BILL NO. 2822 ORDINANCE NO. 2639

AN ORDINANCE AMENDING ORDINANCE NUMBER 35, SCHEDULE VI, INTERSECTION STOPS, OF THE ORDINANCES OF THE CITY OF CHESTERFIELD BY ADDING PROVISIONS THERETO TO INCLUDE RHL DRIVE AT COMMONS FRONTAGE ROAD

NOW, THEREFORE, BE IT ORDAINED BY THE CITY COUNCIL OF THE CITY OF CHESTERFIELD, ST. LOUIS COUNTY, MISSOURI, AS FOLLOWS:

Section 1. Ordinance Number 35, Section 3, Schedule VI, as it relates to intersection stop signs, is hereby amended by adding the following provision thereto:

Intersection	*Traffic on Highway, Road, Street or Alley Listed Below Shall Stop*
Commons Frontage Road	RHL Drive (north and southbound)

Section 2. In all other respects, Ordinance Number 35 is in full force and effect.

Section 3. This ordinance shall be in full force and effect from and after its passage and approval.

Passed and approved this 7th day of February, 2011.

ACTING MAYOR

ATTEST:

CITY CLERK

[FIRST READING HELD: 1/19/11]

III. C.

MEMORANDUM

DATE: **December 29, 2010**

TO: **Planning and Public Works Committee**

FROM: **Brian McGownd**
Public Works Director/City Engineer

RE: **RHL Drive and Commons Frontage Road**
Intersection Control Analysis and Stop Sign Ordinance

In response to recent retail development plans moving forward in the Chesterfield Commons West Subdivision, the Department of Planning and Public Works performed an intersection control analysis at the intersection of RHL Drive with the Commons frontage road serving Lowe's to the east and Home Depot to the west. The intersection control analysis and ordinance are provided for your review and consideration. As a result of the findings of the study performed in house, we have attached an ordinance authorizing an all-way stop at the intersection of RHL Drive with the Commons frontage road.

RECOMMENDATION

It is recommended that the Planning and Public Works Committee consider the attached ordinance, and forward it to the full City Council for consideration and approval.

attachments

cc: Michael G. Herring, City Administrator
Michael O. Geisel, Director of Planning & Zoning
Aimee Nasiff, Planning and Development Services Director

MEMORANDUM

DATE: December 28, 2010

TO: Brian McGownd, PWD/CE

CC: Aimee Nassif, PDSD

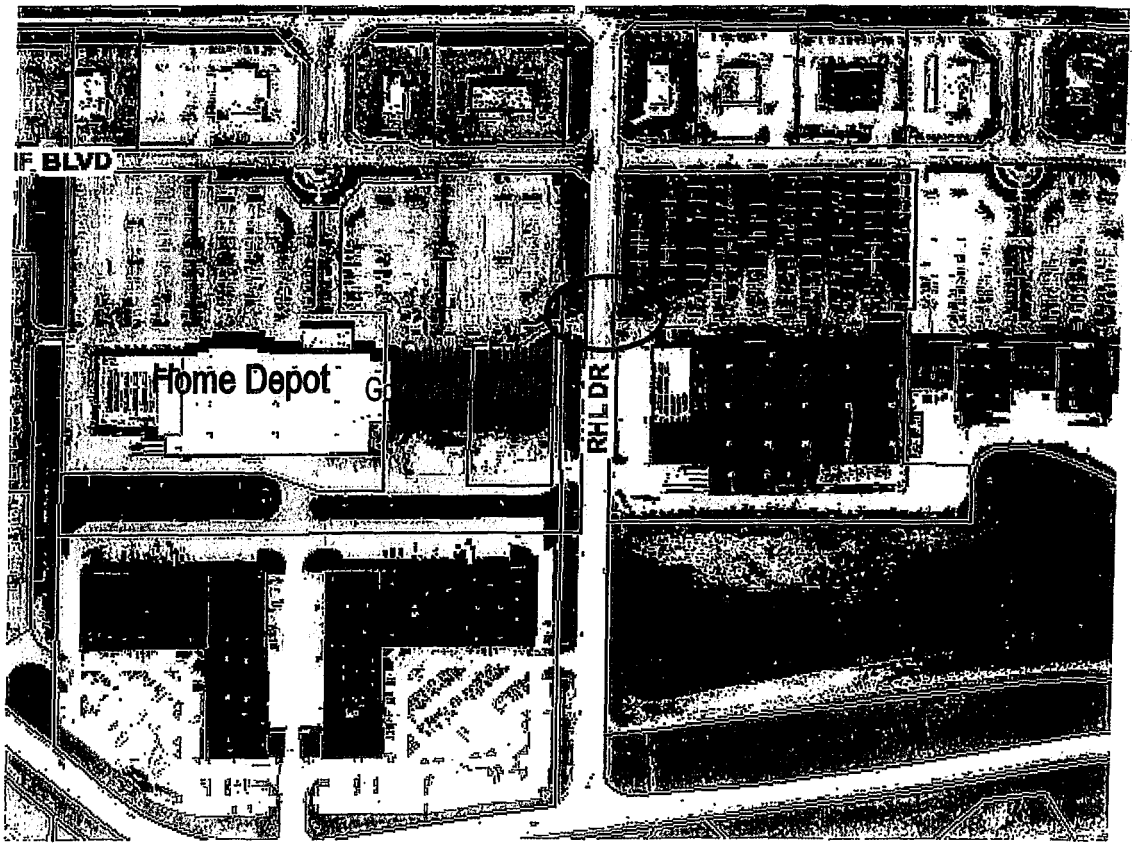
FROM: Susan Mueller, Principal Engineer S. Mueller

