MEMORANDUM

AYRES ASSOCIATES

To: Dennis Osgood, La Crosse County Commissioner

From: John Davis, P.E., PTOE and Leah Ness, P.E.

Date: May 5, 2010 Project No.: 45-0338.00

Re: Traffic Signal Warrant Study

County Trunk Highway OT (CTH OT) in La Crosse County runs east/west from State Trunk Highway 35 (STH 35) to CTH SN/Sand Lake Road. The traffic signal warrant study is focusing on the intersection of CTH OT/Corporate Drive/Commerce Road which is located approximately 725 feet west of USH 53 southbound ramp terminal intersecting with CTH OT in the Town of Onalaska. The following discusses the data collection and field investigation related to the study, area development that will potentially impact CTH OT traffic volumes at the study intersection, and evaluation of traffic signal warrants for the study intersection.

EXHIBIT 1: CTH OT/Commerce Road/Corporate Drive Intersection

Data Collection and Field Reconnaissance
The intersection of CTH OT/Corporate Drive/Commerce Road currently operates with two-way stop sign control on Corporate Drive and Commerce Road. The east and westbound lanes on CTH OT are shared through-left and shared through-right turn lanes. The Corporate Drive and Commerce Road approaches operate with a dedicated right turn lane and a shared through-left turn lane as shown to the right.

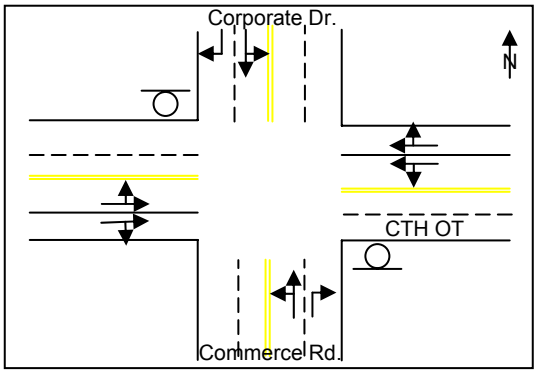


EXHIBIT 2: CTH OT/Commerce Road/Corporate Drive Geometrics

3433 Oakwood Hills Parkway ● Eau Claire, WI 54701-7698 ● 715.834.3161 ● Fax: 715.831.7500 ● www.AyresAssociates.com

During the field investigation, photos were taken on each of the intersection approaches at 125 feet, 250 feet, and 500 feet as shown in Attachment A. There are business and residential driveways within 500 feet of the intersection on three of the four approaches (the EB CTH OT approach does not have any accesses between the CTH OT/Southbound USH 53 Ramp terminal. Currently there are no designated pedestrian or bicycle facilities at the intersection. However, there are curb ramps on the southbound approach of Corporate Drive to accommodate future sidewalk along the north side of CTH OT.

CTH OT has a decent to the intersection with Corporate Drive and Commerce Road from both the east and westbound directions. According to the as-built plans, the profile east and west of the intersection is approximately 3 to 3.5% grade.

Manual Traffic Turning Movement Count

A 12-hour manual traffic turning movement count was collected at the intersection of CTH OT/Corporate Drive/Commerce Road in La Crosse County, on Tuesday, March 16, 2010. Vehicles were classified as passenger cars, heavy single unit trucks and semi trailers. Pedestrian and bicyclist data was also collected. Attachment B summarizes the manual turning movement count data which has been used to evaluate traffic signal warrants as described in the Warrant Analysis section.

The 12-hour manual traffic turning movement count defined three peak travel periods throughout the day. The morning peak travel period occurred between 7:15 AM to 8:15 AM, the midday peak travel period from 12:00 PM to 1:00 PM and the evening peak travel period from 4:45 PM to 5:45 PM. Of the entering traffic at the intersection, 51% is east and westbound through traffic on CTH OT and approximately 23% of the traffic is making a left turn from CTH OT. The left turning movement from Corporate Drive and Commerce Road combine for 52% of all the side street movements.

There are no sidewalks, crosswalks or paths at the CTH OT/ Corporate Drive/Commerce Road intersection. On the day of the data collection 21 pedestrian movements were recorded. The movements were split fairly equal between the north, south and east approaches. No bicyclists were recorded during the observation. If a bicyclist was commanding the driving lane, the bicyclist was considered a passenger vehicle.

The overall truck percentage was approximately 2% trucks, 1.5% being heavy single unit vehicles/Buses and 0.5% being semi-tractor trailers.

Intersection Crash History

Crash data and the corresponding police reports were requested from the Wisconsin Traffic Operations and Safety Laboratory at the study intersection of CTH OT/Corporate Drive/Commerce Road from January 2005 through December 2009. In the five year time period, there were 12 collisions at the study intersection of which eight were left angle crashes. There was at least one left turn crash on each of the intersection approaches with the eastbound approach having the highest number – three, see Attachment C for an intersection collision diagram and crash summary. Seven of the twelve crashes over the past five years occurred in 2009. Likewise, the highest total of crashes reported in any 12-month over the five year period was seven with only one crash of the nature that might be correctable by the installation of a traffic signal. A pattern was not detected in the time periods or direction of crashes that have occurred at the CTH OT/Commerce Road/Corporate Drive intersection. In Table 1, the annual crash rate trend for the CTH OT/Commerce Road/Corporate Drive intersection is shown.

TABLE 1. CTH OT/Commerce Road/Corporate Drive Intersection Crash Rate Trend

Year*	Intersection Crash Rate per Million Miles
2005	0.28
2006	0.57
2007	0.00
2008	0.57
2009	1.99
5 Year	0.68

*Crash Rate for each year calculated using the 2010 entering volumes

The 2009 crash rate of 1.99 is a result of seven crashes occurring in the one year. Over the five year time period, the twelve crashes results in a crash rate of 0.68. The table below summarized the crashes by type and severity.

TABLE 2. CTH OT/Commerce Road/Corporate Drive Intersection Crash Type and Severity

	Property Damage Only	Injury Severity Type			Total
Crash Type		C	B	A	
Left Turn	6	2	0	0	8
Right Angle	0	1	0	0	1
Rear End	3	0	0	0	3
Total	9	3	0	0	12

Of the twelve crashes at the CTH OT/Commerce Road/Corporate Drive intersection during the five year analysis time period, 66% of the crashes were left turn crashes with two of the eight left turn crashes resulting in injury. Overall 25% of the intersection crashes resulted in injury at a Type C level which means a possible injury. A Type C injury is considered “any injury which is not observable or evident at the scene but is claimed by the individual or suspected by the law enforcement officer.”

Intersection Operation

Level of Service (LOS) and delay are two measures of effectiveness used to analyze intersection operation. This analysis uses the *2000 Highway Capacity Manual* (HCM) for guidance on reporting LOS and delay for the study intersections. The following is a description of the HCM LOS definitions:

TABLE 3. Level of Service

LOS				
ALPHA LOS	**NUMERIC LOS**	**SIGNALIZED DELAY** (seconds/vehicle)	**UNSIGNALIZED DELAY** (seconds/vehicle)	**DESCRIPTION**
A	1.01 to 2.00	< 10	< 10	No Congestion, Minimal Delay
B	2.01 to 3.00	> 10 to 20	> 10 to 15	No Congestion
C	3.01 to 4.00	> 20 to 35	> 15 to 25	Minimal Congestion
D	4.01 to 5.00	> 35 to 55	> 25 to 35	Moderate Congestion
E	5.01 to 6.00	> 55 to 80	> 35 to 50	Severe Congestion
F	> 6.00	> 80	> 50	Extreme Congestion

LOS is a numeric ranking with a LOS 'A' requiring minimal driver interaction. This allows speed and vehicle path decisions to be unaffected by other roadway users resulting in no congestion and minimal delays. The LOS 'F' requires constant driver interaction. Speed and vehicle path are totally dictated by interaction with other users resulting in high congestion levels and delays.

Currently, CTH OT operates at LOS 'A' at the CTH OT/Corporate Drive/Commerce Road intersection during the morning, midday and evening peak periods. The side street approaches operate at a LOS 'D' or better during these peak periods.

Typically the LOS objective is for all movements on the Major Street to operate at LOS 'C' or better during the peak travel periods. Traffic operation on non-arterial highway streets intersecting with CTH OT may operate at a lower LOS during peak traffic periods.

Existing Development and Business

Commerce Road and Corporate Drive provide access to light industrial businesses, gas station and convenience stores, fast food restaurants, hotel, and residential land uses. In the northeast quadrant of the intersection there is a McDonald's and a Subway restaurant. In the southeast quadrant, there is a Kwik Trip gas station and convenience store. Each of these businesses along with the other local businesses generates trips through the CTH OT/ Corporate Drive/Commerce Road intersection. The driveway accesses to both Kwik Trip and McDonald's are fairly close to the intersection, which could be impacted with the installation of traffic signals or other control devices.

EXHIBIT 3: Businesses at the CTH OT/Commerce Road/Corporate Drive Intersection.

New Development Review

Based on discussions with Charlie Handy, the County Planner, the following locations have potential to develop which could directly effect on the CTH OT/Commerce Road/Corporate Drive intersection:

- Seven open parcels within Circle Drive are zoned industrial development
- Five open parcels on Creekside Lane are zoned industrial development
- Fifty plus open parcels on Heritage Village Drive are zoned residential (also have access to STH 35)

Using the 8th Edition of the *ITE Trip Generation,* trips were estimated for the undeveloped parcels that remain along CTH OT. The table below summarizes the possible development and related trip generation. All other properties are developed in areas adjacent to the study area.

TABLE 4. Trip Generation for Potential Development Impacts on CTH OT

Potential Development Impacts on CTH OT Trip Generation La Crosse County, Wisconsin							
		Weekday AM Peak Period			Weekday PM Peak Period		
Land Use	Proposed Size	In	Out	Total	In	Out	Total
110 General Light Industrial (Circle Drive)	7.71 acres	50	10	60	30	115	145
111 General Light Industrial (Creekside Lane)	3.3 acres	20	5	25	30	100	130
240 Mobile Home Park	40 occupied dwelling units	5	25	30	15	10	25
New Trips		**75**	**40**	**115**	**75**	**225**	**300**

Trips are rounded to nearest 5

ITE Fitted Curve Equation used to calculate Trips In/Out if available

Trip Generations are based on peak hour of adjacent street traffic if data was available

Based on *ITE Trip Generation,* 8th Edition

The existing development located on Corporate Drive is similar to that which the land is zoned for, therefore, the trip distribution of the potential development trips will be based on the existing peak hour turning movement count data. Attachment D shows the 12-hour trip distribution for the potential development.

Warrant Analysis

Due to the dedicated right turn lane on the minor streets, the 100% Urban traffic signal warrants was evaluated with no minor street right turns and 50% of the minor street right turns included. Warrant analysis was not completed for the 70% Rural level. This traffic signal warrant criterion is typically considered when the 85th percentile speed on the major street exceeds 40 mph or when the intersection lies within the built up area of an isolated community having a population of less than 10,000 people.

The traffic signal warrant worksheets related to the following analysis can be found in Attachment E.

Existing Traffic Volume Analysis

Traffic signal warrants, were evaluated using the existing 2010 traffic volume turning movement counts as described in the Manual of Uniform Traffic Control Devices (MUTCD) as adopted by the State of Wisconsin, and the WisDOT Traffic Signal Design Manual (TSDM), Chapter 2. The following warrants were not met with the existing 2010 traffic volumes at the 100% Urban evaluation level with no minor street right turns or with 50% of the minor street right turns:

- Warrant 1 – Eight Hour Vehicular Volume
- Warrant 2 – Four Hour Volume
- Warrant 3 – Peak Hour Volume
- Warrant 7 – Crash Experience

The following warrants were not evaluated for this study:

- Warrant 4 – Pedestrian Volume
- Warrant 5 – School Crossing
- Warrant 6 – Coordinated Signal System
- Warrant 8 – Roadway Network

The left turn conflict analysis is a supplement to the signal warrant analysis. Satisfaction of the left turn conflict analysis itself does not satisfy signal warrant criteria. However, at such locations where the left turn conflict analysis is satisfied, the planned traffic signal installation **shall** operate with a left turn phase. Based on the existing left turns and conflicting movements, the intersection conflicts are below the left turn conflict threshold.

