

October 2, 2012

Ginger Warner Westfall Associates, LLC 140 Towerview Court Cary, NC 27513 P: 919-463-9940 x 117 E: ginger@impactholdings.com

### Subject: Westfall Development – Updated Traffic Assessment Chatham County, North Carolina

Dear Ms. Warner:

This letter provides an update for the traffic assessment previously completed for the subject development to be located east of US 15-501, south of Lystra Road, and north of Jack Bennett Road in Chatham County. Based on the plan, the development would include a total of 242 single-family residential units; 113 for Phase 1A, 69 for Phase 1B, and 60 for Phase 1C. Full build-out of the site is expected to be complete by the year 2017. The proposed site plan has been provided in Appendix A.

The previous traffic study and access points were approved by the North Carolina Department of Transportation (NCDOT) and the driveways are currently built in these locations. Access to the development is proposed via one driveway on Lystra Road and two driveways on Jack Bennett Road. All three driveways will be full access driveways. The driveway on Lystra Road (Phase 1A Driveway) is approximately 0.4 miles west of Sam Jones Road. The western driveway on Jack Bennett Road (Phase 1B Driveway) is approximately 1800 feet west of the eastern driveway on Jack Bennett Road (Phase 1C Driveway). Phase 1C is approximately 2900 feet west of Big Woods Road. The site plan indicates there will not be roadway interconnectivity between the different phases. A driveway for the proposed Northeast Chatham High School could be located between Site Driveways 1B and 1C and is approximately 900 feet from each site driveway.

The study area for this project includes the following intersections:

- Lystra Road and Phase 1A Driveway
- Jack Bennett Road and Phase 1B Driveway
- Jack Bennett Road and Proposed School Driveway
- Jack Bennett Road and Phase 1C Driveway

Intersection capacity analyses were completed during the weekday AM and PM peak hours for the combined (2017) conditions with full site build-out scenario.



### **Existing Traffic Counts**

Turning movement traffic counts were completed by Ramey Kemp & Associates, Inc. (RKA) at the following locations during the peak AM (7:00 - 9:00) and peak PM (4:00 - 6:00) periods.

- Lystra Road and Phase 1A Driveway
- Jack Bennett Road and Big Woods Road
- Jack Bennett Road and Lystra Road

Traffic counts were taken when North Chatham Elementary School was in session.

Figure 1 (in Appendix A) provides the existing lane configurations and existing (2012) AM and PM peak hour traffic volumes at the study intersections. Refer to Appendix B for the traffic count reports.

#### **Background (2017) Traffic Conditions**

To determine background traffic volumes, existing traffic volumes were projected to the build out year 2017 by applying a compounded annual growth rate of 3%. This growth rate is based on historical traffic volumes and engineering judgment.

Additionally, the background conditions consider the potential Northeast Chatham High School. This site is expected to have a driveway located between the Phase 1B and Phase 1C driveways on Jack Bennett Road. A traffic impact analysis (TIA) for this proposed high school was prepared by Martin Alexiou Bryson and dated December 11, 2008. It should be noted that there were two future year analysis years considered in the build out of the site. The first scenario (year 2013) assumed the school would open with a student population of 800. The other scenario considers the 2020 year and a student population of 1,200. Since the school site was originally expected to open in 2012, the first scenario was considered in determining the adjacent development traffic expected for the build-out year of the Westfall development. It is not likely that the school's expected 2020 year student population will occur until well after the Westfall development is built. The school site trips and recommended roadway improvements associated with the school for the 2013 scenario were used in determining the background (2017) conditions for the Westfall development. The pertinent information from the Northeast Chatham High School TIA has been provided in Appendix C.

The background (2017) AM and PM peak hour traffic (existing traffic with growth + adjacent development traffic) is illustrated in Figure 2 (in Appendix A).

#### **Future Roadway Improvements**

There are proposed roadway improvements along Jack Bennett Road associated with the proposed high school. While there are two phases of improvements anticipated to be constructed with the high school, only the first phase will likely be in place by the expected build-out for the Westfall development. These improvements include the school driveway (approximately midway between the Phase 1B and Phase 1C driveways) and proposed eastbound and westbound exclusive turn lanes into the site. The second phase of roadway improvements associated with the high school will include a traffic signal at the school driveway on Jack Bennett Road. This improvement is not expected to be in place until after the build-out of the Westfall development and was not considered in this study.



### Site Trip Generation and Assignment

Average weekday daily, AM peak hour, and PM peak hour trips for the proposed development were calculated utilizing methodology contained within the Institute of Transportation Engineers (ITE) *Trip Generation* manual, 8<sup>th</sup> Edition. A detailed breakdown of the trip generation results can be found in Table 1.

As shown in Table 1, the development is expected to generate a total of 2,550 primary (new) trips (entering and exiting) to the adjacent streets during a typical weekday. Of this total, 200 new trips (50 entering and 150 exiting) are expected to occur during the AM peak hour, while 259 trips (163 entering and 96 exiting) are expected to occur during the PM peak hour.

