Ribicoff Cottages – Stop Sign Warrant

TO: Housing Authority of New Haven

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Tighe & Bond reviewed the unsignalized intersection of Woodin Street and Belden Street in Hamden with regards to the proposed addition of Augustine Street, a new local roadway connection approved by the City of New Haven as part of the redevelopment of the Ribicoff Cottages. The addition of Augustine Street will convert this intersection from a three-leg intersection to a four-leg intersection. Augustine Street will provide both vehicular and pedestrian access to Woodin Street from the proposed Ribicoff Cottages and West Rock development area.

Travel Speeds and Sight Distances

Woodin Street is classified by the Connecticut Department of Transportation (CTDOT) as an urban minor arterial. It runs east-west in southwestern Hamden, near the New Haven city line, connecting Wintergreen Avenue and Dixwell Avenue (Route 10). The speed limit along Woodin Street, in the vicinity of the development is 25 miles per hour, with one travel lane in each direction.

An automatic traffic recorder (ATR) was placed along Woodin Street between West Side Drive and Belden Street in November 2013. This ATR recorded traffic volumes and travel speeds along Woodin Street. A review of the data exhibits an 85th percentile speed of 40 miles per hour. The 85th percentile speed is defined as the speed at which 85 percent of the traffic is traveling at or below. The 85th percentile speed of 40 miles per hour is 15 miles per hour above the posted speed limit.

Intersection sight distances were evaluated at the proposed four-leg intersection of Augustine Street and Belden Street with Woodin Street, to determine if adequate sight lines for vehicles exiting either Augustine Street or Belden Street are provided.

Since the Town of Hamden does not explicitly define intersection sight distance requirements the Connecticut Department of Transportation (CTDOT) Highway Design Manual was consulted to determine intersection sight distance requirements. According to the Connecticut Department of Transportation Highway Design Manual (2003), the intersection sight distances required for passenger vehicles based on 40 miles per hour travel speeds on a two-lane (one travel lane in each direction) roadway are 445 feet to the right and left. The intersection sight distances from the existing Belden Street approach is approximately 225 feet in both directions based on a review of existing condition mapping. The proposed sight distances from Augustine Street are approximately 225 feet in both directions. As noted the existing Belden Street intersection sight distance is below minimum CTDOT published requirements. However, based on a review of the accident data presented in our previous memorandum related to roadway safety along Wooding Street there is no reported accident history that indicates the less than minimum sight distance poses an existing safety concern.

Recommended Improvements

While existing sight distances do not appear to be problematic for existing drivers, it is acknowledged that minimum intersection sight distance requirements are not met. Therefore, to address this condition for the existing and proposed condition, the existing side street stop control at the Belden Street intersection is proposed to be converted to all-way stop control with stop signs on each approach and with an advance stop sign ahead warning sign on the Woodin Street westbound approach in accordance with the Manual on Uniform Traffic Control Devices (MUTCD). The revised intersection traffic control will facilitate intersection turning movements under protected right of way operations. Furthermore, pedestrian crossings are proposed at this intersection and the all-way stop control will facilitate pedestrian crossing activity. These improvements will also benefit Belden Street traffic, which currently operates under side street stop control only. Additionally, an important benefit of the four-way stop sign control at Belden Street and Augustine Street, is a reduction of travel speeds along Woodin Street.

Justification

Manual on Uniform Traffic Control Devices – Stop Sign Warrants

In accordance with MUTCD standards for multi-way stop control applications, all-way stop control may be considered for "Locations where a road user, after stopping, cannot see conflicting traffic and is not able to negotiate the intersection unless conflicting cross traffic is also required to stop." The less than required sight distances due to the existing roadway geometry and topography of Woodin Street, to the east of the current intersection with Belden Street, combined with operating speeds above the posted speed limit along Woodin Street, justify the installation of all-way stop control to improve traffic safety at this location.

All-Way Stop Control Traffic Operations

Analysis of the weekday morning and afternoon peak hours show that the proposed all-way stop controlled intersection would operate efficiently, with all approaches operating at LOS A in the combined condition with the Augustine Street connection. It is anticipated that the maximum, 95th percentile queue would be less than one vehicle in length and the delay along all approaches less than ten seconds during the weekday morning and afternoon peak hours. A summary of the results of the capacity analysis are enclosed.