Existing Traffic Volumes plus Development Analysis

Similar to the Existing Traffic Volume Analysis, traffic signal warrants were evaluated using the existing 2010 traffic volume turning movement counts plus the potential development. The following were not met with the existing 2010 plus potential development traffic volumes at the 100% Urban evaluation level with no minor street right turns or with 50% of the minor street right turns:

- Warrant 1 – Eight Hour Vehicular Volume
- Warrant 2 – Four Hour Volume
- Warrant 3 – Peak Hour Volume

The following warrants were not evaluated for this study:

- Warrant 4 – Pedestrian Volume
- Warrant 5 – School Crossing
- Warrant 6 – Coordinated Signal System
- Warrant 7 – Crash Experience
- Warrant 8 – Roadway Network

The left turn conflict analysis is a supplement to the signal warrant analysis. Satisfaction of the left turn conflict analysis itself does not satisfy signal warrant criteria. However, at such locations where the left turn conflict analysis is satisfied, the planned traffic signal installation **shall** operate with a left turn phase. Based on the existing left turns and conflicting movements, the intersection conflicts are below the left turn conflict threshold.

Traffic Signal Warrant Sensitivity Analysis

The Eight Hour, Four Hour and Peak Hour traffic signal warrants were evaluated for future traffic volumes to determine when the volumes at the CTH OT/Commerce Road/Corporate Drive intersection might meet these traffic signal warrants. Using the 100% Urban evaluation level with no minor street right turns, the following warrants are expected to be met when:

- Warrant 1 – Eight Hour Vehicular Volume

  As shown in Table 5, when no minor street right turns are included in the volumes, the Major and Minor street volumes need to increase 85% to meet the 100% condition. At the 80% condition, the Major street would need a 50% increase in traffic and the Minor street a 45% increase in traffic.

  When 50% of the minor street right turns are included in the volumes, the Major and Minor street volumes need to increase 85% and 50% respectively to meet the 100% condition. At the 80% condition, the Major street would need a 50% increase in traffic and the Minor street a 20% increase in traffic.

TABLE 5. Traffic Volume Increase to Meet Warrant 1 Thresholds

	No Minor Street Right Turns		50% Minor Street Right Turns	
	Major Street	Minor Street	Major Street	Minor Street
Condition A				
100%	25%	85%	25%	50%
80%	-	45%	-	20%
Condition B				
100%	85%	-	85%	-
80%	50%	-	50%	-
Condition C				
Condition A	-	45%	-	20%
Condition B	50%	-	50%	-

- Indicates the movement meets the warrant threshold

- Warrant 2 – Four Hour Volume

At minimum, for the Four Hour Volume Warrant 2 to be met, the lowest of the four hour volumes would need to increase by 20% when 50% of the Minor Street right turns are included. If there are no right turns included, the lowest of the four hour volumes would need to increase by 25% as shown in Table 6.

TABLE 6. Traffic Volume Increase to Meet Warrant 2 Threshold

No Minor Street Right Turns	50% Minor Street Right Turns
25% increase to lowest of Four Hour Volumes	20% increase to lowest of Four Hour Volumes

- Warrant 3 – Peak Hour Volume

Similar to Warrant 2, for the Peak Hour Volume Warrant 3 to be met, the peak hour volumes would need to increase by 45% when 50% of the Minor Street right turns are included and by 60% when no right turns are included, as shown in Table 7.

TABLE 7. Traffic Volume Increase to Meet Warrant 3 Threshold

No Minor Street Right Turns	50% Minor Street Right Turns
60% increase to Peak Hour Volumes	45% increase to Peak Hour Volumes

Conclusions and Recommendations

Evaluation of the traffic signal warrants at the CTH OT/Corporate Drive/Commerce Road intersection results in none of the warrants being met at the 100% Urban level with 50% of the minor street right turns included or without right turns included in the analysis. Neither the existing 2010 traffic volumes nor the 2010 traffic volumes with development are anticipated to meet the 100% Urban level traffic signal warrants. Warrant No. 7 – Crash Experience is not met as only one of crash in any 12-month period was susceptible to being corrected by the installation of a traffic signal.

From the review of the existing crash data and confirmation from field observation, it is concluded that a left turning motorist from the side street at the CTH OT/Corporate Drive/Commerce Road intersection may have difficulty seeing through traffic on CTH OT if there is a left or right turning vehicle on CTH OT with the current intersection geometry. The addition of a designated left turn lane on CTH OT would reduce the chances of a vehicle on the inside lanes of CTH OT colliding with a turning or through moving vehicle from the side street.

It is our opinion that incorporation of geometric changes at the CTH OT/Corporate Drive/Commerce Road intersection should be pursued prior to implementing traffic signal control. According to the FHWA Desktop Reference for Crash Reduction Factors, the addition of a left turn lane on CTH OT could result in up to a 48% crash reduction of all crashes and a 60% crash reduction of left-turn crashes. Operations of the intersection are expected to improve with the addition of a left turn lane on CTH OT as well as motorists' sight of through traffic improving. A proposed geometric concept sketch is attached in Attachment F which also incorporates a two-way left-turn lane on CTHOT. The lane reduction allows for a two-way left turn lane between STH 35 and the CTH OT/Corporate Drive/Commerce Road intersection.

Additionally, bike lanes can be pavement marked off on both the north and south side of CTH OT.

Reducing a roadway from four lanes to three lanes is commonly called a “road diet”. According to the ITE *Designing Walkable Urban Thoroughfares: A Context Sensitive Approach,* “road diets reduce conflicts at intersection, reduce accidents and have minimal effects on traffic capacity and diversion on thoroughfares under 20,0000 vehicles per day.” and in some cases, road diets reduce travel speeds resulting in improved traffic flow.

ATTACHMENT A
Intersection Approach Photos

1. 125 FT Commerce Rd.JPG

2. 250 FT Commerce Rd 2.JPG

3. 500 FT Commerce Rd 2.JPG

4. 125 FT EB CTH OT.JPG

5. 250 FT EB CTH OT 2.JPG

6. 500 FT EB CTH OT 2.JPG

7. 125 FT Corporate Dr 2.JPG

8. 250 FT Corporate Dr 3.JPG

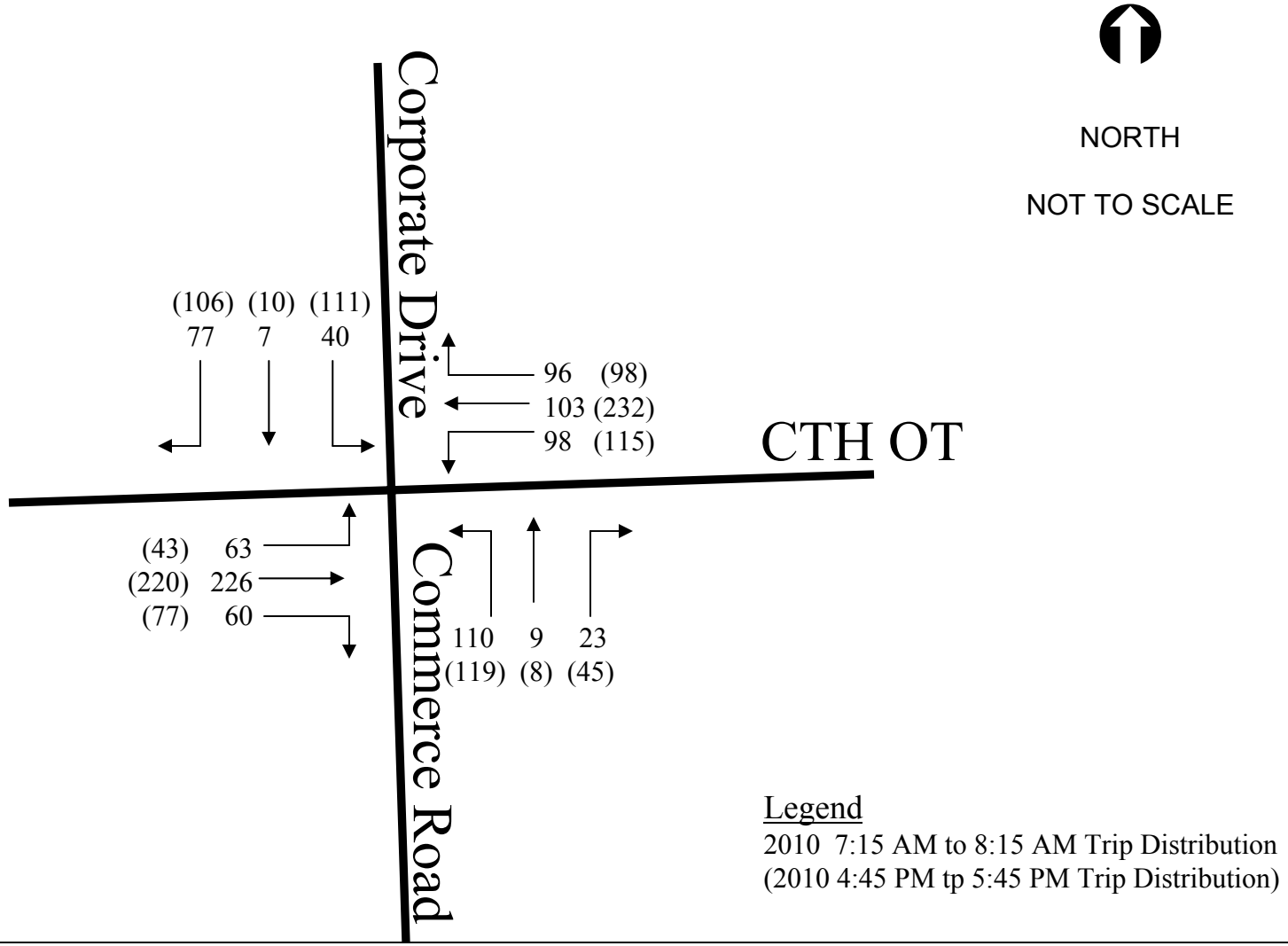
10. 125 FT WB CTH OT 2.JPG

11. 250 FT WB CTH OT 3.JPG

12. 500 FT WB CTH OT 4.JPG

9. Corporate Dr-Circle Dr Intersection looking SB.JPG

ATTACHMENT B
Summary of Manual Turning Movement Count Data



CTH OT Traffic Signal Warrant Study Corporate Drive/Commerce Road La Crosse County, Wisconsin April 2010	Attachment B 2010 Peak Period Manual Turning Movement Traffic Volumes	AYRES ASSOCIATES

ATTACHMENT C
Intersection Collision Diagram and Crash Summary

TRAFFIC SURVEY VEHICLE VOLUME COUNT
GRAPHIC SUMMARY SHEET

Date: Tuesday, March 16, **Day:** 0 **Time:** 6 AM to 6 PM

Region: N/A **County:** La Crosse **Rural:** No **City:** Town of Holman

Intersection of: CTH OT/Commerce/Corporate

Weather: Partly Cloudy **Road Condition:** Dry **Observers:** Jeff Stockburger and Joe Robertson

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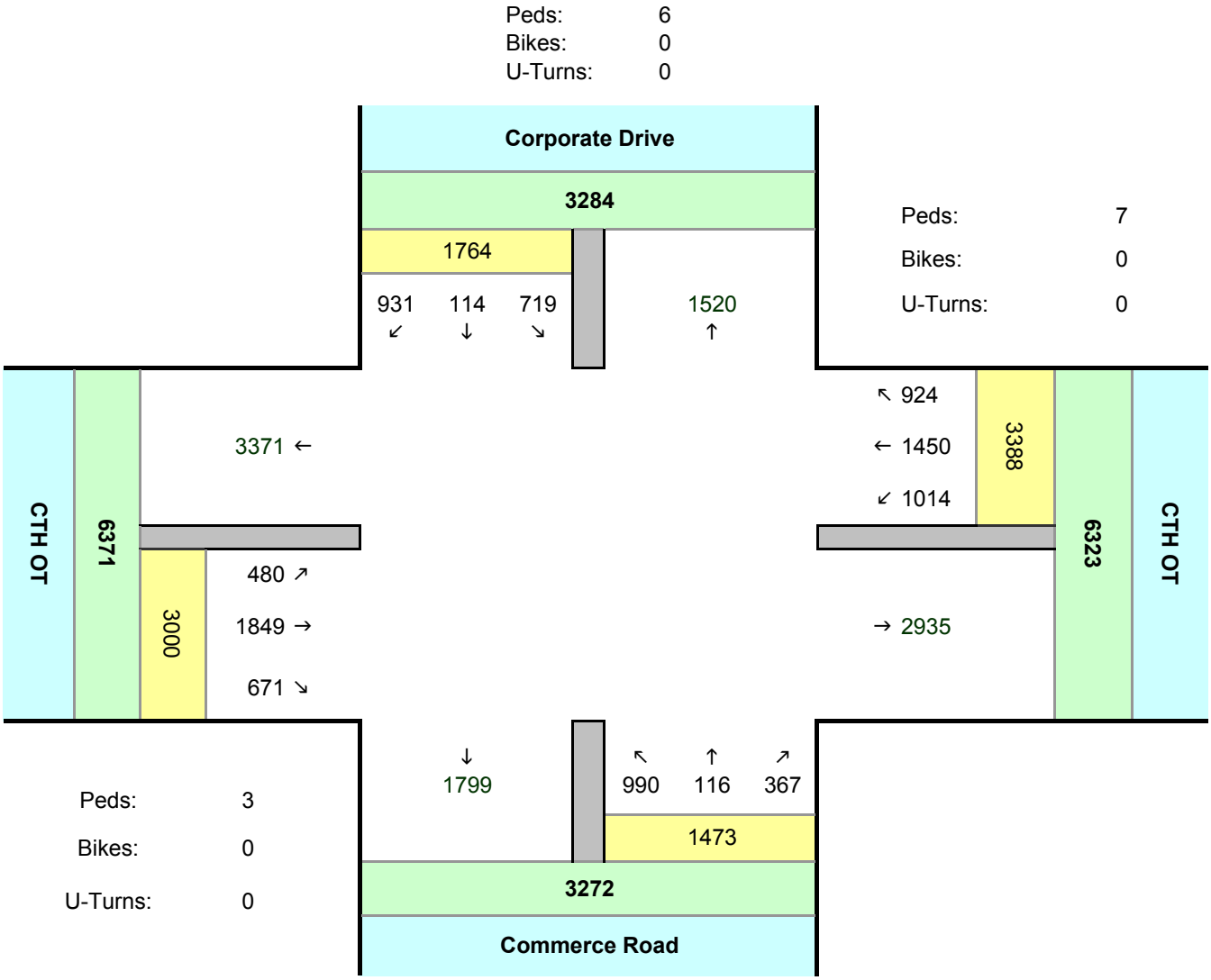
All Vehicle Types/Peds/Bike/U-Turn:



Volume Summary - ALL VEHICLES

INTERSECTION: CTH OT/Commerce/Corporate

Date: Tuesday, March 16, 2010 Day: 0 City: Town of Holman Traffic Control: Two-Way Stop
Weather: Partly Cloudy Legend: LT = Left Turn, TH = Thru, RT = Right Turn

Time Period	Corporate Drive From North				Commerce Road From South				CTH OT From East				CTH OT From West				Total ALL DIR	PHF Peak Hr Vol	PHF[1]	PHF Segment Peak Hr Vol	
	LT	TH	RT	Total	LT	TH	RT	Total	LT	TH	RT	Total	LT	TH	RT	Total					
6:00 AM	4	3	2	9	8	0	5	13	5	4	14	23	6	13	6	25	70	*	*	**AM Peak Hour Intervals**	
6:15 AM	3	1	7	11	16	0	5	21	8	7	25	40	14	24	5	43	115	*	*		
6:30 AM	3	0	6	9	20	0	4	24	11	9	24	44	9	34	3	46	123	*	*	7:15 AM	
6:45 AM	7	0	14	21	23	1	4	28	11	27	21	59	13	39	9	61	169	477	0.71	7:30 AM	
7:00 AM	5	2	9	16	24	3	8	35	14	13	17	44	14	49	14	77	172	579	0.84	7:45 AM	
7:15 AM	13	1	17	31	20	1	7	28	20	26	22	68	13	52	21	86	213	677	0.79	8:00 AM	
7:30 AM	9	2	18	29	37	3	8	48	23	26	27	76	20	64	11	95	248	802	0.81		
7:45 AM	8	2	23	33	31	4	4	39	24	29	25	78	20	77	12	109	259	892	0.86		
8:00 AM	10	2	19	31	22	1	4	27	31	22	22	75	10	33	16	59	192	**912**	0.88		
8:15 AM	7	1	19	27	16	2	6	24	23	22	19	64	10	52	12	74	189	888	0.86		
8:30 AM	8	2	21	31	21	2	6	29	20	19	16	55	9	40	13	62	177	817	0.79		
8:45 AM	10	2	23	35	24	4	6	34	18	17	11	46	9	30	15	54	169	727	0.95		
9:00 AM	14	1	17	32	19	4	2	25	13	13	11	37	6	31	12	49	143	678	0.90	0.88	AM Peak Hour Volume
9:15 AM	9	0	15	24	13	2	2	17	9	12	6	27	4	34	11	49	117	606	0.86		
9:30 AM	11	3	11	25	11	3	1	15	13	14	12	39	7	26	14	47	126	555	0.82		
9:45 AM	13	0	10	23	15	0	7	22	10	18	17	45	7	32	5	44	134	520	0.91		
10:00 AM	5	1	16	22	14	0	11	25	16	23	10	49	12	33	9	54	150	527	0.88		
10:15 AM	10	2	10	22	13	1	4	18	13	17	17	47	6	21	17	44	131	541	0.90		
10:30 AM	12	3	11	26	14	1	6	21	15	19	13	47	7	24	12	43	137	552	0.92		
10:45 AM	15	4	13	32	16	1	8	25	17	21	9	47	9	29	6	44	148	566	0.94		
11:00 AM	10	0	11	21	16	2	8	26	11	22	8	41	14	33	7	54	142	558	0.94	**Midday Peak Hour**	
11:15 AM	15	1	18	34	17	3	3	23	31	25	12	68	9	32	14	55	180	607	0.84	12:00 PM	
11:30 AM	11	2	15	28	9	3	2	14	14	11	7	32	6	15	12	33	107	577	0.80	12:15 PM	
11:45 AM	11	0	32	43	12	3	9	24	30	35	21	86	8	25	17	50	203	632	0.78	12:30 PM	
12:00 PM	23	7	30	60	31	3	7	41	41	24	22	87	8	32	36	76	264	754	0.71	12:45 PM	
12:15 PM	26	10	35	71	23	9	14	46	30	34	25	89	11	39	17	67	273	847	0.78		
12:30 PM	29	8	33	70	21	3	13	37	30	26	17	73	7	31	20	58	238	978	0.90		
12:45 PM	20	3	24	47	15	4	7	26	28	27	15	70	11	41	23	75	218	**993**	0.91		
1:00 PM	30	5	29	64	12	1	7	20	22	20	19	61	3	23	24	50	195	924	0.85	0.91	Midday Peak Hour
1:15 PM	19	2	27	48	14	2	4	20	33	22	19	74	11	32	11	54	196	847	0.89		
1:30 PM	25	2	16	43	11	1	8	20	18	33	8	59	13	27	20	60	182	791	0.91		
1:45 PM	13	3	17	33	16	3	6	25	16	35	10	61	10	33	21	64	183	756	0.96		
2:00 PM	14	3	25	42	13	3	11	27	21	24	26	71	5	33	11	49	189	750	0.96	**PM Peak Hour**	
2:15 PM	14	2	28	44	15	4	4	23	19	40	18	77	13	29	15	57	201	755	0.94	4:45 PM	
2:30 PM	14	5	15	34	24	0	14	38	19	31	24	74	9	41	15	65	211	784	0.93	5:00 PM	
2:45 PM	6	1	13	20	22	1	6	29	18	44	21	83	6	43	8	57	189	790	0.94	5:15 PM	
3:00 PM	12	1	22	35	35	6	5	46	21	37	25	83	17	36	11	64	228	829	0.91	5:30 PM	
3:15 PM	18	3	20	41	22	1	15	38	22	53	30	105	7	52	8	67	251	879	0.88		
3:30 PM	17	3	20	40	27	3	15	45	25	55	33	113	8	54	13	75	273	941	0.86		
3:45 PM	17	3	21	41	31	4	16	51	28	57	36	121	8	57	17	82	295	1047	0.89		
4:00 PM	29	4	20	53	23	4	11	38	27	48	32	107	10	41	11	62	260	1079	0.91		
4:15 PM	20	1	24	45	30	2	12	44	26	52	20	98	14	38	15	67	254	1082	0.92		
4:30 PM	21	2	27	50	26	6	12	44	26	58	21	105	12	51	12	75	274	1083	0.92	0.99	**PM Peak Hour**
4:45 PM	24	2	24	50	21	2	12	35	24	63	22	109	13	57	27	97	291	1079	0.93		
5:00 PM	23	4	29	56	34	2	11	47	31	51	19	101	10	70	14	94	298	1117	0.94		
5:15 PM	33	2	29	64	30	2	12	44	32	67	25	124	9	41	16	66	298	1161	0.97		
5:30 PM	31	2	24	57	34	2	10	46	28	51	32	111	11	52	20	83	297	**1184**	0.99		
5:45 PM	18	1	22	41	29	4	5	38	29	47	19	95	12	54	13	79	253	1146	0.96		
Total	719	114	931	1764	990	116	367	1473	1014	1450	924	3388	480	1849	671	3000	9625		Average Daily PHF:		0.93

Notes:

1. PHF shown for hour that ends with that interval. For example, the PHF shown at 6:45 AM is for the 6:00 - 7:00 AM hour.
2.
3

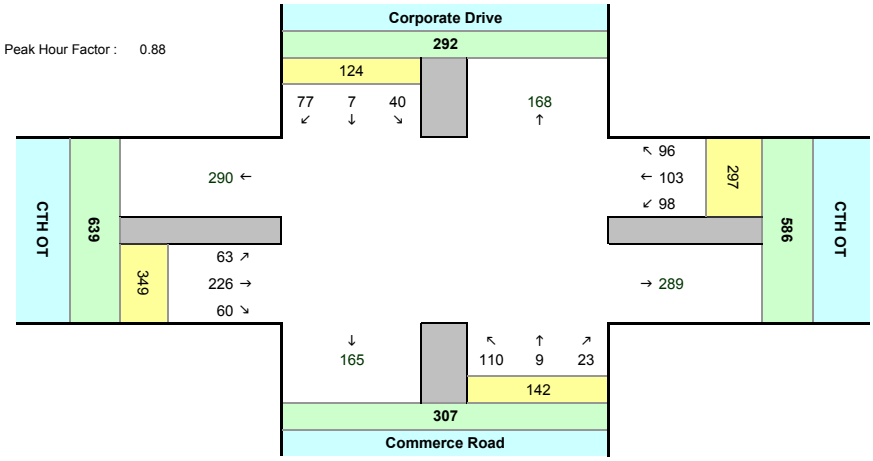
Volume Summary - AM Peak Hour Volume Summary

INTERSECTION: CTH OT/Commerce/Corporate

Date: Tuesday, March 16, 2010 Day: 0 City: Town of Holman Traffic Control: Two-Way Stop
Weather: Partly Cloudy Legend: LT = Left Turn, TH = Thru, RT = Right Turn

	Corporate Drive				Commerce Road				CTH OT				CTH OT				Totals			U - Turns				
	From North				From South				From East				From West				North	East	ALL	From				ALL
Time Period	LT	TH	RT	Total	LT	TH	RT	Total	LT	TH	RT	Total	LT	TH	RT	Total	South	West	DIR	N	S	E	W	DIR
6:00 AM																								
6:15 AM																								
6:30 AM																								
6:45 AM																								
7:00 AM																								
7:15 AM	13	1	17	31	20	1	7	28	20	26	22	68	13	52	21	86	59	154	213	0	0	0	0	0
7:30 AM	9	2	18	29	37	3	8	48	23	26	27	76	20	64	11	95	77	171	248	0	0	0	0	0
7:45 AM	8	2	23	33	31	4	4	39	24	29	25	78	20	77	12	109	72	187	259	0	0	0	0	0
8:00 AM	10	2	19	31	22	1	4	27	31	22	22	75	10	33	16	59	58	134	192	0	0	0	0	0
8:15 AM																								
8:30 AM																								
8:45 AM																								
9:00 AM																								
9:15 AM																								
9:30 AM																								
9:45 AM																								
10:00 AM																								
10:15 AM																								
10:30 AM																								
10:45 AM																								
Total	40	7	77	124	110	9	23	142	98	103	96	297	63	226	60	349	266	646	912	0	0	0	0	0

PEAK HOUR TRAFFIC MOVEMENTS (AM)



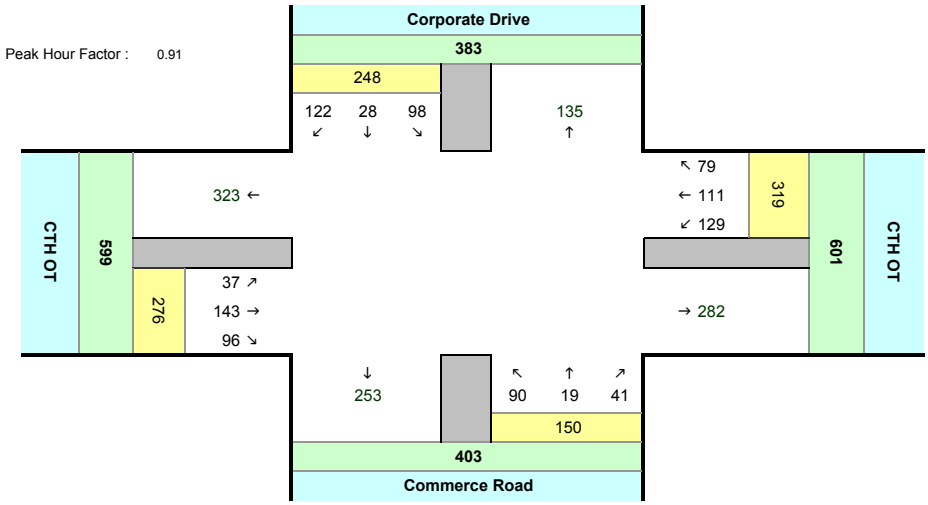
Volume Summary - Midday Peak Hour Volume Summary