ITE Land Use (Code)	Size	Average Daily Traffic	A Peak (vj	M Hour ph)	P Peak (vj	M Hour ph)
		(vpd)	Enter	Exit	Enter	Exit
		Phases 1A				
Single-Family Detached (210)	113 units	1160	22	67	74	43
		Phase 1B				
Single-Family Detached (210)	69 units	740	15	44	47	28
		Phase 1C				
Single-Family Detached (210)	60 units	650	13	39	42	25
Primary Trips ('	Total)	2,550	50	150	163	96

 TABLE 1

 Trip Generation – Westfall Development

Primary (new) site trip distribution percentages for the proposed development were determined based existing traffic patterns and engineering judgment. Primary trip distribution percentages were broken down between the two phases as follows:

Phase 1A

- 60% of site trips to/from the east on Lystra Road
- 40% of site trips to/from the west on Lystra Road

Phase 1B and 1C

- 60% of site trips to/from the east on Jack Bennett Road
- 40% of site trips to/from the west on Jack Bennett Road

The site trip assignment is illustrated in Figure 3 (in Appendix A).

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### **Combined (2017) Conditions**

Combined traffic volumes were determined by adding total site trips with background traffic volumes. Refer to Figure 4 (in Appendix A) for the combined (2017) peak hour traffic volumes.

#### **Intersection Capacity Analyses**

Intersection capacity analysis was completed using Synchro 7.0 based on methodology in the 2000 Highway Capacity Manual (HCM) published by the Transportation Research Board. Capacity and level of service (LOS) are the design criteria for this traffic study.

Capacity is defined as "the maximum hourly rate at which persons or vehicles can reasonably be expected to traverse a point or uniform section of a lane or roadway during a given time period under prevailing roadway, traffic, and control conditions." Level of service (LOS) is a term used to compare operating conditions, and is defined as a "qualitative measure describing operational conditions within a traffic stream, and their perception by motorists and/or passengers." Level of service varies from LOS A representing free flow, to LOS F where breakdown conditions are evident. Typically, capacity is defined as the threshold between LOS D and LOS E. At unsignalized intersections; however, it is not uncommon for minor street approaches to operate at LOS E or LOS F with short queues if minor street volumes are not heavy.

Analysis was completed for weekday AM and PM peak hours under the combined (2017) conditions with full buil-out of the site. The results of these analyses are summarized in Table 2 below. Refer to Appendix D for detailed capacity analysis results at the study intersections.

The intersection analysis shows that under combined (2017) conditions all approaches for the study area are expected to operate at LOS C or better during the AM and PM peak hours.

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Recommended lane configurations are illustrated in Figure 5 (in Appendix A).

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ANALYSIS	A P P R	LANES	WEEKDAY AM PEAK HOUR LEVEL OF SERVICE	WEEKDAY PM PEAK HOUR LEVEL OF SERVICE
SCENARIO	A C H		Approach	Approach
Lystra Road and Phase 1A Driveway	EB WB NB SB	1 L-T, 1 R 1 L, 1 T-R 1 L-T-R 1 L-T-R	$ \begin{array}{c} \mathbf{A}^1 \\ \mathbf{A}^1 \\ \mathbf{B}^2 \\ \mathbf{B}^2 \end{array} $	$ \begin{array}{c} \mathbf{A}^1 \\ \mathbf{A}^1 \\ \mathbf{B}^2 \\ \mathbf{A}^2 \end{array} $
Jack Bennett Road and Phase 1B Driveway	EB WB SB	<b>1 L</b> , 1 T 1 T, <b>1 R</b> 1 L-R	$\frac{A^{1}}{B^{2}}$	$\frac{A^{1}}{B^{2}}$
Jack Bennett Road and School Driveway	EB WB SB	1 L, 1 T 1 T, 1 R 1 L, 1 R	$A^1$ $\overline{C}^2$	$A^1$ $\overline{C}^2$
Jack Bennett Road and Phase 1C Driveway	EB WB SB	<b>1 L</b> , 1 T 1 T, <b>1 R</b> 1 L-R	$A^1$ $C^2$	

 TABLE 2

 Intersection Capacity Analysis Results Driveway – Combined (2017) Conditions

<sup>1</sup> Level of service for major street left turn movement at unsignalized intersection <sup>2</sup> Level of service for minor street approach at unsignalized intersection **Improvements in bold**.

# Summary

The Westfall development is not expected to have a significant impact on the study area intersections. The study area intersections are expected to operate at LOS C or better during the AM and PM peak hours under combined (2017) conditions.

The expected roadway improvements shown in Figure 5 of Appendix A should allow for safe and efficient travels throughout the study area network under combined (2017) conditions. These improvements include exclusive turn lanes into the Westfall development from both directions along the major roadways at all site driveways.



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If you should have any questions or comments regarding this study, please feel free to contact me at 919-872-5115.

