CHITTENDEN COUNTY RPC
Communities Planning Together

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TECHNICAL MEMORANDUM

TO: **Lisa Schaeffler; Assistant Public Works Director, Town of Williston**
FROM: **Sai Kumar Sarepalli, P.E., Transportation Planning Engineer**
DATE: **12/09/2016**
RE: **STOP sign study: Blair Park/Paul St., and Zephyr Road/Day Lane Intersections**

The Town of Williston requested that the CCRPC investigate the appropriateness of changing the existing configuration of stop signs at two intersections; Blair Park Road and Paul Street, and Zephyr Road and Day Lane.

This memo outlines the guidelines, criteria and findings for altering the stop sign configuration at study intersections based on the current traffic and safety conditions.

Figure 1: Study Intersections

Existing Conditions

CCRPC staff gathered vehicle turning movement data at both study intersections on October 6, 2016 for both AM peak hour (7:30 AM to 8:30 AM) and PM peak hour (4:30 PM to 5:30 PM) and conducted a reconnaissance field survey to identify potential safety hazards and sight distance issues. Figures 2 and 3 show AM and PM peak turning movement counts at both study intersections, respectively.

Figure 2: AM Peak Hour Turning Movement Count

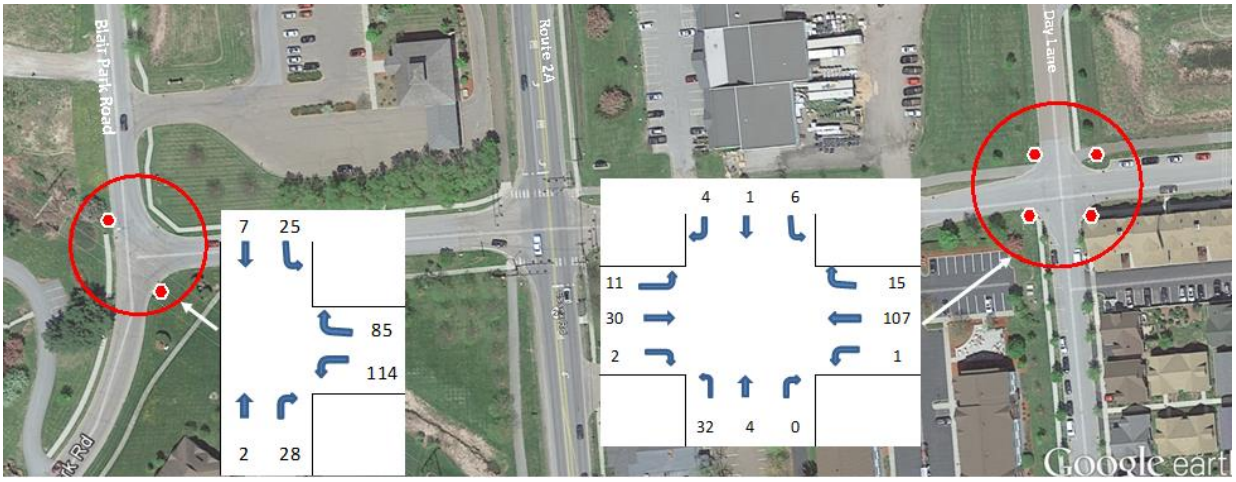
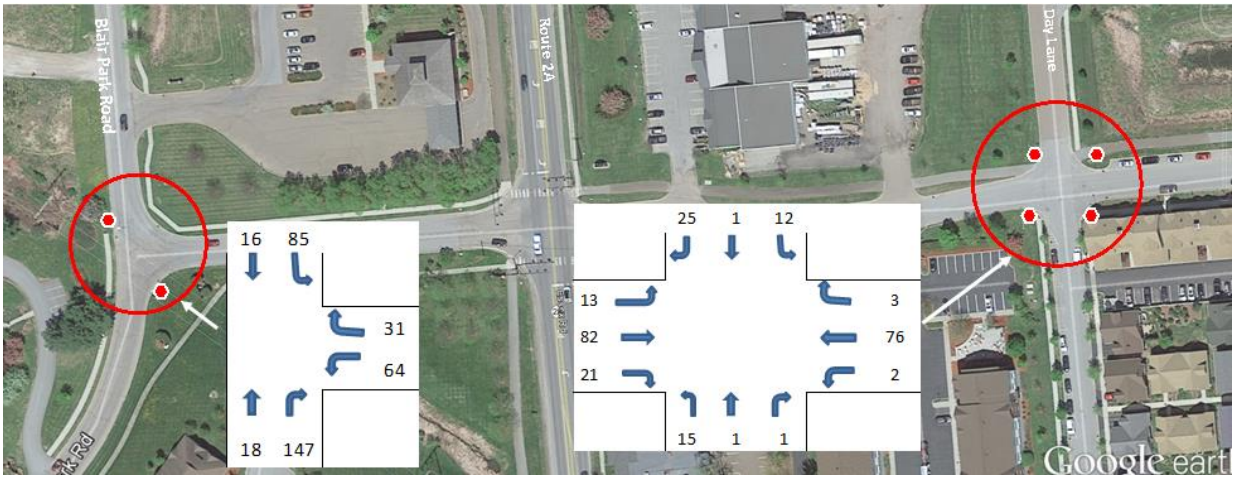