INTERSECTION: CTH OT/Commerce/Corporate

Date: Tuesday, March 16, 201 Day: 0 City: Town of Holman Traffic Control: Two-Way Stop
Weather: Partly Cloudy Legend: LT = Left Turn, TH = Thru, RT = Right Turn

Time Period	Corporate Drive From North				Commerce Road From South				CTH OT From East				CTH OT From West				Totals			U - Turns From				
	LT	TH	RT	Total	LT	TH	RT	Total	LT	TH	RT	Total	LT	TH	RT	Total	North South	East West	ALL DIR	N	S	E	W	ALL DIR
11:00 AM																								
11:15 AM																								
11:30 AM																								
11:45 AM																								
12:00 PM	23	7	30	60	31	3	7	41	41	24	22	87	8	32	36	76	101	163	264	0	0	0	0	0
12:15 PM	26	10	35	71	23	9	14	46	30	34	25	89	11	39	17	67	117	156	273	0	0	0	0	0
12:30 PM	29	8	33	70	21	3	13	37	30	26	17	73	7	31	20	58	107	131	238	0	0	0	0	0
12:45 PM	20	3	24	47	15	4	7	26	28	27	15	70	11	41	23	75	73	145	218	0	0	0	0	0
1:00 PM																								
1:15 PM																								
1:30 PM																								
1:45 PM																								
Total	98	28	122	248	90	19	41	150	129	111	79	319	37	143	96	276	398	595	993	0	0	0	0	0

PEAK HOUR TRAFFIC MOVEMENTS (Midday)



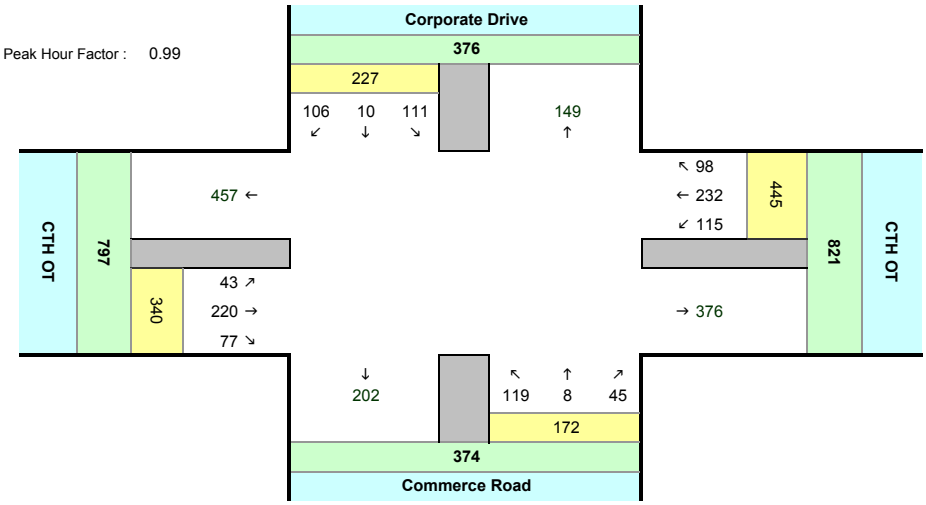
Volume Summary - PM Peak Hour Volume Summary

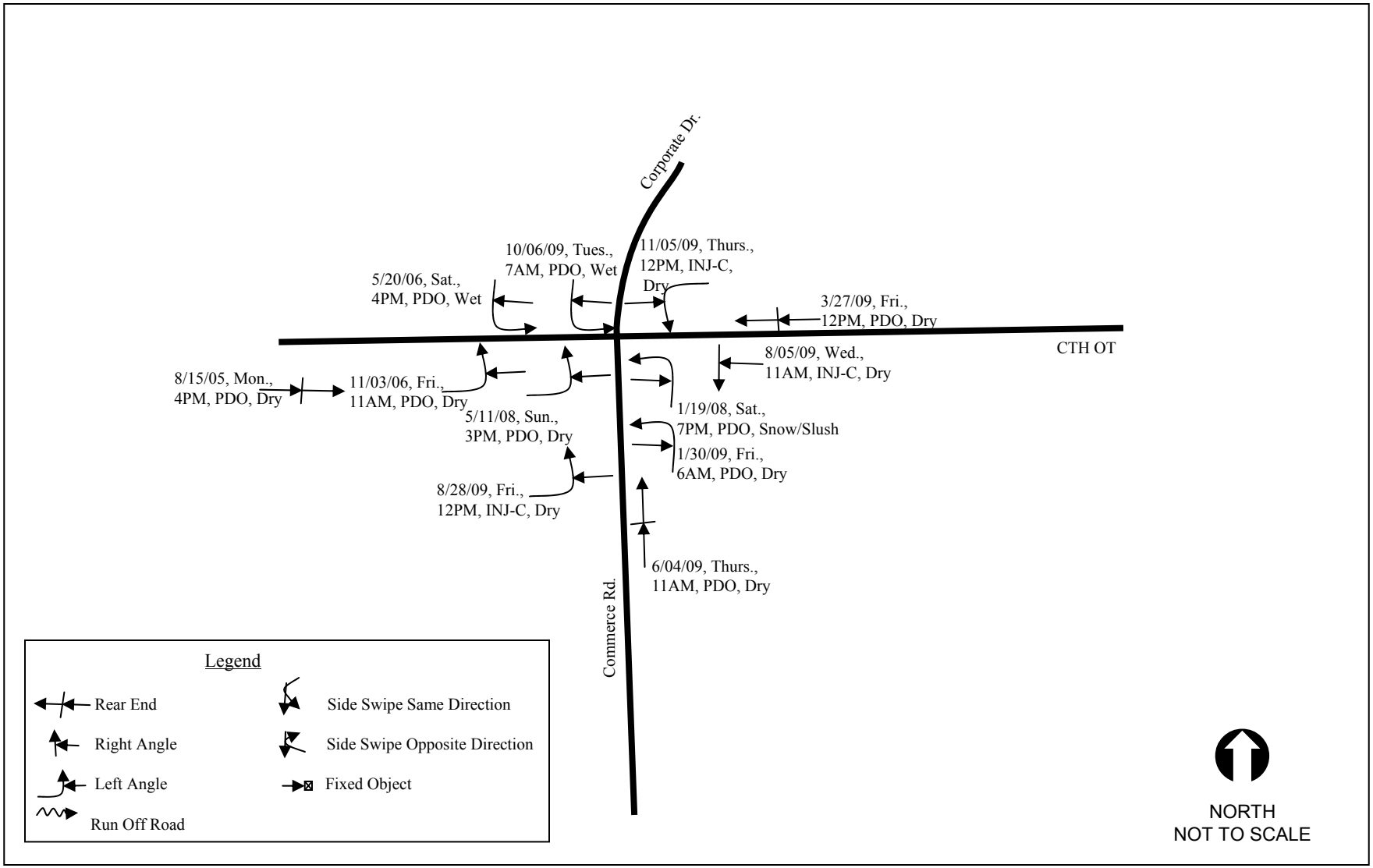
INTERSECTION: CTH OT/Commerce/Corporate

Date: Tuesday, March 16, 201 Day: 0 City: Town of Holman Traffic Control: Two-Way Stop
Weather: Partly Cloudy Legend: LT = Left Turn, TH = Thru, RT = Right Turn

Time Period	Corporate Drive From North				Commerce Road From South				CTH OT From East				CTH OT From West				Totals			U - Turns From				
	LT	TH	RT	Total	LT	TH	RT	Total	LT	TH	RT	Total	LT	TH	RT	Total	North South	East West	ALL DIR	N	S	E	W	ALL DIR
2:00 PM																								
2:15 PM																								
2:30 PM																								
2:45 PM																								
3:00 PM																								
3:15 PM																								
3:30 PM																								
3:45 PM																								
4:00 PM																								
4:15 PM																								
4:30 PM																								
4:45 PM	24	2	24	50	21	2	12	35	24	63	22	109	13	57	27	97	85	206	291	0	0	0	0	0
5:00 PM	23	4	29	56	34	2	11	47	31	51	19	101	10	70	14	94	103	195	298	0	0	0	0	0
5:15 PM	33	2	29	64	30	2	12	44	32	67	25	124	9	41	16	66	108	190	298	0	0	0	0	0
5:30 PM	31	2	24	57	34	2	10	46	28	51	32	111	11	52	20	83	103	194	297	0	0	0	0	0
5:45 PM																								
Total	111	10	106	227	119	8	45	172	115	232	98	445	43	220	77	340	399	785	1184	0	0	0	0	0

PEAK HOUR TRAFFIC MOVEMENTS (PM)





CTH OT Traffic Signal Warrant Study Corporate Drive/Commerce Road La Crosse County, Wisconsin April 2010	Attachment C CTH OT/Commerce Rd./Corporate Dr. 2005-2009 Crash Diagram	AYRES ASSOCIATES

INTERSECTION CRASH STATISTICS

AYRES ASSOCIATES

INTERSECTION: CTH OT/Commerce Road/Corporate Drive
MUNICIPALITY: Onalaska COUNTY: La Crosse STATE: WI
PERIOD: 5 YEARS 0 MONTHS FROM: 1/1/2005 TO: 12/31/2009

PROJECT ID:	45-0338.00 00A98	PREPARED BY:	LMN	DATE:	3/18/2010

INTERSECTION CHARACTERISTICS

TRAFFIC CONTROL: MINOR STOP CONTROLLED
INTERSECTION AADT (2005): 9,250
NUMBER OF LEGS: 4
POSTED SPEED MAJOR: 35
POSTED SPEED MINOR: 25

CRASH STATISTICS

CRASH FREQUENCY & SEVERITY				
YEAR	PDO	INJURY	FATAL	TOTAL
2005	1	0	0	1
2006	2	0	0	2
2007	0	0	0	0
2008	2	0	0	2
2009	4	3	0	7
TOTAL	9	3	0	12
PERCENT	64.9%	35.1%	0.0%	100.0%
YEAR AVG.	7.40	4.00	0.00	11.40

CRASH RATES	per MEV
CRASH RATE	3.38
INJURY CRASH RATE	1.18
FATAL CRASH RATE	0.00

LIGHT CONDITIONS		%
DAY	1	100.0%
DARK	0	0.0%
TOTAL	1	100.0%

ROAD CONDITIONS		%
DRY	9	75.0%
WET	2	16.7%
SNOW	1	8.3%
ICE	0	0.0%
OTHER	0	0.0%
TOTAL	12	100.0%

CRASH TYPE		%
LEFT ANGLE	8	66.7%
RIGHT ANGLE	1	8.3%
REAR-END	3	25.0%
SS-SAME	0	0.0%
SS-OPPOSITE	0	3.6%
PEDESTRIAN	0	0.0%
BICYCLE	0	0.0%
FIXED	0	0.0%
NOT FIXED	0	0.0%
DEER	0	0.0%
OVERTURN	0	0.0%
OTHR/UNKN	0	0.0%
TOTAL	12	100.0%

DAY AND TIME							
DAY OF WEEK	*EARLY MORNING* 12:00 AM TO 5:59 AM	*AM PEAK* 6:00 AM TO 9:59 AM	*MIDDAY* 10:00 AM TO 2:59 PM	*PM PEAK* 3:00 PM TO 6:59 PM	*LATE EVENING* 7:00 PM TO 11:59 PM	TOTAL	
MONDAY	0	0	0	1	0	1	
TUESDAY	0	1	0	0	0	1	
WEDNESDAY	0	0	1	0	0	1	Weekday
THURSDAY	0	0	2	0	0	2	
FRIDAY	0	1	3	0	0	4	
SATURDAY	0	0	0	1	1	2	Weekend
SUNDAY	0	0	0	1	0	1	
TOTAL	0	2	6	3	1	12	

Notes:

Attachment C
INTERSECTION CRASH STATISTICS
CTH OT/Commerce Rd/Commercial Dr

K:\45033800\Traffic Analysis\Crash Data\[Ayres Int Crash Stats.CTH OT Commerce Corp.xls]CTH OT-Corp-Comm

