



Multi-Way Stop for the Intersection of
E Bay Blvd and Western St
City Engineering Department
July 2014

Criteria for Multi-Way Stop Installation

Based on MUTCD 2009 Edition Standards

Criterion 1: Crash Experience

This criterion is **not satisfied** because there have been no accidents at this intersection in the past 12 months that could have been prevented by a Multi-Way Stop.

Criterion 2: 8-hour Vehicular Volume

This criterion is **not satisfied** because the vehicles per hour entering the intersection of East Bay Blvd and Western St coming from East Bay Blvd is 65, which does not exceed the required minimum 300 vehicles per hour for any 8 hours of an average day. The vehicles per hour entering the intersection from Western St is 5 with an average delay to vehicular traffic is 1 second, which does not exceed the required minimum 200 vehicles per hour for the same 8 hours and the minimum average delay time of 30 seconds per vehicle during the peak hour.

Criterion 3: Major Road Approach Speed

This criterion is **not satisfied** because the 85th-percentile approach speed of traffic on East Bay Blvd is 28 mph, which does not exceed the required minimum of 40 mph.

Additional Notes

The level of service of the intersection was found to be a level A with an average control delay of 1 second per vehicle. Although there were no pedestrians observed during the peak hour, there were three people on bicycles that appeared to be exercising. This led to the conclusion that this section of East Bay Blvd. is not as popular an exercise route as the rest, but it is still used by some residents as one. It appeared that most vehicles that travel through this area bypass the N. E. Bay Blvd. and Western intersection using Birchwood. The vehicles that did travel on N. E. Bay Blvd. though tended to rolling stop through the intersection, and 15 of the total 57 vehicles on E. Bay Blvd. ran the stop sign. The number of gaps was 45 during the peak hour, due to long gap times in between vehicles.



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Date: 7-22-14

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Date: 7-28-14

- Encl:
- 2009 MUTCD Section 2B.07 Multi-Way Stop Applications
 - Stop Sign Criteria Data for E Bay Blvd and Western St
 - Stop Time Delay Tabulation
 - Stop Warrant Field Observations
 - Detailed TraxPro 2014 N. East Bay Blvd Speed Report
 - 2012 TraxPro Western St. Volume Report
 - 2014 TraxPro N East Bay Blvd Volume Report



Section 2B.07 Multi-Way Stop Applications

Support:

01 Multi-way stop control can be useful as a safety measure at intersections if certain traffic conditions exist. Safety concerns associated with multi-way stops include pedestrians, bicyclists, and all road users expecting other road users to stop. Multi-way stop control is used where the volume of traffic on the intersecting roads is approximately equal.

02 The restrictions on the use of STOP signs described in [Section 2B.04](#) also apply to multi-way stop applications.

Guidance:

03 *The decision to install multi-way stop control should be based on an engineering study.*

04 *The following criteria should be considered in the engineering study for a multi-way STOP sign installation:*

- A. *Where traffic control signals are justified, the multi-way stop is an interim measure that can be installed quickly to control traffic while arrangements are being made for the installation of the traffic control signal.*
- B. *Five or more reported crashes in a 12-month period that are susceptible to correction by a multi-way stop installation. Such crashes include right-turn and left-turn collisions as well as right-angle collisions.*
- C. *Minimum volumes:*
 - 1. *The vehicular volume entering the intersection from the major street approaches (total of both approaches) averages at least 300 vehicles per hour for any 8 hours of an average day; and*
 - 2. *The combined vehicular, pedestrian, and bicycle volume entering the intersection from the minor street approaches (total of both approaches) averages at least 200 units per hour for the same 8 hours, with an average delay to minor-street vehicular traffic of at least 30 seconds per vehicle during the highest hour; but*
 - 3. *If the 85th-percentile approach speed of the major-street traffic exceeds 40 mph, the minimum vehicular volume warrants are 70 percent of the values provided in Items 1 and 2.*
- D. *Where no single criterion is satisfied, but where Criteria B, C.1, and C.2 are all satisfied to 80 percent of the minimum values. Criterion C.3 is excluded from this condition.*

