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MEMORANDUM

DATE: October 15, 2014

TO: Wes Wegner, P.E., Wallis Engineering

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SUBJECT: 1st Street/Russell Avenue Traffic Control, Stevenson, WA

P14163-015

This memorandum documents intersection analysis of 1st Street and SW Russell Avenue in Stevenson, Washington. The purpose of this analysis is to determine if the stop signs on 1st Street are needed to provide for safe movement through the intersection. The sections of this memorandum identify the existing traffic operations, safety analysis, multi-way stop warrant analysis, and qualitative assessment.

Existing Intersection Operations

Traffic counts were collected at the intersection of 1st Street and SW Russell Avenue between 6:00 a.m. and 8:00 p.m. (i.e., for 14 hours) on September 25, 2014. This was a typical midweek day (Thursday) when there is no local cruise ship docked nearby. When a ship is present, pedestrian volumes can be much higher. However, since this represents a relatively small number of days, it would be more appropriate to build the transportation system for more typical conditions.

Intersection traffic operations, determined based on the *2000 Highway Capacity Manual* methodology¹, were analyzed for the peak hour (i.e., the hour with the highest number of entering vehicles, which occurred between 11:25 a.m. and 12:25 p.m.) to determine how much congestion is currently being experienced. Table 1 shows the estimated average delay (in seconds), level of service (LOS), and volume-to-capacity (v/c) ratio for the study intersection. As shown, the intersection experiences very low levels of delay. This indicates that the presence of the stops signs may not be having a significant impact on the ability to efficiently travel along 1st Street.

Table 1: 2014 Existing Peak Hour Intersection Operating Conditions (11:25 AM – 12:25 AM)

Intersection	PM Peak Hour		
	Delay	LOS	V/C
1 st Street/SW Russell Avenue	7.8	A/A	0.08

LOS = Level of Service of Major Street/Minor Street
V/C = Volume-to-Capacity Ratio of Worst Movement

¹ *2000 Highway Capacity manual*, Transportation Research Board, Washington DC, 2000.



Safety Analysis

Five years of collision records (2008-2012) for the study intersection were obtained from the WSDOT Collision Data & Analysis Branch. As shown in Table 2, only one collision occurred at the intersection during the five-year period. That collision did not result in any injuries. In addition, the collision rate does not exceed 1.0 collision per million entering vehicles, a common transportation threshold used to identify intersections that would benefit from a more detailed safety evaluation.

Table 2: Collision History (2008-2012)

Intersection	Collisions (by Severity)				Collision Rate
	Fatal	Injury	PDO	Total	
1 st Street/SW Russell Avenue	0	0	1	1	0.28

^a PDO = Property damage only.

^b Collision Rate for intersections = average annual collisions per million entering vehicles (MEV); MEV estimates based on p.m. peak-hour traffic count and applicable factors

Multi-Way Stop Warrants

To determine whether the collision history and the existing vehicle, pedestrian, and bicycle volumes warrant a multi-way stop at the 1st Street/SW Russell Avenue intersection, the MUTCD Multi-Way Stop Applications analysis was performed.² This analysis includes the following:

- Evaluation of reported crashes in a 12-month period that may be susceptible to correction by a multi-way stop intersection (Criterion B)
- The vehicle traffic entering from the major street (Criterion C.1)
- Vehicle, bicycle, and pedestrian traffic entering from the minor street (Criterion C.2)

Because stop control is already present on all approaches to the intersection, the analysis of past collision data would not be able to reveal if there have been collisions susceptible to correction by multi-way stop installation. Therefore, this criterion cannot be appropriately evaluated when considering the proposed stop control removal.

Table 3 lists the traffic volume thresholds required to meet Criteria C.1 or C.2. As mentioned previously in this memorandum, 14 hours of traffic counts were collected on September 25, 2014. As shown in Table 3, the existing 1st Street/SW Russell Avenue approximate volumes are below both thresholds. Therefore, none of the criteria are met, indicating that multi-way stop control would typically not be recommended for this intersection based on the results of the warrant analysis. If traffic volumes increased along 1st Street in response to the removal of the stop signs, they would have to reach a level greater than four times the current volume before reinstallation of the stop signs would be justified.

² MUTCD, Federal Highway Administration, Section 2B.07 Multi-Way Stop Applications, 2009

**Table 3: Multi-Way Stop Warrant Results based on Traffic Volumes**

Intersection	Criterion C.1		Criterion C.2		Criteria Met?
	Threshold	Peak 8-hour Average Volume	Threshold	Peak 8-hour Average Volume ^a	
1 st Street/SW Russell Avenue	300	70	200	110	Neither

^aCriterion C.2 volumes includes vehicles, pedestrians, and bicyclists.

Qualitative Assessment

With the removal of the stop signs on the 1st Street approaches to SW Russell Avenue, 1st Street would become a more attractive route, particularly for eastbound vehicles (which have a free movement off of SR 14 as they approach town and back onto SR 14 as they leave town). Westbound vehicles would still be required to perform left-turn movements on both sides of town, so 1st Street would not be as attractive for them. Therefore, some eastbound traffic may shift from SR 14 to 1st Street but this is unlikely to occur for westbound traffic.

The removal of the stop signs would also allow vehicles on 1st Street to maintain their travel speed because they will no longer have to stop at SW Russell Avenue. Traffic speeds could increase as a result, however, design features present on 1st Street, such as the on-street parking and street trees, should help mitigate speeding. If speeds do increase, the installation of other features such as curb extensions could be considered.

The primary safety impact of removing the multi-way stop at 1st Street/SW Russell Avenue relates to pedestrian crossings. Because SW Russell Avenue provides a direct route between downtown Stevenson and the pier on the Columbia River, higher pedestrian activity is expected. The existing counts documented between 25 and 35 pedestrians crossing 1st Street during both the midday peak hour (11:35 a.m. to 12:35 p.m.) as well as the mid-afternoon peak hour (3:30 p.m. to 4:30 p.m.). These volumes are expected to be higher on days when the local cruise ship is docked at Stevenson. With the removal of the stop signs on 1st Street, it may be beneficial to install another type of enhanced pedestrian crossing on 1st Street, such as a pedestrian actuated flashing yellow beacon and/or curb extensions.

Conclusions

- If the stop signs on 1st Street are removed to relieve congestion on SR 14, adequate signing on SR 14 to make drivers aware of this option should be provided to make this strategy effective. However, it is likely that only eastbound travelers will find this route attractive.
- Traffic volumes along 1st Street are presently low enough that removal of the stop signs should not result in excessive delay for drivers approaching from SW Russell Avenue. However, the impact on volumes along 1st Street following removal of the stop signs should be monitored. If volumes along 1st Street increase three times or more from current levels, reinstallation of the stop signs may be needed.



- Traffic speeds may increase as a result of the stop sign removal. However, the current street design and environment should encourage appropriate travel speeds. If speeds do increase, other streetscape enhancements could be installed as mitigation.
- Removal of the stop signs on 1st Street may have the greatest impact on safe and comfortable pedestrian crossings. With moderately high pedestrian activity and traffic volumes that may increase, there may be a future need for improvements at this intersection to provide an enhanced crossing. Such improvements could include curb extensions, warning signs, and/or flashing yellow beacons activated by pedestrian pushbuttons. This situation should be carefully monitored following removal of the stop signs on 1st Street. Higher pedestrian volumes coinciding with cruise ships docked nearby would further drive the need for such improvements.