INTERSECTION CRASH DATA

AYRES ASSOCIATES

INTERSECTION: CTH OT/Commerce Road/Corporate Drive
MUNICIPALITY: Onalaska COUNTY: La Crosse STATE: WI
PERIOD: 5 YEARS 0 MONTHS FROM: 1/1/2005 TO: 12/31/2009

PROJECT ID:	41-0586.00 41S04	PREPARED BY:	LMN	DATE:	3/18/2010

CRASH DETAILS

REF. NUMBER	LABEL	DATE	DAY OF WEEK	TIME OF DAY	SEVERITY	MANNER OF COLLISION	ACCIDENT TYPE	LIGHT COND.	ROAD COND.
7224500		08/15/05	MONDAY	4 PM	PDO	REAR-END	MV IN TRANS.	DAY	DRY
7851331		05/20/06	SATURDAY	4 PM	PDO	LEFT ANGLE	MV IN TRANS.	DAY	WET
8419537		11/03/06	FRIDAY	11 AM	PDO	LEFT ANGLE	MV IN TRANS.	DAY	DRY
8750300		05/11/08	SUNDAY	3 PM	PDO	LEFT ANGLE	MV IN TRANS.	DAY	DRY
A146014		03/27/09	FRIDAY	12 PM	PDO	REAR-END	MV IN TRANS.	DAY	DRY
FHXDM9F		06/04/09	THURSDAY	11 AM	PDO	REAR-END	MV IN TRANS.	DAY	DRY
FHSGV06		08/05/09	WEDNESDAY	11 AM	INJ-C	RIGHT ANGLE	MV IN TRANS.	DAY	DRY
8750399		08/28/09	FRIDAY	12 PM	INJ-C	LEFT ANGLE	MV IN TRANS.	DAY	DRY
F2CHZGZ		10/06/09	TUESDAY	7 AM	PDO	LEFT ANGLE	MV IN TRANS.	DAY	WET
F2CHZH4		11/05/09	THURSDAY	12 PM	INJ-C	LEFT ANGLE	MV IN TRANS.	DAY	DRY
F2QROFQ		01/19/08	SATURDAY	7 PM	PDO	LEFT ANGLE	MV IN TRANS.	DAY	SNOW/SLU
F2KP4W8		01/30/09	FRIDAY	6 AM	PDO	LEFT ANGLE	MV IN TRANS.	DAWN	DRY

Notes:

Attachment C
INTERSECTION CRASH STATISTICS
CTH OT/Commerce Rd/Commercial Dr

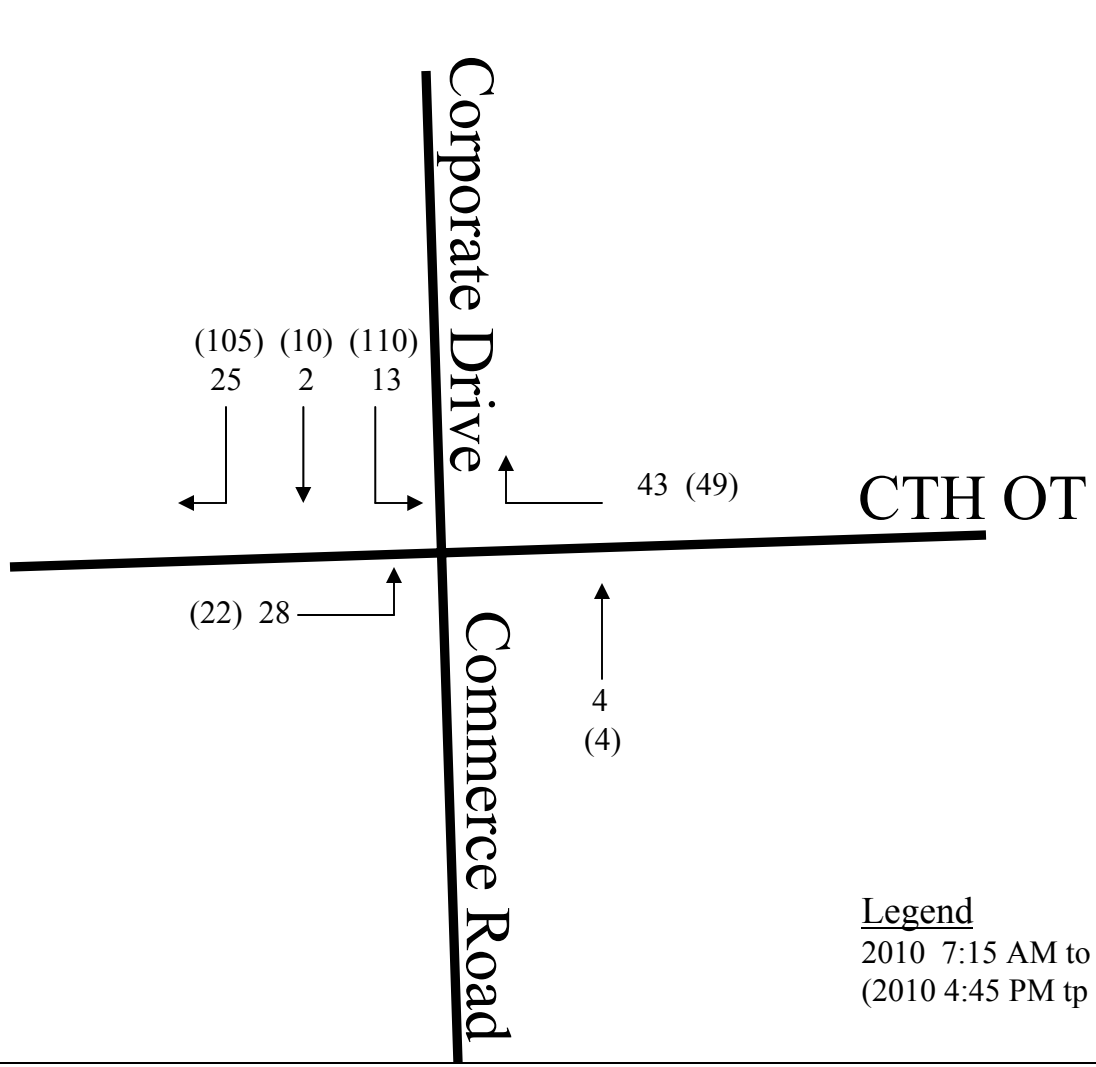
K:\45033800\Traffic Analysis\Crash Data\[Ayres Int Crash Stats CTH OT Commerce Corp.xls]CTH OT-Corp-Comm

ATTACHMENT D
12-Hour Trip Distribution for Potential Development

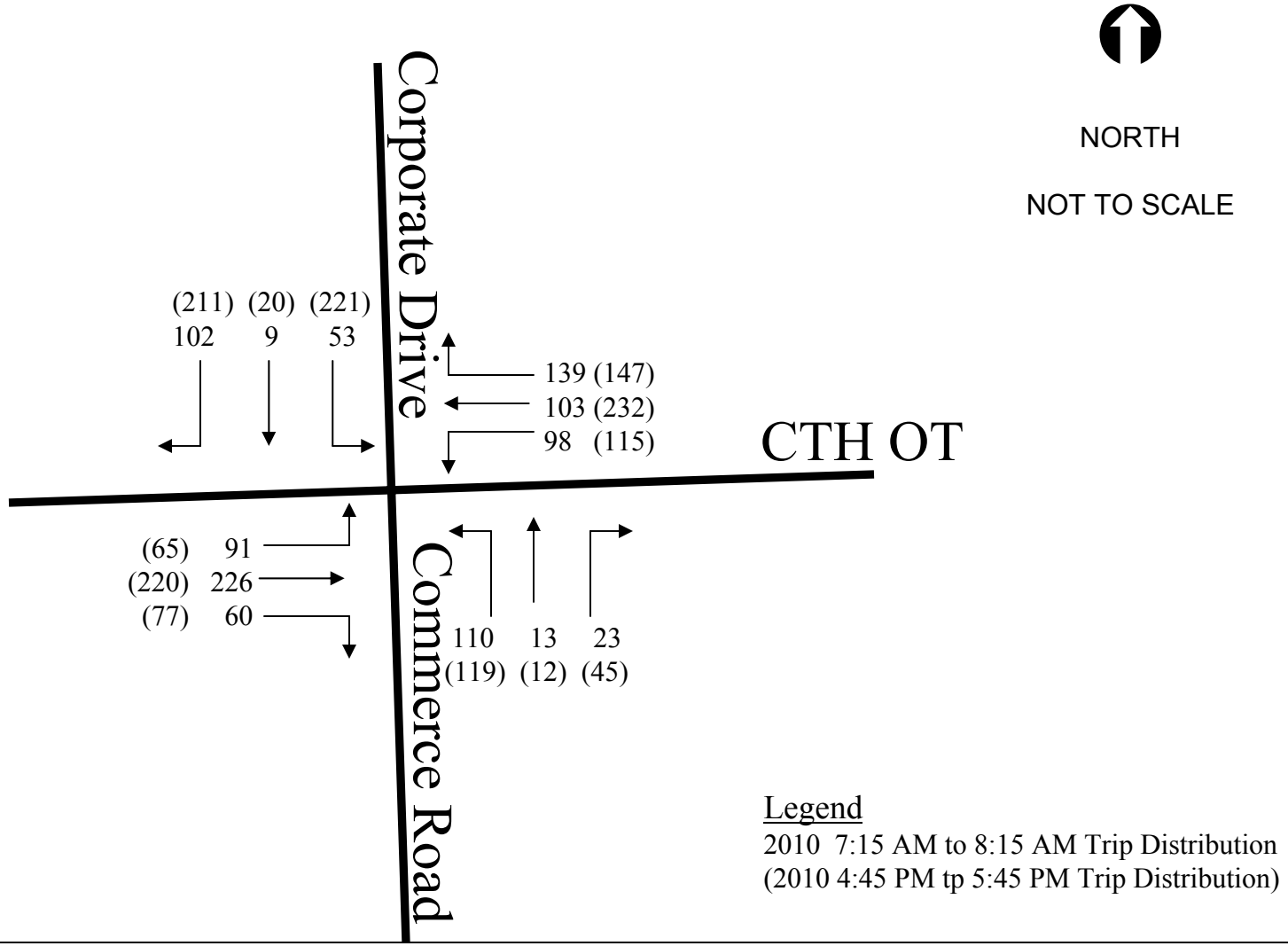
Volume Summary - ALL VEHICLES

2010 traffic count plus Development

	Corporate Drive				Commerce Road				CTH OT				CTH OT			
Time	From North				From South				From East				From West			
Period	LT	TH	RT	Total	LT	TH	RT	Total	LT	TH	RT	Total	LT	TH	RT	Total
6:00 AM	25	6	42	73	67	1	32	86	61	47	84	166	42	110	40	175
7:00 AM	47	9	90	146	112	11	35	150	104	94	91	289	67	242	75	384
8:00 AM	41	8	97	147	83	9	27	114	111	80	68	259	38	155	68	261
9:00 AM	57	5	64	126	58	9	15	79	55	57	46	158	24	123	52	199
10:00 AM	52	12	62	126	57	3	34	89	71	80	49	200	34	107	51	192
11:00 AM	59	4	95	158	54	11	26	87	101	93	48	242	37	105	59	201
12:00 PM	112	32	140	284	90	19	47	150	148	111	79	338	37	143	110	290
1:00 PM	99	14	102	215	53	7	30	85	107	110	56	273	37	115	92	244
2:00 PM	63	14	106	183	74	8	44	117	97	139	89	325	33	146	61	240
3:00 PM	92	14	119	226	115	14	62	180	117	202	124	443	40	199	60	299
4:00 PM	123	12	124	259	100	14	54	161	119	221	95	435	49	187	75	311
5:00 PM	130	11	128	269	127	10	45	175	142	216	95	453	42	217	75	334
Total	1942	142	1170	3254	2096	116	449	2579	7944	1450	924	3582	480	1849	817	3128



CTH OT Traffic Signal Warrant Study Corporate Drive/Commerce Road La Crosse County, Wisconsin April 2010	Attachment D-1 Peak Period Trip Distribution Potential Development	AYRES ASSOCIATES



CTH OT Traffic Signal Warrant Study Corporate Drive/Commerce Road La Crosse County, Wisconsin April 2010	Attachment D-2 2010 Peak Period Manual Turning Movement plus Proposed Development Traffic Volumes	AYRES ASSOCIATES

ATTACHMENT E
Traffic Signal Warrant Analysis

Wisconsin Department of Transportation
Traffic Signal Warrant Summary Sheet

100% URBAN

The Worksheet(s) attached are provided as an attachment to the Engineering Investigation Study for:
Intersection: CTH OT/Corporate Drive/Commerce Road Date: 03/30/2010
County: La Crosse

Town / Village / City: Onalaska

Major Street	CTH OT	Critical Approach Speed	35	Lanes	2 per direction
Minor Street	Corporate/Commerce	Critical Approach Speed	25	Lanes	1

THIS INTERSECTION IS ANALYZED FOR URBAN WARRANTS. COMMENTS:

Note: The warrants for rural areas (70% of urban warrant) are used when the 85% speed on the major street exceeds 40 m.p.h. or when the intersection lies within the built-up area of an isolated community having a population of less than 10,000.

