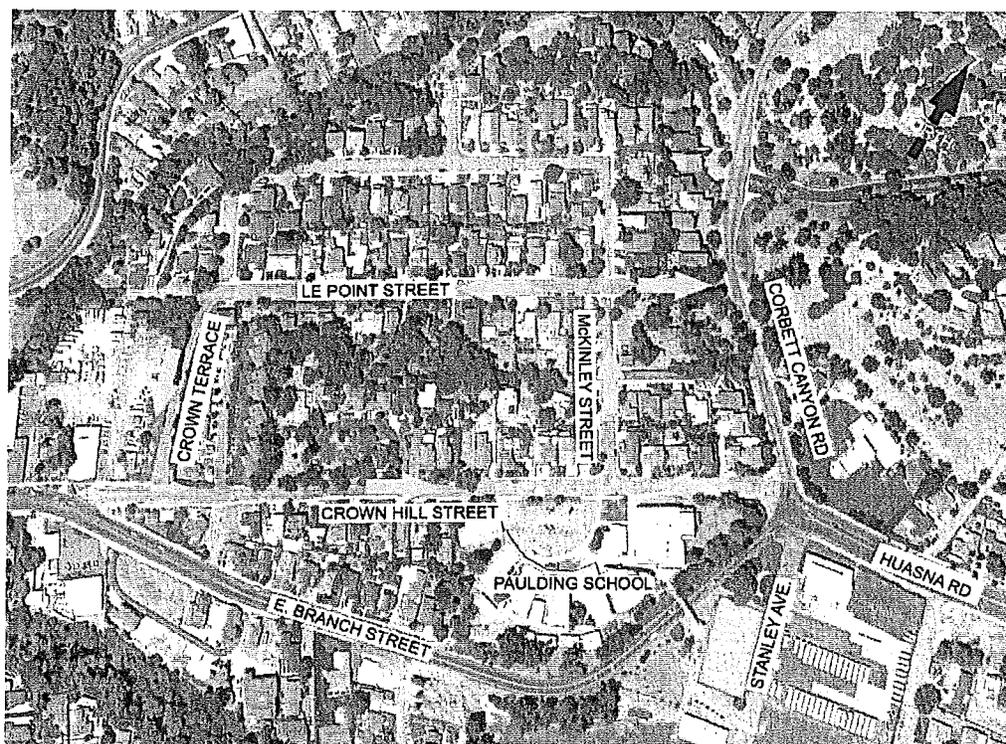


### Scenario 3: Convert Neighborhood Streets to One-Way Couplets

Scenario 3 converts several neighborhood streets to one-way streets. This scenario proposes to open Crown Hill Street at the intersection of East Branch Street/Stanley Avenue/Huasna Road/Corbett Canyon Road/Crown Hill Street. Traffic flow would be restricted to one-way westbound (inbound) traffic between that intersection and McKinley Street. Between Le Point Terrace and McKinley Street, Crown Hill Street would be restricted to one-way eastbound (outbound) traffic. McKinley Street would be restricted to one-way northbound traffic. Le Point Street would be restricted to one-way westbound traffic between Crown Terrace and McKinley Street and one-way eastbound between McKinley Street and Corbett Canyon Road. Crown Terrace would also be converted to a one-way southbound street.

Crown Hill Street and Le Point Street would act as east-west one-way couplets, and Crown Terrace and McKinley Street would act as north-south one-way couplets. See Figure 6.

**FIGURE 6:  
SCENARIO #3 SCHEMATIC**



The trip redistribution for this scenario is presented on Figure 7, and as can be seen the AM peak hour redistribution has the greatest potential to impact the neighborhood. During the morning dropoff at Paulding Middle School, trips that would normally return westbound on Crown Hill Street after dropping off their children would be required to take McKinley Street, Le Point Street, and Crown Terrace to return to Crown Hill Street at E. Branch Street westbound.

The collected traffic data indicates that there are 213 existing trips westbound on Crown Hill Street during the AM peak hour, consisting of approximately 147 return trips from the school. Converting this segment of road to one-way diverts these trips to north on McKinley Road, west



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on Le Point Street, and south on Crown Terrace, a distance of about 2,200 feet. The distance on Crown Hill Street from the school to Crown Terrace is approximately 950 feet, so this scenario would result in up to 1,270 feet of out-of-direction travel. There are also 44 residences along the longer route which would experience elevated traffic volumes while 18 residences along Crown Hill Street between Crown Terrace and McKinley Street would see a commensurate decrease in traffic.

As can be seen on Figure 7, the out-of-direction travel results in a greater demand on Intersection #4 as well, with approximately 58 additional AM trips approaching the intersection from the west on East Branch Street, with 38 of those trips continuing through the intersection to travel north on Corbett Canyon Road. These additional trips primarily originate from Le Point Street west of McKinley Street and would be redirected to west on Le Point Street, south on Crown Terrace to Crown Hill Street and then east on East Branch Street to Corbett Canyon Road. The out-of-direction travel distance to the intersection of Corbett Canyon Road and Le Point Street would be up to 3,900 feet, while the existing distance is 320 feet.

The trip redistribution and projected intersection volumes were also analyzed for LOS and the resulting LOS conditions are summarized in Table 4.

**TABLE 5:  
SCENARIO 3 INTERSECTION LOS**

#	Intersection	Control Type <sup>1,2</sup>	Target LOS	AM Peak Hour			PM Peak Hour		
				Delay	LOS	Warrant Met? <sup>3</sup>	Delay	LOS	Warrant Met? <sup>3</sup>
1	Crown Hill Street / Crown Terrace	TWSC	C	12.0	B	-	8.6	A	-
2	Crown Hill Street / Le Point Terrace	TWSC	C	12.0	B	-	8.4	A	-
3	Crown Hill Street / McKinley Street	TWSC	C	16.1	C	-	9.7	A	-
4	<b>East Branch Street / Huasna Road / Corbett Canyon Road / Stanley Avenue</b>	<b>AWSC</b>	<b>C</b>	<b>22.0</b>	<b>C</b>	<b>-</b>	<b>40.2</b>	<b>E</b>	<b>-</b>
5	Le Point Street / Corbett Canyon Rd	TWSC	C	12.3	B	-	12.2	B	-
6	Le Point Street / McKinley Street	AWSC	C	22.2	C	-	7.7	A	-

As shown in Table 5, the study intersections are projected to generally operate at LOS C or better during both the AM and PM peak hours. However, the intersection of East Branch Street/Huasna Road/Corbett Canyon Road/Stanley Avenue/Crown Hill Street is projected to worsen to LOS E in the PM peak hour under this scenario. The increase in delay at the intersection can be attributed to the combination of the additional conflicting movements from the opening of Crown Hill Street discussed under Scenario 1, and the redirected traffic through the intersection which currently uses Le Point Street inbound from Corbett Canyon Road, and the redirected traffic through the intersection which currently uses Le Point Street eastbound as discussed above.





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## Conclusion

The intersection of East Branch Street / Huasna Road / Corbett Canyon Road / Stanley Avenue (Intersection #4) is currently operating at LOS B in the AM peak hour and LOS C in the PM peak hour (See Table 6). The opening of Crown Hill Street at the intersection (Scenario 1) adds traffic and introduces another conflict point which is projected to degrade the intersection to LOS C in the AM Peak Hour and LOS D in the PM peak hour.

Scenario 1A further degrades the intersection by restricting traffic on Le Point Street to one way eastbound between McKinley Street and Corbett Canyon Road. The diverted trips must go through Intersection #4 and the increased volume results in LOS D in the PM Peak Hour.

Scenarios 1 and 1A result in negligible benefit in terms of intersection delay at other intersections.

**TABLE 6:  
INTERSECTION LOS SUMMARY**

#	Intersection	AM Peak Hour LOS (Delay)					PM Peak Hour LOS (Delay)				
		Existing	Scenario				Existing	Scenario			
			1	1A	2	3		1	1A	2	3
1	Crown Hill Street / Crown Terrace	B (11.2)	B (11.2)	B (11.2)	B (10.9)	B (12)	A (8.5)	A (8.5)	A (8.5)	A (8.5)	A (8.6)
2	Crown Hill Street / Le Point Terrace	B (13.2)	B (13.1)	B (13.1)	B (11.7)	B (12)	A (8.5)	A (8.5)	A (8.5)	A (8.7)	A (8.4)
3	Crown Hill Street / McKinley Street	A (9.8)	A (9)	B (10.7)	B (10.2)	C (16.1)	A (8.4)	A (8.4)	A (8.6)	A (8.4)	A (9.7)
4	East Branch Street / Huasna Road / Corbett Canyon Road / Stanley Avenue	B (13.4)	C (17.2)	C (20.9)	B (13.4)	C (22)	C (18.6)	D (30.5)	D (31.84)	C (18.6)	E (40.2)
5	Le Point Street / Corbett Canyon Rd	B (14.9)	B (13.8)	B (13.8)	B (14.9)	B (12.3)	B (11.5)	B (11.4)	B (11.4)	B (11.5)	B (12.2)
6	Le Point Street / McKinley Street	A (8.38)	A (7.8)	A (8.23)	A (8.76)	C (15.6)	A (7.08)	A (6.97)	A (7.1)	A (7.3)	A (7.7)

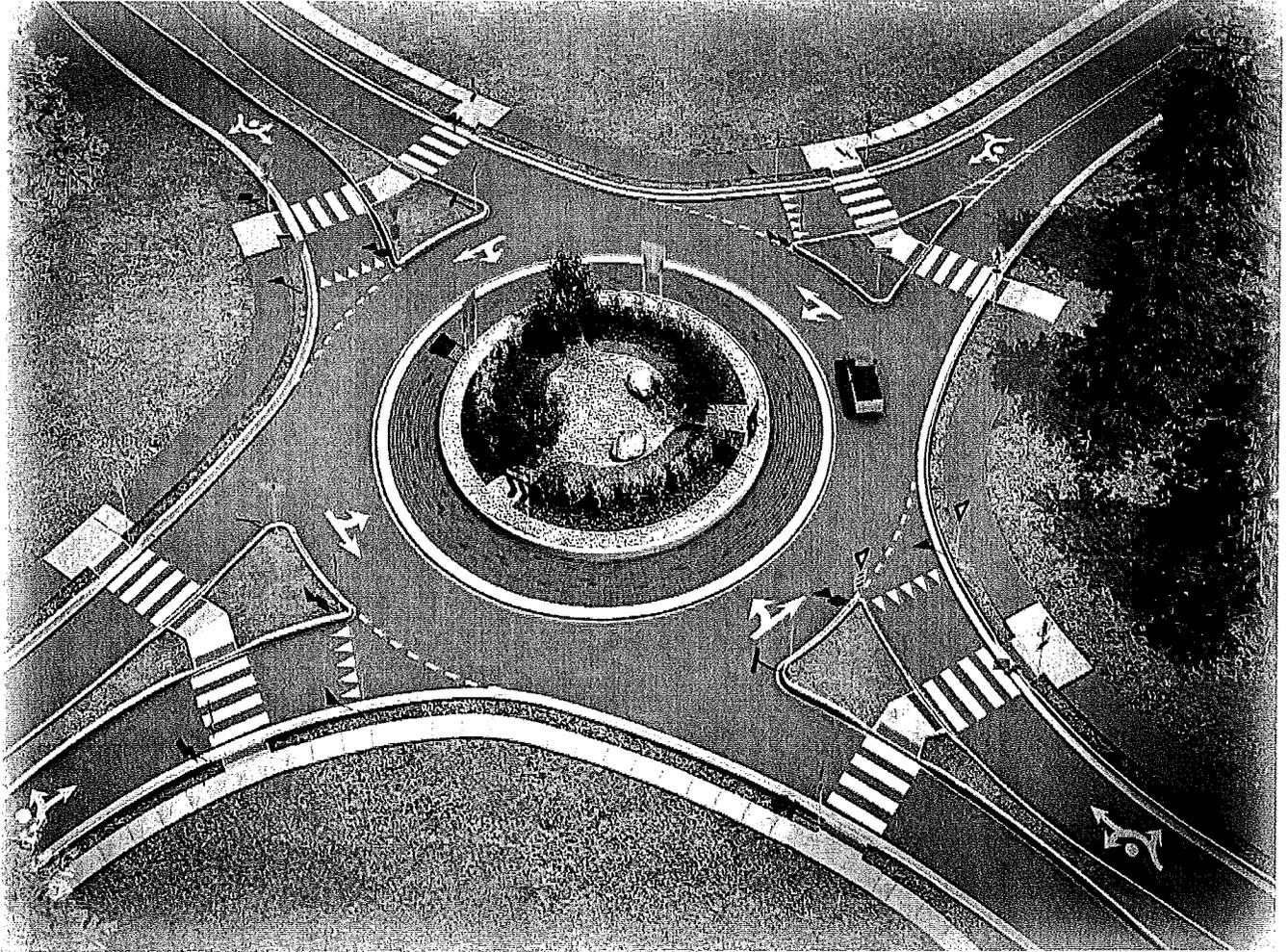
Scenario 2 leaves Crown Hill Street closed and analyzes the conversion of Crown Hill Terrace to one-way southbound. The traffic impact of this change is negligible. Although the intersection of Crown Hill Street / McKinley Street is shown to be reduced from LOS A to B, the delay in the existing condition is 9.8 seconds and with the change increases only 0.4 seconds to 10.2 seconds. The maximum out-of-direction travel for residents at the west end of Le Point Street is approximately 2,050 feet. The out-of-direction travel would impact up to 33 residences and increase traffic in front of up to 26 residences and Paulding Middle School along Crown Hill Street west of McKinley Street and McKinley Street south of Le Point Street. The main benefit of converting Crown Hill Street to one-way is to utilize a portion of the available road width to construct a sidewalk and improve safety for pedestrians on what is currently a narrow two-way road.

Scenario 3 provides negligible benefit to Intersections #2 and #5 during the AM peak hour and results in significant reduction in the level of service at Intersection #4 during the PM peak hour from LOS C to LOS E. The intersections of McKinley Street/Crown Hill Street and McKinley Street/Le Point Street are also projected to be negatively impacted by this scenario, with AM



peak hour LOS degrading from LOS A to LOS C. Further, this scenario results in significant out-of-direction travel within the neighborhood with an increase of over 200 AM peak hour trips on McKinley Street south of Le Point Street, Le Point Street west of McKinley Street, and Crown Terrace. This scenario is therefore not recommended.