Option:

05 Other criteria that may be considered in an engineering study include:

- A. The need to control left-turn conflicts;
- B. The need to control vehicle/pedestrian conflicts near locations that generate high pedestrian volumes;
- C. Locations where a road user, after stopping, cannot see conflicting traffic and is not able to negotiate the intersection unless conflicting cross traffic is also required to stop; and
- D. An intersection of two residential neighborhood collector (through) streets of similar design and operating characteristics where multi-way stop control would improve traffic operational characteristics of the intersection.

**2014 Multi-Way Stop Sign Criteria -- East Bay Blvd and Western St
Intersection Data**

KEY	
= Area of Concern	
**Estimates and Projected Data are found by using a 2% per year growth rate	

General Information

Major Road	Minor Road	Total Control Delay (sec)	Average Control Delay (sec/vehicle)	Level of Service	Total Pedestrians	School Children	Gaps	Bicycles	Main Road Speed Limit
East Bay	Western	5	1.00	A	0	0	45	3	25

Criterion 1: Crash Experience

Main Road	Minor Road	Correctable Crashes in Past 12 Months	Meets Conditions B
East Bay	Western	0	no

Criterion 2: 8-hour Vehicular Volume

Major Road	Minor Road	Vehicles per Hour on Major Road	Vehicles per Hour on Minor Road	Meets Condition C1	Meets Condition C2	Meets Condition B, C 1 and C 2 Combination to 80% of minimum	Major Street Volume Estimated** from:	Minor Street Volume Estimated** from:
East Bay	Western	65	5	no	no	no	Current (2014)	Past (2012 Speed Study)

Criterion 3: Major Road Approach Speed

Major Road	85th Percentile Approach Speed (mph)	Meets Condition C 3	Speed Data from:
East Bay	28	no	Current (2014)

Notes

· Currently the intersection is a 3 - way stop



Job Multi-Way Stop Warrant Additional
Description Field Observations for
N. East Bay Blvd. + Western St.

Project No. _____
Computed by John Zaradonis Date 6-27-14
Checked by _____ Date _____

Reference

of cars turning of Western:

III

(when I left 1 sec. delay
not counted)

~~Cars for them~~

Delay time for them specifically:

1 sec. 1 sec. 1 sec.
1 sec. 1 sec.

* on E Bay Blvd.

→ Times Stop Sign Blown / Roll Stops: ^{Real Bad}

III III III

Cars not counted from cars coming off
Western:

II

N. E. Bay Blvd.
 (400 Block, between Eastern Ave. and Western St.)
 Speed (Combined)

SB, NB	0	15	16	21	26	31	36	41	46	51	56	61	66	71	76	Total
Start Time	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	9999
07/17/14	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
01:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
02:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
03:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
04:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
05:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
06:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
07:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
08:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
09:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
10:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
11:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
12 PM	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
13:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
14:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
15:00	3	11	18	11	4	0	0	0	0	0	0	1	0	1	1	46
16:00	1	8	41	26	9	1	0	0	0	0	0	0	0	0	0	87
17:00	2	12	17	27	7	0	0	0	0	0	0	0	0	0	0	66
18:00	0	8	28	16	4	0	0	0	0	0	0	0	0	0	0	56
19:00	0	13	18	11	2	0	0	0	0	0	0	0	0	0	0	47
20:00	0	6	15	9	5	0	0	0	0	0	0	0	0	0	0	35
21:00	0	8	11	4	0	0	0	0	0	0	0	0	0	0	0	25
22:00	0	4	6	2	1	0	0	0	0	0	0	0	0	0	0	13
23:00	0	1	3	1	0	0	0	0	0	0	0	0	0	0	0	5
Day Total	6	66	157	107	32	1	0	0	0	0	0	1	0	1	1	380

