

ORANGE COUNTY PUBLIC WORKS TRAFFIC INVESTIGATIONS

STAFF REPORT OF: January 6, 2019

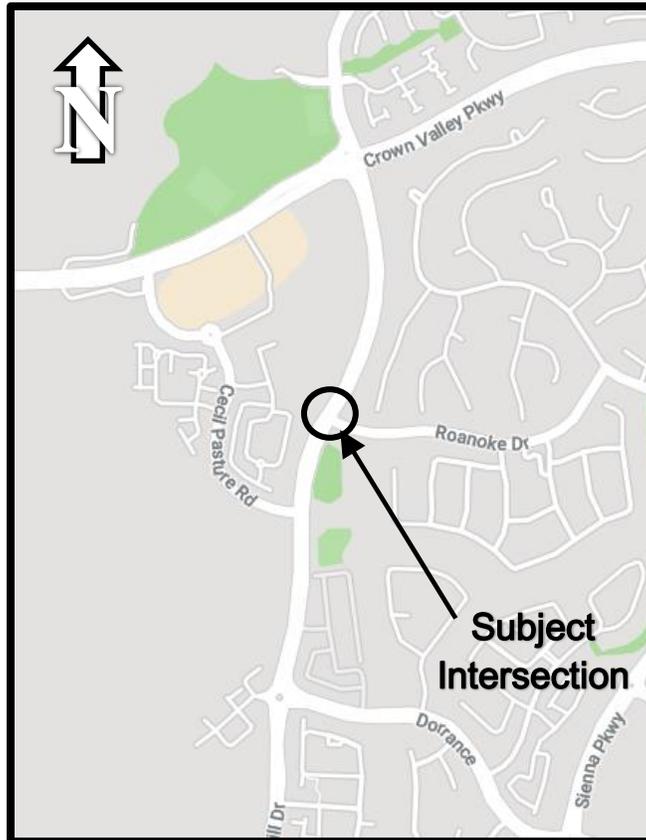
SUPERVISORIAL DISTRICT: 5

SUBJECT: Intersection Control Evaluation

LOCATION: O'Neill Drive at Roanoke Drive;
Ladera Ranch; TB 922-E6

INVESTIGATOR: Clever Tan

LOCATION MAP



EXISTING CONDITIONS

O’Neill Drive is a north-south 78-foot wide Secondary Arterial Highway with two travel lanes and a bike lane in each direction separated by a 14-foot raised median. O’Neill Drive is fully improved with curb, gutter and sidewalk. Parking is prohibited on both sides of O’Neill Drive. The posted speed limit on O’Neill Drive is 45 miles per hour (MPH).

Roanoke Drive is an east-west 40-foot wide residential collector street with one travel lane in each direction. Roanoke Drive is fully improved with curb, gutter and sidewalk. Parking is allowed on both sides of Roanoke Drive except during street sweeping times. The posted speed limit on Roanoke Drive is 35 MPH.

The intersection of O’Neill Drive at Roanoke Drive (Intersection) is currently a one-way stop-controlled T-intersection. Vehicles on Roanoke Drive are required to stop before entering O’Neill Drive.

TRAFFIC VOLUMES

• **TABLE 1 - 24 HOUR VOLUMES: ENTERING INTERSECTION**

Location	Date	Direction	Volume	Peak Hour Volume	
				AM	PM
O’Neill Dr.	9/13/17	SB	9,371	532	1,112
O’Neill Dr.	9/13/17	NB	9,732	1,304	646
Roanoke Dr.	9/13/17	WB	2,157	246	157

• **TABLE 2 - HIGHEST 8 HOUR VOLUMES: ENTERING INTERSECTION (COLLECTED ON 9/13/17)**

Approach Lanes	7 am	8 am	12pm	3 pm	4 pm	5 pm	6 pm	7 pm
Total of Both Approaches Major St. (O’Neill Dr.) Volume	1,572	1,522	1,002	1,293	1,487	1,708	1,540	1,240
Highest Approach Minor St. (Roanoke Dr.) Volume	231	238	113	157	132	130	138	92

