



## TECHNICAL MEMORANDUM

**TO:** Bart Stepp, PE

**FROM:** Anne Sylvester, PTE  
Scott Sawyer, PE

**DATE:** May 6, 2014

**PROJECT #:** 0729.01

**SUBJECT:** City Council Staff Report - Traffic Analysis of intersection Options for SR 503 at Scott Avenue

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### 1. INTRODUCTION

The purpose of this memorandum is to present a traffic analysis of improvement options at the intersection of SR 503 with Scott Avenue in the City of Woodland. Analysis includes the development of improved and/or expanded intersection channelization with either traffic signal or roundabout intersection control. This analysis reflects comments and feedback received from WSDOT and the City of Woodland. Included in this memorandum are the following:

- A summary and detailed PM peak hour analysis of both roundabout and traffic signal improvement options at the intersection.
- Analysis of daily delay of both the roundabout and the traffic signal intersection options.

### 2. COMPARISON OF INTERSECTION OPERATIONS

#### 2.1 Assumptions

The roundabout and traffic signal improvement options considered and discussed in this memo assume that traffic will have a single approach lane on all legs of the intersection. Analysis was conducted for the PM peak hour in years 2015 (opening year), 2025 (equivalent to the corridor link capacity) and 2040 (design year for the Scott Avenue Reconnection Project).

Analysis is based on an hourly saturation flow rate of 1,750 for each lane for the traffic signal intersection and an environmental factor of 1.2 for 2015, and 1.0 for 2025 and 2040 for the roundabout.

Analysis considers three different conditions relative to the Scott Avenue Reconnection Project:

- **No Build** – Scott Avenue is not reconnected.
- **Undercrossing Alternatives** – Scott Avenue is reconnected roughly on current alignment with I-5 crossing over Scott Avenue.
- **Overcrossing Alternatives with Goerig Closure** – Scott Avenue is rerouted southerly to cross over I-5 and join SR 503 near Goerig Street.



## 2.2 Results

Table 1 summarizes the results of intersection operations analysis for the PM peak hour. As indicated in the table, both traffic signal and roundabout improvements operate acceptably through 2025 except under conditions with “Overcrossing Alternatives with Goerig Closure.” This condition includes closure of the SR 503/Goerig Road intersection which results in a significant increase in traffic turning left from northbound SR 503 to westbound Scott Avenue. With this condition, both the traffic signal and roundabout options operate within the city’s threshold level of service standard (LOS D), but both would likely experience significant traffic queuing. By 2040, both the traffic signal and the roundabout would fail without additional lanes in the intersection.

When viewing the 2040 PM peak hour results it’s important to consider these forecasts are based on broad land use assumptions that are beyond the time horizon of the City’s Comprehensive Plan in terms of both the magnitude and location of land development. They also reflect a level of traffic growth in the SR 503 corridor that likely could not occur given the corridor capacity is limited by a single travel lane in each direction. The practical capacity of a single travel lane in this area is about 1,100 vehicles per hour. The 2040 forecasts assume 1,650 vehicles per lane per hour. Thus, while these projections could be said to reflect demand for travel, they exceed what would be likely to actually occur at the intersection.