SOURCE: TINLEY PARK, ILLINOIS

# DRAFT ROUNDABOUT FEASIBILITY STUDY

Prepared For: City of Arroyo Grande

Lance Knox  
Graduate Thesis Project  
California Polytechnic State University

November 2015

Lance Knox

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## EXECUTIVE SUMMARY

Lance Knox has been retained by the City of Arroyo Grande to perform a feasibility study at the intersection of Highway 227 and Huasna Road. The purpose of this feasibility study is to provide a comparative analysis of the operational performance of a modern roundabout versus an all-way stop at the identified intersection with a final recommendation. Comparisons between each alternative in terms of capacity, safety, and costs have been analyzed and documented for the future design years. The changes in traffic control are proposed to confront the current challenging crossing scenarios for pedestrians and bicyclists. Changes also address current and future level of service deficiencies with an operating Crown Hill Road, as well as solve traffic flow issues, reduce air pollution, improve safety, and provide a gateway entry point on the east side of the city. The general conclusions and recommendations of the feasibility study are provided below:

### CONCLUSIONS

- Modern roundabouts are feasible and less restrictive traffic control devices.
- The modern roundabouts provide superior capacity over the signalized and unsignalized alternatives concerning the overall operations, level of service, delay, and queue lengths for all of the intersections.
- The “before” and “after” safety statistics provide substantial evidence of the superior safety performance for both vehicles and pedestrians.
- The roundabouts and proposed signals will require additional right-of-way in future conditions; however, no severe ROW issues were identified for either alternative.
- The roundabouts would reduce air pollutants / vehicle emissions.
- The roundabouts would enhance the character of the City of Arroyo Grande at and near the intersection, and create a gateway to the City.

### RECOMMENDATION

- City should undergo the preferred choice of roundabout Alternative B.
- Roundabout Alternative B provides the optimal connectivity, while providing an acceptable LOS.
- Creates multiple options for the City when considering adding the Crown Hill Road approach. Additionally, allows for progressive integration of the approach.
- The inclusion and circulation benefits from opening Crown Hill Road justifies the additional cost within Alternative B.
- Installing roundabout Alternative B would provide the least restrictive form of traffic control that produces safe and efficient operation for all modes.

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## INTRODUCTION

This report evaluates the feasibility and potential transportation impacts of a roundabout project located in the City of Arroyo Grande. Two roundabout alternatives are evaluated:

- **Alternative A:** The Alternative A project includes a 74-foot diameter roundabout intersecting the four existing operating approaches, Highway 227, Huasna Road, Stanley Avenue, and E. Branch Street.
- **Alternative B:** The Alternative B project includes a 74-foot diameter roundabout intersecting the four existing operating approaches, Highway 227, Huasna Road, Stanley Avenue, and E. Branch Street. The project also include the opening of Crown Hill Road to one-way westbound traffic, creating a 5-leg roundabout.

The project's location and study intersection are shown on **Figure 1**, and **Figure 2** calls out key components and features of the existing intersection. The roundabout obliges a circulation measure covered in the City's Master Bike Plan that promotes bicycle and pedestrian activity, while safely serving local residents and students at the nearby middle school.

Vehicular levels of service are reported for the study intersection consistent with the City's Transportation Impact Guidelines. The study location was evaluated under these scenarios:

1. **Existing Conditions** reflects 2015 traffic counts and the existing transportation network.
2. **Existing Plus Alternative A** adds the Alternative A roundabout design to Existing Conditions and volumes.
3. **Existing Plus Alternative B** adds the Alternative B roundabout design to Existing Conditions and volumes.
4. **Cumulative Conditions** represents future traffic conditions reflective of the buildout of land uses in the area, not including the proposed Alternative A roundabout or Alternative B roundabout.
5. **Cumulative Plus Alternative A Conditions** represents future traffic conditions reflective of the buildout of land uses in the area, including the proposed Alternative A roundabout.
6. **Cumulative Plus Alternative B Conditions** represents future traffic conditions reflective of the buildout of land uses in the area, including the proposed Alternative B roundabout.
7. **Cumulative Sensitivity Conditions** represents significant increases in future traffic conditions that are not reflective of the buildout of land uses, however the buildout of land uses in the area are included.
8. **Cumulative Plus Alternative A Sensitivity Conditions** represents significant increases in future traffic conditions that are not reflective of the buildout of land uses, however the buildout of land uses in the area and Alternative A roundabout are included.
9. **Cumulative Plus Alternative B Sensitivity Conditions** represents significant increases in future traffic conditions that are not reflective of the buildout of land uses, however the buildout of land uses in the area and Alternative B roundabout are included.

Each scenario is described in more detail in the appropriate chapters.

Figure 1 - Study Location

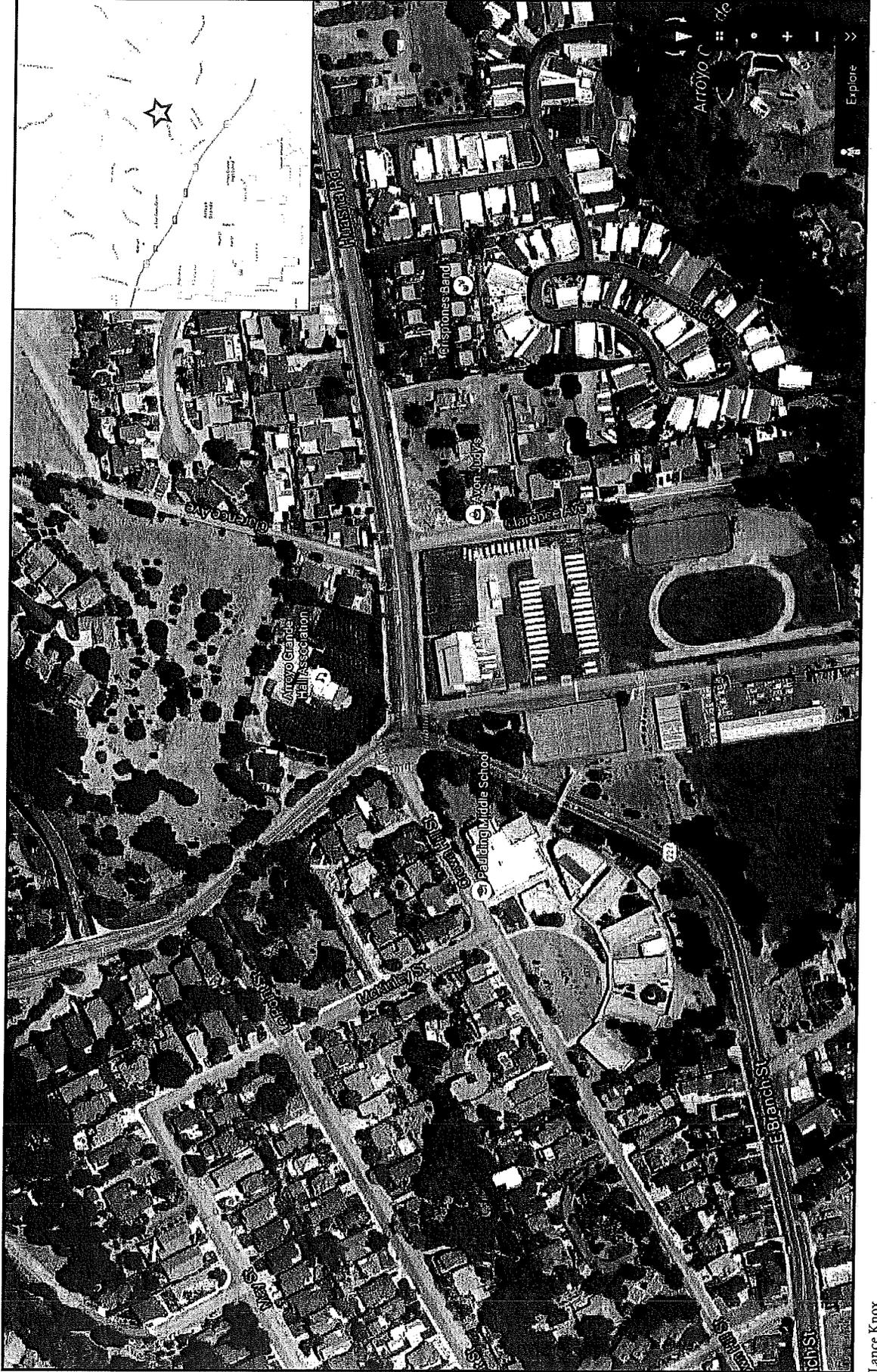
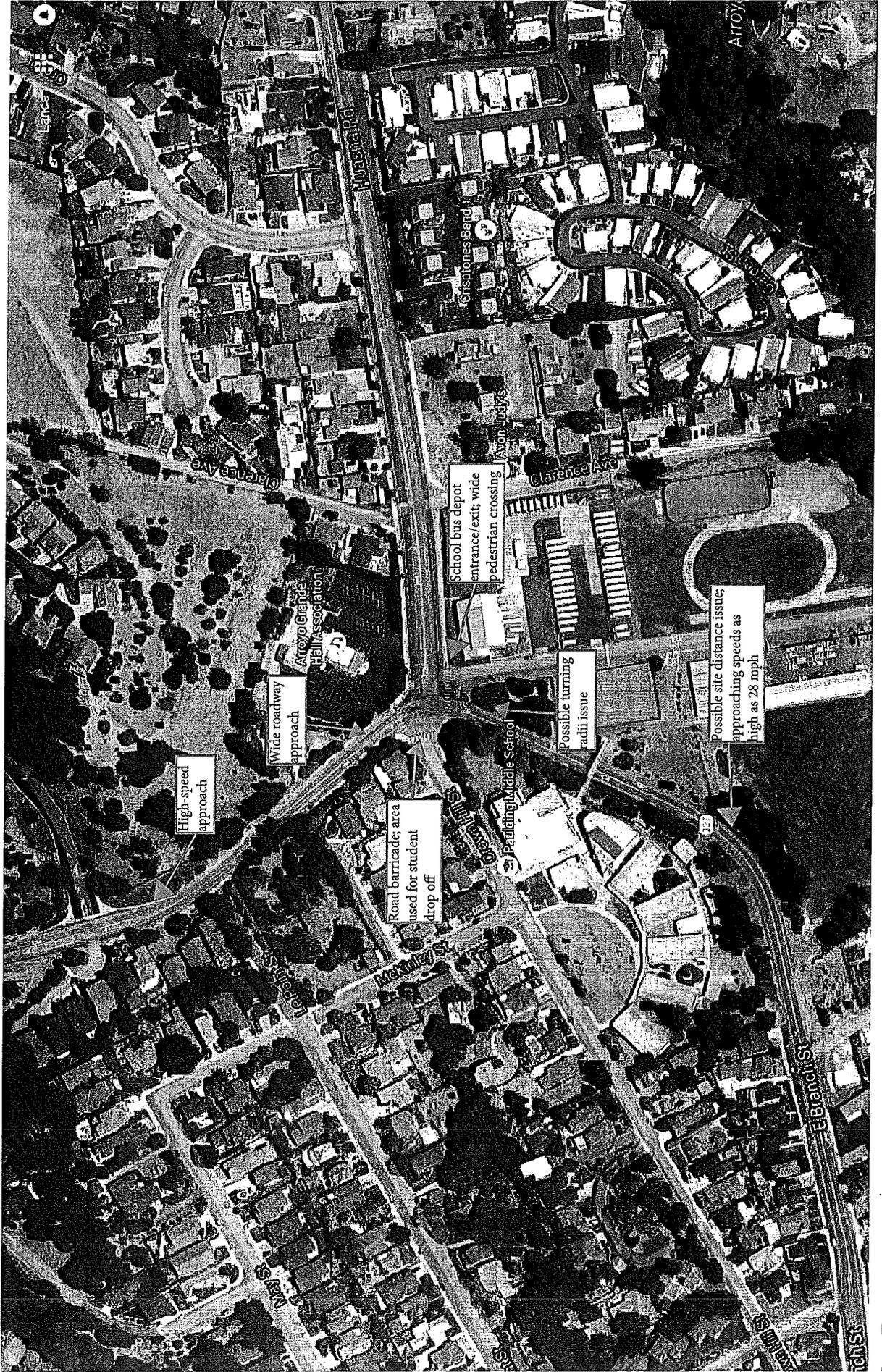


Figure 2 - Site Observations

Attachment 2



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## ANALYSIS METHODS

The analysis approach was developed based on the City of Arroyo Grande, County of San Luis Obispo, and Caltrans standards and policies, as well as similar roundabout feasibility studies.

### CITY OF ARROYO GRANDE FACILITIES

Facilities operated by the City of Arroyo Grande were evaluated using thresholds identified in the Circulation Element. Objective CT2 of the Circulation Element specifies that level of service (LOS) C or better operations shall be attained and maintained for vehicular modes in the study area. Where deficiencies of LOS E or LOS F exists, minimum mitigation to an LOS D is required with plans for improvements to achieve LOS C.

### CALTRANS FACILITIES

Caltrans strives to maintain operations at the LOS C/D threshold on state-operated facilities like Highway 227, where LOS C is acceptable but LOS D is not. If an existing State Highway facility is operating at LOS D, E, or F the existing service level should be maintained.

### LEVEL OF SERVICE THRESHOLDS

The level of service thresholds for intersections based on the 2010 Highway Capacity Manual (HCM) are presented in **Table 1**. The study intersection was analyzed with the Synchro 9 and Sidra 6 software package applying the 2010 HCM methods. Where 2010 methods do not allow analysis of a specific lane or configuration, the 2000 HCM methods were applied.

The 95<sup>th</sup> percentile queues represent the queue length that would not be exceeded 95 percent of the time. Queue lengths are discussed under each scenario, and are reported on the calculation sheets in Appendix B.

<b>Table 1: Intersection Level of Service Thresholds</b>	
<b>Stop Sign Controlled Intersections<sup>1</sup></b>	
<b>Control Delay (seconds/vehicle)</b>	<b>Level of Service</b>
≤ 10	A
> 10 - 15	B
> 15 - 25	C
> 25 - 35	D
> 35 - 50	E
> 50	F

1. Source: Exhibits 19-1 and 20-2 of the 2010 Highway Capacity Manual.

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## THRESHOLDS OF SIGNIFICANCE

### **City of Arroyo Grande Facilities:**

#### Unsignalized intersections:

- Result in an unsignalized intersection that will operate at an acceptable LOS D or better in the No Project condition to deteriorate to an unacceptable LOS E or worse in the Plus Project Condition; or,
- Increase the delay by more than 5 seconds at an unsignalized intersection that is already operating or will already operate at an unacceptable LOS in the No Project condition.

