

APPENDIX E
Traffic Assessment

To: Matt Capuzzi, PE & Amabelle Paquia, PE – Kimley Horn Associates

From: Sohrab Rashid, TE

Date: ~~June 17, 2015~~ May 5, 2016

Subject: North Park/Mid City – Robinson Avenue Bikeway Transportation Assessment

The Robinson Avenue Bikeway (proposed project) is located in the North Park community of the City of San Diego primarily within the Robinson Avenue right-of-way (ROW) from just east of Park Boulevard to Alabama Street. The project site is surrounded on all sides by an existing mix of single and multi-family residential and commercial land uses typical of the area.

Robinson Avenue is not a connected roadway between Florida Street and Alabama Street as shown in **Figure 1** below. From Florida Street, Robinson Avenue extends approximately 170 feet east before ending at a traffic guardrail and the entrances to an alley that travels to the north and a private driveway that extends east. From Alabama Street, Robinson Avenue extends approximately 120 feet west before ending at the entrance of a private parking lot for the surrounding residential land uses.

The proposed project includes several roadway improvements between Park Avenue and Alabama Street, including an elevated shared-use path (bikeway path), buffered bike lanes, bicycle sharrows, ~~a mini-roundabout~~, a neighborhood traffic circle, crosswalk striping, and stop-control improvements at the Robinson Avenue/Alabama Street intersection.