RE: RHL Drive Intersection Control Analysis

Introduction

As requested, staff has completed an analysis of the existing operations along RHL Drive at its intersection with the "frontage road" serving the future Aldi's and Gordman's sites to the west and the Lowe's store to the east. The intersection spans the boundary between Chesterfield Commons Subdivision and Chesterfield Commons West Subdivision. RHL Drive has a single through traffic lane and a single dedicated left turn lane in both the NB and SB directions entering this intersection. The "frontage road" has one traffic lane in the EB and WB direction entering the intersection.

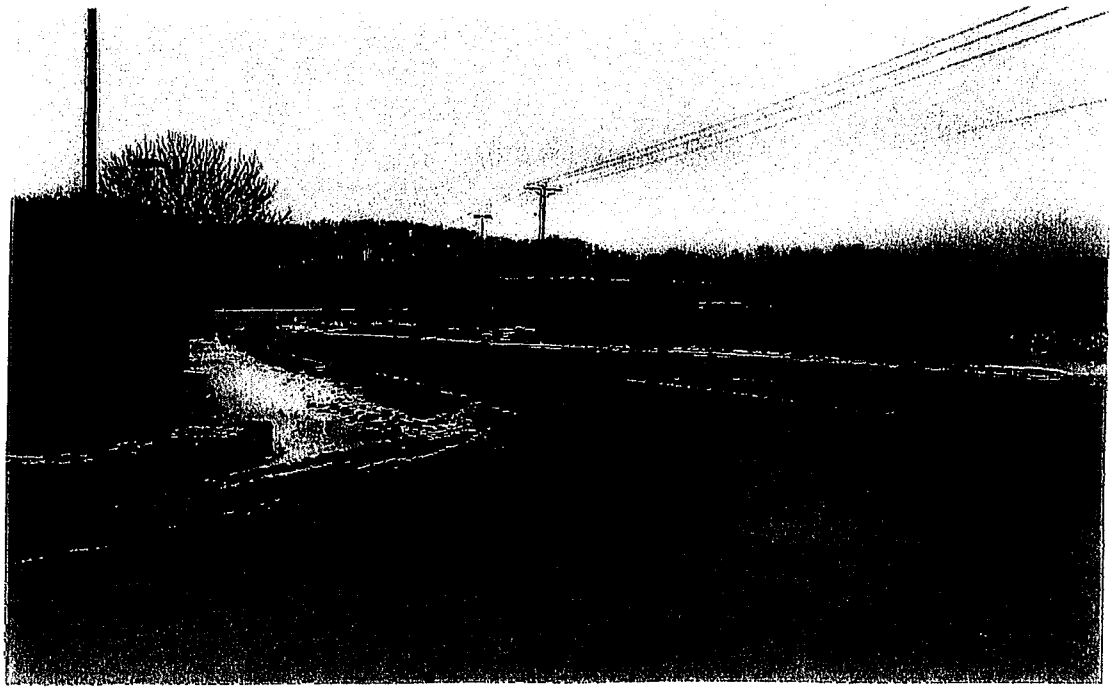
Figure 1: Analysis Intersection



Visibility of oncoming traffic on RHL Drive from the "frontage road" stop bar is clear in both the northbound and southbound directions. The driver view of RHL Drive from the "frontage road" is depicted in Figures 2 and 3 below.