• **TABLE 3 - SPEED ZONE FIELD DATA**

Location:	Date	85 th Percentile (MPH)	50 th Percentile (MPH)	Pace Speed (MPH)	Pace (%)	Posted Speed Limit (MPH)
		NB/SB	NB/SB	NB/SB	NB/SB	
O’Neill Dr. n/o Roanoke Dr.	4/16/13	47	43	39-48	75	45
Roanoke Dr. e/o O’Neill Dr.	1/11/13	41	37	31-40	79	35

ACCIDENT DATA

Traffic Engineering's collision record reveals 7 reported accidents at this intersection within the past five years, of which 4 are broadside collisions associated with vehicles making left-turns, 2 are pedestrian-vehicle collisions and 1 is a rear-end collision.

ANALYSIS OF ALTERNATIVE INTERSECTIONS

OC Public Works (OCPW) Traffic Engineering initiated this investigation in response to a request from a Ladera Ranch resident. The resident stated it is difficult to turn left from either O'Neill Drive or Roanoke Drive due to heavy traffic volumes on O'Neill Drive and claimed there is a high frequency of collisions at this intersection. As part of the investigation, OCPW Traffic Engineering collected traffic data for the intersection and evaluated multiple alternatives including those presented to Ladera Ranch Civic Council (LRCC) by a resident in July 2018.

A. Do Nothing

Doing nothing will not improve traffic safety for vehicles making left-turn movements at the Intersection.

B. All-way Stop

The Intersection is a T-intersection and has one-way stop control at Roanoke Drive, which is typical for a collector street intersecting an arterial highway. Based on the Orange County Traffic Manual, an all-way stop control may be warranted if the traffic data satisfies either the volume or the accident criteria, which this Intersection does not. An all-way stop control can also be warranted if there is an urgent need for an interim measure before installing a traffic signal, which does not apply to this case either. Therefore, we do not recommend an all-way stop control for the Intersection.

C. Traffic Signal

Engineering criteria considered for the installation of a traffic signal shall be based on traffic conditions, pedestrian characteristics, and physical characteristics of the location. The parameters established by the California Manual on Uniform Traffic Control Devices (CA MUTCD) as well as Orange County Traffic Manual include but are not limited to vehicle volumes, pedestrian volumes and crash experience.

While the crash experience does not justify the installation of a traffic control signal and no pedestrian volumes were collected due to the absence of a marked crosswalk at this location, the vehicle volume criteria were met for two major parameters: the eight-hour vehicle

volume and the four-hour vehicle volume.

The Eight-Hour Vehicular Volume warrant is met because the traffic volume on the major street is so heavy that traffic on the minor intersecting street suffers excessive delay or conflict in entering or crossing the major street.

The Four-Hour Vehicular Volume warrant is met because the volume of intersecting traffic is the principal reason to consider installing a traffic control signal.

The installation of a traffic signal may reduce or even eliminate the broadside collisions and vehicle-pedestrian collisions, which constitutes over 85% of the accidents that have occurred at this location based on the 5-year collision history. A traffic signal offers the maximum degree of control at an intersection by assigning right of way to conflicting movements. This leads to increased safety for vehicles, bicyclists, and pedestrians.

However, studies have shown that the installation of a signal can lead to an increase in rear-end collisions, for which the consequences are typically less severe than broadside collisions. Adding a signal at this Intersection may also cause additional delay to the traffic flow on O'Neill Drive. However, the potential delay can be minimized using signal coordination with the two adjacent intersections at Crown Valley Parkway and Cecil Pasture.

D. Roundabout

Per the CA MUTCD, engineering studies shall include consideration of a yield-controlled roundabout in lieu of evaluation signal installation as it is a viable and practical solution.