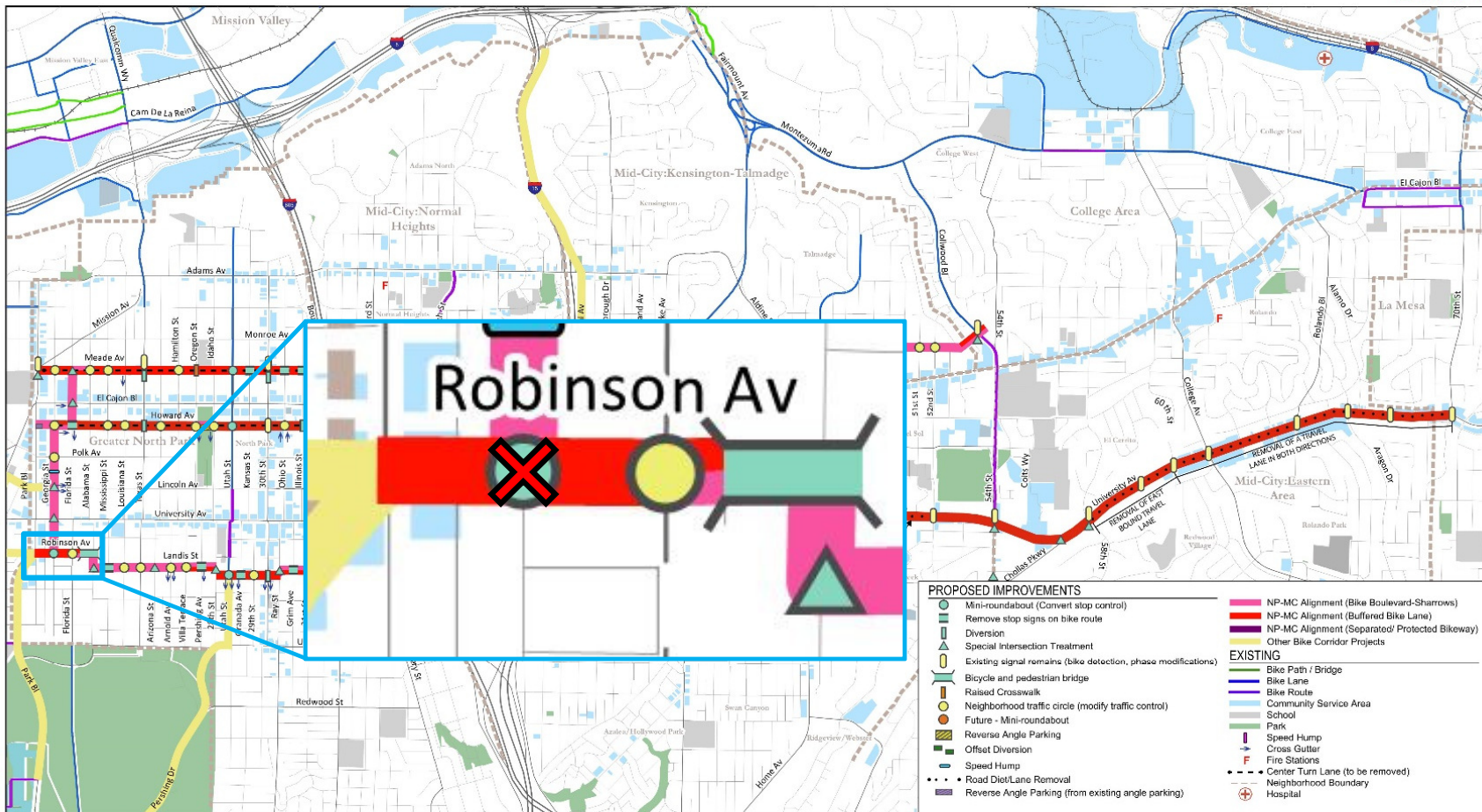
Figure 1 Project Study Area

Project Description

Improvements along the corridor are illustrated in **Figure 2** and include:

- Bikeway path
- Buffered bike lanes along Robinson Avenue from Park Avenue to Florida Street
- Bicycle sharrows along Robinson Avenue (eastbound only) from Florida Street to the bicycle/pedestrian path
- Class II bicycle lanes along Robinson Avenue (westbound only) from Florida Street to the bicycle/pedestrian path
- Two-way protected bicycle lanes on Robinson Avenue on the east side of the bikeway path
- ~~Mini-roundabout at the Robinson Avenue / Georgia Street Intersection~~
- Neighborhood traffic circle at the Robinson Avenue / Florida intersection
- Stop-control improvements at the Robinson Avenue/Alabama Street intersection
- Continental crosswalk striping at the Robinson Avenue / Georgia Street Intersection

At present the traffic speed along Robinson Avenue west of the Florida Street exceeds the posted speed limit by 3 mph. The proposed improvements focus on reducing the 85th percentile speed through the integration of narrower travel lanes and a traffic circle. ~~and a mini-roundabout.~~ By altering the cross-section of the road and integrating these horizontal deflections, it is anticipated the travel speed along the road would be reduced. The proposed improvements and their potential effect on mobility for various travel modes are discussed in detail below.



North Park - Mid-City Regional Bike Corridor Project
Proposed Improvements (May 5, 2015)



Figure 2 Recommended Improvements on Robinson Avenue from Park Boulevard to Alabama Street

Buffered Bike Lanes

Buffered bike lanes are proposed on Robinson Avenue from Park Boulevard to Florida Street in both the east and westbound directions. The existing curb-to-curb width along this section is 52 feet. Buffered bicycle lanes include a three foot striped buffer adjacent to a six foot bicycle lane that will provide space between the cars on Robinson Avenue and the bicycles in the bicycle lane. The buffer will require that the existing lanes along Robinson Avenue be restriped from two 19-foot travel lanes with two seven foot parallel parking lanes to two 10 foot travel lanes, with six foot bicycle lanes and a three foot buffer, on each side, and two seven foot parallel parking lanes. **Figure 3** illustrates a typical cross-section of Robinson Avenue from just east of Park Boulevard to Florida Street.

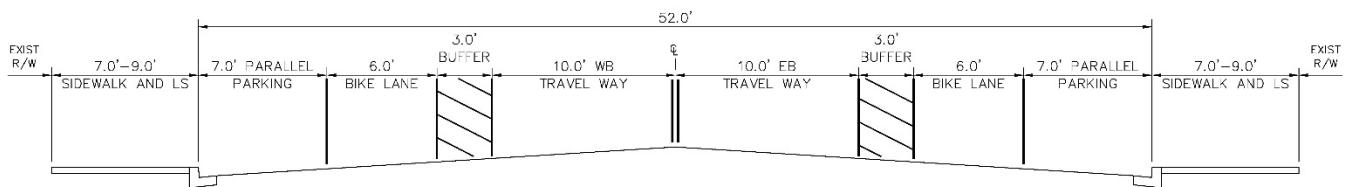


Figure 3: Robinson Avenue Cross-Section (Georgia Street to Florida Street (Class II))

City of San Diego speed survey data from 2010 along Robinson Avenue showed the 85th percentile speed along Robinson Avenue to be 33 mph, whereas the posted speed is 30 mph. The narrower lanes that result from the installation of buffered bicycle lanes will help reduce the travel speed along Robinson Avenue, without reducing the lane capacity.

