



## Memorandum

**Date:** December 12, 2017  
**Project:** SRA119  
**To:** Mr. Bradley Djukich  
Empire USA  
**From:** Dalene J. Whitlock  
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**Subject:** Analysis of Freitas Parkway/US 101 North Ramps/Civic Center Drive

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As requested, W-Trans has prepared an evaluation of operation of the intersection of Manuel T. Freitas Parkway/US 101 North Ramps/Civic Center Drive-Redwood Highway. This location includes two intersections that are so closely-spaced that one cannot be evaluated without looking also at the other.

### Geometrics

The westerly part of the two-intersection study area is a tee-intersection where the northerly leg is Freitas Parkway, the southerly leg is the on- and off-ramps to and from US 101 North, and the eastern leg is the connector to Redwood Highway-Civic Center Drive. The length of this connector as measured from the easterly side of the northbound lane from US 101 to Freitas Parkway to the westerly side of the southbound lane between Redwood Highway and Civic Center Drive is about 100 feet. There are no controls at the westerly intersection and the only movement with any conflicting traffic is the left turn from Freitas Parkway to the connector. Traffic approaching from the east is channelized into a northbound lane on Freitas Parkway; left turns onto the on-ramp are prohibited as this access is available from Redwood Highway less than 500 feet north of the intersection.

The easterly intersection has the connector as the west leg and a one-way eastbound driveway leading to 4040 Civic Center Drive as the east leg. The north leg is Redwood Highway and the south leg is Civic Center Drive; both of these approaches are stop-controlled. There are separate turn lanes on both approaches to turn right or left toward Freitas Parkway.

### Methodology

The Synchro software application and *Highway Capacity Manual (HCM) 2010* methodology were used. The City supplied the Synchro base file that contained the volumes and basic parameters for the analysis. Using this data, a new Synchro file was prepared that contains only the study locations, but with the City's data and established parameters.

An attempt to obtain Level of Service results using standard Synchro output indicated that the stop-controlled volumes on Redwood Highway-Civic Center Drive exceed the maximum values that the methodology can evaluate. The service level for the intersection could therefore not be established through application of the normal procedures. This is likely the same finding reached by the City as they have indicated they could not evaluate the service level for this intersection. However, Synchro has an affiliated application that evaluates operation through simulation called SimTRAFFIC.

### Findings

The SimTRAFFIC application was run, and ten different simulation runs performed, then averaged. Based on this analysis of the two closely-spaced intersections it was determined that Civic Center Drive-Redwood Drive/Freitas Parkway is operating at LOS C or better overall. These results are indicated in Table 1 and copies of the output are attached.

**Table 1 – Operational Analysis Summary**

<b>Location</b> <i>Worst Case Movement</i>	<b>Existing Conditions</b>				<b>Existing plus Project</b>			
	<b>AM Peak</b>		<b>PM Peak</b>		<b>AM Peak</b>		<b>PM Peak</b>	
	<b>Delay</b>	<b>LOS</b>	<b>Delay</b>	<b>LOS</b>	<b>Delay</b>	<b>LOS</b>	<b>Delay</b>	<b>LOS</b>
Civic Center-Redwood/Freitas	12.6	B	24.3	C	13.4	B	23.4	C

Project-generated trips as provided to the City were added to the appropriate movements at the intersection, which resulted in five fewer trips from US 101 North through to Freitas Parkway during the a.m. peak hour and seven additional trips during the p.m. peak hour. The results of the ten simulation runs performed for each peak period indicate that the project would be expected to have a less-than significant impact, and in fact, results in slight reductions in the average delay during both peaks.

While this is counter-intuitive, this condition occurs when a project adds trips to movements that have delays that are below the intersection average, resulting in a lower overall average delay. The project adds traffic only to the through movement at the westerly “ramps” intersection. This movement has zero delay, resulting in a slight reduction in the overall average delay. Further, because the analysis was performed using a stochastic simulation model, trips are assigned in a random pattern that varies from one run to the next, so the average results also vary to reflect the assignment pattern specified for the ten runs included in any given analysis. Because of these variables, the average delay indicated should be considered as accurate within plus/minus one or two seconds.