Figure 3: PM Peak Hour Turning Movement Count



Blair Park Road and Paul Street Intersection Evaluation

The Blair Park Road and Paul Street intersection is a two-way stop controlled intersection with STOP control on the northbound and southbound approaches (Blair Park Road) and no control for the westbound direction (Paul Street). Based on the turning movement data, the westbound approach (Paul Street) is the prominent movement in the AM peak, whereas, in the PM peak the northbound approach is prominent. The posted speed limit on both roads is 25 mph. The current intersection control is unconventional in that the through street (Blair Park Road) vehicles must stop at the T-intersection. In a conventional T-intersection configuration, Paul Street should be controlled by a STOP sign so that it removes any confusion for unfamiliar drivers and doesn't breed poor driving habits.

A Synchro traffic simulation model was developed to model traffic operation with a conventional T-intersection configuration with stop control for the westbound approach (Paul Street) and free movement or no-control for northbound and southbound approaches (Blair Park Road).

Table 1 shows traffic performance metrics in terms of level of service and average delay in seconds for each approach from the model for AM and PM peak periods.

Table 1: Traffic Performance Metrics from model for Blair Park Road and Paul Street

	Existing			New Configuration		
AM	WB	NB	SB	WB	NB	SB
LOS	A	A	B	A	A	A
Avg. Delay (s)	4.5	8.7	11.9	9.9	0	5.7
PM						
LOS	A	A	B	B	A	A
Avg. Delay (s)	5.0	9.3	13.8	10.9	0	6.6

Results indicate that there is no significant impact on traffic operations at the intersection with the new STOP sign configuration. The westbound approach may experience a slight increase in delay in AM and PM peak hours.

The Manual on Uniform Traffic Control Devices (MUTCD) for streets and highways (Section 2B.07), and the FHWA Office of Safety Design provides guidance and criteria for the appropriate installation of multi-way stop control[1]. As per the MUTCD guidance, a multi-way stop control installation is appropriate when the following conditions are met:

- Total major street vehicular volumes for both approaches must average at least 300 vehicles per hour for any 8 hours of an average day; and
- Minor street combined vehicular, pedestrian and bicycle volume total of both approaches averages at least 200 units per hour for the same 8 hours, with an average delay to minor street traffic of at least 30 seconds per vehicle.

Traffic volumes, pedestrian and bicycle counts at this intersection do not meet the MUTCD guidance and hence, an all-way stop control is not recommended for this location.

Recommendations

It is recommended to install a STOP sign on Paul Street and remove the STOP signs on Blair Park Road (northbound and southbound approaches) at this intersection. Even though this new configuration will slightly increase delays for the westbound approach (Paul Street), it will also transform the intersection to a conventional T-intersection which is more predictable, removes uncertainty thus enhancing safety for all road users.