Summary

As noted above, there are several benefits that will be realized through the implementation of all-way stop control at the proposed intersection of Belden Street and Augustine Street at Woodin Street. In addition to mitigating the existing less than required intersection sight distance from the Belden Street approach, the stop sign will also reduce travel speeds along Woodin Street and provide very good traffic operations at the proposed all-way stop controlled intersection. Furthermore, the all-way stop sign control will facilitate pedestrian crossing activity at this intersection. These benefits will be realized with a negligible effect on traffic operations along Woodin Street

Intersection	
Intersection Delay, s/veh	8.2
Intersection LOS	A

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBU	NBL	NBT	NBR
Vol, veh/h	0	2	140	0	0	26	134	6	0	3	0	39
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	2	152	0	0	28	146	7	0	3	0	42
Number of Lanes	0	0	1	0	0	0	1	0	0	0	1	0

Approach	EB	WB	NB
Opposing Approach	WB	EB	SB
Opposing Lanes	1	1	1
Conflicting Approach Left	SB	NB	EB
Conflicting Lanes Left	1	1	1
Conflicting Approach Right	NB	SB	WB
Conflicting Lanes Right	1	1	1
HCM Control Delay	8.2	8.4	7.4
HCM LOS	A	A	A

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	7%	1%	16%	79%
Vol Thru, %	0%	99%	81%	0%
Vol Right, %	93%	0%	4%	21%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	42	142	166	19
LT Vol	0	140	134	0
Through Vol	39	0	6	4
RT Vol	3	2	26	15
Lane Flow Rate	46	154	180	21
Geometry Grp	1	1	1	1
Degree of Util (X)	0.053	0.18	0.209	0.027
Departure Headway (Hd)	4.151	4.189	4.177	4.754
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	868	844	848	757
Service Time	2.152	2.274	2.256	2.758
HCM Lane V/C Ratio	0.053	0.182	0.212	0.028
HCM Control Delay	7.4	8.2	8.4	7.9
HCM Lane LOS	A	A	A	A
HCM 95th-tile Q	0.2	0.7	0.8	0.1

Intersection	
Intersection Delay, s/veh	
Intersection LOS	

Movement	SBU	SBL	SBT	SBR
Vol, veh/h	0	15	0	4
Peak Hour Factor	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2
Mvmt Flow	0	16	0	4
Number of Lanes	0	0	1	0

Approach	SB
Opposing Approach	NB
Opposing Lanes	1
Conflicting Approach Left	WB
Conflicting Lanes Left	1
Conflicting Approach Right	EB
Conflicting Lanes Right	1
HCM Control Delay	7.9
HCM LOS	A

Lane

Intersection	
Intersection Delay, s/veh	8
Intersection LOS	A

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBU	NBL	NBT	NBR
Vol, veh/h	0	5	80	0	0	37	124	21	0	1	0	42
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	5	87	0	0	40	135	23	0	1	0	46
Number of Lanes	0	0	1	0	0	0	1	0	0	0	1	0

Approach	EB	WB	NB
Opposing Approach	WB	EB	SB
Opposing Lanes	1	1	1
Conflicting Approach Left	SB	NB	EB
Conflicting Lanes Left	1	1	1
Conflicting Approach Right	NB	SB	WB
Conflicting Lanes Right	1	1	1
HCM Control Delay	7.8	8.3	7.2
HCM LOS	A	A	A

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	2%	6%	20%	58%
Vol Thru, %	0%	94%	68%	0%
Vol Right, %	98%	0%	12%	42%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	43	85	182	12
LT Vol	0	80	124	0
Through Vol	42	0	21	5
RT Vol	1	5	37	7
Lane Flow Rate	47	92	198	13
Geometry Grp	1	1	1	1
Degree of Util (X)	0.052	0.108	0.224	0.016
Departure Headway (Hd)	3.999	4.202	4.081	4.484
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	901	844	874	803
Service Time	1.999	2.272	2.131	2.486
HCM Lane V/C Ratio	0.052	0.109	0.227	0.016
HCM Control Delay	7.2	7.8	8.3	7.6
HCM Lane LOS	A	A	A	A
HCM 95th-tile Q	0.2	0.4	0.9	0

Intersection	
Intersection Delay, s/veh	
Intersection LOS	

Movement	SBU	SBL	SBT	SBR
Vol, veh/h	0	7	0	5
Peak Hour Factor	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2
Mvmt Flow	0	8	0	5
Number of Lanes	0	0	1	0

Approach	SB
Opposing Approach	NB
Opposing Lanes	1
Conflicting Approach Left	WB
Conflicting Lanes Left	1
Conflicting Approach Right	EB
Conflicting Lanes Right	1
HCM Control Delay	7.6
HCM LOS	A

Lane