## Conclusions

The analysis performed indicates that both intersections are currently operating at LOS C or better overall during both peak periods. If a variance of two seconds is included to reflect the stochastic nature of the simulation analysis, the results would still be either LOS C or perhaps just over the threshold to LOS D. The range of delay for LOS D is 25 to 35 seconds, so considering a two-second accuracy level, average delay at the intersection at Redwood Highway-Civic Center Drive could be about 26 seconds, which is within the range for LOS D. Since the City’s standard requires operation at mid-LOS D (30 seconds) or better, it is reasonable to conclude that both intersections are operating acceptably at mid-LOS D or better both individually and as a unit during both peak periods.

We hope this information is helpful to the City in reviewing your application. Please let us know if you have any questions.

DJW/djw/SRA119.M3

Attachments: Simulation Results

1: US 101 On-/Off-Ramps & Manuel T Freitas Pkwy Performance by movement

Movement	WBR	NBT	NBR	SBL	SBT	All
Denied Del/Veh (s)	0.0	1.5	1.5	0.5	0.4	1.0
Total Del/Veh (s)	7.0	2.8	4.1	91.1	1.1	14.8

2: Civic Center Dr/Redwood Hwy & Manuel T Freitas Pkwy /Private Driveway Performance by movement

Movement	EBL	EBT	EBR	NBL	NBT	NBR	SBL	SBT	SBR	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.2	0.4	0.1	3.5	3.7	1.9	1.2
Total Del/Veh (s)	1.5	1.1	1.6	10.1	11.5	4.5	33.8	32.6	12.9	12.6

Total Network Performance

Denied Del/Veh (s)	1.5
Total Del/Veh (s)	19.1

1: US 101 On-/Off-Ramps & Manuel T Freitas Pkwy Performance by movement

Movement	WBR	NBT	NBR	SBL	SBT	All
Denied Del/Veh (s)	0.0	0.5	0.4	0.4	0.4	0.4
Total Del/Veh (s)	10.8	1.0	1.5	11.1	1.4	3.6

2: Civic Center Dr/Redwood Hwy & Manuel T Freitas Pkwy /Private Driveway Performance by movement

Movement	EBL	EBT	EBR	NBL	NBT	NBR	SBL	SBT	SBR	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.3	0.3	0.4	1.8	2.8	0.8	0.6
Total Del/Veh (s)	1.5	0.7	1.1	8.2	11.7	6.7	43.5	38.3	70.2	24.3

Total Network Performance

Denied Del/Veh (s)	0.6
Total Del/Veh (s)	16.0

1: US 101 On-/Off-Ramps & Manuel T Freitas Pkwy Performance by movement

Movement	WBR	NBT	NBR	SBL	SBT	All
Denied Del/Veh (s)	0.0	1.4	1.4	0.5	0.4	0.9
Total Del/Veh (s)	7.1	2.7	3.9	85.5	0.8	14.0

2: Civic Center Dr/Redwood Hwy & Manuel T Freitas Pkwy /Private Driveway Performance by movement

Movement	EBL	EBT	EBR	NBL	NBT	NBR	SBL	SBT	SBR	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.2	0.4	0.1	3.4	3.7	1.9	1.2
Total Del/Veh (s)	1.5	1.2	1.6	9.8	11.8	4.9	36.0	34.6	14.4	13.4

Total Network Performance

Denied Del/Veh (s)	1.4
Total Del/Veh (s)	18.8

**1: US 101 On-/Off-Ramps & Manuel T Freitas Pkwy Performance by movement**

Movement	WBR	NBT	NBR	SBL	SBT	All
Denied Del/Veh (s)	0.0	0.5	0.4	0.4	0.5	0.4
Total Del/Veh (s)	10.7	1.0	1.6	11.5	1.4	3.6

**2: Civic Center Dr/Redwood Hwy & Manuel T Freitas Pkwy /Private Driveway Performance by movement**

Movement	EBL	EBT	EBR	NBL	NBT	NBR	SBL	SBT	SBR	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.3	0.3	0.4	1.8	2.9	0.8	0.6
Total Del/Veh (s)	1.5	0.9	1.1	8.4	10.9	6.1	35.8	36.1	67.8	23.4

**Total Network Performance**

Denied Del/Veh (s)	0.6
Total Del/Veh (s)	15.5