THE ANALYSIS IS BASED ON COUNTS CONDUCTED ON 3/16 & , 20 10 (DATES), Tuesday (DAYS), FROM 6:00 AM PM TO 6:00 AM PM

0% Right Turns Included

Warrant Evaluation Summary		**YES/NO/NOT EVALUATED**
Warrant 1	**Eight-Hour Vehicular Volume**	**NO**
Condition A	Minimum Vehicular Volume	NO
Condition B	Interruption of Continuous Traffic	NO
Condition C	Combination: 80% of A and B	NO
Warrant 2	**Four Hour Volume**	**NO**
Warrant 3	**Peak Hour Volume**	**NO**
Warrant 4	**Pedestrian Volume**	**NOT-EVALUATED**
Warrant 5	**School Crossing**	**NOT-EVALUATED**
Warrant 6	**Coordinated Signal System**	**NOT-EVALUATED**
Warrant 7	**Crash Experience**	**NO**
Warrant 8	**Roadway network**	**NOT-EVALUATED**
	Left Turn Conflict Analysis	**NO**

This analysis was conducted by:

Leah M Ness
(Name)

Ayres Associates
Agency)

03/30/2010
(Date)

TRAFFIC SIGNAL WARRANTS ANALYSIS FORM

Date: 03/30/2010

County: La Crosse

Town / Village / City: Onalaska

Major Street	CTH OT	Critical Approach Speed	35	Lanes	2 per direction
Minor Street	Corporate/Commerce	Approach Speed	25	Lanes	1

Volume Level

1. Critical speed of major road traffic > 40 mph : ☐ Yes ☒ No
2. In built-up area of isolated community of < 10,000 pop.: ☐ Yes ☒ No

If Question 1 or 2 above is answered "Yes" then use "70%" volume level: ☐ 70% ☒ 100%

WARRANT 1 – Eight-Hour Vehicular Volume

Warrant is satisfied if Condition A or B is "100 % satisfied." Warrant also satisfied if Condition C (80% of A and B) is satisfied.

8 Highest Hours								
Hour	5PM	4PM	3PM	7AM	1PM	2PM	12PM	8AM
Major Road Both App. vph	753	720	710	633	483	533	595	489
Minor Road High App. vph	137	114	129	123	99	82	126	92

Record hours where condition is met and the corresponding volumes in boxes provided. Condition is 100% satisfied if the minimum volumes are met for eight hours.

Condition A – Minimum Vehicular Volume

(volumes in veh/h)	Minimum Requirements (80% Shown in Brackets)			
Approach Lanes:	1		2 or more	
Volume Level:	100%	Hours	100%	Hours
Major Road-Both Approaches	**500**		**600**	4
	(400)		**(480)**	8
Minor Road-Highest Approach	**150**	0	**200**	
	(120)	4	**(160)**	

100% Satisfied: NO
80 % Satisfied: NO

Condition B – Interruption of Continuous Traffic

(volumes in veh/h)	Minimum Requirements (80% Shown in Brackets)			
Approach Lanes:	1		2 or more	
Volume Level:	100%	Hours	100%	Hours
Major Road-Both Approaches	**750**		**900**	0
	(600)		**(720)**	2
Minor Road-Highest Approach	**75**	8	**100**	
	(60)	8	**(80)**	

100% Satisfied: NO
80 % Satisfied: NO

Condition C – Combination of Condition A and B: Condition A and B Both 80% Satisfied?: NO

Warrant Satisfied?: NO

% Right Turns Included: 0

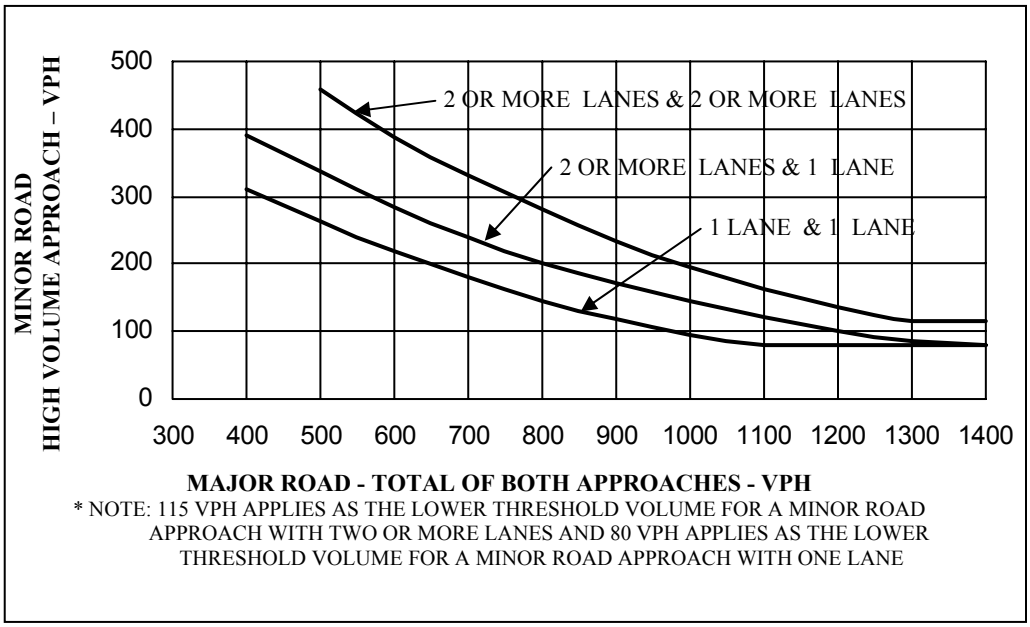
TRAFFIC SIGNAL WARRANTS ANALYSIS FORM

Warrant 2 – Four-Hour Vehicular Volume

Plot four volume combinations on the applicable figure below. If four points lie above the appropriate line, then the warrant is satisfied.

Figure A. Criteria for "100%" volume level.

Hour	5PM	4PM	3PM	7AM
Major Vol.	753	720	710	633
Minor Vol.	137	114	129	123



Satisfied?: NO

Warrant 3 – Peak Hour

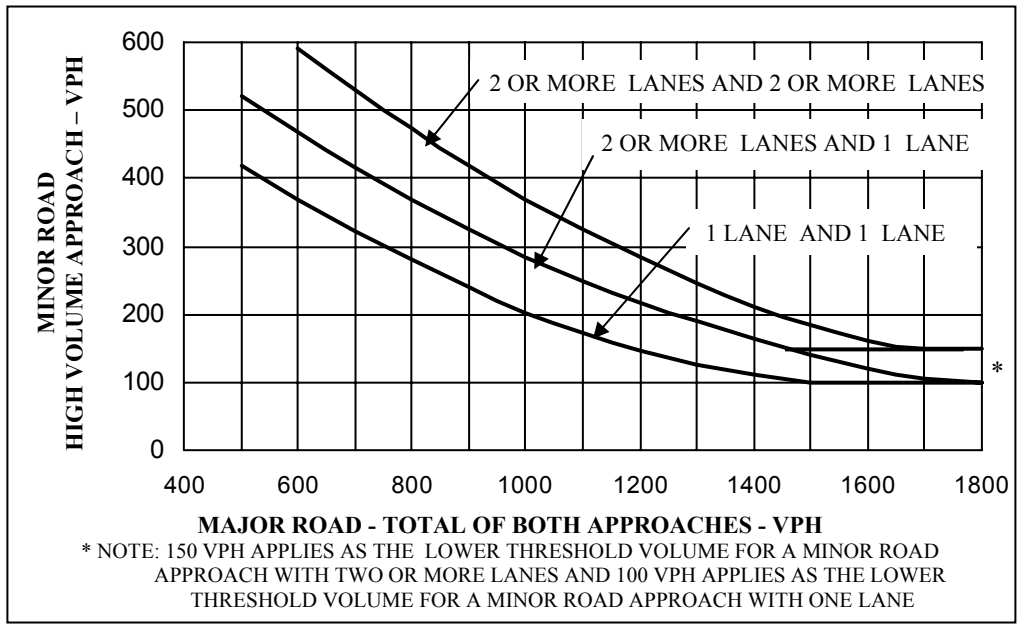
Unusual condition justifying use of warrant: _____

Record hour where criteria are fulfilled and the corresponding delay or volume in boxes provided. Plot the peak hour volume combination on the applicable figure below. If all three criteria are fulfilled or the plotted point lies above the appropriate line, then the warrant is satisfied.

Criteria	Approach Lanes		No. of Approaches		Hour	Fulfilled?	
	1	2	3	4		Yes	No
1. Delay on Minor Approach (veh-h)	4	5				☐	☐
2. Volume on Minor Approach (veh/h)	100	150				☐	☐
3. Total Entering Volume (veh/h)			650	800		☐	☐

Figure A. Criteria for "100%" volume level.

Hour	5PM
Major Vol.	753
Minor Vol.	137



Satisfied?: NO

Wisconsin Department of Transportation
Traffic Signal Warrant Summary Sheet

100% URBAN

The Worksheet(s) attached are provided as an attachment to the Engineering Investigation Study for:
Intersection: CTH OT/Corporate Drive/Commerce Road Date: 03/30/2010
County: La Crosse

Town / Village / City: Onalaska

Major Street	CTH OT	Critical Approach Speed	35	Lanes	2 per direction
Minor Street	Corporate/Commerce	Critical Approach Speed	25	Lanes	1

THIS INTERSECTION IS ANALYZED FOR URBAN WARRANTS. COMMENTS: W/Development

Note: The warrants for rural areas (70% of urban warrant) are used when the 85% speed on the major street exceeds 40 m.p.h. or when the intersection lies within the built-up area of an isolated community having a population of less than 10,000.

THE ANALYSIS IS BASED ON COUNTS CONDUCTED ON 3/16 & (DATES), 20 10, Tuesday (DAYS), FROM 6:00 AM PM TO 6:00 AM PM

0% Right Turns Included

Warrant Evaluation Summary		**YES/NO/NOT EVALUATED**
Warrant 1	**Eight-Hour Vehicular Volume**	**NO**
Condition A	Minimum Vehicular Volume	NO
Condition B	Interruption of Continuous Traffic	NO
Condition C	Combination: 80% of A and B	NO
Warrant 2	**Four Hour Volume**	**NO**
Warrant 3	**Peak Hour Volume**	**NO**
Warrant 4	**Pedestrian Volume**	**NOT-EVALUATED**
Warrant 5	**School Crossing**	**NOT-EVALUATED**
Warrant 6	**Coordinated Signal System**	**NOT-EVALUATED**
Warrant 7	**Crash Experience**	**NOT-EVALUATED**
Warrant 8	**Roadway network**	**NOT-EVALUATED**
	Left Turn Conflict Analysis	**NO**

This analysis was conducted by:

Leah M Ness
(Name)

Ayres Associates
Agency)

03/30/2010
(Date)

TRAFFIC SIGNAL WARRANTS ANALYSIS FORM

Date: 03/30/2010

County: La Crosse

Town / Village / City: Onalaska

Major Street	CTH OT	Critical Approach Speed	35	Lanes	2 per direction
Minor Street	Corporate/Commerce	Approach Speed	25	Lanes	1

Volume Level

1. Critical speed of major road traffic > 40 mph : ☐ Yes ☒ No
2. In built-up area of isolated community of < 10,000 pop.: ☐ Yes ☒ No

If Question 1 or 2 above is answered "Yes" then use "70%" volume level: ☐ 70% ☒ 100%

WARRANT 1 – Eight-Hour Vehicular Volume

Warrant is satisfied if Condition A or B is "100 % satisfied." Warrant also satisfied if Condition C (80% of A and B) is satisfied.

8 Highest Hours								
Hour	5PM	4PM	3PM	12PM	7AM	2PM	1PM	8AM
Major Road Both App. vph	787	746	741	629	673	565	517	519
Minor Road High App. vph	141	135	129	144	123	82	113	92

Record hours where condition is met and the corresponding volumes in boxes provided. Condition is 100% satisfied if the minimum volumes are met for eight hours.

