



City of Arts & Innovation

Transportation Committee

TO: TRANSPORTATION COMMITTEE MEMBERS DATE: NOVEMBER 8, 2018

FROM: PUBLIC WORKS DEPARTMENT WARDS: 3, 4, AND 5

SUBJECT: DISCUSSION OF ROUNDABOUTS ALONG VICTORIA AVENUE

ISSUE:

Discuss the potential to construct roundabouts along Victoria Avenue, with primary attention given to the intersection of Victoria Avenue and Washington Street.

RECOMMENDATIONS:

That the Transportation Committee:

1. Receive and file a report on traffic control alternatives at the intersection of Victoria Avenue and Washington Street; and
2. Discuss whether staff should pursue funding for an alternative study, design, and implementation of alternative traffic control at Victoria Avenue & Washington Street.

BACKGROUND:

On February 8, 2018, the Transportation Committee received a resident request during oral communications from the audience to consider construction of a roundabout at the intersection of Victoria Avenue and Washington Street. On May 10, 2018, the Transportation Committee requested that Staff provide general information regarding roundabouts, and review the potential to construct a roundabout at this intersection, and at neighboring locations along Victoria Avenue.

DISCUSSION:

Victoria Avenue

Victoria Avenue, a tree-lined roadway between La Sierra Avenue and Ivy Street within the City of Riverside, is a City Landmark listed on the National Register of Historic Places. Its traveled lanes are flanked by Mexican Fan Palms, and thousands of 'Ragged Robin' roses. Victoria Avenue was commissioned by Matthew Gage in 1892 to serve as a centerpiece of Riverside's Citrus Belt. The current landscape owes much to the master planning efforts of Riverside landscape Designer Franz Hosp, who oversaw the initial planting and design of Victoria Avenue in the late 1800s. Victoria Avenue is used to this day as a major roadway, with additional amenities for biking and

walking, and functions as a linear arboretum – a roadway where residents and visitors alike come to enjoy the colored foliage and flowering of over 20 varieties of median trees. Victoria Avenue benefits from the preservation and beautification efforts of Victoria Avenue Forever (VAF), a nonprofit organization whose members contribute time and financial support to ensure the ongoing well-being of Victoria Avenue in partnership with the City of Riverside. VAF has established an endowment fund as part of their preservation efforts, dedicated the Rosanna Scott Memorial Bike Trail, and has planted over 1400 trees and thousands of roses.



Ragged Robin Rose, Image Courtesy of VAF

Roundabouts, General Information

Roundabouts are circular intersections, characterized by a raised central island and additional raised medians to guide motorists through the intersection in a counter-clockwise motion. Roundabouts are designed to maintain an even vehicle speed throughout the intersection, allow for 'yield' operations as motorists enter the circle, and minimize vehicular conflict. Roundabouts differ from traffic circles (smaller circles that do not require the overall intersection footprint or design to change) and rotaries (large circles that are closer to a one-way road system, often with over four entry/exit legs). An image of a modern, single-lane roundabout is shown below:



Example of a single-lane roundabout.

Source: FHWA

Operational Analysis

The level of service at an intersection is a letter grade ranging from A through F to represent the delays experienced by motorists. Software is used to input the number of lanes, vehicles, traffic signal timing, and other pertinent details of an intersection, and the average delay in seconds is calculated.

Below is a table depicting the calculated delay using traffic volumes measured in the field for the intersection of Victoria Avenue at Washington Street. The PM Peak Hour, which begins at 4:45 PM, was calculated as the worst-case peak hour under existing conditions with a level of service of F. While the existing level of service during the AM Peak Hour were calculated at level of service C, the software does not adequately account for the close spacing of the two stop controlled intersections. Both the traffic signal and roundabout have the potential to improve existing condition levels of service to C. Both alternatives would eliminate the two stage stopping maneuver currently required to navigate the intersection.

At the request of residents, an alternative that retains the two-stage stop configuration but adds a lane to the eastbound (EB) direction of travel along Washington to match the current westbound (WB) configuration was assessed. Because of the increase in potential conflict points, delays were slightly worsened under this alternative configuration when compared to the existing scenario.