[1] Manual on Uniform Traffic Control Devices, FHWA, 2009

Zephyr Road and Day Lane Intersection Evaluation

The Zephyr Road and Day Lane intersection is currently an all-way stop controlled intersection. The posted speed limit on both roads is 25 mph. Turning movement counts indicate that Zephyr Road (eastbound and westbound) approaches serve substantially higher traffic volumes, in both the AM and PM peak hours, than the Day Lane (northbound and southbound) approaches—see Figures 2 and 3. With recent construction, Zephyr Road became a part of the grid street network (see Figure 4) connecting VT Route 2A and US Route 2 which has the potential of further increasing traffic on the Zephyr Road approaches at this location.

Figure 4: Zephyr Road Grid Street Network

A Synchro traffic simulation model was developed to model traffic conditions with a two-way stop control configuration for both AM and PM peak periods. The two-way stop control configuration is controlling the northbound and southbound approaches (Day Lane) with STOP signs and allowing free movement or no-control for eastbound and westbound approaches (Zephyr Road).

Table 2 shows traffic performance metrics in terms of level of service and average delay for each approach from the model for AM and PM peak periods.

Table 2: Traffic Performance Metrics from model for Zephyr Road and Day Lane Intersection

	All-Way Stop Control				Two-Way Stop Control			
AM	EB	WB	NB	SB	EB	WB	NB	SB
LOS	A	A	A	A	A	A	B	A
Avg. Delay (s)	7.8	7.5	7.8	7.3	2.0	0.1	10.1	9.6
PM								
LOS	A	A	A	A	A	A	B	A
Avg. Delay (s)	7.7	7.7	7.6	7.3	0.9	0.2	10.4	9.4

Results indicate that the traffic model with two-way stop control shows improved traffic operations for the eastbound and westbound (Zephyr Road) approaches with negligible average delay while the northbound and southbound approaches may experience slightly increased delay at the intersection in both AM and PM peak hours. However, there is no significant impact on the levels of service for minor-street approaches with the two-way stop control configuration.

Intersection Sight Distance

Intersection sight distance is the distance provided at intersections to allow drivers to perceive the presence of potentially conflicting vehicles. This distance is required for motorists to stop or adjust their speed, as appropriate, to avoid collision with other vehicles in the intersection. The sight distance at an all-way stop control intersection should be such that the first stopped vehicle on one approach should be visible to the drivers of first stopped vehicles on each of the other approaches. Whereas, drivers arriving at a two-way stop control intersection need greater sight distance to decide when to enter the intersection safely.

For a two-way stop control configuration at this study intersection, the available sight distance is adequate from all approaches except the southbound Day lane approach. Currently, there is on-street parking along Zephyr Road (westbound approach) which obstructs drivers' vision on the southbound approach to view vehicles traveling westbound. The following picture shows the existing condition from the southbound approach.

Figure 5: Intersection Sight Distance from the Southbound Approach (Day Lane)

A Policy on Geometric Design of Highways and Streets, commonly known as Green Book, published by American Association of State Highway and Transportation Officials (AASHTO), provides recommended intersection sight distances for a two-way stop controlled intersection based on design speeds and acceptable time gap for a minor road vehicle to enter the major road[2].

The current available sight distance for southbound vehicles to make left turns from a stop condition is approximately 90 ft. As per recommendation provided in the Green Book, a minimum of 280 ft sight distance should be provided along major streets for left turning vehicles from the minor street when the posted speed limit is 25 mph. This will allow for minor street motorists to view potential conflicting vehicles and to make a decision when to enter the intersection safely. The following picture shows recommended intersection sight distance required along Zephyr Road in case of a two-way stop control configuration.

[2] Policy on Geometric Design of Highways and Streets, Exhibit 9-55, AASHTO, 2008

Figure 6: Recommended Intersection Sight Distance for Two-Way Stop Control

Note: Distances shown in the picture are approximate. Decision point is 14.5 ft from the edge of major-road traveled way.

Recommendations

Based on existing traffic volumes and the potential for increased traffic on Zephyr Road due to the connection to US Route 2, it is recommended to convert the existing all-way stop control to a two-way stop control intersection by removing stop signs on Zephyr Road. The sight distance for the south bound approach (Day Lane) should be improved by removing at least two on-street parking spaces on Zephyr Road, as per the AASHTO recommendations, prior to removing stop signs on Zephyr Road.