

MEMORANDUM

Date: December 14, 2012
To: Yvetteh Ortiz, City of El Cerrito
From: Lisa Langenfeld and Sam Tabibnia
Subject: Neighborhood Traffic Management Study – Colusa Avenue

WC12-2889

This memorandum presents the data collection, analysis, and recommendations of a traffic calming study prepared for Colusa Avenue, in the City of El Cerrito, CA. Along Colusa Avenue, the project study area extends between Rockway Avenue in the south and Terrace Drive in the north. The study area is shown on Figure 1.

The following pages present our findings for the neighborhood.

COLUSA AVENUE

History and Background

Between Rockway Avenue and Terrace Drive, Colusa Avenue is a 2-way local street, with a posted speed limit of 25 mph. The roadway varies in width, ranging from 40-feet between Fairmount Avenue and Eureka Avenue, and 30-feet between Eureka Avenue and Terrace Drive. On-street parking is allowed on Colusa Avenue.

Colusa Avenue provides direct access to El Cerrito High School, and is classified as an Emergency Response Route in the City's Neighborhood Traffic Management Plan. It is also currently proposed as a Class III bicycle route.

The minor side streets intersecting Colusa Avenue along this segment are controlled with side-street stops, including: Susan Avenue, Errol Drive, Eureka Avenue and Hotchkiss Avenue. Colusa Avenue has a side-street stop at the intersection with Terrace Drive. Two high visibility crosswalks are provided at the Eureka Avenue intersection, and one mid-block high-visibility crosswalk is provided on Colusa Avenue, between Rockway Avenue and Susan Drive.

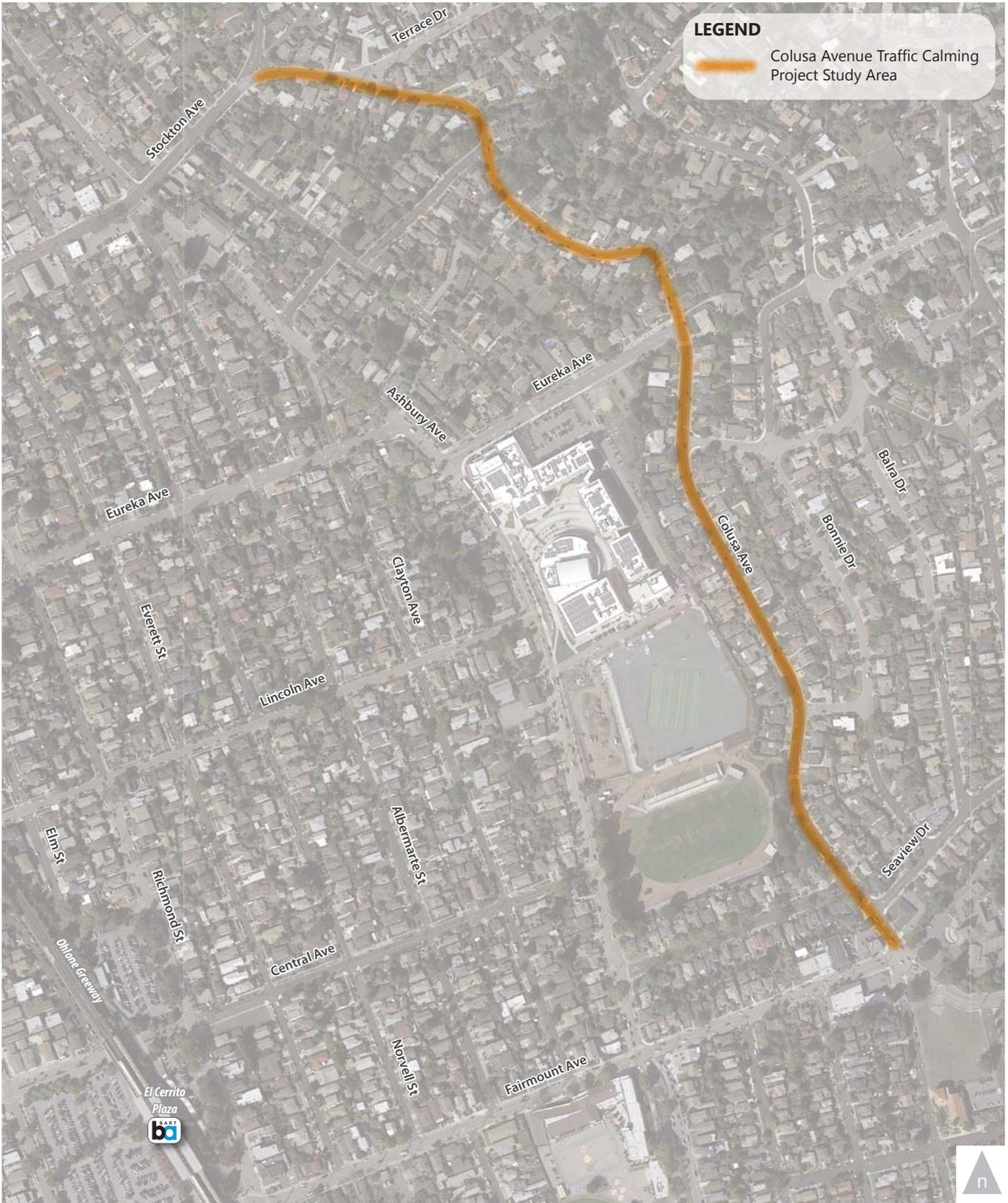


Figure 1.