Average daily traffic (ADT) data for 2010 from the City of San Diego showed that Robinson Avenue carries 4,160 vehicles per day from Park Avenue to Florida Street. Both the speed and volume data are included in the Appendix to this report.

Buffered bike lanes clearly define a space for bicycles that is separated from travel lanes with the three foot striped buffer. The buffer provides separation from the faster moving autos and provides clear space for ~~bicyclists~~ people riding bikes to avoid obstructions within and adjacent to the bicycle lane (such as drivers in parked vehicles opening their door into the bicycle lane). The buffered bicycle lanes proposed for Robinson Avenue from just east of Park Boulevard to Florida Street will not change the available auto capacity. Therefore, the buffered bicycle lanes will not result in a change in auto-oriented operating conditions along Robinson Avenue from Park Boulevard to Florida Street.

Two Way Protected Bicycle Lanes

On the east side of the bikeway path to Alabama Street, two-way protected bicycle lanes will be provided that will remove existing parking along Robinson Avenue on the north side of the street. Access to single family homes fronting Robinson Avenue east of the path will be maintained. The protected bicycle lanes will be separated from the automobiles by a narrow raised median and will provide benefits similar to buffered bike lanes explained above.

Sharrows

The proposed project improvements include the use of bicycle sharrows along Robinson Avenue eastbound from Florida Street to the bicycle/pedestrian path, as well as through proposed neighborhood traffic circles. Sharrows are pavement markings that indicate to people riding bikes and motorists that bicycles and autos should share the lane. Sharrows will have no effect on roadway classification or capacity and will have no negative impacts on the auto-oriented operating conditions along the corridor.

Crosswalk Striping

Along the Robinson Bikeway, three intersections are proposed to have continental crosswalk striping installed: Robinson Avenue / Georgia Street (all four legs), Robinson Avenue / Florida Street (north and south legs), and Robinson Avenue / Alabama Street (west leg only). Crosswalk striping provides a delineated path for people walking across an intersection and indicates to drivers the presence of people walking across the street. The installation of crosswalk striping has no operational impact to the intersection and is a safety enhancement.

Mini-Roundabout at the Robinson Avenue / Georgia Street Intersection

~~A mini roundabout, illustrated in **Figure 4**, is a traffic control device that can be used in lieu of stop sign or signalized control. The center island in the mini-roundabout is fully mountable to allow trucks, buses and emergency response vehicles to navigate the roundabout. The curb extensions and splitter islands on each leg of the intersection are used to create deflection for vehicles entering the mini-roundabout, resulting in slower travel speeds and the circular pattern through the intersection. The splitter islands can be landscaped or concrete pending funding and long term maintenance agreements. When properly designed, installation of a mini-roundabout allows for the removal of stop signs on all approaches.~~

~~The intersection of Robinson Avenue / Georgia Street is currently all-way STOP-controlled, which means under all circumstances vehicles arriving at this intersection will incur some level of stop delay. The replacement of the STOP signs with yield signs and a mini-roundabout will reduce the number of stops and delay for travelers along the Robinson Avenue corridor without compromising the traffic control in the intersection. This will provide some benefit to vehicles~~

~~by substantially reducing the stop delay during the peak hours and eliminating stop delay for vehicles that arrive at this intersection in the off-peak when there are no other vehicles at the intersection. Based on this reduction in delay associated with mini-roundabouts, the conversion of the all-way STOP control intersection will have no negative impacts on the operating conditions or level of service at this intersection.~~



Figure 4: Mini roundabout at Robinson Avenue / Georgia Street

* Mini-Roundabout has been removed from the project. The existing four-way stop controls will be maintained and continental crosswalks will be provided at all four legs of the intersection.

~~Pedestrians also benefit from this improvement because curb extensions will be constructed on each corner of the intersection to narrow the auto entry lane and deflect traffic entering the roundabout, as illustrated in **Figure 5**. As a result, pedestrian crossing distances and exposure to on-coming traffic will be reduced from 52 feet curb-to-curb to two 10 to 14 foot crossings. With the center splitter island, pedestrians will cross one direction of traffic at a time as the island serves as a refuge area should pedestrians need to wait for gaps to cross each direction of traffic. The crosswalks are also set back further from the intersection, requiring vehicles to yield to pedestrians in advance of the roundabout, making pedestrians more visible to the driver. The deflection in the roadway with the mini-roundabout will also moderate travel speeds on all approaches. Lower speeds and the design of merging traffic (instead of crossing vehicles) helps to reduce the severity accidents. While sideswipe collisions might become more frequent than under existing conditions, these are much less severe than head-on and "T-bone" collisions and enhance safety.~~