Sincerely, *Ramey Kemp & Associates, Inc.* 

Rynal Stephenson, P.E. Transportation Manager

Attachments: Figures

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Appendix A – Figures Appendix B – Traffic Count Data Appendix C – Adjacent Development Information Appendix D – Capacity Analysis





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# **APPENDIX** A

FIGURES













# **APPENDIX B**

TRAFFIC COUNT DATA



> File Name : Jack Bennett @ Big Woods Site Code : 00000000 Start Date : 9/4/2012 Page No : 1

								Group	s Printec	I- All V	ehicles								
	N	lo SB A South	Approac bound	h	Ja	ck Ben Westl	nett Roa bound	ad	E	Big Woo North	ods Roa bound	d	Ja	ck Ben Easth	nett Roa oound	ad			
Start Time	Left	Thru	Right	Trucks	Left	Thru	Right	Trucks	Left	Thru	Right	Trucks	Left	Thru	Right	Trucks	Exclu, Total	Inclu. Total	Int. Total
07:00 AM	0	0	0	0	2	7	0	1	5	1	14	0	0	27	4	1	2	60	62
07:15 AM	0	0	0	0	3	16	0	1	8	0	26	1	0	42	1	1	3	96	99
07:30 AM	0	0	0	0	4	35	0	1	16	0	36	2	0	44	1	1	4	136	140
07:45 AM	0	0	0	0	6	45	0	6	18	0	52	1	0	52	4	2	9	177	186
Total	0	0	0	0	15	103	0	9	47	1	128	4	0	165	10	5	18	469	487
08:00 AM	0	0	0	0	19	49	0	1	20	0	34	0	0	43	18	3	4	183	187
08:15 AM	0	0	0	0	4	30	0	1	21	0	19	1	0	73	12	2	4	159	163
08:30 AM	0	0	0	0	5	14	0	0	11	0	12	0	0	41	9	0	0	92	92
08:45 AM	0	0	0	0	6	9	0	0	12	0	13	0	0	33	6	3	3	79	82
Total	0	0	0	0	34	102	0	2	64	0	78	1	0	190	45	8	11	513	524
*** Break/No V	'olume *	k * *																	
04:00 PM	0	0	0	0	15	28	1	0	14	0	3	4	0	15	11	0	4	87	91
04:15 PM	0	0	0	0	12	16	0	1	12	0	4	1	0	14	6	0	2	64	66
04:30 PM	0	0	0	0	14	22	0	0	6	0	9	0	0	10	10	0	0	71	71
04:45 PM	0	0	0	0	14	45	0	0	8	0	9	1	0	16	18	0	1	110	111
Total	0	0	0	0	55	111	1	1	40	0	25	6	0	55	45	0	7	332	339
05:00 PM	0	0	0	0	10	31	0	0	10	0	5	0	0	18	13	0	0	87	87
05:15 PM	0	0	0	0	21	31	0	0	9	0	4	0	0	27	10	0	0	102	102
05:30 PM	0	0	0	0	19	67	0	3	5	0	11	0	0	21	16	0	3	139	142
05:45 PM	0	0	0	0	35	50	0	3	12	0	5	0	0	16	34	1	4	152	156
Total	0	0	0	0	85	179	0	6	36	0	25	0	0	82	73	1	7	480	487
Grand Total	0	0	0	0	189	495	1	18	187	1	256	11	0	492	173	14	43	1794	1837
Apprch %	0	0	0		27.6	72.3	0.1		42.1	0.2	57.7		0	74	26				
Total %	0	0	0		10.5	27.6	0.1		10.4	0.1	14.3		0	27.4	9.6		2.3	97.7	



> File Name : Jack Bennett @ Big Woods Site Code : 00000000 Start Date : 9/4/2012 Page No : 2

		No SB A South	Approac bound	h	J	lack Ber West	nnett Roa tbound	ad		Big Wo North	ods Roa ibound	d		Jack Ber East	nnett Roa bound	ad	
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analy	sis From	07:00 A	M to 11	:45 AM - F	eak 1 of	1											
Peak Hour for En	tire Inter	section I	Begins a	t 07:30 AM	1												
07:30 AM	0	0	0	0	4	35	0	39	16	0	36	52	0	44	1	45	136
07:45 AM	0	0	0	0	6	45	0	51	18	0	52	70	0	52	4	56	177
08:00 AM	0	0	0	0	19	49	0	68	20	0	34	54	0	43	18	61	183
08:15 AM	0	0	0	0	4	30	0	34	21	0	19	40	0	73	12	85	159
Total Volume	0	0	0	0	33	159	0	192	75	0	141	216	0	212	35	247	655
% App. Total	0	0	0		17.2	82.8	0		34.7	0	65.3		0	85.8	14.2		
PHF	.000	.000	.000	.000	.434	.811	.000	.706	.893	.000	.678	.771	.000	.726	.486	.726	.895





> File Name : Jack Bennett @ Big Woods Site Code : 00000000 Start Date : 9/4/2012 Page No : 3