N. E. Bay Blvd.
 (400 Block, between Eastern Ave. and Western St.)
 Speed (Combined)

SB, NB	0	15	16	21	26	31	36	41	46	51	56	61	66	71	76	Total
Start Time	0	15	20	25	30	35	40	45	50	55	60	65	70	75	9999	
07/18/14	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	3
01:00	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1
02:00	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1
03:00	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1
04:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:00	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	3
06:00	0	0	1	2	4	1	0	0	0	0	0	0	0	0	0	8
07:00	3	3	1	3	10	12	3	0	0	0	0	0	0	0	0	32
08:00	0	0	1	8	21	8	3	0	0	0	0	0	0	0	0	41
09:00	3	3	1	8	19	10	1	0	0	0	0	0	0	0	0	42
10:00	0	0	0	12	22	12	3	0	0	0	0	0	0	0	1	50
11:00	2	2	2	15	24	22	2	0	0	0	0	0	0	0	0	67
12 PM	2	2	1	5	21	29	4	0	0	0	0	0	0	0	1	63
13:00	2	2	2	11	29	15	2	0	0	0	0	0	0	0	0	61
14:00	1	1	1	9	34	20	4	1	0	0	0	0	0	0	0	70
15:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
16:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
17:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
18:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
19:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
20:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
21:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
22:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
23:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Day Total	14	14	10	74	187	132	22	1	1	0	0	0	0	0	2	443
Grand Total	20	20	18	140	344	239	54	2	1	0	0	1	0	1	3	823

15th Percentile : 22 MPH
 50th Percentile : 28 MPH
 85th Percentile : 33 MPH
 95th Percentile : 36 MPH
 Mean Speed(Average) : 28 MPH
 10 MPH Pace Speed : 25-34 MPH
 Number in Pace : 532
 Percent in Pace : 64.9%
 Number of Vehicles > 25 MPH : 645
 Percent of Vehicles > 25 MPH : 78.7%

Western St.
(200 Block)
Count #20

Start Time	01-Oct-12 Mon	02-Oct-12 Tue	03-Oct-12 Wed	04-Oct-12 Thu	05-Oct-12 Fri	Weekday Average	06-Oct-12 Sat	07-Oct-12 Sun
12:00 AM	*	*	*	*	*	*	0	0
01:00	*	*	*	*	*	*	0	0
02:00	*	*	*	*	*	*	0	0
03:00	*	*	*	*	*	*	0	0
04:00	*	*	*	*	*	*	0	0
05:00	*	*	*	*	*	*	0	0
06:00	*	*	*	*	*	*	1	2
07:00	*	*	*	*	*	*	1	1
08:00	*	*	*	*	*	*	2	1
09:00	*	*	*	*	*	*	3	5
10:00	*	*	*	*	*	*	4	5
11:00	*	*	*	*	3	3	0	2
12:00 PM	*	*	*	*	2	2	4	5
01:00	*	*	*	*	4	4	2	3
02:00	*	*	*	*	3	3	2	7
03:00	*	*	*	*	1	1	13	4
04:00	*	*	*	*	7	7	2	2
05:00	*	*	*	*	5	5	4	7
06:00	*	*	*	*	7	7	2	2
07:00	*	*	*	*	2	2	2	1
08:00	*	*	*	*	2	2	3	2
09:00	*	*	*	*	2	2	4	5
10:00	*	*	*	*	2	2	1	0
11:00	*	*	*	*	0	0	1	1
Total	0	0	0	0	40		51	55
Percentage	0.0%	0.0%	0.0%	0.0%	100.0%		127.5%	137.5%
AM Peak	-	-	-	-	11:00	-	10:00	09:00
Vol.	-	-	-	-	3	-	4	5
PM Peak	-	-	-	-	16:00	-	15:00	14:00
Vol.	-	-	-	-	7	-	13	7