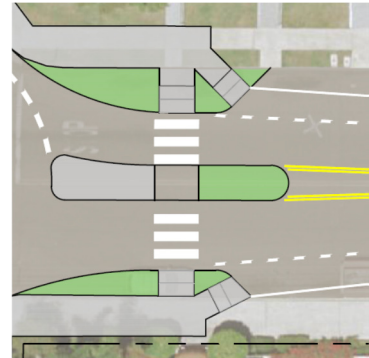


Figure 5: Crosswalk at Mini-Roundabout

Neighborhood Traffic Circle at the Robinson Avenue / Florida Street Intersection

The Robinson Avenue / Florida Street intersection is currently all-way STOP controlled. The placement of the traffic circle in the intersection would not change this condition. ~~Similar to the mini-roundabout, the~~ The presence of the center island in the intersection requires deflection of vehicles and results in reduced traffic speeds through the intersection. The ability to landscape the center median will improve the visual quality of the intersection and make the driver aware of the presence of the circle. As shown in **Figure 46**, the center island of a traffic circle is raised and often landscaped or adorned with public art. The splitter islands are striped.

~~Bicycles~~ People riding a bike will travel through the traffic circle with vehicle traffic, and sharrows will be provided ~~through~~ around the ~~circle~~ roundabout to: 1) guide people riding bikes to the center of the lane, and 2) to remind drivers of the presence of people riding bikes along the corridor. ~~Unlike the mini-roundabout, the~~ traffic circle is not a traffic control device ~~but~~ it is a traffic calming measure used to help manage speed and volume along a corridor. All existing STOP signs remain in place and the intersection continues to operate under its existing condition. In addition to providing reduced speeds, the traffic circle also provides for improved safety as they have been proven to reduce "T-bone" and head-on collisions in intersections.

Since the STOP signs will remain in place and the capacity of the intersection will remain unchanged, the installation of a neighborhood traffic circle at this intersection will have no impact on the auto-oriented operating conditions or level of service (LOS).