		No SB / South	Approac Ibound	h	J	lack Ber West	nnett Ro tbound	ad		Big Wo North	ods Roa 1bound	d	J	ack Ber East	nett Ro bound	ad	
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analy	sis From	12:00 P	M to 05:	45 PM - P	eak I of	1											
Peak Hour for En	tire Inter-	section 1	Begins a	t 05:00 PM	1												
05:00 PM	0	0	0	0	10	31	0	41	10	0	5	15	0	18	13	31	87
05:15 PM	0	0	0	0	21	31	0	52	9	0	4	13	0	27	10	37	102
05:30 PM	0	0	0	0	19	67	0	86	5	0	11	16	0	21	16	37	139
05:45 PM	0	0	0	0	35	50	0	85	12	0	5	17	0	16	34	50	152
Total Volume	0	0	0	0	85	179	0	264	36	0	25	61	0	82	73	155	480
% App. Total	0	0	0		32.2	67.8	0		59	0	41		0	52.9	47.1		
PHF	.000	.000	.000	.000	.607	.668	.000	.767	.750	.000	.568	.897	.000	.759	.537	.775	.789





> File Name : Jack Bennett @ Lystra Site Code : 00000000 Start Date : 9/5/2012 Page No : 1

								Group	s Printed	I- A11 V	'ehicles				гауе	INU .			
		Lystra	Road		N	o WB	Approac	h		Lystra	Road		Ja	ck Ben	nett Ro	ad			
		South	bound			West	bound			North	bound	i		Easth	ound			1	
Start Time	Left	Thru	Right	Trucks	Left	Thru	Right	Trucks	Left	Thru	Right	Trucks	Left	Thru	Right	Trucks	Exclu. Total	Inclu, Total	Int. Total
07:00 AM	0	13	1	3	0	0	0	0	9	18	0	0	4	0	29	1	4	74	78
07:15 AM	0	22	0	1	0	0	0	0	20	21	0	1	11	0	46	3	5	120	125
07:30 AM	0	37	9	2	0	0	0	0	26	40	0	2	22	0	58	2	6	192	198
07:45 AM	0	66	26	4	0	0	0	0	24	72	0	6	31	0	53	2	12	272	284
Total	0	138	36	10	0	0	0	0	79	151	0	9	68	0	186	8	27	658	685
08.00 AM	٥	75	25	1	0	٥	٥	٥	27	25	٥	0	20	٥	69	2	4	250	262
08.00 AM	0	21	35	0	0	0	0	0	27	23	0	2	20	0	72	2		250	202
08.15 AM	0	12	2	0	0	0	0	0	14	17	0	2	5	0	40	5	5	104	104
08:45 AM	0	16	2	0	0	0	0	0	14	12	0	0	7	0	20	1	1	100	06
Total	0	135	41	1	0	0	0	0	03	66	0	2	13	0	240		10	618	628
*** Break/No V	'olume *	**																	
04:00 PM	0	21	4	0	0	0	0	0	32	27	0	1	2	0	18	0	1	104	105
04:15 PM	0	19	10	0	0	0	0	0	30	22	0	3	4	0	20	1	4	105	109
04:30 PM	0	22	8	1	0	0	0	0	31	33	0	3	1	0	24	0	4	119	123
04:45 PM	0	26	7	1	0	0	0	0	56	32	0	0	2	0	20	0	1	143	144
Total	0	88	29	2	0	0	0	0	149	114	0	7	9	0	82	1	10	471	481
05:00 PM	0	12	8	0	0	0	0	0	45	35	0	0	3	0	18	0	0	121	121
05:15 PM	0	25	7	0	0	0	0	0	50	40	0	0	4	0	32	0	0	158	158
05:30 PM	0	32	8	0	0	0	0	0	64	32	0	1	5	0	15	0	1	156	157
05:45 PM	0	27	4	0	0	0	0	0	75	39	0	4	2	0	29	0	4	176	180
Total	0	96	27	0	0	0	0	0	234	146	0	5	14	0	94	0	5	611	616
Grand Total	0	457	133	13	0	0	0	0	555	477	0	23	134	0	602	16	52	2358	2410
Apprch %	0	77.5	22.5		0	0	0		53.8	46.2	0		18.2	0	81.8				
Total %	0	19.4	5.6		0	0	0		23.5	20.2	0		5.7	0	25.5		2.2	97.8	



> File Name : Jack Bennett @ Lystra Site Code : 00000000 Start Date : 9/5/2012 Page No : 2

		Lystra	Road		1	No WB	Approa	ch		Lystr	a Road			Jack Ber	nett Ro	ad	
		South	Dound			wesi	douna			NOT	ndound			East	bouna		
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analy	sis From	07:00 A	M to 11	:45 AM - I	Peak 1 of	1											
Peak Hour for En	tire Inter	section H	Begins a	t 07:30 AN	1												
07:30 AM	0	37	9	46	0	0	0	0	26	40	0	66	22	0	58	80	192
07:45 AM	0	66	26	92	0	0	0	0	24	72	0	96	31	0	53	84	272
08:00 AM	0	75	35	110	0	0	0	0	27	25	0	52	28	0	68	96	258
08:15 AM	0	31	2	33	0	0	0	0	33	17	0	50	3	0	73	76	159
Total Volume	0	209	72	281	0	0	0	0	110	154	0	264	84	0	252	336	881
% App. Total	0	74.4	25.6		0	0	0		41.7	58.3	0		25	0	75		
PHF	.000	697	514	639	.000	000	000	000	833	535	000	688	677	000	863	875	810