**El Cerrito Traffic Calming
 Colusa Avenue Project Study Area**

WC12-2889_x_ColusaStudyArea





Moving south to north, Colusa Avenue is relatively flat from Rockway Avenue to Susan Drive. Approaching Errol Drive, the roadway begins to slope upwards, reaching the crest at Eureka Avenue. Horizontal curves are also present on this roadway section – one near Susan Drive, and one near Errol Drive.

From Eureka Avenue to the north, the slope along Colusa Avenue begins to steepen, particularly just north of Eureka Avenue, and just north of Hotchkiss Avenue. The steep roadway slope at these locations is also combined with two large horizontal curves. The northern-most intersection at Terrace Drive is at the very crest of the hill for Colusa Avenue.

Sidewalks, as well as on-street parking, are provided on both sides of Colusa Avenue, although the sidewalk is often overtaken by parked vehicles.

In 2010, the City of El Cerrito adopted the Neighborhood Traffic Management Plan (NTMP), which identifies a process through which a street may be evaluated for traffic control devices. If a street or segment qualifies, various measures are presented to assist with traffic control related concerns. For Colusa Avenue, the study segment meets the NTMP criteria based on the current vehicle speeds exceeding the posted speed of 25 mph by 5 mph (based on 2012 data) and the daily traffic volumes exceeding 1,000 vehicles per day. Current vehicle speeds taken on Colusa Avenue, (south of Hotchkiss) show an 85th percentile speed of 30 mph; the current ADT along this same segment of Colusa Avenue averages 2,200 vehicles per day.

UNDERSTANDING OF TRAFFIC CONCERNS

In response to recent concerns and a petition from the neighborhood, the City has been studying the Colusa Avenue corridor, identifying current issues and presenting potential Tier 1 and Tier 2 measures, consistent with the NTMP. Tier 1 measures include enforcement, education and outreach, as well as engineering measures limited to striping, signage, and pavement markings. Tier 2 measures are more physical elements, including speed humps, traffic circles, raised intersections, roadway closures, and enhanced crosswalk systems. Tier 1 measures are often recommended as a first step, and as more enforcement or adherence is needed, Tier 2 measures are implemented.

The following concerns were raised by neighbors in a petition filed in 2011:

- Speeding, especially near Eureka Avenue
- Sideswipe vehicle collisions



- Heavy traffic volumes during the peak commute periods
- Limited sight distance at minor intersecting roadways
- On-street parked vehicles blocking sidewalk and pedestrian path
- Unsafe environment for multi-modal users due to the above concerns

The City held a neighborhood community meeting in January 2012 to collect additional resident feedback. The following concerns were raised by residents during this meeting:

- Poor Visibility (ranked highest on the northern section of Colusa Avenue between Eureka Avenue and Terrace Avenue)
- Sideswipe (ranked highest on the northern section)
- Speeding (entire segment of Colusa Avenue)
- Sidewalk constraints (mostly recognized along northern portion)
- Sight distance (northern section)
- Traffic volumes (highest on southern section)

The main focus of this study is to present solutions that alleviate these concerns, including “calming” traffic, and improving the walkability of the corridor, providing a safer experience for pedestrians and residents.

Collision History

Fehr & Peers collected SWITRS (Statewide Integrated Traffic Records System) data to use in this analysis. From a review of available data between 2007 and 2010, 11 collisions were reported along Colusa Avenue, with the majority reported in 2009. The majority of the collisions reported were sideswipe collisions, followed by 2 broadside collisions, one head-on collision, and one collision with a hit object. The following collisions were reported by year.

- 2 collisions in 2007 (both sideswipe)
- 3 collisions in 2008 (2 sideswipe, 1 broadside)
- 5 collisions in 2009 (1 head-on, and 4 sideswipe)
- 2 collisions in 2010 (1 broadside, and 1 hit object)

No particular trend was reported at one location – the collisions were spread out along the entire study corridor. The sideswipe collisions mostly occurred on Colusa Avenue near Susan Drive, and north of Hotchkiss Avenue, and a few on Eureka Avenue approaching Colusa Avenue



Volume Data

Fehr & Peers collected turning movement counts and 48-hour tube counts on Tuesday, April 24, 2012, when school was in session. Turning movement counts were conducted at the Colusa Avenue / Eureka Avenue intersection, between 6:00 AM and 8:00 PM, to capture hours with the highest number of vehicles, pedestrians and bicyclists. 48-hour tube counts were collected on Colusa Avenue, between Stockton Avenue and Terrace Drive. Recent tube counts were also conducted on Colusa Avenue, between Eureka Avenue and Terrace Drive, on Wednesday November 14, 2012.