Level of Service Analysis: Victoria Ave + Washington St								
	No Build ¹		Added EB Lanes		Traffic Signal ²		Roundabout	
	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS
AM Peak	19.1 ¹	C	21.7	C	20.2	C	24.4 ³	C ³
PM Peak	62.8	F	63.7	F	25.9	C	33.9	D

1. Actual delays measured for critical lane movements in the field under current stop-sign conditions average to 4 minutes and 47 seconds (287 seconds) during the AM Peak Hour, and 2 minutes, 57 seconds during the PM Peak Hour (177 seconds). The images below depict queueing conditions at the subject intersection:



Images of the AM Peak Hour of Traffic



Images of the PM Peak Hour of Traffic

2. It should be noted that in the above table, an additional left turn lane was added for the northbound approach along Victoria Avenue to achieve acceptable levels of service for the signalized intersection configuration.
3. A secondary right hand turn lane in the westbound direction along Washington is likely required to achieve acceptable levels of service during the AM Peak Hour of Traffic as shown for the roundabout alternative, the design of a right turn bypass lane is discussed further in Section 4. An alternative to an additional right turn lane is to meter specific roundabout approaches. The roundabout was assumed to have a single circulating lane. A more detailed analysis using software more specifically suited for the assessment of roundabouts such as SIDRA, PTV Vissim, or Rodel is recommended.

Because motorists yield when entering a roundabout, a reduction in vehicular delay can also be expected at a roundabout operating at acceptable demand levels. A recent Caltrans Traffic Operations Policy Directive requires projects to evaluate the construction of roundabouts as an alternative to encourage the use of this traffic control method.

Design and Cost

Both the construction of a roundabout or signalized intersection would require modifications to the existing landscaped median along Victoria Avenue. The traffic signal would require the median to be pulled back to accommodate vehicle turning radii, and to allow for a dedicated left turn pocket to be installed for the eastbound approach. The cost of construction and pavement modifications for the traffic signal would reach approximately \$400,000. A conceptual plan of the traffic signal can be found in Attachment 1.

The cost to construct a roundabout at this location is approximately \$400,000 - \$450,000. The roundabout would require more extensive pavement and landscaping modifications at the outset, but long-term costs for operations and maintenance are significantly less expensive than that of a traffic signal, as no electronic or above ground structural elements are needed. Preliminary analysis of the roundabout's operations indicate that a right turn or right turn bypass lane may be needed for westbound Washington. The right hand turn lane can simply be an added lane at the intersection approach or a bypass lane, which is a separated lane for motorists completing a right turn that does not pass through the roundabout. A bypass lane helps lower volumes in the circulating roadway of the roundabout, and allows a heavy right turn movement to flow freely, but forces pedestrians to cross additional lanes of traffic and increases the overall footprint and cost of the intersection. Metering of critical approaches using a signal / pedestrian signal solely during peak hours of traffic can be an effective alternative to adding lanes at a roundabout. Roundabouts may also be constructed to allow for added lanes in the future, in case the additional capacity is

not needed at the outset. A conceptual rendering of the roundabout with and without a right turn bypass lane can be found in Attachment 2.

The edge of the roundabout's central island can be traversable by trucks and emergency services vehicles, and feature a raised artistic or barrier element at the center to discourage illegal turning movements. Landscaping removed by the construction of the roundabout can be relocated (to the greatest extent possible) or replaced within the newly created central island and curb extensions at the intersection.

Safety: Vehicles, Pedestrians and Bicycles

A 10 year collision summary report [Attachment 3] was compiled for the intersection of Victoria and Washington. Ten (10) collisions, five (5) of which have been recorded as injury collisions, are reported by the Riverside Police Department's Crossroads Collision database. No fatal collisions are reported in the 10 year accident history. Of these collisions, three were classified as broadsides, three as rear ends, one head-on, one sideswipe, and two were unstated. Three of the collisions involved pedestrians / bicyclists. As detailed in Attachment 4, many of these collision types may be addressed through construction of a roundabout, and to a lesser degree a traffic signal. For comparison, the adjacent intersection of Victoria at Madison St has only one reported collision since 2007 in the Crossroads Database.