> File Name : Jack Bennett @ Lystra Site Code : 00000000 Start Date : 9/5/2012 Page No : 3

		Lystr Soutl	a Road ibound		1	No WB West	Approad bound	ch		Lystr North	a Road ibound		J	ack Ber East	nnett Ro bound	ad	
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App, Total	Int. Total
Peak Hour Analys	sis From	12:00 P	M to 05	:45 PM - P	eak 1 of	l											
Peak Hour for En	tire Inter	section	Begins a	t 05:00 PM	1												
05:00 PM	0	12	8	20	0	0	0	0	45	35	0	80	3	0	18	21	121
05:15 PM	0	25	7	32	0	0	0	0	50	40	0	90	4	0	32	36	158
05:30 PM	0	32	8	40	0	0	0	0	64	32	0	96	5	0	15	20	156
05:45 PM	0	27	4	31	0	0	0	0	75	39	0	114	2	0	29	31	176
Total Volume	0	96	27	123	0	0	0	0	234	146	0	380	14	0	94	108	611
% App. Total	0	78	22		0	0	0		61.6	38.4	0		13	0	87		
PHF	.000	.750	.844	.769	.000	.000	.000	.000	.780	.913	.000	.833	.700	000	.734	750	868





> File Name : Lystra @ Development Dvwy Site Code : 0000000 Start Date : 9/6/2012 Page No : 1

· · · · · · · · · · · · · · · · · · ·								Groups	s Printec	l- All V	ehicles								
	Res	identia South	l Drivev bound	vay		Lystra Westl	Road		Dev	elopme North	nt Drive bound	eway		Lystra Easth	Road				
Start Time	Left	Thru	Right	Trucks	Left	Thru	Right	Trucks	Left	Thru	Right	Trucks	Left	Thru	Right	Trucks	Exclu. Total	Inclu Total	Int. Total
07:00 AM	1	0	0	0	1	8	0	0	0	0	0	0	0	14	2	2	2	26	28
07:15 AM	0	0	1	0	2	10	0	0	4	0	0	2	0	32	0	0	2	49	51
07:30 AM	0	0	0	0	0	11	0	0	0	0	1	0	0	32	0	1	1	44	45
07:45 AM	1	0	0	0	2	32	0	0	0	0	0	0	0	56	0	0	0	91	91
Total	2	0	1	0	5	61	0	0	4	0	1	2	0	134	2	3	5	210	215
08:00 AM	0	0	0	0	1	39	1	0	2	0	0	0	0	44	0	0	0	87	87
08:15 AM	1	0	0	0	0	28	0	0	0	0	0	0	1	19	0	0	0	49	49
08:30 AM	0	0	0	0	1	13	0	0	1	0	0	0	0	33	1	1	1	49	50
08:45 AM	0	0	0	0	0	13	0	0	0	0	0	0	0	18	0	0	0	31	31
Total	1	0	0	0	2	93	1	0	3	0	0	0	1	114	1	1	1	216	217
*** Break/No V	olume *	***																	
04:00 PM	0	0	0	0	0	31	0	0	0	0	0	0	1	13	0	0	0	45	45
04:15 PM	0	0	0	0	0	23	0	0	0	0	1	0	0	25	0	1	1	49	50
04:30 PM	0	0	1	0	1	30	1	0	0	0	0	0	0	21	0	0	0	54	54
04:45 PM	0	0	1	0	0	33	0	0	0	0	0	0	0	23	0	1	1	57	58
Total	0	0	2	0	1	117	1	0	0	0	1	0	1	82	0	2	2	205	207
05:00 PM	0	0	0	0	0	26	0	0	0	0	1	0	0	21	0	0	0	48	48
05:15 PM	0	0	0	0	0	35	0	0	0	0	0	0	0	22	0	0	0	57	57
05:30 PM	0	0	0	0	0	42	0	0	0	0	0	0	0	31	0	0	0	73	73
05:45 PM	0	0	0	0	0	35	0	0	0	0	0	0	0	21	0	0	0	56	56
Total	0	0	0	0	0	138	0	0	0	0	1	0	0	95	0	0	0	234	234
Grand Total	3	0	3	0	8	409	2	0	7	0	3	2	2	425	3	6	8	865	873
Apprch %	50	0	50		1.9	97.6	0.5		70	0	30		0.5	98.8	0.7				
Total %	0.3	0	0.3		0.9	47.3	0.2		0.8	0	0.3		0.2	49.1	0.3		0.9	99.1	