This traffic count data aided in the analysis of certain traffic control devices, including speed tables and speed lumps, and all-way stop signs. Per the criteria outlined in the NTMP, speed humps are not recommended on roadways with volumes greater than 4,000 average daily trips (ADT); traffic volumes on Colusa Avenue are less than half of this criterion, however Colusa Avenue is also an emergency response route, so speed tables or speed lumps should be considered instead of speed humps. Volumes collected in 2012 just north of Eureka Avenue identified 2,201 ADT on Colusa Avenue. Volume data collected in 2012 just south of Eureka Avenue identified 2,860 ADT on Colusa Avenue.

All-Way Stop Sign Warrants

The Colusa Avenue/Eureka Avenue intersection was evaluated for all-way stop control. The NTMP proposes criteria for assessing if all-way stop control should be installed at an intersection on a residential street, based on volumes (a combination of vehicle and pedestrian), collision history, and visibility. Exceptions are granted to these criteria based on the overall neighborhood circulation and special considerations. A street must meet either the volume, collision history or visibility criterion (with or without the exceptions) to be considered for an all-way stop control. These are briefly described below.

Volume: The combined volume from all approaches must equal 300 units per hours for eight hours in one day, and that the minor street must equal one-third of the total entering volume, for the same eight hours of that day.

Collision: The total number of reported collisions averages at least three or more per year, for at least two years. These collisions must be of the type that can be corrected by a multi-way stop sign.



Visibility: If a significant visibility problem exists at an intersection for a travel distance of less than 150 feet, and cannot be corrected by other means (trimming vegetation).

Neighborhood Circulation: *Traffic volumes may be reduced by 60% for all the above values if these three conditions are met: 1) neither street is an arterial street, 2) there is not a stop sign or traffic signal within 600 feet of the study intersection and 3) the stop sign installation is compatible with the overall traffic circulation within the neighborhood.*

Special Conditions: *Traffic volumes may also be reduced to 60% of the overall values if other measures have not been effective in regulating crossing safety for pedestrians, bicyclists, or motorists within 600 feet of a school, park or playground, community facility, or on a steep grade.*

For the Colusa Avenue segment, the traffic volumes were reduced by 60% based on the neighborhood circulation and special conditions criteria, with the street located near a school, and the all-way stop control being consistent with the traffic flow and circulation of the neighborhood.

CORRIDOR ANALYSIS

Colusa Avenue, between Rockway Avenue and Susan Drive

Colusa Avenue, south of Susan Drive, is flat and relatively straight, presenting a scenario for speeding vehicles. To aid in calming traffic on the beginning of the study segment, a speed lump is recommended 175 feet north of Rockway Avenue, halfway between Rockway Avenue and the mid-block crosswalk.

Colusa Avenue/Susan Drive

Colusa Avenue approaching Susan Drive is relatively flat in both directions, however there are horizontal curves just south and north of the intersection limiting visibility for drivers turning out of Susan Drive. To aid in increasing corner visibility, red curb is recommended on Colusa Avenue, for at least 50 feet in advance of the Susan Drive intersection, and on Susan Drive, for at least 15 feet in advance of the intersection. Alternatively, cross-hatched bulbout can also be painted at the intersection corners to reduce the corner turning radii and turning speeds. In the long-term, the painted bulbouts can be replaced with bulbouts with curbs that extend the sidewalk.



Colusa Avenue, between Susan Drive and Errol Drive

To address not only concerns from residents but also recent speed surveys showing vehicle speeds of 30 mph, exceeding the posted speed limit by 5 mph on this roadway segment, three equally spaced speed lumps are recommended along the roughly 1,000-foot segment of Colusa Avenue between Susan Drive and Errol Drive.

Colusa Avenue/Errol Drive

The approach to Errol Drive from Colusa Avenue in both directions is on a horizontal curve, presenting visibility concerns for drivers turning out of Errol Drive. To aid in increasing corner visibility, red curb is recommended on Colusa Avenue, for at least 50 feet in advance of the Errol Drive intersection, and on Errol Drive, for at least 15 feet in advance of the intersection. Alternatively, cross-hatched bulbout can also be painted at the intersection corners to reduce the corner turning radii and turning speeds. In the long-term, the painted bulbouts can be replaced with bulbouts with curbs that extend the sidewalk

Colusa Avenue/Eureka Avenue

At the Colusa Avenue/Eureka Avenue intersection, the all-way stop criteria were applied to evaluate the potential for stop signs on all approaches (currently only the Eureka Avenue approach is stop-controlled). The results of the *volume data analysis* indicate a much higher percentage of traffic on Colusa Avenue than on Eureka Avenue. With the 60% reductions in traffic permitted in the City's NTMP, the intersection does not meet the criteria to install an all-way stop sign due to the large difference in traffic volumes on the two streets. The minor street volume is still below the 1/3 criterion in the NTMP. It is important to note that where unwarranted, multi-way stop signs may actually increase vehicle speeds, and may further decrease driver compliance. For these reasons, other treatments should be considered before all-way stop signs are installed at unwarranted locations. Analysis results are presented in Appendix B.