Figure 2: EB frontage rd. looking NB on RHL Drive

Figure 3: WB frontage rd. looking SB on RHL Drive



Data Collection

Volume Data

In November, 2010, the City installed traffic counters on the six (6) approach lanes into the intersection to determine existing Average Annual Daily Traffic (AADT) volumes and Peak Hour weekday volumes. Traffic volume data was collected for each lane of traffic entering the intersection and was compared to the Manual for Uniform Traffic Control Devices (MUTCD) volumetric warrants for stop control.

City data collectors indicate that vehicular volumes entering the intersection from the two minor approaches are **190 vph** for peak weekday 8 hour interval from 11:00 am until 7:00 pm. These weekday volumes are within 5% of meeting the MUTCD Section 2B.06 and 2B.07 guidance of 200 vph in an eight hour interval in terms of entering vehicular volumes, and average vehicular delay for application of stop control. Weekend vehicular volumes were not collected, however, in the ITE Trip Generation Manual for Home Improvement Superstores, weekend trips are 50% greater than weekday trips. Therefore, it is reasonable to assume that the peak Saturday 8 hour interval from 11:00 am to 7:00 pm would meet this 200 vph MUTCD warrant. Vehicle volumes entering the intersection from the major approaches averaged **350 vph** for the same peak weekday interval of 11:00 am until 7:00 pm. Major street weekday volumes currently meet the minimum multi-way stop warrant C1 of 300 vph in an eight hour interval on both days.

Analysis for Level of Service (LOS) during the weekday peak hour was performed using Syncro 7 - Light. Synchro reports are included as Exhibits A through D. The results of City traffic analysis is similar to and confirms the findings in the CBB traffic analysis dated April 6, 2010 for the proposed Aldi grocery store. Using trip generation calculations from the CBB study for the Aldi grocery store, LOS and average intersection delay was calculated for two stop configurations and is included in the Tables below. Table 1 contains 2-way and all-way stop configurations under existing conditions. Before the Aldi's store opens, a two way stop configuration allows this intersection to function with an average intersection delay of **9.2** seconds/vehicle during peak hour conditions. An all-way stop configuration improves LOS for EB and WB Frontage Road however, when all movements must stop, the average intersection delay increases to **11.8** seconds/vehicle.

Table 1: Intersection LOS and Delay existing conditions

Intersection Movement	Existing 2-Way Stop		Proposed All-Way Stop	
NB RHL Dr Left	A	7.8 sec/vehicle	A	8.7 seconds/vehicle
NB RHL Dr Through	A	No Stop	B	13.0 seconds/vehicle
SB RHL Dr Left	A	8.0 sec/vehicle	A	9.1 seconds/vehicle
SB RHL Dr Through	A	No Stop	B	11.5 seconds/vehicle
EB Frontage Rd	C	17.8 sec/vehicle	B	10.3 seconds/vehicle
WB Frontage Rd	D	27.5 sec/vehicle	B	12.1 seconds/vehicle
Intersection Avg Delay	**A**	**9.2 seconds/vehicle**	**B**	**11.8 seconds/vehicle**

Table 2 contains 2-way and all-way stop configurations after Aldi's is open. After the Aldi's store opens, the additional volume of traffic will cause the two way stop configuration to generate an average intersection delay of **18.3** seconds/vehicle during peak hour conditions. Under this traffic load, an all-way stop generates a significantly lower average intersection delay of **13.7** seconds/vehicle. The Synchro reports associated with Table 2 are found in Exhibits A and B.