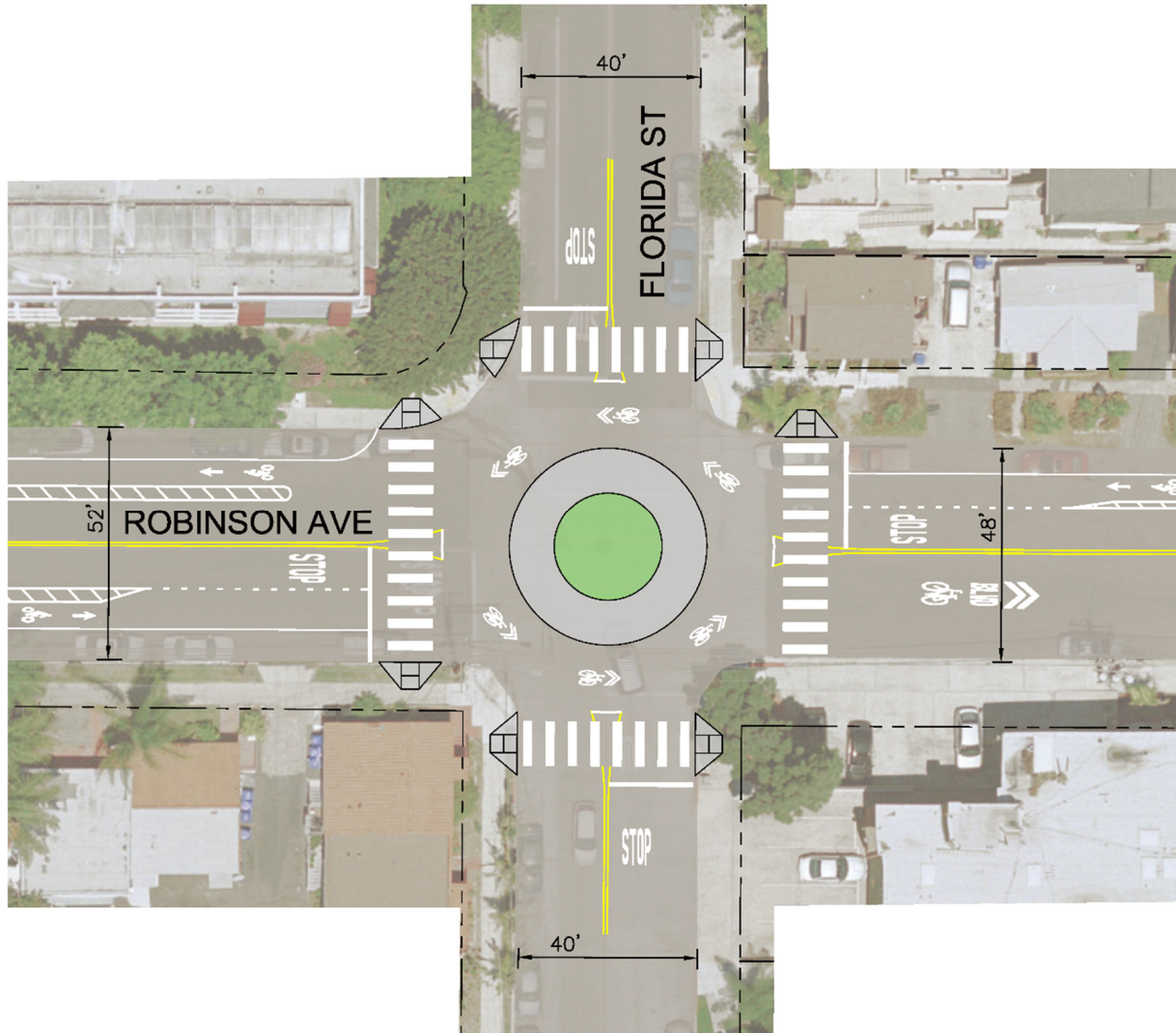


Figure 46: Neighborhood Traffic Circle at Robinson Avenue / Florida Street

Stop-Control Improvements at the Robinson Avenue/Alabama Street Intersection

The intersection of Robinson Avenue / Alabama Street is currently STOP controlled on the side street (Robinson Avenue), and Alabama Street is currently uncontrolled. The project will install STOP signs on Alabama Street on both the northbound and southbound approach. Adding the STOP control is intended to improve bicycle safety and will slow traffic through this intersection. The presence of a STOP sign will improve visibility of the intersection, which is currently constrained due to parked vehicles along both Robinson Avenue and Alabama Street. The presence of the STOP sign will also require all vehicles to stop at the intersection, improving access for ~~pedestrians~~ people walking and ~~bicycles~~ people riding bikes entering/exiting the planned cycle track. The bikeway project will extend down Alabama Street to Landis Street, which makes this intersection a key connection for the overall Robinson Avenue-Landis Street bicycle corridor project.

The installation of STOP signs on Alabama Street will result in an increase in delay for vehicles traveling both northbound and southbound on Alabama Street. The existing daily traffic volume along Alabama Street is approximately 1,000 vehicles per day, based on traffic volumes collected in March 2015, with approximately 75 a.m. peak hour and 170 p.m. peak hour trips split between the northbound and southbound direction through the intersection. The a.m. and p.m. peak hours are the highest one-hour volume totals in the morning (7 a.m. to 9 a.m.) and evening (4 p.m. to 6 p.m.) weekday commute periods.

Based on the p.m. peak hour demand, the intersection is forecast to operate with an average of less than 10 seconds per vehicle of delay on the stop-controlled in the p.m. peak with the improvement. This is equivalent to ~~Level of Service (LOS)~~ A, where intersection operations are rated from LOS A (best) through F (worst), and the City's minimum desired operating goal is LOS D. Since the p.m. peak has higher traffic volumes than the a.m. peak, additional analysis was not conducted for the a.m. peak period. Based on the information available for this intersection, the STOP signs proposed for this intersection will not result in deficient (LOS E or F) operating conditions along Alabama Street. The LOS calculation worksheet is included in the Appendix to this report.

Access to Neighboring Properties

As stated previously, on either end of the bikeway path, there are residential units that take access from Robinson Avenue. From Florida Street, Robinson Avenue extends approximately 170 feet east before ending at a traffic guardrail and the entrances to an alley that travels to the north and a private driveway that extends east (see **Figure 57**). At the end of the street is a driveway that leads down to a multifamily residential complex. Access to this area and the multifamily development will not be modified with the construction of the bikeway path. Therefore, no access issues are anticipated on this side of Robinson Avenue.