The *collision history* criterion was not met at this intersection as the collisions reported did not occur at this intersection during this period of time. Of the 11 collisions reported along the corridor during the 5 year period, 4 occurred near the Colusa Avenue/Eureka Avenue intersection. Four collisions were reported in 2009; however only one collision was reported in 2008. For the criterion to be met, three collisions per year which could be corrected with multi-way stop signs would need to occur within two consecutive years.



The last criterion, *visibility*, point to areas where visibility may obstruct the driver's view of oncoming traffic. At the Colusa Avenue/Eureka Avenue intersection, motorists turning left from eastbound Eureka Avenue to northbound Colusa Avenue have limited visibility due to the crest vertical curve at the top of the Eureka Avenue approach to Colusa Avenue. Coupled with the northbound approach horizontal curve, this intersection presents a visibility concern that cannot be corrected through tree-trimming or other non NTMP-measures. Therefore, an **all-way stop sign is recommended at the Colusa Avenue/Eureka Avenue intersection.**

Colusa Avenue, between Eureka Avenue and north of Hotchkiss Avenue

Between Hotchkiss and Eureka Avenues, Colusa Avenue narrows to 30 feet, and presents a combination of horizontal and vertical curves that affect driver visibility in both directions. This road narrowing also leads to increases in sideswiped vehicles parked on-street. Residents raised concerns that vehicles that park on-street often block the pedestrian sidewalk to reduce their risk of sideswipe.

To improve driver visibility and pedestrian walkability, red curb is recommended for the downhill portion of Colusa Avenue around the curved roadway sections (see Figure 2), as well as centerline striping with Botts Dots. The centerline roadway striping will delineate the roadway and encourage drivers to stay within their travel lane. The centerline striping will be coupled with "SLOW" pavement markings and "curve ahead/winding road" warning signs and advisory speed limit sign for downhill traveling vehicles. The red-curb will also ensure sidewalk accessibility is provided for pedestrian use. It is estimated that this will result in loss of 9 on-street parking spaces.

Speed lumps are also recommended north of the curve to calm traffic on this roadway section. These measures seek to improve the walkability, reduce collisions, and reduce vehicle speeds.

Colusa Avenue, Terrace Drive

Vehicles traveling north on Colusa, making a left turn onto Terrace Drive, have limited sight distance to oncoming westbound-traveling vehicles. To improve the sight distance at this intersection, 60 feet of red-curb is recommended on Terrace Drive.

Vehicles traveling southbound on Colusa, approaching the Terrace Drive intersection, often reach high speeds as they begin decelerating towards and down Colusa Avenue. To slow traffic and discourage drivers from taking the corner at high speeds, striping improvements, including



hatching, and either AC-curb or raised Botts Dots, are recommended to delineate the curb extension.

RECOMMENDATIONS

The goal of this study is to present measures that address concerns raised along Colusa Avenue. The City currently has approximately \$35,000 for Tier 1 and Tier 2 improvements along Colusa Avenue.

Table 1 summarizes the Tier 1 and Tier 2 measures described in the previous section that could be considered along this segment, along with their rough order of magnitude cost.

Based on the City's current budget for improvements along Colusa Avenue, and the recommended goals of this traffic calming study, the following combination of Tier 1 and Tier 2 near-term measures are suggested along Colusa Avenue. These improvements are identified on Figure 2.

Recommended Near-Term Tier 1 Measures

- Intersection narrowing features, including cross-hatching, at Colusa Avenue / Terrace Drive (southbound direction onto Colusa Avenue)
- Red curb striping for 15 to 25 feet along Colusa Avenue in advance of Susan Drive, Errol Drive, Hotchkiss Avenue.
- Red curb and centerline striping for approximately 200 feet on the south/west side of Colusa Avenue on the horizontal curves
 - north of Eureka Avenue
 - north of Hotchkiss Avenue
- All-way stop sign at Colusa Avenue/Eureka Avenue

Recommended Near-Term Tier 2 Measures

- Speed lumps along Colusa Avenue at the following locations:
 - One speed lump halfway between Rockway Avenue and the midblock crosswalk
 - Three speed lumps between Susan Drive and Errol Drive
 - Two speed lumps between Eureka Avenue and Hotchkiss Avenue
- Raised AC curb at the southwest corner of Colusa Avenue / Terrace Drive.



TABLE 1
POTENTIAL TIER 1 AND TIER 2 TRAFFIC CALMING MEASURES – COLUSA AVENUE

Tier	Measure	Pros	Cons	Approximate Cost
Tier 1	Red Curb Painting	Improves corner visibility	On-street parking reduction	\$2.50 / linear foot
	Centerline Striping	Adds roadway definition, may visually narrow the roadway	Requires maintenance; compliance is voluntary	\$1.75 / linear foot
	All-Way Stop Control	Will enhance visibility	May increase noise in vicinity	\$700 per sign
	Intersection narrowing features, including hatching and striping	May visually narrow intersection, will improve corner visibility	Requires maintenance	\$2.00 / linear foot for striping and botts dots
Tier 2	Speed Lumps	High impact on reducing vehicle speeds. May also reduce traffic volume	May increase noise in vicinity; may conflict with bicyclists	\$3,500-4,000 each
	Speed feedback signs	May reduce vehicle speeds	Compliance is voluntary; may require enforcement	\$5,000 - \$10,000/ each
	Speed Tables	High impact on reducing vehicle speeds. May also reduce traffic volumes. Can include colored/ textured pavement	High cost; may reduce emergency response times	\$10,000 - \$15,000 each
	AC Curb	Will add definition, may visually narrow the roadway	Will require maintenance; may conflict with bicyclists; may require drainage improvements	\$26.00 / linear foot
	Enhanced Crosswalk (flashing beacons, in-roadway warning lights)	Will enhance crosswalk visibility	High cost; requires maintenance	\$20,000 to \$40,000 (complete system)
	ADA-Compliant Curb Ramps	Provides accessible path of travel	High cost; may require additional improvements (drainage relocation)	\$3,500 - \$4,000 (per each)

Source: Fehr & Peers, 2012.