> File Name : Lystra @ Development Dvwy Site Code : 00000000 Start Date : 9/6/2012 Page No : 2

	Re	esidentia	l Drive	√ay		Lysti	a Road		De	velopme	ent Driv	eway		Lysti	a Road		
		South	bound			Wes	tbound			North	nbound	-		East	bound		
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analy	sis From	07:00 A	M to 11	:45 AM - I	Peak 1 of	1											
Peak Hour for En	tire Inter	section 1	Begins a	t 07:45 AN	1												
07:45 AM	1	0	0	1	2	32	0	34	0	0	0	0	0	56	0	56	91
08:00 AM	0	0	0	0	1	39	1	41	2	0	0	2	0	44	0	44	87
08:15 AM	1	0	0	1	0	28	0	28	0	0	0	0	1	19	0	20	49
08:30 AM	0	0	0	0	1	13	0	14	1	0	0	1	0	33	1	34	49
Total Volume	2	0	0	2	4	112	1	117	3	0	0	3	1	152	1	154	276
% App. Total	100	0	0		3.4	95.7	0.9		100	0	0		0.6	98.7	0.6		
PHF	500	000	000	500	500	718	250	713	375	000	000	375	250	670	250	688	758





> File Name : Lystra @ Development Dvwy Site Code : 00000000 Start Date : 9/6/2012 Page No : 3

	Re	esidentia South	l Drivev	way		Lystr West	a Road tbound		De	velopme Nortl	ent Drive abound	eway		Lystr East	a Road bound	0.000099999999999999999999999999999999	
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analy	sis From	12:00 P	M to 05:	45 PM - P	eak 1 of	1											
Peak Hour for En	tire Inter	section I	Begins a	t 04:45 PM	[												
04:45 PM	0	0	1	1	0	33	0	33	0	0	0	0	0	23	0	23	57
05:00 PM	0	0	0	0	0	26	0	26	0	0	1	1	0	21	0	21	48
05:15 PM	0	0	0	0	0	35	0	35	0	0	0	0	0	22	0	22	57
05:30 PM	0	0	0	0	0	42	0	42	0	0	0	0	0	31	0	31	73
Total Volume	0	0	1	1	0	136	0	136	0	0	1	1	0	97	0	97	235
% App. Total	0	0	100		0	100	0		0	0	100		0	100	0		
PHF	.000	.000	.250	.250	.000	.810	.000	.810	.000	.000	.250	.250	.000	.782	.000	.782	.805



# **APPENDIX C**

# **ADJACENT DEVELOPMENT INFORMATION**







# **APPENDIX D**

# **CAPACITY ANALYSIS**

## HCM Unsignalized Intersection Capacity Analysis 2: Lystra & Residential Driveway

	۶		$\mathbf{F}$	1	-	*	1	1	1	5	Ļ	-
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations Volume (veh/h) Sign Control	1	<b>র্ধ</b> 215 Free	<b>ř</b> 10	<b>1</b> 8	<b>₽</b> 138 Free	1	30	↔ 0 Stop	40	2	↔ 0 Stop	0
Grade Peak Hour Factor Hourly flow rate (vph) Pedestrians Lane Width (ft) Walking Speed (ft/s) Percent Blockage	0.90 1	0% 0.90 239	0.90 11	0.90 20	0% 0.90 153	0.90 1	0.90 33	0% 0.90 0	0.90 44	0.90 2	0% 0.90 0	0.90 0
Right turn flare (veh) Median type Median storage veh) Upstream signal (ft) pX. platoon unblocked		None			None							
vC, conflicting volume vC1, stage 1 conf vol vC2, stage 2 conf vol	154			250			434	436	239	479	446	154
vCu, unblocked vol tC, single (s) tC 2 stage (s)	154 4.1			250 4.1			<b>434</b> 7.1	436 6.5	239 6.2	479 7.1	446 6.5	154 6.2
tF (s) p0 queue free % cM capacity (veh/h)	2.2 100 1426			2.2 98 1316			3.5 94 525	4.0 100 506	3.3 94 800	3.5 100 463	4.0 100 499	3.3 100 892
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1						
Volume Total Volume Left Volume Right cSH Volume to Capacity Queue Length 95th (ft) Control Delay (s) Lane LOS Approach Delay (s) Approach LOS	1426 0.00 0.00 0.0 A 0.0	0 11 1700 0.01 0 0.0	20 20 0 1316 0.02 1 7.8 A 0.9	0 1 1700 0.09 0 0.0	78 33 44 654 0.12 10 11.3 B 11.3 B	2 0 463 0.00 0 12.8 B 12.8 B						
Intersection Summary Average Delay Intersection Capacity Utilization Analysis Period (min)	1		2.1 25.3% 15	IC	CU Level o	of Service			A			