Roundabouts may improve traffic flow as cars do not have to wait for a green light, therefore promoting continuous traffic flow. This is especially true in low flow or uncongested traffic routes. In some instances such as on busy main roads, cars entering from the minor road would have to wait much longer for an acceptable gap to enter the roundabout than they would have to wait for a green light at a traffic signal, making the signal a better option. The traffic signal is also a better option when the intersection has highly variable flow, such as this location, where the volume on Roanoke is less than 20% of the volume on O'Neill Drive. It is also not a good practice to design a roundabout between two signalized intersections less than half a mile apart.

A roundabout typically requires more right of way than a signalized intersection. To maintain the capacity on O'Neill Drive, a multilane roundabout may be required in order to maintain basic lane continuity. Per California Highway Design Manual (CA HDM), a multilane roundabout (2-lane) generally has an inscribed circle diameter of 150 to 220 feet to accommodate the California Legal design vehicle for a non-STAA (Surface Transportation

Assistance Act) route such as O’Neill Drive. The existing right-of-way width on O’Neill Drive is 94 feet.

E. Median U-Turn Intersection

Median U-Turn (MUT) is another alternative design, which can achieve safer and more efficient intersection performance by eliminating left turns at intersections and move them to median crossovers beyond the intersection. MUT can be implemented fully for all approaches or partially on only selected approaches.

Currently the left-turn vehicles from Roanoke Drive are challenged by the conflict with the heavy through traffic on O’Neill Drive during peak hours and the limited intersection sight distance. With the proposed MUT design, left-turn movements from Roanoke Drive will be restricted and force drivers to make U-turns at a crossover few hundred feet north of the intersection on O’Neill Drive. Large vehicles other than passenger vehicles are exempt as they will not be able to complete the U-turn at the MUT due to the tight turning radius.

The MUT will be placed at a location with sufficient sight distances for both the southbound drivers and the ones making U-turns. A storage length of 150 feet is recommended for this MUT, which is the same as other left-turn pockets for a street like O’Neill Drive to accommodate six vehicles in queue. The capacity is greater than the expected demand based on existing volumes.

The MUT will not restrict the left-turns from O’Neill Drive at the intersection and in fact will improve the safety for these drivers as it eliminates the conflict between the two left-turn movements. The MUT, however, may introduce potential weaving conflicts on northbound O’Neill Drive. The vehicles from Roanoke Drive that need to make the U-turn will have to switch across the No. 1 lane before moving into the U-turn lane, hence the conflict with the though traffic.

- **Exhibit 1 - Median U-Turn Concept**



F. Other Alternatives

Other alternatives that were preliminarily evaluated include a new left-turn entry lane on O’Neill, a new right-turn entry lane on O’Neill, a combination of both a left-turn and a right-turn entry lane(s) on O’Neill, and a combination of a roundabout with a right-turn entry lane on O’Neill. These alternatives would require the reconstruction of either the raised median, the sidewalk or both, and all of them would introduce additional conflict with the existing bike lane users; therefore, none of them will be further evaluated or recommended.

CONCLUSION

Table 4 below lists the top three alternatives based on our evaluation.

• **Table 4 – Alternative Comparison Matrix**

Alternative	Pros	Cons
C. Traffic Signal	<ul style="list-style-type: none"> • improves safety for all roadway users • improves efficiency by signal timing coordination with the two adjacent intersections 	<ul style="list-style-type: none"> • highest cost
E. Median U-Turn	<ul style="list-style-type: none"> • improves safety for left-turn drivers • improves efficiency • lower cost 	<ul style="list-style-type: none"> • may require additional maintenance to ensure adequate sight distance • may introduce weaving conflicts • requires tree removal and reconstruction of median
A. Do Nothing	<ul style="list-style-type: none"> • no cost • no aesthetic impact 	<ul style="list-style-type: none"> • no improvement on traffic safety • no improvement on efficiency

RECOMMENDATION

Install a traffic signal at the intersection of O’Neill Drive at Roanoke Drive. Approval by the Orange County Board of Supervisors is necessary to establish this recommendation.