The approximate cost for these improvements is detailed in Table 2.

While the above measures are proposed to calm traffic by reducing vehicle speeds on Colusa Avenue, they may also reduce vehicle volumes as well. Based on nationally-conducted traffic calming evaluations, speed lumps are shown to reduce vehicle volumes by approximately 20%. This reduction in vehicle volumes on Colusa Avenue may cause some vehicles to divert to other parallel streets, such as Ashbury Avenue or Pomona Avenue.

Alternative Near-Term Tier 1 and Tier 2 Measures

As an alternative to the near-term Tier 1 and Tier 2 measures described above, the following can also be considered:

- Speed tables instead of speed humps at the six locations described above
- Cross-hatched bulbouts at the corner of intersections of Colusa Avenue with Susan Drive and Errol Drive

Recommended Long-Term Tier 1 and Tier 2 Measures

As additional funds become available, long-term solutions may include the following:

- Speed feedback signs on Colusa Avenue, south of Susan Drive (approximate cost = \$5,000 - \$10,000)
- Enhanced crosswalk and curb ramps at the mid-block crosswalk south of Susan Drive (approximate cost - \$20,000 - \$50,000)
- Bulbouts at the corner of intersections of Colusa Avenue with Susan Drive and Errol Drive (approximate cost - \$15,000 to \$25,000 per corner)
- Evaluation and implementation of sidewalk improvements

Appendices:

Appendix A: Turning Movement Counts at Colusa Avenue/Eureka Avenue

Appendix B: All-way stop control analysis, Colusa Avenue/Eureka Avenue



Figure 2.
 El Cerrito Traffic Calming
 Recommended Traffic Calming on Colusa Avenue

WC12-2889_2_ColusaStudyArea



TABLE 2 NEAR-TERM TRAFFIC CALMING RECOMMENDATIONS - CONSTRUCTION COSTS

Location	Item	Unit of Measure	Unit Cost	Quantity	Total
Colusa Avenue between Rockway Avenue and Susan Drive	Speed Lump	EA	\$4,000	1	\$4,000
Susan Drive	Red Curb	LF	\$2.50	100	\$250
Colusa Avenue between Susan Drive and Errol Drive	Speed Lump	EA	\$4,000	3	\$12,000
Errol Drive	Red Curb	LF	\$2.50	100	\$250
Colusa Avenue / Eureka Avenue	All-Way Stop Sign	EA	\$700	2	\$1,400
	Stop Markings	SF	\$8.00	80	\$640
Colusa Avenue between Eureka Avenue and Hotchkiss Avenue	Speed Lumps	EA	\$4,000	2	\$8,000
	Red Curb	LF	\$2.50	200	\$500
	Pavement Markings	SF	\$8.00	25	\$200
	Centerline Stripe	LF	\$1.50	200	\$300
Colusa Avenue between Hotchkiss Avenue and Terrace Drive	Red Curb	LF	\$2.50	200	\$500
	Pavement Markings	SF	\$8.00	25	\$200
	Centerline Stripe	LF	\$1.50	200	\$300
Colusa Avenue at Terrace Drive	Red Curb	LF	\$2.50	200	\$500
	Pavement Markings	SF	\$8.00	50	\$400
	Botts Dotts	LF	\$1.50	20	\$30
Subtotal					\$29,470
Traffic Control, Construction Management, and Mobilization (Total of 25%)					\$7,367.50
Contingency (15%)					\$4,420.50
TOTAL					\$41,258

Does not include design fee (approximately 15% of construction cost)
 Source: Fehr & Peers, 2012.

INTERSECTION TURNING MOVEMENT COUNT SUMMARY

CLIENT: FEHR AND PEERS
 PROJECT: EL CERRITO TRAFFIC COUNTS
 DATE: TUESDAY APRIL 24, 2012
 PERIOD: 6:00 A.M. TO 8:00 P.M.
 INTERSECTION: N/S COLUSA AVENUE
 E/W EUREKA AVENUE
 CITY: EL CERRITO