### **Caltrans Facilities:**

Operations degrade from LOS C or better LOS D, E, or F; or project traffic is added to an intersection operating at LOS D, E, or F.

### **County Facilities:**

The County's Traffic Impact Study policies provide guidelines for identifying transportation impacts, with different standards for urban and rural areas. The project is located within the Arroyo Grande Urban Reserve Line, where LOS D is acceptable but LOS E or F is not.

## EXISTING CONDITIONS

This section describes the existing transportation system and current operating conditions in the study area.

### EXISTING ROADWAY NETWORK

*Highway 227* is a north-south facility connecting Arroyo Grande to San Luis Obispo. It is a two-lane highway where it connects to E. Branch Street at Huasna Road. Highway 227 is classified as a state truck route and a local arterial, as it serves residential, commercial, and agricultural areas as well as the San Luis Obispo Regional Airport. It has varying grades and at-grade intersections.

*E. Branch Street* is an east-west facility connecting the residential and agricultural areas of Arroyo Grande to the downtown area and US 101. The road is a two-lane arterial that not only connects to the truck route along Highway 227 in addition to the residential, commercial, and agricultural areas.

*Huasna Road* is an east-west facility that connects to the residential and agricultural areas of Arroyo Grande. The four-lane arterial functions as a conduit, connecting to both E. Branch Street, which connects to downtown and US 101, and Highway 227, which is a regional facility.

*Stanley Avenue* is a north-south facility connecting to the Lucia Mar Unified School District's bus depot and school facilities. The two-lane local road primarily services the school district's school bus dispatch depot and its respective employees.

*Crown Hill Road* is an east-west facility that connects to the Paulding Middle School and the residential areas. It is a two-lane road where it connects to E. Branch Street. Crown Hill Road is classified as a local street with on-street parking. The local road contains a barricade on its approach at the intersection of Huasna Road and Highway 227.

### EXISTING PEDESTRIAN AND BICYCLE FACILITIES

Pedestrian facilities include sidewalks, crosswalks, and multi-use paths. Only Huasna Road and Crown Hill contain paved sidewalks on or part of the segments within the study area. With the exception of Crown Hill, only Huasna Road and Highway 227 have crosswalk facilities.

Bicycle facilities in the study area consists of separated bicycle facilities (Class I), striped bike lanes on the roadway (Class II), and shared lanes between bikes and vehicles (Class III). Huasna Road has Class II bike lanes on both sides of the roadway.

### EXISTING TRANSPORTATION CONDITIONS

Traffic counts and turn movements collected for vehicles, pedestrians, and bicyclists for all approaches were in May and June of 2015, while the school year was in session. Morning (AM) approach counts observe a 36-hour period, while evening (PM) approach counts observe a 48-hour period.

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The morning peak hour occurred from 7:00 AM to 8:00 AM, with total volumes reaching as high as 873 vehicles throughout the intersection. The volume distributed by approaching leg during the three-day observation showed that Highway 227 and East Branch Street currently are the primary conduits of volumes in the intersection, attributing to about 76% of the vehicles during the AM peak hour.

The evening peak hour occurred from 4:30 PM to 5:30 PM, with total volumes reaching as high as 1,111 vehicles throughout the intersection. Volume distribution resembles the AM peak hour with Highway 227 and East Branch Street continuing to be the major conduits of volumes at the intersection. Traffic counts are located in Appendix A.

Traffic turn movements showed a significant volume of traffic turning onto Huasna Road. **Figure 2** illustrates the lane configuration and turn movements observed for both AM and PM traffic.

Additionally, a circulation study within the area accounts for the integration of a Crown Hill Road approach. The study analyzed the possibility of opening Crown Hill Road to westbound only traffic. The Alternative B scenario utilizes the analysis in conjunction with this report's data. **Figure 3** presents the lane configuration and turn movements of the intersection with an operating Crown Hill Road.

The study intersection currently harbors an all-way stop controlled system. The HCM identifies control delay as the primary service measure for signalized and unsignalized intersections. With the intersection being unsignalized and volume maintaining well below capacity, delay becomes a vital factor in determining the quality of service produced in the area.

**Table 2** illustrates the existing control delay and queues at the intersection.

<b>TABLE 2: Existing Intersection Level of Service</b>				
		<b>Delay<sup>1</sup></b>	<b>LOS</b>	<b>Queues (feet)<sup>2</sup></b>
Highway 227	AM	14.1	B	63
	PM	16.3	C	90
Huasna Road	AM	16.7	C	105
	PM	12.8	B	48
E. Branch Street	AM	22.4	C	140
	PM	<b>34.0</b>	<b>D</b>	225
Stanley Avenue	AM	10.8	B	5
	PM	11.0	B	5
Overall Performance	AM	18.0	C	-
	PM	23.0	C	-
1. HCM 2010 average control delay in seconds per vehicle. 2. Queue length that would not be exceeded 95 percent of the time. Queues are reported for turning movements.				

During both peak hours, all approaches operate adequately. The E. Branch Street approach is deficient with a LOS D during the PM peak hour. Although reported at LOS C, Huasna Road had an observed 32.5 seconds of control delay, which would also result in LOS D.

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E. Branch Street had the largest queue during the PM peak hour at 225 feet. The significant level of queues align with field observations. However, Huasna Road had the largest observed queue of 325 feet during the PM peak hour. Huasna Road’s queue exceeded its storage length of 270 feet, causing spillback into the single lane. The queue length shows that the overall LOS C performance of the intersection disguises the significant extended queues individual approaches experience.

Table 3 shows the existing control delay and queues with an operating Crown Hill Road approach at the intersection.

<b>TABLE 3: Existing Intersection w/ Crown Hill Level of Service</b>				
		<b>Delay<sup>1</sup></b>	<b>LOS</b>	<b>Queues (feet)<sup>2</sup></b>
Highway 227	AM	18.7	C	98
	PM	30.7	D	188
Huasna Road	AM	28.8	D	178
	PM	18.8	C	85
E. Branch Street	AM	26.4	D	160
	PM	64.2	F	343
Stanley Avenue	AM	10.9	B	5
	PM	11.9	B	8
Overall Performance	AM	24.8	C	-
	PM	41.9	E	-

1. HCM 2010 average control delay in seconds per vehicle.  
 2. Queue length that would not be exceeded 95 percent of the time. Queues are reported for turning movements.

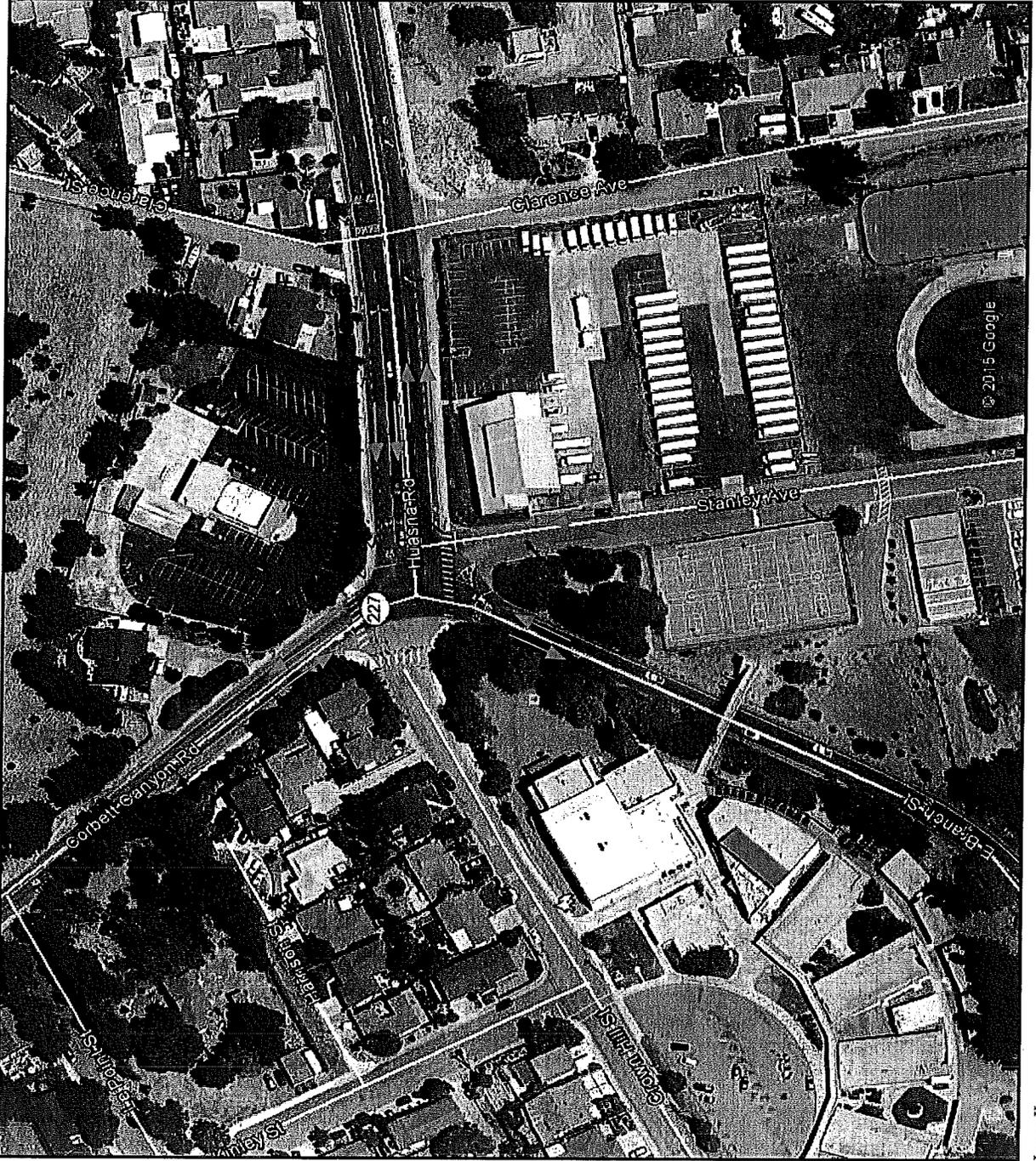
With the addition of the Crown Hill Road approach, all but Stanley Avenue worsen in operation. The following approaches operate with deficiency:

- E. Branch Street operates at LOS D during the AM peak hour and LOS F during the PM peak hour. Delay for the approach reaches over a minute while the queue is extended over 300 feet.
- Highway 227 operates at LOS D during the PM peak hour.
- Huasna Road functions inadequately during the PM peak hour at an LOS D.
- The intersection as a whole is unsatisfactory with a LOS E during the PM peak hour. This is due to the added delay for right-of-way and decision making purposes.

CRASH ANALYSIS

Collisions at the intersection have been minimal with only two collisions in the past five years, resulting in a collision rate of 0.09 per million entering vehicles. This is below the California State Highway average rate of 0.25 collisions for a 4-way stop intersection. While one collision injured two people, there were no fatalities and the collision was with a fixed object turning right onto eastbound Huasna Road from E. Branch Street. The most recent collision occurred in November of 2013. The collision was also with a fixed object due to driving under the influence. Both incidents occurred early in the morning between 12:00 am and 2:00 am.

Figure 3 - Lane Configuration



### Turn Movements

<p>Highway 227</p> <p>186 7 43 266 10 62</p>	<p>Huasna Rd.</p> <p>60 42 290 205 1 1</p>
<p>E. Branch St.</p> <p>148 208 172 242 15 21</p>	<p>Stanley Ave.</p> <p>15 2 2 24 3 3</p>

**LEGEND:**

XX AM PEAK HOUR TRAFFIC VOLUMES  
XX PM PEAK HOUR TRAFFIC VOLUMES

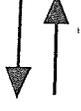
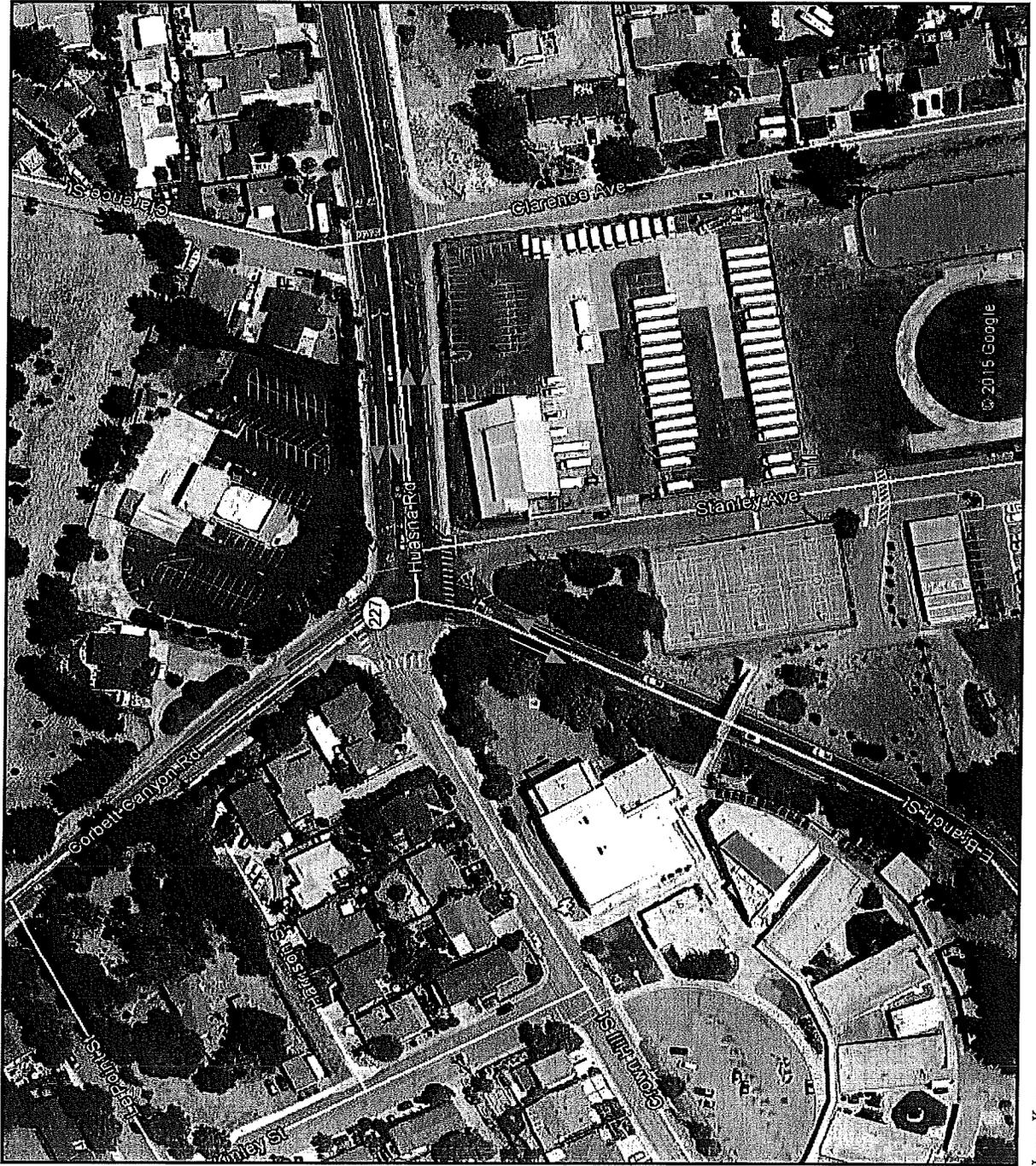


Figure 4 - Lane Configuration with Crown Hill



### Turn Movements

<p>Highway 227</p> <p>31 186 7 43 11 266 10 62</p>	<p>Huasna Rd.</p> <p>26 34 34 8 290 205 1 1</p>
<p>E. Branch St.</p> <p>3 2 145 206 172 242 15 21</p>	<p>Stanley Ave.</p> <p>15 0 2 2 24 0 3 3</p>

**LEGEND:**

XX AM PEAK HOUR TRAFFIC VOLUMES

XX PM PEAK HOUR TRAFFIC VOLUMES



DIRECTION OF TRAFFIC

## EXISTING CONDITIONS WITH ROUNDABOUT

This section evaluates the impacts of the proposed project Alternative A and Alternative B on the presiding transportation network.