**Table 1. Scott Avenue at SR 503 Comparison of Intersection Operations Analysis**

Analysis Year	Alternative	Movement	PM Peak Hour Results				
			Delay	Volume/ Capacity	Level of Service	Maximum 95 <sup>th</sup> % Queue	NB Volume n/o Scott Avenue
<b>No Build - Scott Avenue is not reconnected</b>							
2015	Signal Improvements	All	9.2	0.64	A	180 ft	790
2015	Roundabout Improvements	All	8.0	0.68	A	185 ft	790
2025	Signal Improvements	All	18.5	0.86	B	273 ft	1,115
2025	Roundabout Improvements	All	10.5	0.81	B	328 ft	1,115
2040	Signal Improvements	All	<b>62.1</b>	<b>1.12</b>	<b>E</b>	<b>3,185 ft</b>	1,650
2040	Roundabout Improvements	All	<b>92.2</b>	<b>1.44</b>	<b>F</b>	<b>3,141 ft</b>	1,650
<b>Undercrossing Alternatives - Scott Avenue is reconnected with I-5 crossing over Scott Avenue</b>							
2015	Signal Improvements	All	9.5	0.64	A	174 ft	790
2015	Roundabout Improvements	All	8.1	0.68	A	184 ft	790
2025	Signal Improvements	All	19.5	0.86	B	269 ft	1,115
2025	Roundabout Improvements	All	10.7	0.79	B	303 ft	1,115
2040	Signal Improvements	All	<b>63.2</b>	<b>1.13</b>	<b>E</b>	<b>3,071 ft</b>	1,650
2040	Roundabout Improvements	All	<b>96.0</b>	<b>1.50</b>	<b>F</b>	<b>3,096 ft</b>	1,650
<b>Overcrossing Alternatives with Goerig Closure – Scott Avenue crosses over I-5 and join SR 503 near Goerig Street</b>							
2015	Signal Improvements	All	9.7	0.66	A	176 ft	790
2015	Roundabout Improvements	All	8.8	0.74	A	238 ft	790
2025	Signal Improvements	All	24.7	0.93	C	555 ft	1,115
2025	Roundabout Improvements	All	25.1	<b>1.03</b>	C	<b>1,113 ft</b>	1,115
2040	Signal Improvements	All	<b>157.0</b>	<b>1.39</b>	<b>F</b>	<b>10,000+ ft</b>	1,650
2040	Roundabout Improvements	All	<b>208.0</b>	<b>1.78</b>	<b>F</b>	<b>6,350 ft</b>	1,650



### 3. EVALUATION OF DAILY DELAY

Table 2 presents a short summary that compares the differences between vehicle delay over an entire day for roundabout and traffic signal improvement options. Total hours of delay per day are shown for two Scott Avenue Reconnection conditions – “Undercrossing Alternatives” and “Overcrossing Alternatives with Goerig Closure” – and for years 2015 (opening year), 2025 (equivalent to the corridor link capacity), and 2040 (design year for the Scott Avenue Reconnection Project). Hours of delay are shown also for year 2040 with additional lanes in the intersection to improve operations (one additional northbound through lane and one additional eastbound left turn lane) – 2040 (mitigated).

This information shows the roundabout creates less delay than the traffic signal. This is especially true as volumes increase and approach the corridor link capacity (year 2025). During much of the day, traffic volumes at the intersection are lower than they are during peak periods. During off peak hours, a roundabout generally does not require that traffic stop if no other conflicting vehicles are immediately present at the intersection. A traffic signal does require that vehicles stop on a red light even if traffic volumes on other legs are light. For example, a driver traveling east on Scott Avenue approaching a roundabout will slow and check for vehicle on the left before moving through the intersection. If no vehicle is immediately conflicting, then the Scott Avenue driver will proceed and make either a left or right turn. At a traffic signal, this driver cannot make a left turn until receiving a green light and, thus, often will experience delay. This type of off peak delay at a traffic signal is compounded over an entire day.

**Table 2. Comparison of Daily Traffic Delay – Signal versus Roundabout**

<b>Alternative/Time Period</b>	<b>Roundabout</b>	<b>Signal</b>	<b>Savings (Roundabout vs. Signal)</b>
<i>Undercrossing Alternatives</i>			
2015	25.4 hours	26.4 hours	4%
2025	40.5 hours	58.2 hours	44%
2040	156.3 hours	164.2 hours	5%
2040 (mitigated)	58.8 hours	79.6 hours	35%
<i>Overcrossings Alternatives with Goerig Closure</i>			
2015	28.0 hours	28.3 hours	2%
2025	59.8 hours	77.9 hours	53%
2040	548.3 hours	476.6 hours	-13%
2040 (mitigated)	151.8 hours	171.5 hours	13%

The delays hours in Table 2 are based on hourly traffic distribution assumptions found in “2011 Congested Corridors Report Powered by INRIX Traffic Data, Appendix B—Methodology” published by the Texas Transportation Institute. This national data was used in the absence of 24-hour count data along SR 503. If actual SR 503 counts were used to determine the hourly traffic distribution, the results would likely vary, but it is not expected that the overall findings would differ substantively.

### 4. CONCLUSION

Both the roundabout and traffic signal operate well in the opening year (2015) and at the corridor capacity (2025), though the queues are significantly longer for Scott Avenue Reconnection “Overcrossing Alternatives with Goerig Closure.” The roundabout creates significantly less total daily delay than the traffic signal in year 2025. Statistically, the roundabout also will result in less severe collisions.