15 MIN COUNTS													
PERIOD	1 SBRT	2 SBTH	3 SBLT	4 WBRT	5 WBTH	6 WBLT	7 NBRT	8 NBTH	9 NBLT	10 EBRT	11 EBTH	12 EBLT	TOTAL
600-615	1	2	0	0	0	0	0	0	3	1	0	0	7
615-630	1	1	0	0	0	0	0	4	2	1	0	0	9
630-645	0	3	0	0	0	0	0	1	2	1	0	1	8
645-700	1	10	0	0	0	0	0	1	0	4	0	0	16
700-715	1	6	0	0	0	0	0	3	5	7	0	0	22
715-730	2	12	0	0	0	0	0	5	11	11	0	0	41
730-745	0	28	0	0	0	0	0	9	5	11	0	3	56
745-800	13	41	0	0	0	0	0	20	13	19	0	5	111
800-815	15	46	0	0	0	0	0	33	29	37	0	13	173
815-830	2	46	0	0	0	0	0	33	9	17	0	4	111
830-845	4	47	0	0	0	0	0	7	12	9	0	2	81
845-900	0	25	0	0	0	0	0	7	11	9	0	0	52
900-915	1	29	0	0	0	0	0	6	6	6	0	0	48
915-930	1	23	0	0	0	0	0	4	6	12	0	0	46
930-945	1	21	0	0	0	0	0	12	5	11	0	1	51
945-1000	2	9	0	0	0	0	0	9	7	8	0	0	35
1000-1015	0	10	0	0	0	0	0	11	6	6	0	1	34
1015-1030	0	8	0	0	0	0	0	6	3	11	0	0	28
1030-1045	2	15	0	0	0	0	0	8	6	5	0	1	37
1045-1100	0	21	0	0	0	0	0	15	8	14	0	1	59
1100-1115	1	5	0	0	0	0	0	7	8	0	0	1	22
1115-1130	1	13	0	0	0	0	0	16	6	9	0	0	45
1130-1145	3	15	0	0	0	0	0	14	8	4	0	1	45
1145-1200	3	10	0	0	0	0	0	12	10	10	0	2	47
1200-1215	0	12	0	0	0	0	0	12	7	5	0	0	36
1215-1230	1	16	0	0	0	0	0	12	4	11	0	0	44
1230-1245	1	15	0	0	0	0	0	14	4	5	0	1	40
1245-100	0	10	0	0	0	0	0	10	8	2	0	0	30
100-115	3	12	0	0	0	0	0	8	12	6	0	3	44
115-130	1	7	0	0	0	0	0	8	15	9	0	2	42
130-145	0	8	0	0	0	0	0	10	11	8	0	1	38
145-200	2	11	0	0	0	0	0	7	14	9	0	0	43
200-215	0	8	0	0	0	0	0	10	9	10	0	0	37
215-230	4	11	0	0	0	0	0	6	13	12	0	0	46
230-245	4	22	0	0	0	0	0	16	15	11	0	8	76
245-300	1	15	0	0	0	0	0	6	21	13	0	1	57
300-315	0	13	0	0	0	0	0	12	36	11	0	2	74
315-330	2	22	0	0	0	0	0	15	35	9	0	2	85
330-345	1	34	0	0	0	0	0	7	17	12	0	2	73
345-400	4	27	0	0	0	0	0	12	24	19	0	5	91
400-415	1	14	0	0	0	0	0	10	23	10	0	1	59
415-430	0	19	0	0	0	0	0	13	16	10	0	2	60
430-445	1	22	0	0	0	0	0	16	31	9	0	1	80
445-500	1	17	0	0	0	0	0	12	30	21	0	2	83
500-515	1	28	0	0	0	0	0	11	36	26	0	1	103
515-530	2	15	0	0	0	0	0	12	26	25	0	1	81
530-545	1	25	0	0	0	0	0	16	27	16	0	4	89
545-600	2	18	0	0	0	0	0	14	23	14	0	2	73
600-615	1	12	0	0	0	0	0	15	22	16	0	1	67
615-630	0	16	0	0	0	0	0	16	20	13	0	6	71
630-645	0	11	0	0	0	0	0	10	14	20	0	0	55

645-700	1	11	0	0	0	0	0	16	22	10	0	1	61
700-715	2	7	0	0	0	0	0	9	14	15	0	1	48
715-730	1	11	0	0	0	0	0	15	12	12	0	0	51
730-745	1	9	0	0	0	0	0	6	12	17	0	2	47
745-800	1	10	0	0	0	0	0	5	9	4	0	1	30