### EXISTING PLUS PROJECT IMPACT ANALYSIS

**Table 4** presents the Existing Plus Project control delay at the intersection.

TABLE 4: Existing Plus Project Intersection Level of Service							
		Existing		Existing Plus Alternative A		Existing Plus Alternative B	
		Delay <sup>1</sup>	LOS	Delay <sup>1</sup>	LOS	Delay <sup>1</sup>	LOS
Highway 227	AM	14.1	B	8.2	A	9.4	A
	PM	16.3	C	9.3	A	9.7	A
Huasna Road	AM	16.7	C	8.5	A	8.5	A
	PM	12.8	B	7.6	A	7.6	A
E. Branch Street	AM	22.4	C	7.0	A	7.5	A
	PM	<b>34.0</b>	<b>D</b>	9.5	A	9.6	A
Stanley Avenue	AM	10.8	B	5.6	A	5.6	A
	PM	11.0	B	6.9	A	6.9	A
Crown Hill Road	AM	N / A		N / A		6.0	A
	PM	N / A		N / A		6.2	A
Overall Performance	AM	18.0	C	7.8	A	8.2	A
	PM	23.0	C	8.9	A	8.6	A

1. HCM 2010 average control delay in seconds per vehicle.

Under both alternatives, all approaches operate adequately, improving to LOS A. The existing E. Branch Street approach improves significantly from LOS D to LOS A during the PM peak hour, while the entire intersection improves from an LOS C to LOS A during both the AM and PM peak hour. Under the Alternative B scenario, one-way traffic integrates well as the approach operates at LOS A. **Figure 4** shows volume distribution.

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QUEUES

Table 5 presents the Existing Plus Project control delay at the intersection.

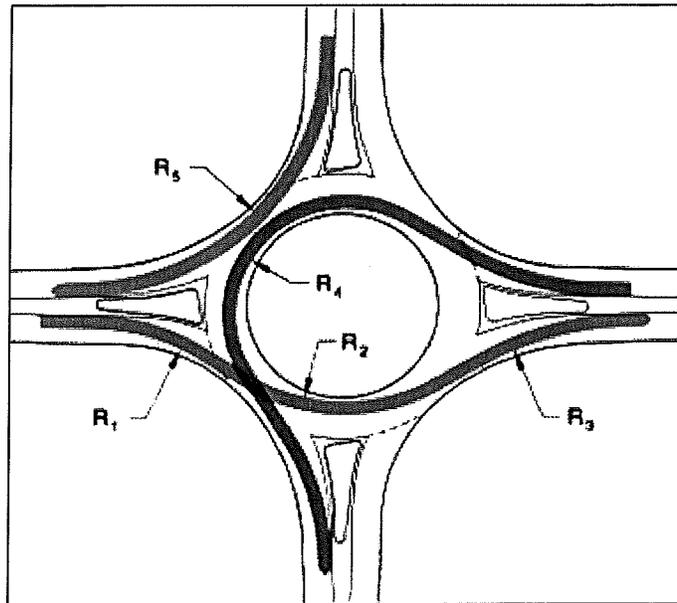
Table 5: Existing Plus Project Queues					
		Existing	Existing Plus Alternative A	Existing Plus Crown Hill	Existing Plus Alternative B
Highway 227	AM	63	33	98	41
	PM	90	50	188	53
Huasna Road	AM	105	50	178	50
	PM	48	33	85	33
E. Branch Street	AM	140	42	160	42
	PM	<b>225</b>	73	<b>343</b>	74
Stanley Avenue	AM	5	3	5	3
	PM	5	5	8	5
1. Queue length that would not be exceeded 95 percent of the time. Queues are reported in feet for turning movements. 2. <b>Bold</b> are approaches operating at LOS E or worse.					

With the installation of a roundabout, vehicle queues decrease at a minimum of 30 feet, albiet Stanley Avenue, which queues remain the consistent. E. Branch Street, which have existing queues exceeding 200 feet, is reduced below 75 feet under both alternatives during the AM and PM peak hour. This significant reduction further contributes to the LOS A grade.

SPEED CONSISTENCY

Both alternative roundabouts have a maximum design speed of 30 mph. To ensure that all possible vehicle paths designed in the alternatives achieve speeds between 20 mph and 30 mph, the overall speed consistency was calculated. Overall speed constancy incorporates the travel speed along each radius within the roundabout, as shown in the image below. Table 6 illustrates the speed consistency of the designed roundabouts.

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SOURCE: FHWA ROUNDABOUTS: AN INFORMATIONAL GUIDE – EXHIBIT 6-12.

<b>Table 6: Existing Plus Project Speed Consistency</b>		
<b>Peak Hour</b>	<b>Existing Plus Alternative A</b>	<b>Existing Plus Alternative B</b>
AM	26.4 mph	26.8 mph
PM	26.1 mph	26.3 mph
Average	26.3 mph	26.3 mph
1. FHWA's <i>Roundabout: An Information Guide</i> - Chapter 6: Geometric Design - Speed consistency.		

Project Alternative A maintains an average speed consistency of 26.3 mph between the AM and PM peak hour. Alternative B operates with an average speed consistency of 26.6 mph between both peak hours as well. With the speed consistency significantly below the design speed of 30 mph, vehicles are traversing the roundabouts within the targeted speed range.

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## CUMULATIVE CONDITIONS

Cumulative conditions represent build-out of the land uses in the region.

### CUMULATIVE VOLUME FORECASTS

The surrounding land uses within the study area are projected to remain the consistent through 2035. Moreover, there were no network changes affecting the study location under Cumulative conditions.

Cumulative traffic volume forecasts as well as a sensitivity analysis, shown in **Figure 5** and **Figure 6** respectively, were developed using the SLOCOG's Travel Demand Model, which includes planned network changes expected upon buildout of the City's General Plan. The traffic forecasted volumes encapsulate both minimal and significant increases within the transportation network. Sensitivity growth rates were based on the threshold of operational failure. The sensitivity analysis applied separate growth thresholds for the AM and PM peak hour.

### CUMULATIVE TRANSPORTATION CONDITIONS

The transportation network within the immediate area of the study intersection also is projected to remain constant.

**Table 7** illustrates the Cumulative and Cumulative Plus Project control delay at the study intersection.

TABLE 7: Cumulative Plus Project Intersection Level of Service							
		Cumulative		Cumulative Plus Alternative A		Cumulative Plus Alternative B	
		Delay <sup>1</sup>	LOS	Delay <sup>1</sup>	LOS	Delay <sup>1</sup>	LOS
Highway 227	AM	13.6	B	7.9	A	9.0	A
	PM	15.4	C	8.8	A	9.2	A
Huasna Road	AM	16.1	C	8.4	A	8.5	A
	PM	12.6	B	7.6	A	7.6	A
E. Branch Street	AM	22.6	C	7.1	A	7.1	A
	PM	<b>34.6</b>	<b>D</b>	9.6	A	9.7	A
Stanley Avenue	AM	10.7	B	5.6	A	5.6	A
	PM	10.9	B	6.9	A	7.0	A
Crown Hill Road	AM	N / A		N / A		5.9	A
	PM	N / A		N / A		6.0	A
Overall Performance	AM	17.8	C	7.8	A	8.1	A
	PM	23.3	C	8.9	A	9.0	A

1. HCM 2010 average control delay in seconds per vehicle.

Under Cumulative conditions, E. Branch Street operates below the desired level at LOS D during the PM peak hour. Because of static adjacent land uses and minimal changes in the transportation network, cumulative traffic is projected to maintain its overall operation of LOS C. Therefore, alternative roundabout

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installation would improve the overall performance and improve operations for each approach of the intersection from at least LOS D to LOS A, during both the AM and PM peak hour.

**Table 8** present the sensitivity analysis under cumulative conditions with and without the project. The table below shows the resulting control delay at the study intersection.

<b>TABLE 8: Cumulative Plus Project Sensitivity Intersection Level of Service</b>							
		Cumulative		Cumulative Plus Alternative A		Cumulative Plus Alternative B	
		Delay <sup>1</sup>	LOS <sup>2</sup>	Delay <sup>1</sup>	LOS <sup>2</sup>	Delay <sup>1</sup>	LOS <sup>2</sup>
Highway 227	AM	21.2	C	10.4	B	12.6	B
	PM	21.5	C	10.5	B	11.1	B
Huasna Road	AM	<b>32.1</b>	<b>D</b>	10.7	B	10.8	B
	PM	14.9	B	8.4	A	8.4	A
E. Branch Street	AM	<b>54.6</b>	<b>F</b>	8.2	A	8.3	A
	PM	<b>61.8</b>	<b>F</b>	10.7	B	10.8	B
Stanley Avenue	AM	12.4	B	6.2	A	6.2	A
	PM	11.9	B	7.4	A	7.5	A
Crown Hill Road	AM	N / A		N / A		6.8	A
	PM	N / A		N / A		6.6	A
Overall Performance	AM	<b>37.0</b>	<b>E</b>	9.7	A	10.3	B
	PM	<b>37.2</b>	<b>E</b>	10.0	B	10.2	B
1. HCM 2010 average control delay in seconds per vehicle.							
2. Sensitivity analysis assumes 22% increase in volumes during the AM, 11% increase during the PM.							

At the point of operational failure, under Cumulative conditions, E. Branch Street operates inadequately at LOS F, while the overall intersection performance operates at LOS E. With the installation of roundabout Alternative A, E. Branch Street improves to LOS A in the AM peak hour and LOS B in the PM peak hour. Moreover, Huasna Road improves from LOS D to LOS B. The same improvements are reflected under the Alternative B scenario. The overall performance of Alternative A improves operations during the AM peak hour from LOS E to LOS A, and from LOS E to LOS B during the PM peak hour. Comparatively, Alternative B's overall performance improves both peak hours from LOS E to LOS B.

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QUEUES

Table 9 presents the Cumulative Plus Project queues at the intersection.

Table 9: Cumulative Plus Project Queues					
		Cumulative	Cumulative Plus Alternative A	Cumulative Plus Crown Hill	Cumulative Plus Alternative B
Highway 227	AM	58	31	83	37
	PM	80	46	158	48
Huasna Road	AM	98	48	158	49
	PM	45	33	83	33
E. Branch Street	AM	145	43	158	43
	PM	<b>233</b>	76	<b>345</b>	77
Stanley Avenue	AM	5	3	5	3
	PM	5	5	8	5

1. Queue length that would not be exceeded 95 percent of the time. Queues are reported in feet for turning movements.  
 2. **Bold** are approaches operating at LOS E or worse.

Under both cumulative conditions without the project, queues are of significant length, greater than 200 feet, contributing to the approach operating at LOS E or worse. Installation of a roundabout reduces all queues at the intersection, and diminishes E. Branch Street’s queues below 100 feet.

Table 10 shows the sensitivity analysis under cumulative conditions with and without the project. The table below displays the resulting queues at the study intersection.

Table 10: Cumulative Plus Project Sensitivity Queues					
		Cumulative	Sensitivity Plus Alternative A	Sensitivity Plus Crown Hill	Sensitivity Plus Alternative B
Highway 227	AM	118	48	180	65
	PM	130	62	<b>260</b>	68
Huasna Road	AM	<b>215</b>	70	<b>328</b>	71
	PM	63	39	115	39
E. Branch Street	AM	<b>303</b>	57	<b>333</b>	57
	PM	<b>348</b>	90	<b>333</b>	90
Stanley Avenue	AM	5	3	5	3
	PM	8	6	8	6

1. Queue length that would not be exceeded 95 percent of the time. Queues are reported in feet for turning movements.  
 2. Sensitivity analysis assumes 22% increase in volumes during the AM, 11% increase during the PM.  
 3. **Bold** are approaches operating at LOS E or worse.

The table above shows that with significant traffic growth under cumulative conditions, Huasna Road has a queue of at least 215 feet or greater during the AM peak hour with and without an operating Crown Hill Road. Moreover, E. Branch Street has a queue length minimum of 300 feet during both the AM and PM

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peak hour. The approaches' operation at LOS E or worse are a factor of their respective considerable queue length.

SPEED CONSISTENCY

Table 11 illustrates the speed consistency of the designed roundabouts under both the Cumulative and Sensitivity conditions.

<b>Table 11: Cumulative &amp; Sensitivity Plus Project Speed Consistency</b>			
<b>Scenario</b>	<b>Peak Hour</b>	<b>Cumulative Plus Alternative A</b>	<b>Cumulative Plus Alternative B</b>
Cumulative <sup>2</sup>	AM	26.4 mph	26.8 mph
	PM	26.1 mph	26.2 mph
	Average	26.3 mph	26.5 mph
Sensitivity <sup>3</sup>	AM	25.8 mph	26.1 mph
	PM	25.8 mph	25.9 mph
	Average	25.8 mph	26.0 mph
1. FHWA's <i>Roundabout: An Information Guide</i> - Chapter 6: Geometric Design - Speed consistency. 2. Based on SLOCOG 2035 TDM projected volumes. 3. Sensitivity analysis assumes 22% increase in volumes during the AM, 11% increase during the PM.			