Roundabouts have been identified by both the Federal Highway Administration and the State Department of Transportation (Caltrans) as a *proven safety countermeasure*, and have been measured to reduce severe collisions at traffic signals and stop signs by 72-82% when installed at an intersection [Attachment 4]. One key safety component at a roundabout is the reduction in conflict points, as motorists need only look to their left as they enter the circulating roadway. Pedestrians cross at a roundabout before the circulating roadway entry, so that motorists are only ever worried about a singular direction of conflict. Additionally, because the entryway of the roundabout is flared towards the right, and motorists travelling inside the circle are continually turning left, collisions at the entry point of a roundabout are often less-severe sideswipes as opposed to direct broadsides. When roundabouts are initially constructed, as with traffic signals, an initial increase in minor collisions can be expected. Speeds play a role in many collisions at intersections, and roundabouts are designed to restrict higher end vehicle speeds throughout the circulating roadway; motorists attempting to exceed the advisory speed will often have difficulty navigating the roundabout's turning radii.

The FHWA publication 'Roundabouts *with Pedestrians and Bicycles*, A Safe Choice for Everyone' highlights the benefits of roundabouts to vulnerable roadway users. Single lane roundabouts with raised 'splitter' islands are often more easily navigated by users at the crosswalk – especially the visually impaired, as a pedestrian must only cross a single lane of travel and is provided with a refuge area before encountering the next vehicle lane. The lower speed inside of the roundabout's circulating roadway reduces the severity of collisions involving pedestrians and bicyclists. Crosswalks are set back from the vehicular conflict points at the roundabout, allowing motorists to focus on pedestrians. Bicyclists traversing the roundabout have the option to intermingle with vehicular traffic, or to exit early and walk through the crosswalk. Experienced bicycle riders appreciate the yield control at entry, as there is no longer a need to bring the bicycle to a complete stop.

Historical & Environmental Review

Of concern along this landscaped portion of Victoria Avenue is the potential for new traffic control

at the intersection to alter existing landscaping and the center median. While this report focuses on traffic safety and operations, an initial review of the roundabout alternative reveals that 14 palms, twelve additional median trees, and a multitude of roses would be impacted by the construction of the roundabout. Of these plantings, the roses are most likely to survive relocation to the newly created landscaped areas at the roundabout approach and central island. Although the roundabout would change the roadway design and require removal of trees, the landscaping that is to be removed can be replaced in kind to respect the feel of this historic landscape.

Victoria Avenue is listed in the National Register and designated as a City Landmark, should any formal consideration of the substantial modification to the physical design of Victoria Avenue take place, a Certificate of Appropriateness would be required by the Cultural Heritage Board. The attached brochure [Attachment 5] provided by VAF illustrates Victoria Avenue's history. A Cultural Resources Report would be prepared for the project, and staff anticipates that an Environmental Impact Report (EIR) would likely be required to consider a roundabout along this section of Victoria Avenue as it will impact the character of the historic resource. A traffic signal may not require the same level of environmental review, but would be assessed as part of an EIR. An Environmental Impact Report that fully considers the potential impacts of new traffic control at this location is anticipated to cost approximately \$100,000.

Additional Locations

The Transportation Committee requested that the Public Works Department comment on the potential for multiple roundabouts along Victoria Avenue. Construction of roundabouts at neighboring locations along Victoria Avenue would garner similar benefits as at Washington Street, and are anticipated to operate at better levels of service at locations with reduced side street demand. Completion of a series of roundabouts would significantly enhance the utility of the corridor for motorists and bicyclists, create consistent speeds, lower delays at intersections, minimize the need for bicyclists to stop, and reduce emissions. Additional roundabouts would require expanded environmental review. With each roundabout, additional trees and plantings would be impacted by the reconfiguration of the intersection, and the historic character of the Avenue would be altered.

Conclusions

A roundabout at Victoria and Washington would provide safety and operational benefits for residents at this busy intersection. The design would change the current landscape and roadway configuration along Victoria Avenue – necessitating the removal of existing trees that are of import to the community and the historic character of the roadway, but would allow for continued / replaced landscaping and monument signage as the centerpiece of the intersection.

FISCAL IMPACT:

There is no fiscal impact associated with the receipt of this report.

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Availability of funds:	Edward Enriquez, Interim Chief Financial Officer/Treasurer
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Attachments:

1. Victoria & Washington Signalized Intersection Concept
2. Victoria & Washington Roundabout Concept
3. Victoria & Washington Collision Summary Report
4. FHWA Roundabout Safety Report
5. Victoria Avenue Forever Brochure
6. Presentation