Figure 57: Residential Driveway on Robinson Avenue East of Florida Street

On the east side of the bikeway path, single family homes front the north side of Robinson Avenue. Currently, vehicles park within the Robinson Avenue right-of-way along the north side of the street adjacent to these homes, as shown in **Figure 68**. This parking will be removed and replaced by two-way protected bicycle lanes. One residential driveway intersects at 90 degrees with Robinson Avenue on the



Figure 68: Parking along Robinson Avenue West of Alabama Street

north side of the street. A gap in the protected bicycle lane raised median will be provided to allow access to and from that driveway. Robinson Avenue also serves as a driveway to a multifamily building west of Alabama Street. This driveway, located south of the proposed bikeway path, adjacent to the protected bicycle lane, will not be affected by the proposed improvements. The All-Way STOP control at Robinson Avenue/Alabama Street and removal of parking along Robinson Avenue east of the bikeway path and will improve line of sight and access for people ~~who walk~~walking, riding a bike, or driving through this intersection.

Conclusion

The improvements along Robinson Avenue would not greatly alter traffic patterns within the study area. The bikeway path located at Robinson Avenue/Alabama Street is not intended for auto use and would be restricted to ~~pedestrians~~people walking, ~~bicycles~~people riding bikes, and emergency vehicles only. Therefore, the proposed improvements would not substantially affect

auto circulation patterns, but would provide several benefits to ~~pedestrians~~ people walking and ~~bicyclists~~ people riding bikes, including reduced speeds, shorter crossing distances, and enhanced safety.

APPENDIX

CITY OF SAN DIEGO - TRAFFIC ENGINEERING

Machine Count Traffic Volumes - City Street

All From Dates 1/1/2002 to 1/2/2013

1/2/2013

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STREET NAME	LIMITS	BLOCK NOS.	STATION NUMBER	DIRECTION	WK-DAY VOLUME	STARTING DATE	FILE NUMBER
ROBINSON AV	[PARK BL - GEORGIA ST]	01800 - 01900	2415	EAST	: 2050	7/8/2010	MC0661-1
				WEST	: 2110	7/8/2010	MC0661-1
				*TOTAL	: 4160		
ROCKWOOD RD	[CLOVERDALE (FG) RD - OLD RH (FG) RD]	03000 - 03040	1119	BOTH	: 3210	11/14/2002	1190-02
				EAST	: 1650	3/15/2005	0069-05
				WEST	: 1570	3/15/2005	0069-05
				*TOTAL	: 3220		
				EAST	: 1440	3/4/2008	0095-08
				WEST	: 1420	3/4/2008	0095-08
				*TOTAL	: 2860		
				EAST	: 1850	5/24/2011	MC0291-1
WEST	: 1760	5/24/2011	MC0291-1				
*TOTAL	: 3610						
ROLANDO BL	[CELIA VIS DR - UNIVERSITY AV]	-	3265	NORTH	: 555	11/16/2010	MC1028-1
				SOUTH	: 645	11/16/2010	MC1028-1
				*TOTAL	: 1200		
ROLANDO BL	[MATARO DR - ALAMO DR]	04600 - 04620	3350	NORTH	: 1990	5/25/2005	0320-05
				SOUTH	: 2170	5/25/2005	0320-05
				*TOTAL	: 4160		
				NORTH	: 1015	7/8/2010	MC0662-1
				SOUTH	: 1065	7/8/2010	MC0662-1
				*TOTAL	: 2080		
ROLFE RD	[WILLAMETTE AV - CLAIREMONT MS BL]	04600 - 04639	6402	BOTH	: 2920	11/4/2003	0729-03
				NORTH	: 1590	11/28/2006	0520-06
				SOUTH	: 1440	11/28/2006	0520-06
				*TOTAL	: 3030		
ROMERO DR	[BRODIAEA WY - ROMERO CT]	07250 - 07350	4642	BOTH	: 650	9/12/2006	0307-06