Table 2: Intersection LOS and Delay with Aldi's

Intersection Movement	Existing 2-Way Stop		Proposed All-Way Stop	
NB RHL Drive Left	A	7.9 seconds/vehicle	A	9.8 seconds/vehicle
NB RHL Drive Through	A	No Stop	C	15.3 seconds/vehicle
SB RHL Drive Left	A	8.0 seconds/vehicle	A	9.8 seconds/vehicle
SB RHL Drive Through	A	No Stop	B	13.7 seconds/vehicle
EB Frontage Road	D	25.7 seconds/vehicle	B	12.3 seconds/vehicle
WB Frontage Road	F	57.6 seconds/vehicle	B	14.2 seconds/vehicle
Intersection Average Delay	**C**	**18.3 seconds/vehicle**	**B**	**13.7 seconds/vehicle**

At full development there will be a Gordman's store constructed between the proposed Aldi's site and the existing Home Depot. Under full development, peak hour vehicular trips will increase delay at a two way stop intersection to an unacceptable LOS E with an average intersection delay of **45.0** seconds/vehicle. The proposed all-way stop clearly functions better than a two way stop configuration under the full development scenario providing an average intersection delay of **16.2** seconds/vehicle. The Synchro reports for the results displayed below in Table 3 are located in Exhibits C and D.

Table 3: Intersection LOS and Delay with Aldi's /Gordman's

Intersection Movement	Existing 2-Way Stop		Proposed All-Way Stop	
NB RHL Drive Left	A	8.1 seconds/vehicle	B	11.5 seconds/vehicle
NB RHL Drive Through	A	No Stop	C	18.1 seconds/vehicle
SB RHL Drive Left	A	8.0 seconds/vehicle	B	10.5 seconds/vehicle
SB RHL Drive Through	A	No Stop	C	17.2 seconds/vehicle
EB Frontage Road	F	70 seconds/vehicle	C	16.4 seconds/vehicle
WB Frontage Road	F	152 seconds/vehicle	C	15.8 seconds/vehicle
Intersection Average Delay	**E**	**45.0 seconds/vehicle**	**C**	**16.2 seconds/vehicle**

Speed Data

Traffic data collectors in the southbound through lane of RHL Drive recorded 80% of vehicles exceeding the posted speed limit of 25 mph. The 85th percentile speed was **37.8 mph** for southbound traffic. Data collectors in the northbound through lane of RHL Drive recorded 47% of vehicles exceeding the posted speed limit of 25 mph. The 85th percentile speed was **34.1 mph**. The 85th percentile speed is utilized in traffic engineering to establish

the posted speed limit for a given roadway. The 85th percentile speed is within the 10 mph speed range used by most drivers and indicates that the posted speed limit may be too low. A final speed study of the area roads will be undertaken by City staff after the 4 way stop condition is in place and the Aldi's and Gordman's stores are open for business. Depending upon the results of this final speed analysis, posted speed limits may require modification to fall within the range of 85th percentile speed data.

Incident Data

Incident data in the Law Enforcement Traffic System (LETS) was reviewed for a period of three years on RHL Drive. In total, there were 29 accidents in 3 years along RHL Drive. As can be seen in Figure 4, the majority of traffic accidents on RHL Drive occur at its intersection with THF Boulevard. Based on the information provided by law enforcement records, 2 accidents in 3 years were proximate to the study intersection. This intersection crash rate of 0.67 crashes per year is very low and is well below the MUTCD stop control crash rate warrant of 5.0 crashes per year.

Figure 4: Incident Data from LETS

CHESTERFIELD PD

12/17/2010

LOCATION INCIDENT

Date Range: 12/17/2007- 12/17/2010
Location: PVT RHL DR

Before/After/At	Cross Location	Accident	Citation	Warning	Complaint
PVT RHL DR					
Before	CRD CHESTERFIELD AIRPORT RD	0	0	0	0
After	CRD CHESTERFIELD AIRPORT RD	0	0	0	0
At	CRD CHESTERFIELD AIRPORT RD	1	10	2	0
Before	PVT THF BLVD	0	0	0	0
After	PVT THF BLVD	0	0	0	0
At	PVT THF BLVD	5	57	6	0
Before	CST EDISON AVE	0	3	0	0
After	CST EDISON AVE	0	0	0	0
At	CST EDISON AVE	1	231	48	0
PVT RHL DR NORTH					
Before	PVT THF BLVD	1	1	0	0
After	PVT THF BLVD	1	0	0	0
At	PVT THF BLVD	14	0	0	0
Before	CRD CHESTERFIELD AIRPORT RD	0	1	0	0
After	CRD CHESTERFIELD AIRPORT RD	0	0	0	0
At	CRD CHESTERFIELD AIRPORT RD	2	2	0	0
PVT RHL DR SOUTH					
Before	PVT THF BLVD	1	0	0	0
After	PVT THF BLVD	1	6	0	0
At	PVT THF BLVD	2	3	0	0
TOTAL		29	397	56	0

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Recommendation

Based on field observations and operational analysis of the study intersection, the following recommendations are made for City Council consideration.