The minimal traffic growth under Cumulative conditions attributes to both project alternatives static an average speed consistency of about 26 mph between the AM and PM peak hour. Accounting for significant increases in traffic, within the Sensitivity scenario Alternative A's average speed reduces slightly to 25.8 mph, while Alternative B also reduces but maintains an average speed of 26 mph. Although insignificant changes in speed consistency, the roundabout alternatives preserve significantly below the targeted speed of 30 mph.

CRASH ANALYSIS

The NCHRP 672 outlines methods of estimating injury and total crashes per year based on previous collision trends and existing traffic data. The following table converts those future estimates to collision rates. Estimates use first-hand collected data, San Luis Obispo Council of Government's (SLOCOG) Regional Transportation Plan's (RTP) projected data, and the sensitivity analysis thresholds previously described as comparable sources for the collision analysis.

Table 12 presents the existing and projected collision rates based on existing and estimated ADT.

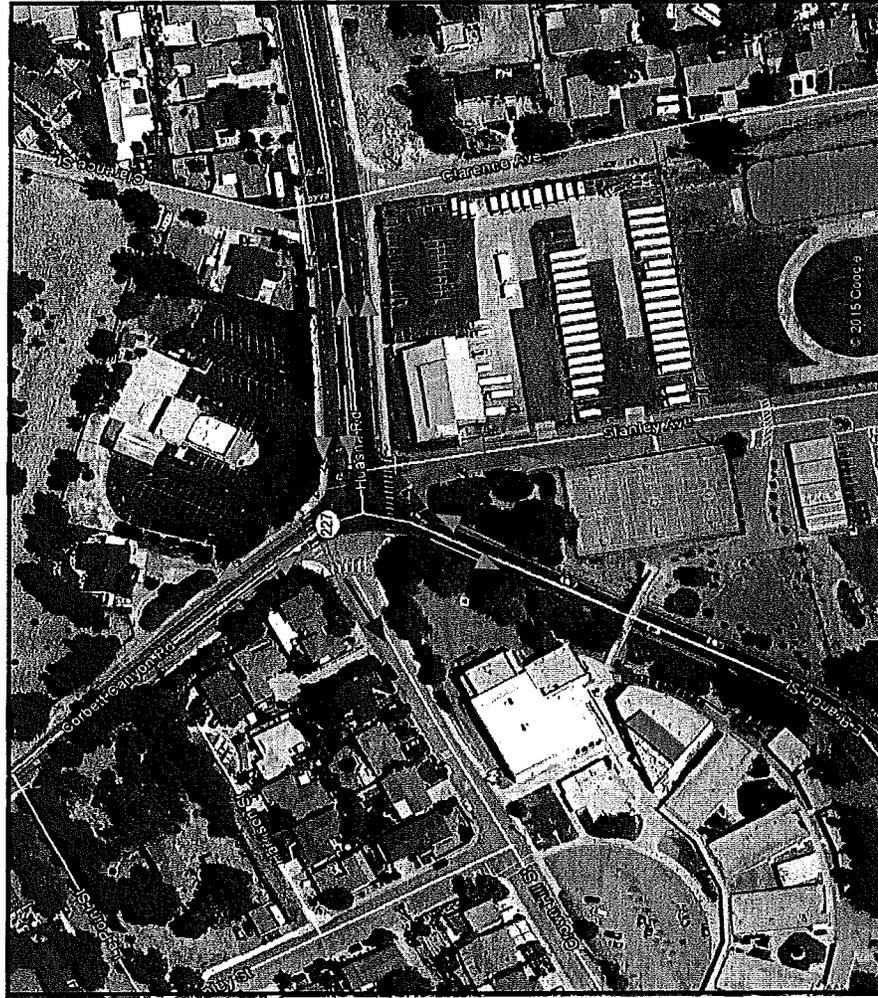
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<b>Table 12: Crash Projection Analysis</b>		
<b>Scenario</b>	<b>ADT<sup>1</sup></b>	<b>Collision Rate<sup>2</sup></b>
Existing	11633	0.09
Cumulative <sup>3</sup>	11479	0.02
Cumulative <sup>4</sup>	14192	0.03
Cumulative <sup>5</sup>	18984	0.02

1. Average daily traffic entering the intersection.  
 2. Average collision rate based on 0.25 threshold from 2009 Collision Data on California State Highways.  
 3. Based on modeled projected volumes.  
 4. Based on SLOCOG 2014 RTP projected volumes.  
 5. Based on maximum sensitivity threshold of 22%.  
 6. NCHRP 672 method for projected total collisions.  
 7. Based on SWITRS data from May 1, 2009 to May 1, 2014.

As shown, the study intersection contains a collision rate of 0.09 collisions per million vehicles entering the intersection, which is below the state average of 0.25. With a roundabout alternative in place, the intersection's collision rate reduces at least 33% to 0.03 collisions per million vehicles entering the intersection, with or without significant traffic growth within the study area.

Figure 5 - Cumulative Trip Distribution



### Turn Movements with Crown Hill

Highway 227	<p>29 175 7 40 10 250 9 58</p>	Huasna Rd.	<p>26 34 33 8 285 202 1 1</p>
E. Branch St.	<p>3 2 148 211 176 248 15 22</p>	Stanley Ave.	<p>15 0 2 2 18 0 2 2</p>

### Turn Movements

Highway 227	<p>175 7 40 250 9 58</p>	Huasna Rd.	<p>59 42 285 202 1 1</p>
E. Branch St.	<p>152 213 176 248 15 22</p>	Stanley Ave.	<p>15 2 2 24 3 3</p>

**LEGEND:**

XX AM PEAK HOUR TRAFFIC VOLUMES

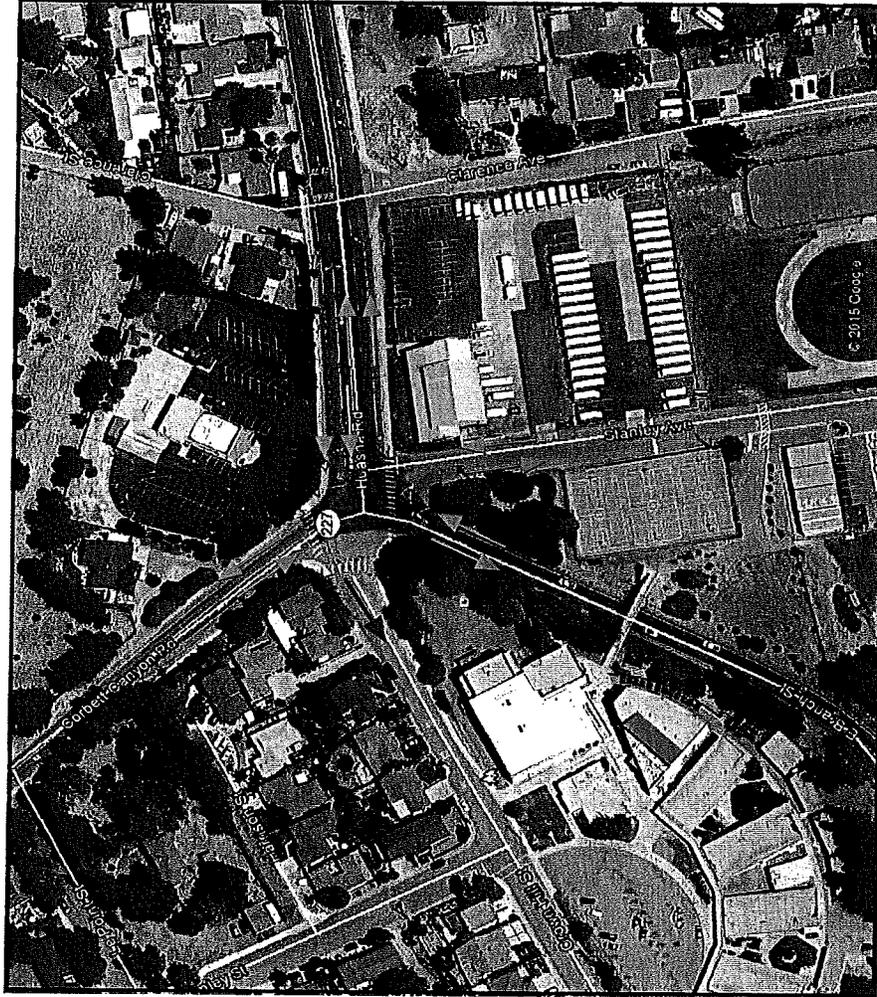
XX PM PEAK HOUR TRAFFIC VOLUMES



DIRECTION OF TRAFFIC

DIRECTION OF CROWN HILL TRAFFIC

Figure 6 - Sensitivity Analysis Trip Distribution



**Turn Movements  
with Crown Hill**

<b>Highway 227</b> 227 9 52 296 11 68 	<b>Huasna Rd.</b> 73 47 354 227 1 1
<b>E. Branch St.</b> 181 231 210 268 18 23	<b>Stanley Ave.</b> 18 2 2 26 4 4

<b>Highway 227</b> 38 227 9 52 12 296 11 68 	<b>Huasna Rd.</b> 32 68 41 9 354 227 1 1
<b>E. Branch St.</b> 4 2 177 229 210 268 18 23	<b>Stanley Ave.</b> 18 0 2 2 26 0 4 4

**LEGEND:**

- XX AM PEAK HOUR TRAFFIC VOLUMES
- XX PM PEAK HOUR TRAFFIC VOLUMES
- DIRECTION OF TRAFFIC
- DIRECTION OF CROWN HILL TRAFFIC

## CONCEPTUAL DESIGN

### ROUNABOUT DESIGN CRITERIA

The conceptual roundabout layout designs were developed primarily by the following guidelines:

- Roundabouts: An Informational Guide 2<sup>nd</sup> Edition (2010)—FHWA NCHRP 672
- Roadway Design Manual (July 2015)-Caltrans
- A Policy on Geometric Design of Highways and Streets (2004)—AASHTO

**Table 13** summarizes the design criteria used for the proposed roundabout concepts. Under the 4-way approach roundabout concept, each movement will include one lane through the roundabout as well as on the entries and exits of the roundabout. Under the 5-way approach, the lane movement resembles that of the previous design but also provides a single lane entry and exit along Crown Hill Road in connection to the roundabout. The approaches to the roundabout were designed with a left-offset, which improves the vehicle deflection at the roundabout entries.

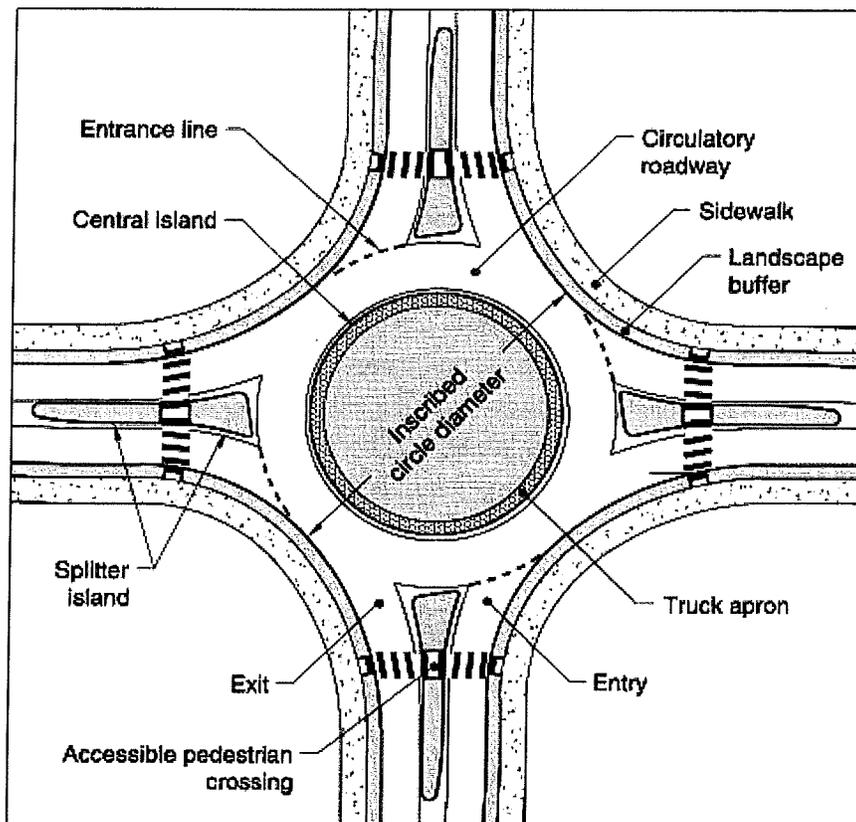
Design Vehicle	WB-65 Truck
Inscribed Diameter	74 feet
Entry Design Speed	30 mph (35 mph max)
Circulatory Roadway Width	18 feet (One Lane)
Truck Apron Width	20 feet

Although the design vehicle is a WB-65 truck, the roundabouts' design was also evaluated for a school bus due to Lucia Mar School District's bus depo and Paulding Middle school located adjacent to the intersection, as well as CAL FIRE's largest fire engine, Model 35. Therefore, in cases of emergency, the fire engine would be able to navigate through the roundabout even with a vehicle in the circulatory roadway. Thus, the roundabout was designed with a textured concrete truck apron that is no more than 2% in slope and only three inches in height. The Design Vehicle Paths section shows illustrations of the WB-67 truck for the critical turns around the roundabouts.

**Figures 7 through 9** graphically represent the conceptual layouts of the roundabouts at the study intersection. It should be noted that **Figures 7 through 9** are conceptual exhibits developed for preliminary discussion purposes only. These sketches simply demonstrate the recommended design lane configurations and initial geometry recommendations with special consideration of the 2035 traffic flows or portion thereof. The actual design plans for either roundabout alternative will be designed differently than what is shown in the exhibits based on more detailed design criteria, funding, and the appropriate lane configurations requested by the City.

The image below reviews the basic geometric features and key dimensions of a roundabout.

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SOURCE: NCHRP 672 ROUNDABOUTS: AN INFORMATIONAL GUIDE 2<sup>ND</sup> EDITION—EXHIBIT 6-2.

The design of a roundabout has demonstrated to be safer than other forms of at-grade intersections. Its design requires vehicles to travel in the same direction, reducing conflict points and eliminating the right angle and left-turn conflicts associated with traditional intersections. Moreover, pedestrians are only required to cross one direction of traffic at a time on each leg of the roundabout. Crosswalks are set back roughly 20 feet from the yield line, creating enough storage space for one vehicle waiting to enter the circulatory roadway. Roundabouts also benefit the safety of bicyclists. Depending on their skill level, cyclists may enter the roundabout and operate as a motor vehicle, or utilize the wide sidewalks as a multiuse path. Designed to inhibit lower speeds, users are provided more time to detect and react to others utilizing the intersection.