## HCM Unsignalized Intersection Capacity Analysis 2: Lystra & Residential Driveway

	۶	-	$\mathbf{\hat{z}}$	4	-	*	1	1	1	1	Ŧ	1
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations Volume (veh/h) Sign Control	0	<b>র্ন</b> 116 Free	<b>7</b> 30	<b>*1</b> 44	<b>₽</b> 186 Free	0	17	0 Stop	27	0	0 Stop	1
Grade Peak Hour Factor	0.90	0% 0.90	0.90	0.90	0% 0.90	0.90	0.90	0% 0.90	0.90	0.90	0% 0.90	0.90
Hourly flow rate (vph) Pedestrians Lane Width (ft) Walking Speed (ft/s) Percent Blockage Right turn flare (veh)	0	129	33	49	207	0	19	0	30	0	0	1
Median type Median storage veh) Upstream signal (ft)		None			None							
vC, conflicting volume vC1, stage 1 conf vol	207			162			434	433	129	463	467	207
vCu, unblocked voi	207			162			434	433	129	463	467	207
tC, single (s) tC, 2 stage (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free % cM capacity (veh/h)	100 1365			97 1417			96 517	100 498	97 921	100 479	100 477	100 834
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1						
Volume Total	129	33	49	207	49	1						
Volume Left	0	0	49	0	19	0						
	1365	აა 1700	1/17	1700	30 708	834						
Volume to Canacity	0.00	0.02	0.03	0.12	0.07	0.00						
Queue Length 95th (ft)	0.00	0.02	3	0.12	6.07	0.00						
Control Delay (s)	0.0	0.0	7.6	0.0	10.5	9.3						
Lane LOS			A		В	A						
Approach Delay (s) Approach LOS	0.0		1.5		10.5 B	9.3 A						
Intersection Summary												
Average Delay Intersection Capacity Utiliza Analysis Period (min)	tion		1.9 26.5% 15	IC	CU Level o	of Service			A			

	٦	-	-		1	1	
Movement	EBL	EBT	WBT	WBR	SBL	SBR	
Lane Configurations Volume (veh/h) Sign Control	<b>"</b> 6	<b>↑</b> 428 Free	<b>↑</b> 313 Free	<b>ř</b> 9	26 Stop	18	
Grade Peak Hour Factor Hourly flow rate (vph) Pedestrians Lane Width (ft)	0.90 7	0% 0.90 476	0% 0.90 348	0.90 10	0% 0.90 29	0.90 20	
Walking Speed (ft/s) Percent Blockage Right turn flare (veh) Median type Median storage veh)		None	None				
vC1, stage 2 conf vol	358				837	348	
vCu, unblocked vol tC, single (s)	358 4.1				837 6.4	348 6.2	
tF (s) p0 queue free % cM capacity (veh/h)	2.2 99 1201				3.5 91 335	3.3 97 695	
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1		
Volume Total Volume Left Volume Right cSH Volume to Capacity Queue Length 95th (ft) Control Delay (s) Lane LOS Approach Delay (s) Approach LOS	7 7 0 1201 0.01 0 8.0 A 0.1	476 0 1700 0.28 0 0.0	348 0 1700 0.20 0 0.0	10 0 10 1700 0.01 0 0.0	49 29 20 425 0.11 10 14.6 B 14.6 B		
Intersection Summary Average Delay Intersection Capacity Utilizat Analysis Period (min)	ion		0.9 32.5% 15	IC	U Level o	f Service	A

	٦		-		1	1	
Movement	EBL	EBT	WBT	WBR	SBL	SBR	
Lane Configurations Volume (veh/h) Sign Control	<b>"</b> 19	<b>↑</b> 209 Free	<b>↑</b> 356 Free	<b>ř</b> 28	17 Stop	11	
Grade Peak Hour Factor Hourly flow rate (vph) Pedestrians	0.90 21	0% 0.90 232	0% 0.90 396	0.90 31	0% 0.90 19	0.90 12	
Lane Width (ft) Walking Speed (ft/s) Percent Blockage Right turn flare (veh)							
Median type Median storage veh) Upstream signal (ft) pX, platoon unblocked		None	None				
vC, conflicting volume vC1, stage 1 conf vol vC2, stage 2 conf vol	427				670	396	
vCu, unblocked vol	427				670	396	
tC, single (s) tC, 2 stage (s)	4.1				6.4	6.2	
tF (s)	2.2				3.5	3.3	
p0 queue free %	98				95	98	
cM capacity (veh/h)	1133				414	654	
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1		
Volume Total	21	232	396	31	31		
Volume Leit	21	0	0	21	19		
cSH	1133	1700	1700	1700	484		
Volume to Capacity	0.02	0.14	0.23	0.02	0.06		
Queue Length 95th (ft)	1	0	0.20	0.02	5		
Control Delay (s)	8.2	0.0	0.0	0.0	12.9		
Lane LOS	А				В		
Approach Delay (s) Approach LOS	0.7		0.0		12.9 B		
Intersection Summary							
Average Delay Intersection Capacity Utiliz	ation		0.8 28.7%	IC	U Level o	of Service	A
Analysis Period (min)			15				