1. Approval of a multi-way (4-way) stop on RHL Drive at the intersection with the frontage road serving Lowe's, and the future Aldi's and Gordman's stores.

EXHIBIT A

HCM Unsignalized Intersection Capacity Analysis
3: Frontage at Aldi's & RHL Drive

2 WAY ALDI'S

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	41	74	49	113	62	65	54	146	150	47	198	33
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	45	80	53	123	67	71	59	159	163	51	215	36
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	716	774	233	768	711	240	251			322		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	716	774	233	768	711	240	251			322		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	82	73	93	45	79	91	96			96		
cM capacity (veh/h)	249	301	806	222	328	799	1314			1238		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	178	261	59	322	51	251
Volume Left	45	123	59	0	51	0
Volume Right	53	71	0	163	0	36
cSH	348	308	1314	1700	1238	1700
Volume to Capacity	0.51	0.85	0.04	0.19	0.04	0.15
Queue Length 95th (ft)	70	185	4	0	3	0
Control Delay (s)	25.7	57.6	7.9	0.0	8.0	0.0
Lane LOS	D	F	A		A	
Approach Delay (s)	25.7	57.6	1.2		1.4	
Approach LOS	D	F				

Intersection Summary			
Average Delay	18.3		
Intersection Capacity Utilization	54.5%	ICU Level of Service	A
Analysis Period (min)	15		

EXHIBIT C

HCM Unsignalized Intersection Capacity Analysis
3: Frontage at Aldi's & RHL Drive

2 WAY ALDI'S/GORDMAN'S

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	71	90	90	100	80	45	94	146	150	47	198	63
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	77	98	98	109	87	49	102	159	163	51	215	68
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	807	878	249	909	830	240	284			322		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	807	878	249	909	830	240	284			322		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	60	61	88	24	68	94	92			96		
cM capacity (veh/h)	193	253	789	144	269	799	1279			1238		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	273	245	102	322	51	284
Volume Left	77	109	102	0	51	0
Volume Right	98	49	0	163	0	68
cSH	300	214	1279	1700	1238	1700
Volume to Capacity	0.91	1.14	0.08	0.19	0.04	0.17
Queue Length 95th (ft)	214	291	7	0	3	0
Control Delay (s)	69.9	151.8	8.1	0.0	8.0	0.0
Lane LOS	F	F	A		A	
Approach Delay (s)	69.9	151.8	1.9		1.2	
Approach LOS	F	F				

Intersection Summary			
Average Delay	45.0		
Intersection Capacity Utilization	50.5%	ICU Level of Service	A
Analysis Period (min)	15		

EXHIBIT D

HCM Unsignalized Intersection Capacity Analysis
3: Frontage at Aldi's & RHL Drive

4 WAY ALDI'S/GORDMAN'S

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	71	90	90	100	80	45	94	146	150	47	198	63
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
Hourly flow rate (vph)	77	98	98	109	87	49	102	159	163	51	215	68

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total (vph)	273	245	102	322	51	284
Volume Left (vph)	77	109	102	0	51	0
Volume Right (vph)	98	49	0	163	0	68
Hadj (s)	-0.12	0.00	0.53	-0.32	0.53	-0.13
Departure Headway (s)	6.7	6.9	7.6	6.7	7.7	7.0
Degree Utilization, x	0.51	0.47	0.22	0.60	0.11	0.55
Capacity (veh/h)	486	467	450	503	434	474
Control Delay (s)	16.4	15.8	11.5	18.1	10.5	17.2
Approach Delay (s)	16.4	15.8	16.5		16.2	
Approach LOS	C	C	C		C	

Intersection Summary			
Delay	16.2		
HCM Level of Service	C		
Intersection Capacity Utilization	50.5%	ICU Level of Service	A
Analysis Period (min)	15		