VOLUME

Alabama St Bet. Robinson Ave & Landis St

Day: Tuesday
Date: 3/24/2015City: San Diego
Project #: CA15_4098_002

DAILY TOTALS					NB	SB	EB	WB	Total		
					474	496	0	0	970		
AM Period	NB	SB	EB	WB	TOTAL	PM Period	NB	SB	EB	WB	TOTAL
00:00	2	2			4	12:00	9	9			18
00:15	2	2			4	12:15	5	9			14
00:30	0	0			0	12:30	3	10			13
00:45	0	4	0	4	0	12:45	15	32	10	38	25
01:00	0	1			1	13:00	5	5			10
01:15	0	0			0	13:15	10	5			15
01:30	1	0			1	13:30	9	6			15
01:45	0	1	0	1	0	13:45	9	33	8	24	17
02:00	1	0			1	14:00	7	7			14
02:15	0	1			1	14:15	8	9			17
02:30	0	2			2	14:30	9	6			15
02:45	1	2	0	3	1	14:45	11	35	7	29	18
03:00	0	0			0	15:00	9	9			18
03:15	1	0			1	15:15	9	11			20
03:30	0	0			0	15:30	9	9			18
03:45	0	1	0		0	15:45	6	33	13	42	19
04:00	0	1			1	16:00	11	8			19
04:15	1	0			1	16:15	10	13			23
04:30	0	1			1	16:30	8	13			21
04:45	1	2	1	3	2	16:45	7	36	3	37	10
05:00	1	0			1	17:00	7	12			19
05:15	0	0			0	17:15	14	12			26
05:30	0	1			1	17:30	8	14			22
05:45	5	6	1	2	6	17:45	7	36	16	54	23
06:00	1	0			1	18:00	11	7			18
06:15	1	2			3	18:15	12	11			23
06:30	4	2			6	18:30	14	10			24
06:45	6	12	1	5	7	18:45	10	47	9	37	19
07:00	3	4			7	19:00	7	10			17
07:15	6	4			10	19:15	8	7			15
07:30	8	1			9	19:30	4	6			10
07:45	1	18	4	13	5	19:45	5	24	8	31	13
08:00	5	7			12	20:00	6	9			15
08:15	4	5			9	20:15	3	5			8
08:30	7	7			14	20:30	6	6			12
08:45	3	19	4	23	7	20:45	3	18	7	27	10
09:00	7	7			14	21:00	4	5			9
09:15	7	12			19	21:15	2	5			7
09:30	5	8			13	21:30	1	1			2
09:45	5	24	4	31	9	21:45	7	14	5	16	12
10:00	7	12			19	22:00	1	3			4
10:15	11	6			17	22:15	1	4			5
10:30	7	10			17	22:30	5	2			7
10:45	1	26	2	30	3	22:45	2	9	4	13	6
11:00	10	5			15	23:00	2	2			4
11:15	12	11			23	23:15	1	2			3
11:30	9	5			14	23:30	0	2			2
11:45	7	38	6	27	13	23:45	1	4	0	6	1
TOTALS	153	142			295	TOTALS	321	354			675
SPLIT %	51.9%	48.1%			30.4%	SPLIT %	47.6%	52.4%			69.6%

DAILY TOTALS					NB	SB	EB	WB	Total
					474	496	0	0	970

AM Peak Hour	11:00	09:15			11:15	PM Peak Hour	18:00	17:00			17:00
AM Pk Volume	38	36			68	PM Pk Volume	47	54			90
Pk Hr Factor	0.792	0.750			0.739	Pk Hr Factor	0.839	0.844			0.865
7 - 9 Volume	37	36	0	0	73	4 - 6 Volume	72	91	0	0	163
7 - 9 Peak Hour	07:15	07:45			08:00	4 - 6 Peak Hour	16:00	17:00			17:00
7 - 9 Pk Volume	20	23	0	0	42	4 - 6 Pk Volume	36	54	0	0	90
Pk Hr Factor	0.625	0.821	0.000	0.000	0.750	Pk Hr Factor	0.818	0.844	0.000	0.000	0.865

HCM Unsignalized Intersection Capacity Analysis

3: Alabama St & Robinson Ave

1/30/2015



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (vph)	50	50	0	200	300	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	54	54	0	217	326	0
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total (vph)	109	217	326			
Volume Left (vph)	54	0	0			
Volume Right (vph)	54	0	0			
Hadj (s)	-0.17	0.03	0.03			
Departure Headway (s)	5.0	4.6	4.5			
Degree Utilization, x	0.15	0.28	0.40			
Capacity (veh/h)	657	755	778			
Control Delay (s)	8.8	9.3	10.5			
Approach Delay (s)	8.8	9.3	10.5			
Approach LOS	A	A	B			
Intersection Summary						
Delay			9.8			
Level of Service			A			
Intersection Capacity Utilization			28.3%	ICU Level of Service		A
Analysis Period (min)			15			