#### ROUNDABOUT ALTERNATIVE A

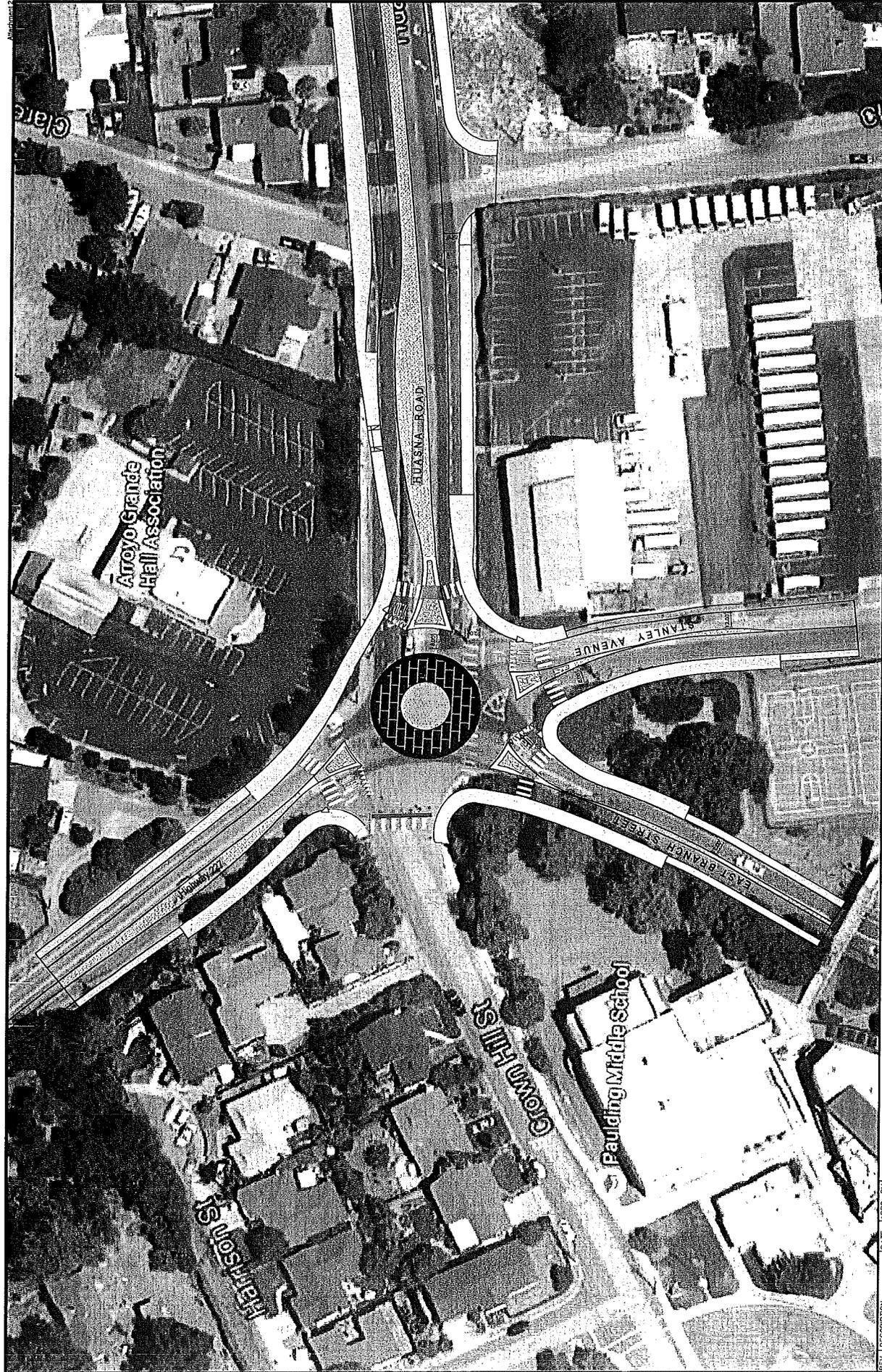
The existing intersection's geometry and size allows for the fit of a one-lane roundabout within the existing intersection footprint and ROW. Therefore, the roundabout can be built utilizing mostly existing pavement, and the existing drainage system can be utilized with relatively minor modifications. The Huasna Road approach can be reduced from two lanes to one lane, with the third lane being utilized to accommodate

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pedestrian sidewalk width and the relocation of the Town Hall driveway. The Lopez Lake water pipe located on the northeast corner of the roundabout is incorporated within the pedestrian sidewalk, barricaded on three of its sides with the fourth side facing the roadway. A small amount of ROW will be needed on the northeast, south, and southeast corner primarily to provide an adequate width of a multiuse path for pedestrian sidewalks and bicyclists. The center island can be landscaped with low-height, drought-tolerant plants to enhance the aesthetics of the area. The splitter islands can be treated similarly with drought-tolerant plants or low-height greenery similar to the surrounding landscaping. Textured paving is provided along the truck apron also to enhance the aesthetics of the project. **Figures 7 and 8** show the proposed roundabout geometry for the existing operating intersection.

#### ROUNDAABOUT ALTERNATIVE B

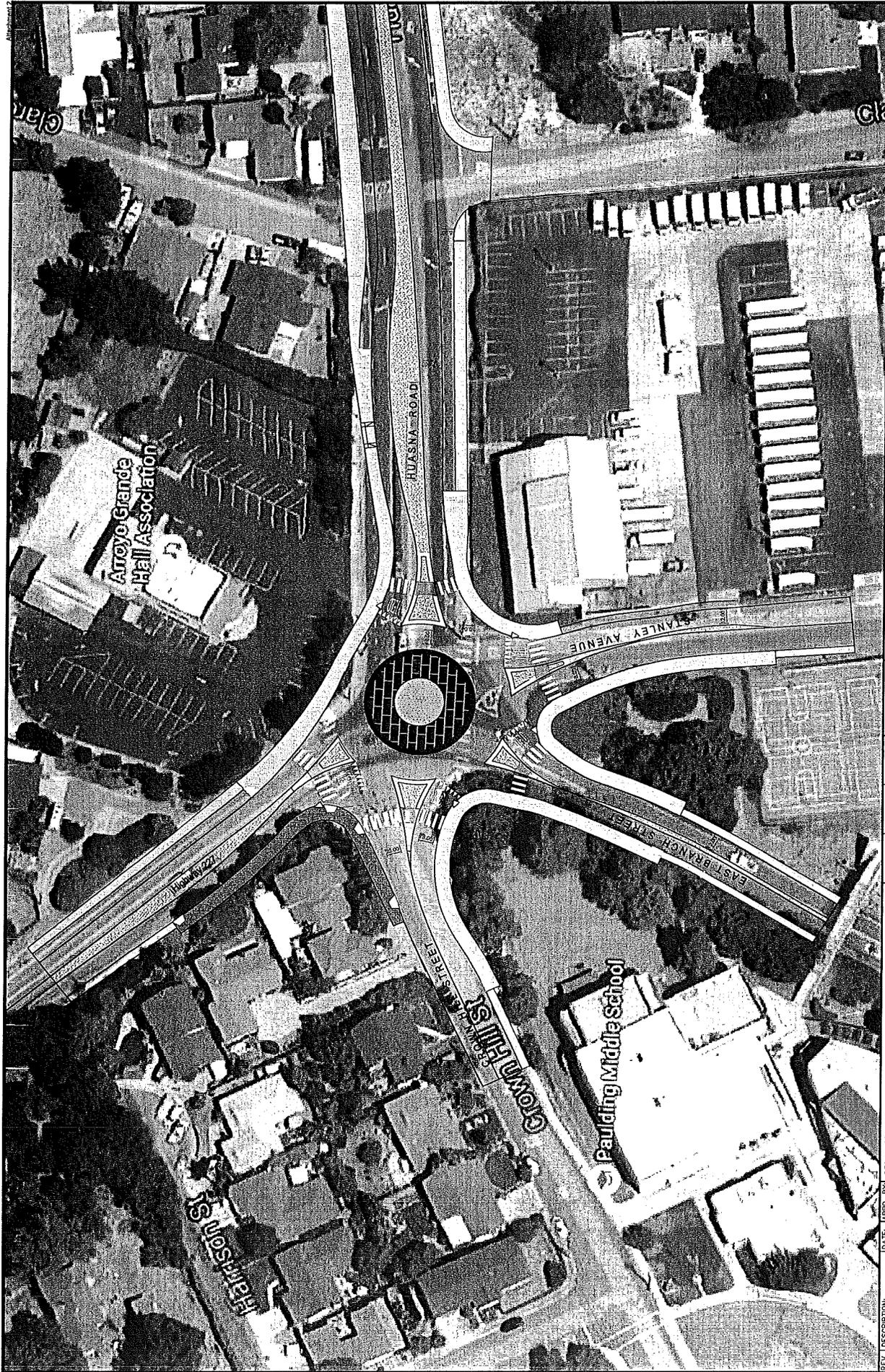
The existing intersection's geometry and size allows for the fit of a one-lane roundabout within the existing intersection footprint and ROW. Therefore, the roundabout can be built utilizing mostly existing pavement, and the existing drainage system can be utilized with relatively minor modifications. The Huasna Road approach can be reduced from two lanes to one lane, with the third lane being utilized to accommodate pedestrian sidewalk width and the relocation of the Town Hall driveway. A small amount of ROW will be needed on the northeast, south, southwest, and southeast corner primarily to provide an adequate width of a multiuse path for pedestrian sidewalks and bicyclists. The entry and exit lanes of the Crown Hill approach can be quartered off with permanent metal knockdown bollards until the City is ready to open the approach for operation. Features similar to Alternative A can be built into this alternative as well. **Figures 9 and 10** show the proposed roundabout geometry for the existing operating intersection.



REV. DESCRIPTION:	DATE:	APPR. BY:	DESIGN PROJECT:
DESIGNED BY:	DRAWN BY:	CHECKED BY:	SCALE:
LK	LK	LK	1" = 20'
PREPARED UNDER THE DIRECTION OF:			HORIZ.
Dr. Robert Bertini			VERT.
RECOMMENDED BY:	PREPARED FOR:	CITY OF ARROYO GRANDE	REFERENCE NO.
LANCE KNOX			
ACCEPTED BY:	CITY ENGINEER	LOCATION:	HIGHWAY 227/HUASNA RD./STANLEY AVE./E. BRANCH ST./CROWN HILL RD.
MATT HORN			
SHEET: 1			OF 6

Roundabout Alternative A

Figure 7



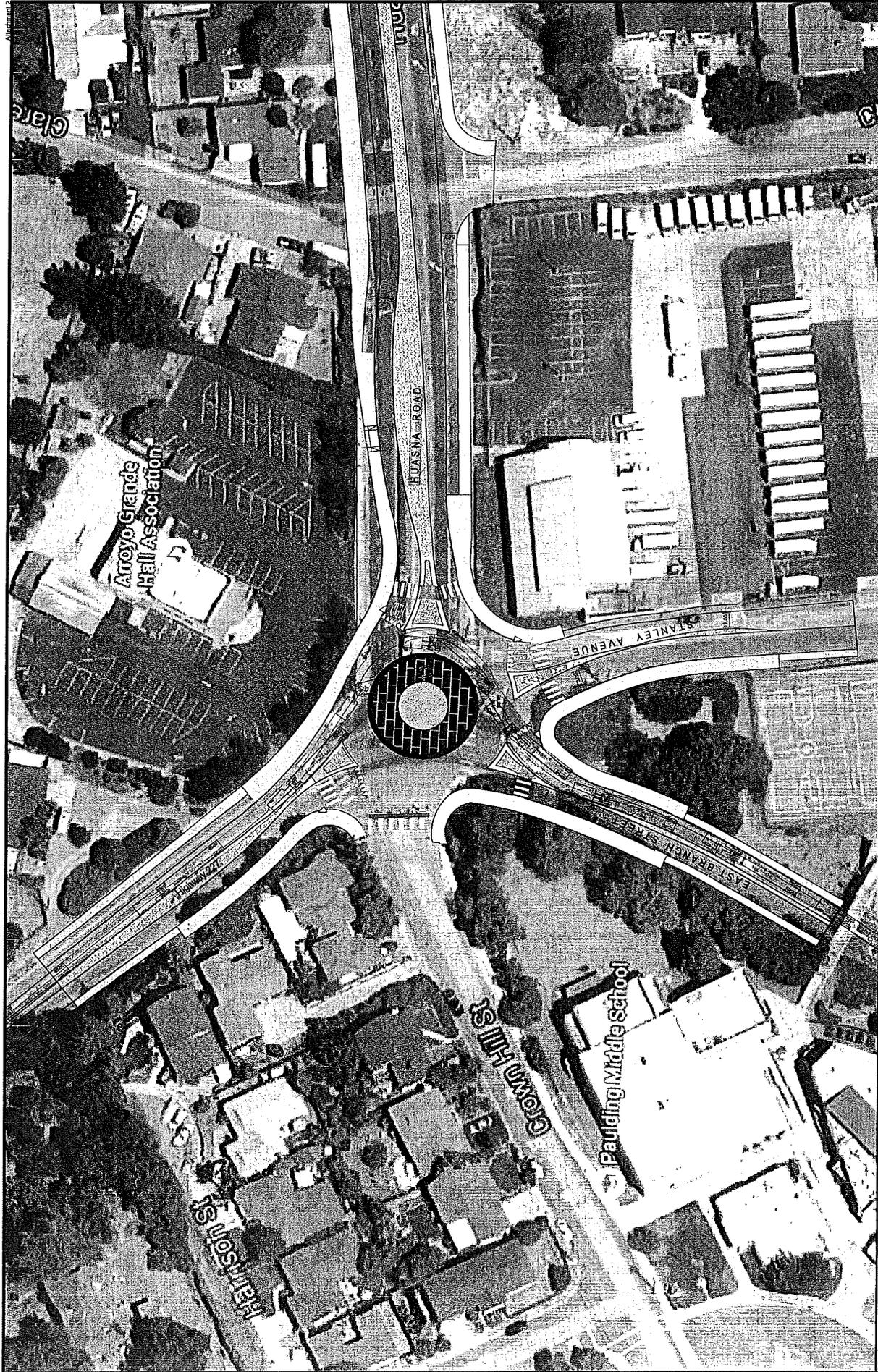
REV. DESCRIPTION:	DATE: APR. 03	DESIGN PROJECT:	DESIGNED BY: LK DRAWN BY: LK CHECKED BY:	SCALE: 1" = 20' HORIZ.	PREPARED UNDER THE DIRECTION OF: Dr. Robert Bertini	RECOMMENDED BY: LANCE KNOX	PREPARED FOR: CITY OF ARROYO GRANDE	REFERENCE NO.
Figure 9	Roundabout Alternative B		ACCEPTED BY: MATT HORN, CITY ENGINEER	LOCATION: HIGHWAY 227/HUASNA RD./STANLEY AVE./E. BRANCH ST./CROWN HILL RD.	SHEET: 3 OF: 6			



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#### DESIGN VEHICLE PATHS

The proposed roundabout geometries were designed to accommodate a WB-65 truck. The striped 20-foot truck apron is designed to allow heavy vehicles to navigate through the roundabout by providing additional traversable capacity around the central island. AutoTURN 8.0, a CAD-based vehicle turning path program, was used to determine the vehicle envelope and swept path. **Figures 11 and 12** display the design vehicle's turning paths within the proposed roundabouts. Although not all turning movements are shown, each approach movement was tested.