HOUR TOTALS													
PERIOD	1 SBRT	2 SBTH	3 SBLT	4 WBRT	5 WBTH	6 WBLT	7 NBRT	8 NBTH	9 NBLT	10 EBRT	11 EBTH	12 EBLT	TOTAL
600-700	3	16	0	0	0	0	0	6	7	7	0	1	40
615-715	3	20	0	0	0	0	0	9	9	13	0	1	55
630-730	4	31	0	0	0	0	0	10	18	23	0	1	87
645-745	4	56	0	0	0	0	0	18	21	33	0	3	135
700-800	16	87	0	0	0	0	0	37	34	48	0	8	230
715-815	30	127	0	0	0	0	0	67	58	78	0	21	381
730-830	30	161	0	0	0	0	0	95	56	84	0	25	451
745-845	34	180	0	0	0	0	0	93	63	82	0	24	476
800-900	21	164	0	0	0	0	0	80	61	72	0	19	417
815-915	7	147	0	0	0	0	0	53	38	41	0	6	292
830-930	6	124	0	0	0	0	0	24	35	36	0	2	227
845-945	3	98	0	0	0	0	0	29	28	38	0	1	197
900-1000	5	82	0	0	0	0	0	31	24	37	0	1	180
915-1015	4	63	0	0	0	0	0	36	24	37	0	2	166
930-1030	3	48	0	0	0	0	0	38	21	36	0	2	148
945-1045	4	42	0	0	0	0	0	34	22	30	0	2	134
1000-1100	2	54	0	0	0	0	0	40	23	36	0	3	158
1015-1115	3	49	0	0	0	0	0	36	25	30	0	3	146
1030-1130	4	54	0	0	0	0	0	46	28	28	0	3	163
1045-1145	5	54	0	0	0	0	0	52	30	27	0	3	171
1100-1200	8	43	0	0	0	0	0	49	32	23	0	4	159
1115-1215	7	50	0	0	0	0	0	54	31	28	0	3	173
1130-1230	7	53	0	0	0	0	0	50	29	30	0	3	172
1145-1245	5	53	0	0	0	0	0	50	25	31	0	3	167
1200-100	2	53	0	0	0	0	0	48	23	23	0	1	150
1215-115	5	53	0	0	0	0	0	44	28	24	0	4	158
1230-130	5	44	0	0	0	0	0	40	39	22	0	6	156
1245-145	4	37	0	0	0	0	0	36	46	25	0	6	154
100-200	6	38	0	0	0	0	0	33	52	32	0	6	167
115-215	3	34	0	0	0	0	0	35	49	36	0	3	160
130-230	6	38	0	0	0	0	0	33	47	39	0	1	164
145-245	10	52	0	0	0	0	0	39	51	42	0	8	202
200-300	9	56	0	0	0	0	0	38	58	46	0	9	216
215-315	9	61	0	0	0	0	0	40	85	47	0	11	253
230-330	7	72	0	0	0	0	0	49	107	44	0	13	292
245-345	4	84	0	0	0	0	0	40	109	45	0	7	289
300-400	7	96	0	0	0	0	0	46	112	51	0	11	323
315-415	8	97	0	0	0	0	0	44	99	50	0	10	308
330-430	6	94	0	0	0	0	0	42	80	51	0	10	283
345-445	6	82	0	0	0	0	0	51	94	48	0	9	290
400-500	3	72	0	0	0	0	0	51	100	50	0	6	282
415-515	3	86	0	0	0	0	0	52	113	66	0	6	326
430-530	5	82	0	0	0	0	0	51	123	81	0	5	347
445-545	5	85	0	0	0	0	0	51	119	88	0	8	356
500-600	6	86	0	0	0	0	0	53	112	81	0	8	346
515-615	6	70	0	0	0	0	0	57	98	71	0	8	310
530-630	4	71	0	0	0	0	0	61	92	59	0	13	300
545-645	3	57	0	0	0	0	0	55	79	63	0	9	266
600-700	2	50	0	0	0	0	0	57	78	59	0	8	254
615-715	3	45	0	0	0	0	0	51	70	58	0	8	235
630-730	4	40	0	0	0	0	0	50	62	57	0	2	215
645-745	5	38	0	0	0	0	0	46	60	54	0	4	207
700-800	5	37	0	0	0	0	0	35	47	48	0	4	176