Western St.
(200 Block)
Count #20

Start Time	08-Oct-12 Mon	09-Oct-12 Tue	10-Oct-12 Wed	11-Oct-12 Thu	12-Oct-12 Fri	Weekday Average	13-Oct-12 Sat	14-Oct-12 Sun
12:00 AM	0	0	*	*	*	0	*	*
01:00	0	0	*	*	*	0	*	*
02:00	0	0	*	*	*	0	*	*
03:00	0	0	*	*	*	0	*	*
04:00	0	0	*	*	*	0	*	*
05:00	0	0	*	*	*	0	*	*
06:00	1	1	*	*	*	1	*	*
07:00	7	1	*	*	*	4	*	*
08:00	6	11	*	*	*	8	*	*
09:00	10	3	*	*	*	6	*	*
10:00	2	6	*	*	*	4	*	*
11:00	7	2	*	*	*	4	*	*
12:00 PM	3	3	*	*	*	3	*	*
01:00	2	5	*	*	*	4	*	*
02:00	4	*	*	*	*	4	*	*
03:00	6	*	*	*	*	6	*	*
04:00	7	*	*	*	*	7	*	*
05:00	3	*	*	*	*	3	*	*
06:00	3	*	*	*	*	3	*	*
07:00	8	*	*	*	*	8	*	*
08:00	0	*	*	*	*	0	*	*
09:00	1	*	*	*	*	1	*	*
10:00	1	*	*	*	*	1	*	*
11:00	0	*	*	*	*	0	*	*
Total	71	32	0	0	0		0	0
Percentage	106.0%	47.8%	0.0%	0.0%	0.0%		0.0%	0.0%
AM Peak	09:00	08:00	-	-	-	-	-	-
Vol.	10	11	-	-	-	-	-	-
PM Peak	19:00	13:00	-	-	-	-	-	-
Vol.	8	5	-	-	-	-	-	-
Total		32	0					

N. E. Bay Blvd.
 (400 Block, between Eastern Ave. and Western St.)
 Count #54

Start Time	14-Jul-14 Mon	15-Jul-14 Tue	16-Jul-14 Wed	17-Jul-14 Thu	18-Jul-14 Fri	Weekday Average	19-Jul-14 Sat	20-Jul-14 Sun
12:00 AM	*	*	*	*	3	3	*	*
01:00	*	*	*	*	1	1	*	*
02:00	*	*	*	*	1	1	*	*
03:00	*	*	*	*	1	1	*	*
04:00	*	*	*	*	0	0	*	*
05:00	*	*	*	*	3	3	*	*
06:00	*	*	*	*	8	8	*	*
07:00	*	*	*	*	32	32	*	*
08:00	*	*	*	*	41	41	*	*
09:00	*	*	*	*	42	42	*	*
10:00	*	*	*	*	50	50	*	*
11:00	*	*	*	*	67	67	*	*
12:00 PM	*	*	*	*	63	63	*	*
01:00	*	*	*	*	61	61	*	*
02:00	*	*	*	*	70	70	*	*
03:00	*	*	*	46	*	46	*	*
04:00	*	*	*	87	*	87	*	*
05:00	*	*	*	66	*	66	*	*
06:00	*	*	*	56	*	56	*	*
07:00	*	*	*	47	*	47	*	*
08:00	*	*	*	35	*	35	*	*
09:00	*	*	*	25	*	25	*	*
10:00	*	*	*	13	*	13	*	*
11:00	*	*	*	5	*	5	*	*
Total	0	0	0	380	443		0	0
Percentage	0.0%	0.0%	0.0%	46.2%	53.8%		0.0%	0.0%
AM Peak Vol.	-	-	-	-	11:00 67	-	-	-
PM Peak Vol.	-	-	-	16:00 87	14:00 70	-	-	-
Total		0	0					