REV. DESCRIPTION:	DATE: APPD. BY:	DESIGN PROJECT:	RECOMMENDED BY:	PREPARED FOR:	REFERENCE NO.
Figure 11		Roundabout Turn Analysis	LANCE KNOX	CITY OF ARROYO GRANDE	
		WB-67 Truck	ACCEPTED BY:		
			MATT HORN, CITY ENGINEER	LOCATION: HIGHWAY 227/HUASNA RD./STANLEY AVE./E. BRANCH ST./CROWN HILL RD.	SHEET: 5
					5 OF 6

SCALE: 1" = 20'

DESIGNED BY: LK  
 DRAWN BY: LK  
 CHECKED BY: LK

PREPARED UNDER THE DIRECTION OF:  
 Dr. Robert Bertini

HORIZ. \_\_\_\_\_  
 VERT. \_\_\_\_\_



REV. DESCRIPTION:	DATE: APR. 03	DESIGN PROJECT:	RECOMMENDED BY:	SCALE:	REFERENCE NO.
Figure 12		Roundabout Turn Analysis Standard 40' Bus	LANCE KNOX	1" = 20'	CITY OF ARROYO GRANDE
			PREPARED UNDER THE DIRECTION OF: Dr. Robert Bertini	HORIZ	
			ACCEPTED BY:	VERT.	
			MATT HORN, CITY ENGINEER		
			LOCATION: HIGHWAY 227/HUASNA RD./STANLEY AVE./E. BRANCH ST./CROWN HILL RD.		SHEET: 6 6 OF 6

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## PROJECT COST ESTIMATE

Costs associated with the roundabouts include construction costs, engineering and design fees, land acquisition, and maintenance costs. The items quantified include work related to pavement demolition and reconstruction, traffic island construction, signing and illumination, and pavement markings. A small contingency was applied to include administrative and additional planning work.

Tables 13 and 14 present the cost estimates for the two proposed alternative roundabouts.

<b>Table 13: Roundabout Alternative A</b>						
<b>Item No.</b>	<b>Item Code</b>	<b>Description</b>	<b>Quantity</b>	<b>Unit</b>	<b>Unit Cost</b>	<b>Total Cost</b>
<b>Right of Way</b>						
1		Land Acquisition	1	LS	\$44,401.33	\$44,401.33
2		Utility Relocation (City Share)	1	LS	\$10,000.00	\$10,000.00
3		Title and Escrow	1	LS	\$3,500.00	\$3,500.00
4		Condemnation Settlements	1	LS	\$3,500.00	\$3,500.00
5		Utility Relocation (Construction Cost)	1	LS	\$5,000.00	\$5,000.00
<b>Total Cost</b>						<b>\$66,401.33</b>
<b>Demolition</b>						
6	31 11 10.10 00304	Tree Removal	7	EA	\$37.85	\$264.95
7	02 41 13.17 6000	Curb Demolition	2,425	LF	\$3.76	\$9,118.79
8	02 41 13.17 5050	Asphalt Removal	8,824	SY	\$7.28	\$64,235.23
<b>Total Cost</b>						<b>\$73,618.97</b>
<b>Pre-Construction Estimate</b>						
9	074019	Prepare Storm Water Pollution Prevention Plan	1	LS	\$6,700.00	\$6,700.00
10	074057	Storm Water Annual Report	2	EA	\$2,000.00	\$4,000.00
<b>Total Cost</b>						<b>\$10,700.00</b>
<b>Traffic Control Estimate</b>						
11	074016	Construction Site Management	1	LS	\$10,000.00	\$10,000.00
12	074033	Construction Entrance	4	EA	\$2,200.00	\$8,800.00
13	074038	Temporary Drainage Inlet Protection	2	EA	\$150.00	\$300.00
14	074026	Temporary Mulch	6,900	SQYD	\$3.00	\$20,700.00
15	074041	Street Sweeping	1	LS	\$5,000.00	\$5,000.00
16	074042	Temporary Concrete Washout (Portable)	1	LS	\$2,000.00	\$2,000.00
17	120090	Construction Area Signs	1	LS	\$15,000.00	\$15,000.00
18	120100	Traffic Control System	1	LS	\$125,000.00	\$125,000.00
19	120120	Type III Barricade	5	EA	\$105.00	\$525.00
20	120159	Temporary Traffic Stripe (Paint)	15,000	LF	\$0.75	\$11,250.00
21	120182	Portable Delineator	110	EA	\$25.00	\$2,750.00
22	128650	Portable Changeable Message Sign	1	LS	\$20,000.00	\$20,000.00
23	129000	Temporary Railing (Type K)	1,320	LF	\$25.00	\$33,000.00
<b>Total Cost</b>						<b>\$67,000.00</b>

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Construction Estimate						
24	150714	Remove Thermoplastic Traffic Stripe	1,500	LF	\$1.50	\$2,250.00
25	150714	Remove Thermoplastic Pavement Marking	500	SQFT	\$5.50	\$2,750.00
26	150742	Remove Roadside Sign	9	EA	\$100.00	\$900.00
27	160101	Clearing and Grubbing	1	LS	\$30,000.00	\$30,000.00
28	190110	Lead Compliance Plan	1	LS	\$2,500.00	\$2,500.00
29	200101	Imported Topsoil	107	CY	\$50.00	\$5,333.64
30	204099	Plant Establishment Work	1	LS	\$14,000.00	\$14,000.00
31	208000	Irrigation System	1	LS	\$7,700.00	\$7,700.00
32	250101	Class 1 Aggregate Subbase	212	CY	\$65.00	\$13,779.28
33	260201	Class 2 Aggregate Base	460	CY	\$50.00	\$22,997.48
34	390132	Hot Mix Asphalt (Type A)	5,882	TON	\$100.00	\$588,234.67
35	397005	Tack Coat	2	TON	\$1,000.00	\$2,092.53
36	32 06 10.10 0310	Minor Concrete Sidewalk	22,785	SQFT	\$3.41	\$77,698.35
37	510526	Minor Concrete (Backfill)	415	CY	\$260.00	\$107,848.00
38	566011	Roadside Sign - One Post	13	EA	\$275.00	\$3,575.00
39	32 16 13.23 0550	Minor Concrete (Curb and Gutter)	3,156	LF	\$14.67	\$46,291.77
40	731626	Minor Concrete (ADA Curb Ramp)	132	CY	\$750.00	\$99,166.67
41	731626	Relocation of Town Hall Driveway	21	CY	\$750.00	\$15,750.00
42	750001	Miscellaneous Iron and Steel	1,130	LB	\$3.00	\$3,390.00
43	840515	Thermoplastic Pavement Marking	771	SQFT	\$5.00	\$3,856.00
44	840560	Thermoplastic Traffic Stripe (Sprayable)	1,966	LF	\$1.50	\$2,948.25
45	850101	Pavement Marker (Non-Reflective)	200	EA	\$4.00	\$800.00
46	850111	Pavement Marker (Retroflective)	250	EA	\$6.00	\$1,500.00
47	860401	Lighting	1	LS	\$50,000.00	\$50,000.00
48	860606A	Solar Flashing Beacon System	1	LS	\$30,000.00	\$30,000.00
49	999990	Mobalization 4%	1	LS	\$45,414.47	\$45,414.47
<b>Total Cost</b>						<b>\$1,445,801.10</b>
Supplemental Work						
50	066070	Maintain Traffic	1	LS	\$60,000.00	\$60,000.00
51	066595	Water Pollution Control Maintenance Sharing	1	LS	\$5,000.00	\$5,000.00
52	066596	Additional Water Pollution Control	1	LS	\$5,000.00	\$5,000.00
53	066597	Storm Water Sampling and Analysis	1	LS	\$1,000.00	\$1,000.00
54	066610	Partnering	1	LS	\$12,000.00	\$12,000.00
55	066670	Payment Adjustments for Price Index Fluctuations	1	LS	\$15,000.00	\$15,000.00
<b>Total Cost</b>						<b>\$98,000.00</b>
State Furnished Materials and Expenses						
56	066062	COZEEP Contract	1	LS	\$55,000.00	\$55,000.00
57	066063	Traffic Management Plan - Public Information	1	LS	\$5,000.00	\$5,000.00
58	066105	Resident Engineers Office	1	LS	\$25,000.00	\$25,000.00
59	066871	Electrical Service Connection	1	LS	\$5,000.00	\$5,000.00
<b>Total Cost</b>						<b>\$90,000.00</b>

<b>Project Subtotal</b>		<b>\$1,851,521.40</b>
<b>Contingencies</b>	<b>5%</b>	<b>\$92,576.07</b>
<b>Total</b>		<b>\$1,944,097.47</b>

This preliminary cost estimate does not include the cost of retaining walls.

Lance Knox

<b>Table 14: Alternative B</b>						
<b>Item No.</b>	<b>Item Code</b>	<b>Description</b>	<b>Quantity</b>	<b>Unit</b>	<b>Unit Cost</b>	<b>Total Cost</b>
<b>Right of Way</b>						
1		Land Acquisition	1	LS	\$44,401.33	\$44,401.33
2		Utility Relocation (City Share)	1	LS	\$10,000.00	\$10,000.00
3		Title and Escrow	1	LS	\$3,500.00	\$3,500.00
4		Condemnation Settlements	1	LS	\$3,500.00	\$3,500.00
5		Utility Relocation (Construction Cost)	1	LS	\$5,000.00	\$5,000.00
<b>Total Cost</b>						<b>\$66,401.33</b>
<b>Demolition</b>						
6	31 11 10.10 00304	Tree Removal	7	EA	\$37.85	\$264.95
7	02 41 13.17 6000	Curb Demolition	2,425	LF	\$3.76	\$9,118.79
8	02 41 13.17 5050	Asphalt Removal	8,824	SY	\$7.28	\$64,235.23
<b>Total Cost</b>						<b>\$73,618.97</b>
<b>Pre-Construction Estimate</b>						
9	074019	Prepare Storm Water Pollution Prevention Plan	1	LS	\$6,700.00	\$6,700.00
10	074057	Storm Water Annual Report	2	EA	\$2,000.00	\$4,000.00
<b>Total Cost</b>						<b>\$10,700.00</b>
<b>Traffic Control Estimate</b>						
11	074016	Construction Site Management	1	LS	\$10,000.00	\$10,000.00
12	074033	Construction Entrance	4	EA	\$2,200.00	\$8,800.00
13	074038	Temporary Drainage Inlet Protection	2	EA	\$150.00	\$300.00
14	074026	Temporary Mulch	6,900	SQYD	\$3.00	\$20,700.00
15	074041	Street Sweeping	1	LS	\$5,000.00	\$5,000.00
16	074042	Temporary Concrete Washout (Portable)	1	LS	\$2,000.00	\$2,000.00
17	120090	Construction Area Signs	1	LS	\$15,000.00	\$15,000.00
18	120100	Traffic Control System	1	LS	\$125,000.00	\$125,000.00
19	120120	Type III Barricade	5	EA	\$105.00	\$525.00
20	120159	Temporary Traffic Stripe (Paint)	15,000	LF	\$0.75	\$11,250.00
21	120182	Portable Delineator	110	EA	\$25.00	\$2,750.00
22	128650	Portable Changeable Message Sign	1	LS	\$20,000.00	\$20,000.00
23	129000	Temporary Railing (Type K)	1,320	LF	\$25.00	\$33,000.00
<b>Total Cost</b>						<b>\$67,000.00</b>

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Construction Estimate						
24	150714	Remove Thermoplastic Traffic Stripe	1,500	LF	\$1.50	\$2,250.00
25	150714	Remove Thermoplastic Pavement Marking	500	SQFT	\$5.50	\$2,750.00
26	150742	Remove Roadside Sign	9	EA	\$100.00	\$900.00
27	160101	Clearing and Grubbing	1	LS	\$30,000.00	\$30,000.00
28	190110	Lead Compliance Plan	1	LS	\$2,500.00	\$2,500.00
29	200101	Imported Topsoil	107	CY	\$50.00	\$5,333.64
30	204099	Plant Establishment Work	1	LS	\$14,000.00	\$14,000.00
31	208000	Irrigation System	1	LS	\$7,700.00	\$7,700.00
32	250101	Class 1 Aggregate Subbase	1,046	CY	\$65.00	\$68,015.64
33	260201	Class 2 Aggregate Base	1,593	CY	\$50.00	\$79,671.50
34	390132	Hot Mix Asphalt (Type A)	6,495	TON	\$100.00	\$649,522.37
35	397005	Tack Coat	2	TON	\$1,000.00	\$2,092.53
36	32 06 10.10 0310	Minor Concrete Sidewalk	22,785	SQFT	\$3.41	\$77,698.35
37	510526	Minor Concrete (Backfill)	415	CY	\$260.00	\$107,848.00
38	566011	Roadside Sign - One Post	13	EA	\$275.00	\$3,575.00
39	32 16 13.23 0550	Minor Concrete (Curb and Gutter)	3,630	LF	\$14.67	\$53,248.73
40	731626	Minor Concrete (ADA Curb Ramp)	170	CY	\$750.00	\$127,500.00
41	731626	Relocation of Town Hall Driveway	21	CY	\$750.00	\$15,750.00
42	750001	Miscellaneous Iron and Steel	1,130	LB	\$3.00	\$3,390.00
43	840515	Thermoplastic Pavement Marking	1,015	SQFT	\$5.00	\$5,072.50
44	840560	Thermoplastic Traffic Stripe (Sprayable)	2,308	LF	\$1.50	\$3,461.28
45	850101	Pavement Marker (Non-Reflective)	200	EA	\$4.00	\$800.00
46	850111	Pavement Marker (Retroflective)	250	EA	\$6.00	\$1,500.00
47	860401	Lighting	1	LS	\$50,000.00	\$50,000.00
48	860606A	Solar Flashing Beacon System	1	LS	\$30,000.00	\$30,000.00
49	999990	Mobalization 4%	1	LS	\$53,783.18	\$53,783.18
<b>Total Cost</b>						<b>\$1,663,387.72</b>
Supplemental Work						
50	066070	Maintain Traffic	1	LS	\$60,000.00	\$60,000.00
51	066595	Water Pollution Control Maintenance Sharing	1	LS	\$5,000.00	\$5,000.00
52	066596	Additional Water Pollution Control	1	LS	\$5,000.00	\$5,000.00
53	066597	Storm Water Sampling and Analysis	1	LS	\$1,000.00	\$1,000.00
54	066610	Partnering	1	LS	\$12,000.00	\$12,000.00
55	066670	Payment Adjustments for Price Index Fluctuations	1	LS	\$15,000.00	\$15,000.00
<b>Total Cost</b>						<b>\$98,000.00</b>
State Furnished Materials and Expenses						
56	066062	COZEEP Contract	1	LS	\$55,000.00	\$55,000.00
57	066063	Traffic Management Plan - Public Information	1	LS	\$5,000.00	\$5,000.00
58	066105	Resident Engineers Office	1	LS	\$25,000.00	\$25,000.00
59	066871	Electrical Service Connection	1	LS	\$5,000.00	\$5,000.00
<b>Total Cost</b>						<b>\$90,000.00</b>

<b>Project Subtotal</b>		<b>\$2,069,108.02</b>
<b>Contingencies</b>	<b>5%</b>	<b>\$103,455.40</b>
<b>Total</b>		<b>\$2,172,563.42</b>

This preliminary cost estimate does not include the cost of retaining walls.