Appendix C -Colusa Avenue/Eureka Avenue TMC

All-way stop warrant analysis
Vehicle, Pedestrian and Bicycle Totals

HOUR TOTAL	Colusa Avenue				Colusa Avenue				Eureka Avenue				TOTAL
	1	2	3	4	5	6	7	8	9	10	11	12	
PERIOD	SBRT	SBTH	SBLT	WBRT	WBTH	WBLT	NBRT	NBTH	NBLT	EBRT	EBTH	EBLT	
600-700	3	23	0	0	2	0	0	6	7	7	1	1	50
615-715	4	25	0	0	1	0	0	9	9	13	0	1	62
630-730	4	35	0	0	0	0	0	10	18	23	0	1	91
645-745	5	67	0	0	1	0	0	18	21	33	0	3	148
700-800	18	98	0	0	2	0	0	37	34	48	0	8	245
715-815	32	139	0	0	2	0	0	67	58	78	0	21	397
730-830	33	172	0	0	3	0	0	95	56	84	0	25	468
745-845	38	186	0	0	4	0	0	93	63	82	1	24	491
800-900	24	170	0	0	3	0	0	80	61	72	1	19	430
815-915	11	154	0	0	4	0	0	53	38	41	2	6	309
830-930	10	133	0	0	4	0	0	24	35	36	2	2	246
845-945	5	106	0	0	2	0	0	29	28	38	2	1	211
900-1000	7	90	0	0	2	0	0	31	24	37	2	1	194
915-1015	5	70	0	0	1	0	0	36	24	37	1	2	176
930-1030	3	53	0	0	0	0	0	38	21	36	1	2	154
945-1045	4	47	0	0	0	0	0	34	22	30	0	2	139
1000-1100	2	61	0	0	0	0	0	40	23	36	0	3	165
1015-1115	3	55	0	0	0	0	0	36	25	30	0	3	152
1030-1130	4	58	0	0	0	0	0	46	28	28	0	3	167
1045-1145	6	59	0	0	1	0	0	52	30	27	1	3	179
1100-1200	9	45	0	0	1	0	0	49	32	23	1	4	164
1115-1215	8	52	0	0	1	0	0	54	31	28	1	3	178
1130-1230	8	55	0	0	1	0	0	50	29	30	1	3	177
1145-1245	5	66	0	0	0	0	0	50	25	31	0	3	180
1200-100	2	66	0	0	0	0	0	48	23	23	0	1	163
1215-115	5	66	0	0	0	0	0	44	28	24	0	4	171
1230-130	5	58	0	0	0	0	0	40	39	22	1	6	171
1245-145	4	39	0	0	0	0	0	36	46	25	1	6	157
100-200	6	41	0	0	0	0	0	33	52	32	1	6	171
115-215	3	37	0	0	0	0	0	35	49	36	2	3	165
130-230	6	42	0	0	0	0	0	33	47	39	2	1	170
145-245	10	58	0	0	0	0	0	39	51	42	3	8	211
200-300	10	62	0	0	1	0	0	38	58	46	3	9	227
215-315	10	69	0	0	1	0	0	40	85	47	2	11	265
230-330	8	79	0	0	1	0	0	49	107	44	2	13	303
245-345	5	91	0	0	1	0	0	40	109	45	1	7	299
300-400	7	104	0	0	0	0	0	46	112	51	4	11	335
315-415	8	104	0	0	0	0	0	44	99	50	4	10	319
330-430	6	101	0	0	0	0	0	42	80	51	4	10	294
345-445	7	88	0	0	1	0	0	51	94	48	4	9	302
400-500	4	81	0	0	1	0	0	51	100	50	4	6	297
415-515	4	94	0	0	1	0	0	52	113	66	6	6	342
430-530	6	89	0	0	1	0	0	51	123	81	6	5	362
445-545	5	93	0	0	0	0	0	51	119	88	9	8	373
500-600	6	91	0	0	0	0	0	53	112	81	7	8	358
515-615	6	79	0	0	0	0	0	57	98	71	5	8	324
530-630	4	80	0	0	0	0	0	61	92	59	4	13	313
545-645	3	66	0	0	0	0	0	55	79	63	3	9	278
600-700	3	58	0	0	1	0	0	57	78	59	2	8	266
615-715	4	54	0	0	1	0	0	51	70	58	3	8	249
630-730	5	51	0	0	1	0	0	50	62	57	3	2	231
645-745	6	49	0	0	1	0	0	46	60	54	1	4	221
700-800	5	47	0	0	0	0	0	35	47	48	1	4	187

Regular Stop Sign Warrant (No Special		
	Minor St	
TOTAL	Lincoln E/W Total	1/3 of Total Met?
50	11	-
62	15	-
91	24	-
148	37	-
245	58	-
397	101	-
468	112	-
491	111	-
430	95	-
309	53	-
246	44	-
211	43	-
194	42	-
176	41	-
154	39	-
139	32	-
165	39	-
152	33	-
167	31	-
179	32	-
164	29	-
178	33	-
177	35	-
180	34	-
163	24	-
171	28	-
171	29	-
157	32	-
171	39	-
165	41	-
170	42	-
211	53	-
227	59	-
265	61	-
303	60	-
299	54	-
335	66	-
319	64	-
294	65	-
302	62	-
297	61	-
342	79	-
362	93	-
373	105	-
358	96	-
324	84	-
313	76	-
278	75	-
266	70	-
249	70	-
231	63	-
221	60	-
187	53	-

60% Volume Reduction on both Total and Minor		
TOTAL reduced to 60%	Lincoln reduced to 60%	Met with 60%
30	6.6	-
37.2	9.0	-
54.6	14.4	-
88.8	22.2	-
147	34.8	-
238.2	60.6	-
280.8	67.2	-
294.6	66.6	-
258	57.0	-
185.4	31.8	-
147.6	26.4	-
126.6	25.8	-
116.4	25.2	-
105.6	24.6	-
92.4	23.4	-
83.4	19.2	-
99	23.4	-
91.2	19.8	-
100.2	18.6	-
107.4	19.2	-
98.4	17.4	-
106.8	19.8	-
106.2	21.0	-
108	20.4	-
97.8	14.4	-
102.6	16.8	-
102.6	17.4	-
94.2	19.2	-
102.6	23.4	-
99	24.6	-
102	25.2	-
126.6	31.8	-
136.2	35.4	-
159	36.6	-
181.8	36.0	-
179.4	32.4	-
201	39.6	-
191.4	38.4	-
176.4	39.0	-
181.2	37.2	-
178.2	36.6	-
205.2	47.4	-
217.2	55.8	-
223.8	63.0	-
214.8	57.6	-
194.4	50.4	-
187.8	45.6	-
166.8	45.0	-
159.6	42.0	-
149.4	42.0	-
138.6	37.8	-
132.6	36.0	-
112.2	31.8	-

*Total must be greater than or equal to 300

**Total must be greater than or equal to 180