Condition A – Minimum Vehicular Volume

(volumes in veh/h)	Minimum Requirements (80% Shown in Brackets)			
Approach Lanes:	1		2 or more	
Volume Level:	100%	Hours	100%	Hours
Major Road-Both Approaches	**500**		**600**	5
	(400)		**(480)**	8
Minor Road-Highest Approach	**150**	0	**200**	
	(120)	5	**(160)**	

100% Satisfied: NO
80 % Satisfied: NO

Condition B – Interruption of Continuous Traffic

(volumes in veh/h)	Minimum Requirements (80% Shown in Brackets)			
Approach Lanes:	1		2 or more	
Volume Level:	100%	Hours	100%	Hours
Major Road-Both Approaches	**750**		**900**	0
	(600)		**(720)**	3
Minor Road-Highest Approach	**75**	8	**100**	
	(60)	8	**(80)**	

100% Satisfied: NO
80 % Satisfied: NO

Condition C – Combination of Condition A and B: Condition A and B Both 80% Satisfied?: NO

Warrant Satisfied?: NO

% Right Turns Included: 0

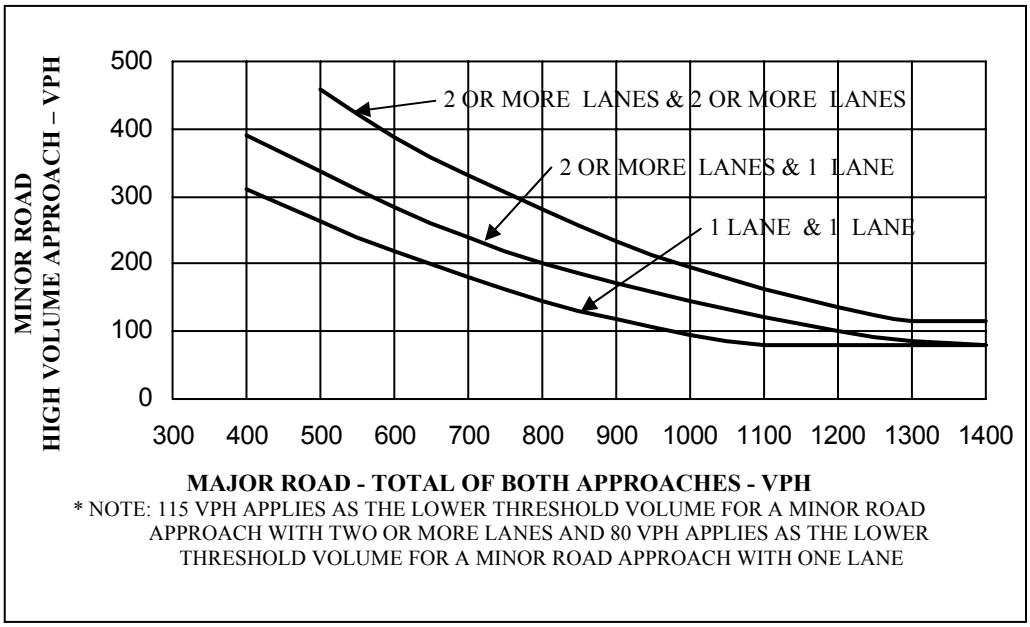
TRAFFIC SIGNAL WARRANTS ANALYSIS FORM

Warrant 2 – Four-Hour Vehicular Volume

Plot four volume combinations on the applicable figure below. If four points lie above the appropriate line, then the warrant is satisfied.

Figure A. Criteria for "100%" volume level.

Hour	5PM	4PM	3PM	12PM
Major Vol.	787	746	741	629
Minor Vol.	141	135	129	144



Satisfied?: NO

Warrant 3 – Peak Hour

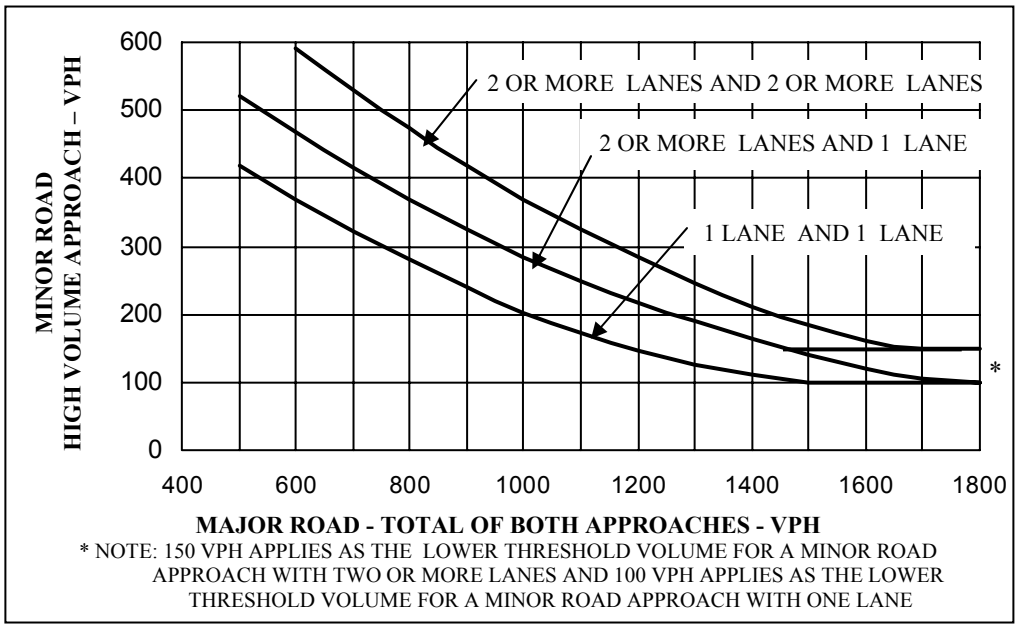
Unusual condition justifying use of warrant: _____

Record hour where criteria are fulfilled and the corresponding delay or volume in boxes provided. Plot the peak hour volume combination on the applicable figure below. If all three criteria are fulfilled or the plotted point lies above the appropriate line, then the warrant is satisfied.

Criteria	Approach Lanes		No. of Approaches		Hour	Fulfilled?	
	1	2	3	4		Yes	No
1. Delay on Minor Approach (veh-h)	4	5				☐	☐
2. Volume on Minor Approach (veh/h)	100	150				☐	☐
3. Total Entering Volume (veh/h)			650	800		☐	☐

Figure A. Criteria for "100%" volume level.

Hour	5PM
Major Vol.	787
Minor Vol.	141



Satisfied?: NO

Wisconsin Department of Transportation
Traffic Signal Warrant Summary Sheet

100% URBAN

The Worksheet(s) attached are provided as an attachment to the Engineering Investigation Study for:
Intersection: CTH OT/Corporate Drive/Commerce Road Date: 03/30/2010
County: La Crosse

Town / Village / City: Onalaska

Major Street	CTH OT	Critical Approach Speed	35	Lanes	2 per direction
Minor Street	Corporate/Commerce	Critical Approach Speed	25	Lanes	1

THIS INTERSECTION IS ANALYZED FOR URBAN WARRANTS. COMMENTS:

Note: The warrants for rural areas (70% of urban warrant) are used when the 85% speed on the major street exceeds 40 m.p.h. or when the intersection lies within the built-up area of an isolated community having a population of less than 10,000.

THE ANALYSIS IS BASED ON COUNTS CONDUCTED ON 3/16 & (DATES), 20 10, Tuesday (DAYS), FROM 6:00 AM PM TO 6:00 AM PM

50% Right Turns Included

Warrant Evaluation Summary		**YES/NO/NOT EVALUATED**
Warrant 1	**Eight-Hour Vehicular Volume**	**NO**
Condition A	Minimum Vehicular Volume	NO
Condition B	Interruption of Continuous Traffic	NO
Condition C	Combination: 80% of A and B	NO
Warrant 2	**Four Hour Volume**	**NO**
Warrant 3	**Peak Hour Volume**	**NO**
Warrant 4	**Pedestrian Volume**	**NOT-EVALUATED**
Warrant 5	**School Crossing**	**NOT-EVALUATED**
Warrant 6	**Coordinated Signal System**	**NOT-EVALUATED**
Warrant 7	**Crash Experience**	**NO**
Warrant 8	**Roadway network**	**NOT-EVALUATED**
	Left Turn Conflict Analysis	**NO**

This analysis was conducted by:

Leah M Ness
(Name)

Ayres Associates
Agency)

03/30/2010
(Date)

TRAFFIC SIGNAL WARRANTS ANALYSIS FORM

Date: 03/30/2010

County: La Crosse

Town / Village / City: Onalaska

Major Street	CTH OT	Critical Approach Speed	35	Lanes	2 per direction
Minor Street	Corporate/Commerce	Approach Speed	25	Lanes	1

Volume Level

1. Critical speed of major road traffic > 40 mph : ☐ Yes ☒ No
2. In built-up area of isolated community of < 10,000 pop.: ☐ Yes ☒ No

If Question 1 or 2 above is answered "Yes" then use "70%" volume level: ☐ 70% ☒ 100%

WARRANT 1 – Eight-Hour Vehicular Volume

Warrant is satisfied if Condition A or B is "100 % satisfied." Warrant also satisfied if Condition C (80% of A and B) is satisfied.

8 Highest Hours								
Hour	5PM	4PM	3PM	7AM	1PM	2PM	12PM	8AM
Major Road Both App. vph	753	720	710	633	483	533	595	489
Minor Road High App. vph	166	151	155	137	144	100	187	137

Record hours where condition is met and the corresponding volumes in boxes provided. Condition is 100% satisfied if the minimum volumes are met for eight hours.

Condition A – Minimum Vehicular Volume

(volumes in veh/h)	Minimum Requirements (80% Shown in Brackets)			
Approach Lanes:	1		2 or more	
Volume Level:	100%	Hours	100%	Hours
Major Road-Both Approaches	**500**		**600**	3
	(400)		**(480)**	8
Minor Road-Highest Approach	**150**	4	**200**	
	(120)	7	**(160)**	

100% Satisfied: NO
80 % Satisfied: NO

Condition B – Interruption of Continuous Traffic

(volumes in veh/h)	Minimum Requirements (80% Shown in Brackets)			
Approach Lanes:	1		2 or more	
Volume Level:	100%	Hours	100%	Hours
Major Road-Both Approaches	**750**		**900**	0
	(600)		**(720)**	2
Minor Road-Highest Approach	**75**	8	**100**	
	(60)	8	**(80)**	

100% Satisfied: NO
80 % Satisfied: NO

Condition C – Combination of Condition A and B: Condition A and B Both 80% Satisfied?: NO

Warrant Satisfied?: NO

% Right Turns Included: 50

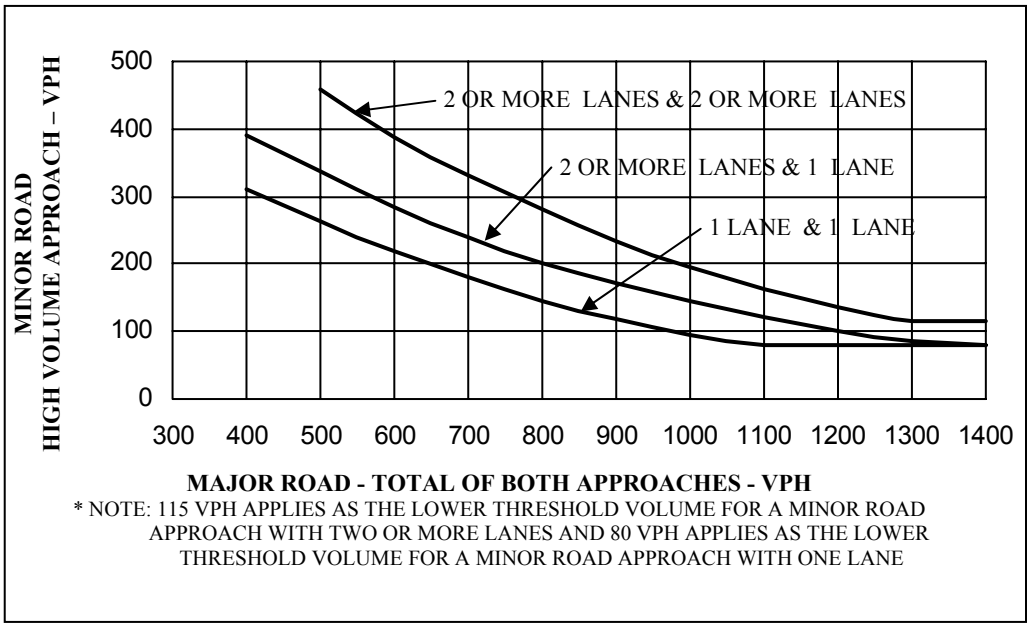
TRAFFIC SIGNAL WARRANTS ANALYSIS FORM

Warrant 2 – Four-Hour Vehicular Volume

Plot four volume combinations on the applicable figure below. If four points lie above the appropriate line, then the warrant is satisfied.

Figure A. Criteria for "100%" volume level.