## RECOMMENDATIONS

Based on the aforementioned analysis, the following conclusions can be made:

- The proposed roundabouts will provide:
  - High level of priority and safety for pedestrians and bicyclists
  - A reduction in conflict points and the severity of vehicular crashes due to slower speeds
  - Excellent LOS with the existing traffic volumes
  - Excellent LOS through the year 2035 during AM and PM peak hours
  - An opportunity to open Crown Hill Road in a safe and efficient manner
  - An aesthetically pleasing gateway into the City
- Both proposed roundabouts can be built utilizing most of the existing pavement and drainage system. It can be built within the existing right-of-way, although small easements will be needed on the northeast, south, and southwest corners to accommodate sidewalks.

Therefore, this report recommends that the City undergo roundabout Alternative B. The alternative provides the optimal connectivity, whilst providing an acceptable LOS. Furthermore, the City can have the option to keep Crown Hill close until it sees fit, additionally allowing for progressive integration of the approach. The inclusion and circulation benefits from opening Crown Hill Road justifies the additional cost within Alternative B. Moreover, while Alternative A does contain deficiencies within the existing operations, operations with Crown Hill Road require a control modification. Installing roundabout Alternative B would provide the least restrictive form of traffic control that produces safe and efficient operation for all modes.

## REFERENCES

- American Association of State Highway and Transportation Officials (AASHTO). 2011. A Policy on Geometric Design of Highways and Streets.
- California Department of Transportation. 2002. Guide for the Preparation of Traffic Impact Studies.
- City of Arroyo Grande. 2007. Circulation Element of the General Plan.
- \_\_\_\_\_. 2012. Bicycle & Trails Master Plan.
- \_\_\_\_\_. 2015. Transportation Impact Analysis Guidelines.
- County of San Luis Obispo. 2007. Traffic Impact Study Policies.
- Federal Highway Administration. 2000. Roundabouts: An Informational Guide
- National Cooperative Highway Research Program Report 672. 2010. Roundabouts: An Informational Guide, Second Edition
- National Cooperative Highway Research Program Report 572. 2007. Roundabouts in the United States
- San Luis Obispo Council of Governments. 2014. Regional Transportation Plan/Sustainable Communities Strategy.





## MEMORANDUM

**TO: TRAFFIC COMMISSION**

**FROM: TERESA MCCLISH, COMMUNITY DEVELOPMENT DIRECTOR**

**BY: MATT HORN, CITY ENGINEER**

**SUBJECT: CONSIDERATION OF SIGHT DISTANCE NEEDS AT THE INTERSECTION OF DEER TRAIL CIRCLE AT EQUESTRIAN WAY**

**DATE: MAY 23, 2016**

### **RECOMMENDATION:**

It is recommended that the Traffic Commission direct staff to restrict parking adjacent to 699 Equestrian Way.

### **IMPACT ON FINANCIAL AND PERSONNEL RESOURCES:**

A minor amount of funding and staff time will be required to complete this work. The total cost is estimated to be less than \$100 in materials and require less than 1 hour of staff time to complete.

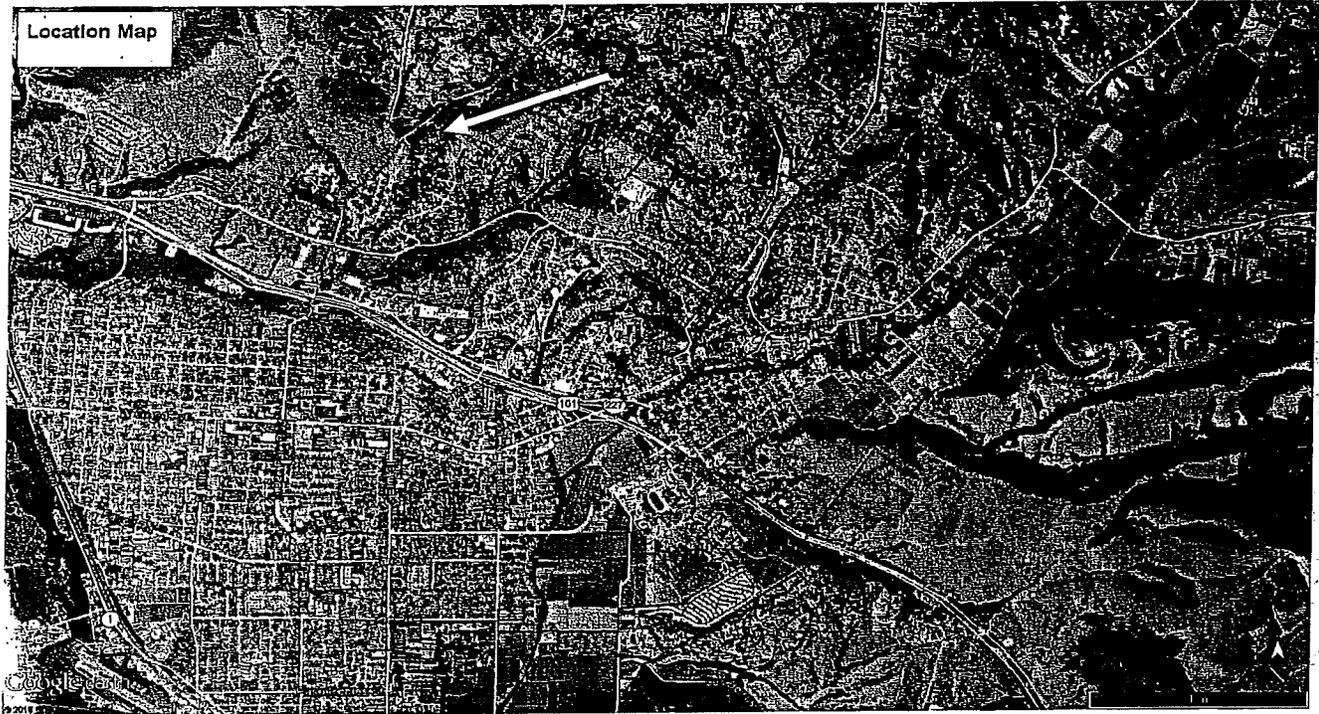
### **BACKGROUND:**

On March 14, 2016 the City received notification of a concern with sight distance at the intersection of Equestrian Way and Deer Trail Circle (see attachment 1).

Equestrian Way is a collector street connecting James Way to Noyes Road. Equestrian Way provides two-way traffic with one travel lane in each direction and parking on both sides of the road. Equestrian Way is slightly less than 40 feet wide. The posted speed limit on Equestrian Way is 25 MPH.

Deer Trail Circle is a local road connecting to Equestrian Way. Deer Trail Circle provides two-way traffic with one travel lane in each direction and parking on both sides of the road. Deer Trail Circle is approximately 26 feet wide. The speed limit is not posted on Deer Trail Circle, therefore the default or prima facie speed limit is 25 MPH.

**CONSIDERATION OF SIGHT DISTANCE NEEDS AT THE INTERSECTION OF DEER TRAIL CIRCLE AT EQUESTRIAN WAY  
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Location Map



Sight Distance to the North



Sight Distance to the South

**ANALYSIS OF ISSUES:**

Vehicles traveling on Deer Trail Circle and using the intersection of Equestrian Way at Deer Trail Circle have insufficient sight distance to the north. This vision triangle is impacted by parking, privately maintained vegetation and privately maintained fencing. The City of Arroyo Grande's Municipal Code Section 10.12 provides guidance for the required sight distance

**CONSIDERATION OF SIGHT DISTANCE NEEDS AT THE INTERSECTION OF DEER TRAIL CIRCLE AT EQUESTRIAN WAY  
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**Municipal Code Vision Triangle Requirements**

The City's Municipal Code Vision Triangle requirements for this location is graphically shown above and is as follows:

*At street intersections, the boundaries of the vision triangle are formed by measuring along the curb lines from their projected intersection a distance of forty (40) feet and then connecting the two points with a straight line.*

While the City's Municipal Code provides tools to obtain compliance with vision triangle needs, staff recommends seeking voluntary compliance and reevaluation after vision triangle work is complete.

**ALTERNATIVES:**

The following alternatives are provided for the Commission's consideration:

- Approve staff's recommendation;
- Do not approve staff's recommendation;
- Provide alternate direction

**PUBLIC NOTICE AND COMMENT:**

The Agenda for this meeting was posted in front of City Hall and on the City's website on Friday, May 20, 2016.

**CONSIDERATION OF SIGHT DISTANCE NEEDS AT THE INTERSECTION OF DEER  
TRAIL CIRCLE AT EQUESTRIAN WAY  
MAY 23, 2016  
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**Attachments:**

1. Notification of sight distance concerns
2. Section 10.12 of the City of Arroyo Grande's Municipal Code.

## Property Maintenance

#440

Category: Neighborhood Services (Code Enforcement)  
Priority: 3  
Assigned To: [REDACTED]  
Submitted: 3/14/2016 6:41 AM  
Source: Website 107.142.231.41

### SUBMITTER

[REDACTED]  
[REDACTED]  
[REDACTED]

[View Request](#)

### CONTACT

[REDACTED]  
[REDACTED] 2

699 equestrian  
Arroyo Grande, Ca 93420

### REQUEST DETAILS

#### Description

In Jan 2016, I reported a concern about a traffic hazard at the intersection of Deer Trail Circle and Equestrian. This concern was assigned number 385. The concern was transferred from the Police Dept to Neighborhood services on 2-9-16. I reopened this concern on 3-4-16 because I did not hear from Neighborhood services. Also just after 2-9-16, I was stopped at the reported intersection and was almost hit by another car due to the blind spot there. This marks the 5th time this has occurred in the last 4 years.

After discussing this matter with other neighbors, they indicated to me that they have experienced the same problem with this intersection.

I am asking something be done about this hazard and to be notified either by email or phone when the city takes corrective action on this matter.

#### Your Information

Name

[REDACTED]

Fax Number

Email Address

[REDACTED]

Preferred Contact Method

[REDACTED]

## **Chapter 10.12 - TRAFFIC VISIBILITY OBSTRUCTIONS**

### **10.12.010 - Obstruction of visibility of driveways or intersections.**

Any hedge, shrubbery, tree, fence, or other obstruction growing, erected or maintained in a parkway or on private property in the vision triangle, as defined in Section 10.12.020 of this chapter, which hazard obstructs the view of any driveway or intersection, or any traffic upon the streets approaching such driveway or intersection, is declared to be a public nuisance. Such hazards may include any structure, fence, landscaping, or other obstruction more than two feet in height above the level of the sidewalk or ground elevation, whichever is higher, in an area called a vision triangle, except that trees may be allowed when no foliage is closer to the ground than seven and one-half feet unless otherwise approved.

### **10.12.020 - Vision triangle defined.**

For the purposes of this chapter, "vision triangle" is defined as follows:

- A. At street intersections, the boundaries of the vision triangle are formed by measuring along the curb lines from their projected intersection a distance of forty (40) feet and then connecting the two points with a straight line.
- B. At driveway entrances, the boundaries of the vision triangle are formed by measuring along the side of the paved driveway and along the street right-of-way line from their intersection a distance as specified below and then connecting the two points with a straight line:
  1. Not less than ten (10) feet for local streets (less than sixty (60) foot right-of-way);
  2. Not less than fifteen (15) feet for collector streets (sixty (60) foot or sixty-four (64) foot right-of-way); and
  3. Not less than twenty (20) feet for major streets (as defined in the circulation element of the general plan.

### **10.12.030 - Notices to abate public nuisances.**

Whenever the director of public works, following review by the traffic commission, finds a public nuisance to exist, as set forth in Section 10.12.010 of this chapter, such public nuisance may be abated under the direction of the director of public works fifteen (15) days after he or she has caused a notice of a hazardous condition to be mailed to the concerned property owner, as required by Government Code Section 38773.

### **10.12.040 - Public nuisances—Abatement—Costs—Assessments.**

If the property owner fails to appear to the council within the allotted time, or if the council finds that the condition of the property noted by the director of public works constitutes a public nuisance and that the property owner should be responsible for the cost of removing such nuisance, the full cost of abating the public nuisance shall be made a special assessment against the concerned parcel. The precise cost of such removal shall be announced and confirmed by the council at a duly noticed hearing of the council as soon as the final costs have been ascertained. The assessment may be collected at the same time and in the same manner as ordinary municipal taxes are collected and shall be subjected to the same penalties and the same procedure and sale in case of delinquency as provided for ordinary municipal taxes. All laws applicable to the levy, collection and enforcement of municipal taxes shall be applicable to such special assessment.