Hour	5PM	4PM	3PM	7AM
Major Vol.	753	720	710	633
Minor Vol.	166	151	155	137



Satisfied?: NO

Warrant 3 – Peak Hour

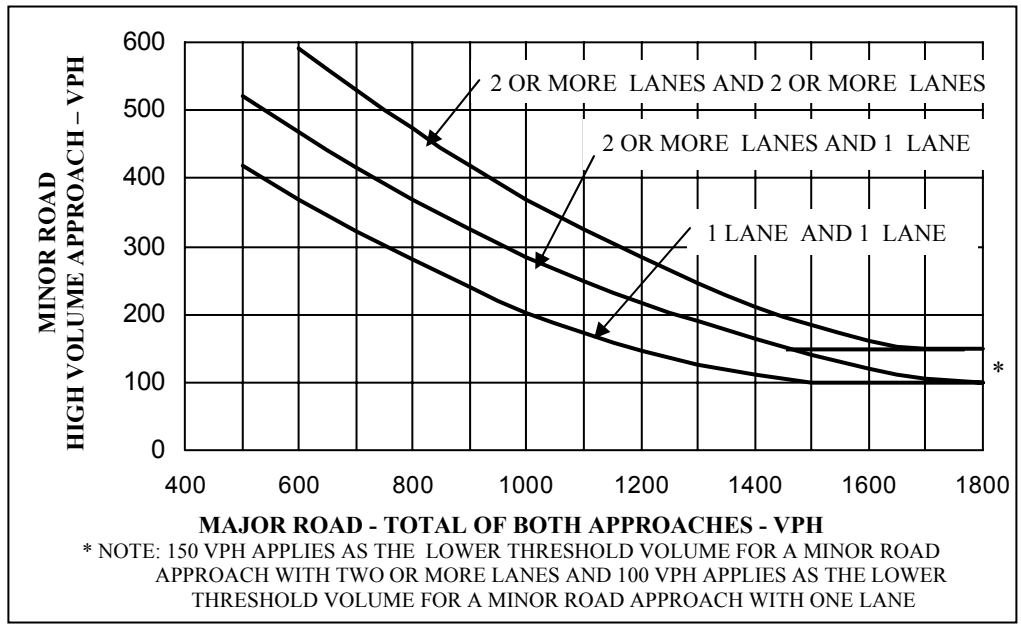
Unusual condition justifying use of warrant: _____

Record hour where criteria are fulfilled and the corresponding delay or volume in boxes provided. Plot the peak hour volume combination on the applicable figure below. If all three criteria are fulfilled or the plotted point lies above the appropriate line, then the warrant is satisfied.

Criteria	Approach Lanes		No. of Approaches		Hour	Fulfilled?	
	1	2	3	4		Yes	No
1. Delay on Minor Approach (veh-h)	4	5				☐	☐
2. Volume on Minor Approach (veh/h)	100	150				☐	☐
3. Total Entering Volume (veh/h)			650	800		☐	☐

Figure A. Criteria for "100%" volume level.

Hour	5PM
Major Vol.	753
Minor Vol.	166



Satisfied?: NO

Wisconsin Department of Transportation
Traffic Signal Warrant Summary Sheet

100% URBAN

The Worksheet(s) attached are provided as an attachment to the Engineering Investigation Study for:
Intersection: CTH OT/Corporate Drive/Commerce Road Date: 03/30/2010
County: La Crosse

Town / Village / City: Onalaska

Major Street	CTH OT	Critical Approach Speed	35	Lanes	2 per direction
Minor Street	Corporate/Commerce	Critical Approach Speed	25	Lanes	1

THIS INTERSECTION IS ANALYZED FOR URBAN WARRANTS. COMMENTS: W/Development

Note: The warrants for rural areas (70% of urban warrant) are used when the 85% speed on the major street exceeds 40 m.p.h. or when the intersection lies within the built-up area of an isolated community having a population of less than 10,000.

THE ANALYSIS IS BASED ON COUNTS CONDUCTED ON 3/16 & , 20 10 (DATES), Tuesday (DAYS), FROM 6:00 AM PM TO 6:00 AM PM

50% Right Turns Included

Warrant Evaluation Summary		**YES/NO/NOT EVALUATED**
Warrant 1	**Eight-Hour Vehicular Volume**	**NO**
Condition A	Minimum Vehicular Volume	NO
Condition B	Interruption of Continuous Traffic	NO
Condition C	Combination: 80% of A and B	NO
Warrant 2	**Four Hour Volume**	**NO**
Warrant 3	**Peak Hour Volume**	**NO**
Warrant 4	**Pedestrian Volume**	**NOT-EVALUATED**
Warrant 5	**School Crossing**	**NOT-EVALUATED**
Warrant 6	**Coordinated Signal System**	**NOT-EVALUATED**
Warrant 7	**Crash Experience**	**NOT-EVALUATED**
Warrant 8	**Roadway network**	**NOT-EVALUATED**
	Left Turn Conflict Analysis	**NO**

This analysis was conducted by:

Leah M Ness
(Name)

Ayres Associates
Agency)

03/30/2010
(Date)

TRAFFIC SIGNAL WARRANTS ANALYSIS FORM

Date: 03/30/2010

County: La Crosse

Town / Village / City: Onalaska

Major Street	CTH OT	Critical Approach Speed	35	Lanes	2 per direction
Minor Street	Corporate/Commerce	Approach Speed	25	Lanes	1

Volume Level

1. Critical speed of major road traffic > 40 mph : ☐ Yes ☒ No
2. In built-up area of isolated community of < 10,000 pop.: ☐ Yes ☒ No

If Question 1 or 2 above is answered "Yes" then use "70%" volume level: ☐ 70% ☒ 100%

WARRANT 1 – Eight-Hour Vehicular Volume

Warrant is satisfied if Condition A or B is "100 % satisfied." Warrant also satisfied if Condition C (80% of A and B) is satisfied.

8 Highest Hours								
Hour	5PM	4PM	3PM	12PM	7AM	2PM	1PM	8AM
Major Road Both App. vph	787	746	742	628	673	565	517	520
Minor Road High App. vph	205	197	166	214	140	130	164	105

Record hours where condition is met and the corresponding volumes in boxes provided. Condition is 100% satisfied if the minimum volumes are met for eight hours.

Condition A – Minimum Vehicular Volume

(volumes in veh/h)	Minimum Requirements (80% Shown in Brackets)			
Approach Lanes:	1		2 or more	
Volume Level:	100%	Hours	100%	Hours
Major Road-Both Approaches	**500**		**600**	5
	(400)		**(480)**	8
Minor Road-Highest Approach	**150**	5	**200**	
	(120)	7	**(160)**	

100% Satisfied: NO
80 % Satisfied: NO

Condition B – Interruption of Continuous Traffic

(volumes in veh/h)	Minimum Requirements (80% Shown in Brackets)			
Approach Lanes:	1		2 or more	
Volume Level:	100%	Hours	100%	Hours
Major Road-Both Approaches	**750**		**900**	0
	(600)		**(720)**	3
Minor Road-Highest Approach	**75**	8	**100**	
	(60)	8	**(80)**	

100% Satisfied: NO
80 % Satisfied: NO

Condition C – Combination of Condition A and B: Condition A and B Both 80% Satisfied?: NO

Warrant Satisfied?: NO

% Right Turns Included: 50

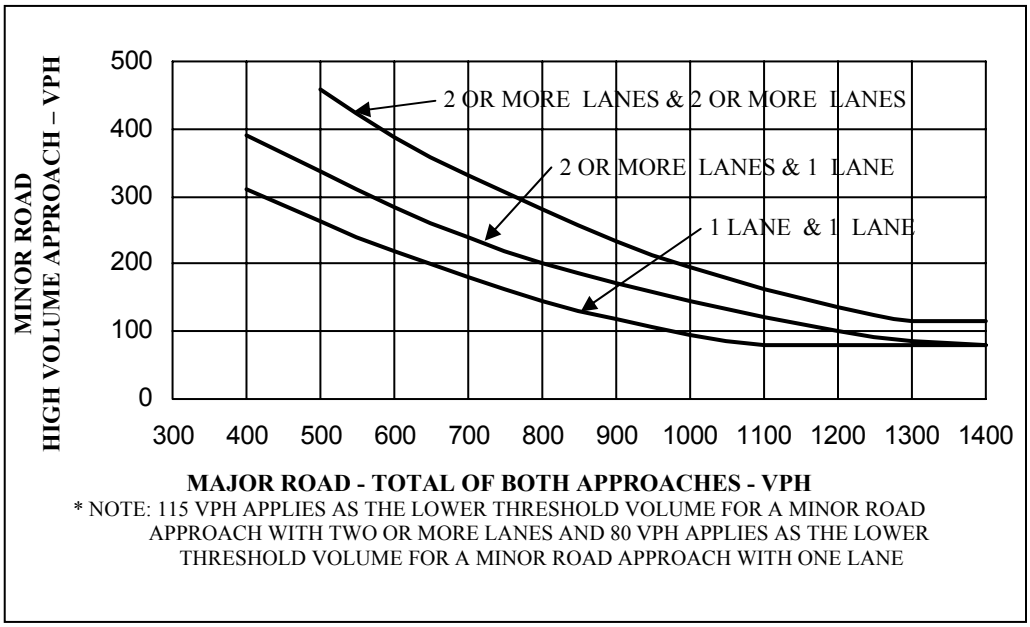
TRAFFIC SIGNAL WARRANTS ANALYSIS FORM

Warrant 2 – Four-Hour Vehicular Volume

Plot four volume combinations on the applicable figure below. If four points lie above the appropriate line, then the warrant is satisfied.

Figure A. Criteria for "100%" volume level.

Hour	5PM	4PM	3PM	12PM
Major Vol.	787	746	742	628
Minor Vol.	205	197	166	214



Satisfied?: NO

Warrant 3 – Peak Hour

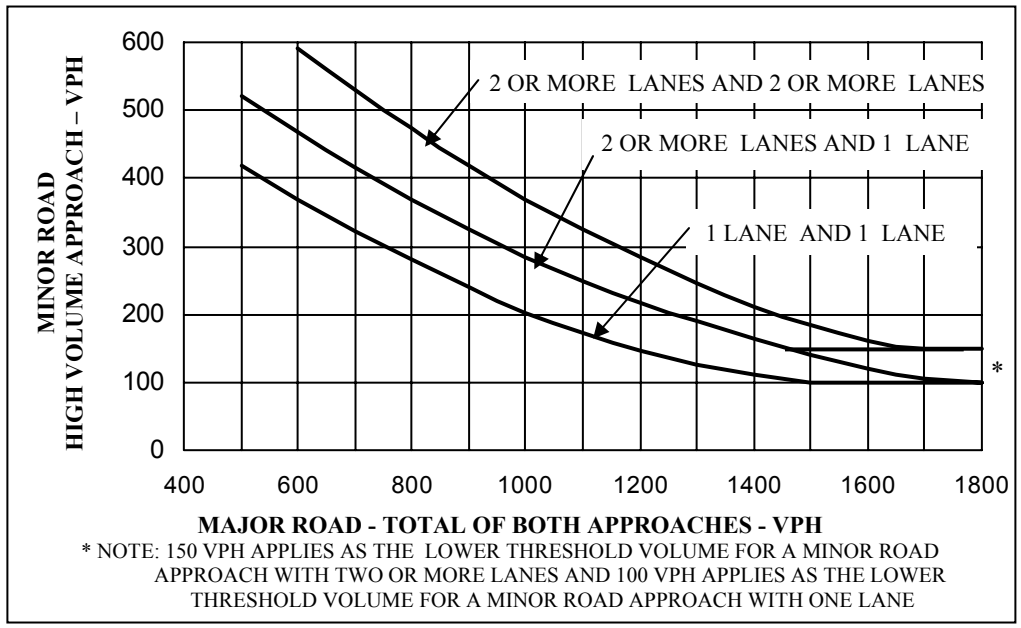
Unusual condition justifying use of warrant: _____

Record hour where criteria are fulfilled and the corresponding delay or volume in boxes provided. Plot the peak hour volume combination on the applicable figure below. If all three criteria are fulfilled or the plotted point lies above the appropriate line, then the warrant is satisfied.

Criteria	Approach Lanes		No. of Approaches		Hour	Fulfilled?	
	1	2	3	4		Yes	No
1. Delay on Minor Approach (veh-h)	4	5				☐	☐
2. Volume on Minor Approach (veh/h)	100	150				☐	☐
3. Total Entering Volume (veh/h)			650	800		☐	☐

Figure A. Criteria for "100%" volume level.

Hour	5PM
Major Vol.	787
Minor Vol.	205



Satisfied?: NO

ATTACHMENT F
Proposed Intersection Geometry


CTH OT
COMMERCE RD
CORPORATE DR