	۶	-	-	•	×	1	
Movement	EBL	EBT	WBT	WBR	SBL	SBR	
Lane Configurations Volume (veh/h) Sign Control	<b>1</b> 37	<b>↑</b> 317 Free	<b>↑</b> 296 Free	<b>7</b> 253	48 Stop	<b>ř</b> 26	
Peak Hour Factor Hourly flow rate (vph) Pedestrians Lane Width (ft)	0.90 152	0% 0.90 352	0% 0.90 329	0.90 281	0,90 53	0.90 29	
Walking Speed (ft/s) Percent Blockage Right turn flare (veh) Median type Median storage veh) Upstream signal (ft)		None	None				
pX, platoon unblocked vC, conflicting volume vC1, stage 1 conf vol vC2, stage 2 conf vol	610				986	329	
vCu, unblocked vol	610				986	329	
tC, single (s) tC, 2 stage (s)	4.1				6.4	6.2	
tF (s)	2.2				3.5	3.3	
p0 queue free %	84				77	96	
cM capacity (veh/h)	969				232	713	
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1	SB 2	
Volume Total	152	352	329	281	53	29	
Volume Left	152	0	0	0	53	0	
	060	1700	1700	201	0	29 712	
Volume to Canacity	0 16	0.21	0 10	0 17	0.23	0.04	
Queue Length 95th (ff)	14	0.21 N	0.19	0.17	0.20	0.04 २	
Control Delay (s)	94	00	00	0.0	25.1	10.3	
Lane LOS	A	0.0	0.0	0.0	<u>20.1</u>	R 10.0	
Approach Delay (s) Approach LOS	2.8		0.0		19.9 C	2	
Intersection Summarv							
Average Delay Intersection Capacity Utilization Analysis Period (min)	1		2.6 36.5% 15	IC	U Level c	f Service	A

	۶		-		1	1	
Movement	EBL	EBT	WBT	WBR	SBL	SBR	
Lane Configurations Volume (veh/h) Sign Control Grade	<b>*</b> 12	<b>↑</b> 214 Free 0%	<b>↑</b> 287 Free 0%	<b>ř</b> 23	<b>*</b> 180 Stop 0%	<b>77</b> 97	
Peak Hour Factor Hourly flow rate (vph) Pedestrians Lane Width (ft) Walking Speed (ft/s) Percent Blockage	0.90 13	0.90 238	0.90 319	0.90 26	0.90 200	0.90 108	
Right turn flare (veh) Median type Median storage veh) Upstream signal (ft) pX, platoon unblocked		None	None				
vC, conflicting volume vC1, stage 1 conf vol vC2, stage 2 conf vol	344				583	319	
vCu, unblocked vol	344				583	319	
tC, single (s) tC, 2 stage (s)	4.1				6.4	6.2	
tF (s)	2.2				3.5	3.3	
p0 queue free %	99				57	85	
cM capacity (veh/h)	1215				469	722	
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1	SB 2	
Volume Total	13	238	319	26	200	108	
Volume Left	13	0	0	0	200	100	
	1015	1700	1700	20	460	100	
Volume to Canacity	0.01	0.14	0.10	0.02	409	0 15	
Oueue Length 95th (ft)	0.01	0.14	0.13	0.02	0. <del>4</del> 3 52	13	
Control Delay (s)	80	00	00	00	18.3	10.9	
Lane LOS	0.0 A	0.0	0.0	0.0	, U.U C	10.0 B	
Approach Delay (s) Approach LOS	0.4		0.0		15.7 C	U	
Intersection Summary							
Average Delay Intersection Capacity Utilizati Analysis Period (min)	on		5.5 31.7% 15	IC	U Level c	of Service	A

	۶	-	-		1	1		
Movement	EBL	EBT	WBT	WBR	SBL	SBR		
Lane Configurations	ሻ	+	1	7	Y		 ••• •	
Volume (veh/h)	5	360	533	8	23	16		
Sign Control		Free	Free		Stop			
Grade		0%	0%		0%			
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90		
Hourly flow rate (vph)	6	400	592	9	26	18		
Pedestrians								
Lane Width (ft)								
Walking Speed (ff/s)								
Percent Blockage								
Right turn flare (ven)		Mana	Mana					
Median type		None	None					
linstream signal (ft)								
nX platoon unblocked								
vC. conflicting volume	601				1003	592		
vC1, stage 1 conf vol	001				1000	UUL		
vC2, stage 2 conf vol								
vCu, unblocked vol	601				1003	592		
tC, single (s)	4.1				6.4	6.2		
tC, 2 stage (s)								
tF (s)	2.2				3.5	3.3		
p0 queue free %	99				90	96		
cM capacity (veh/h)	976				267	506		
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1			
Volume Total	6	400	592	9	43			
Volume Left	6	0	0	0	26			
Volume Right	0	0	0	9	18			
CSH Values to Canadity	9/6	1/00	1/00	1/00	331			
Volume to Capacity	0.01	0.24	0.35	0.01	0.13			
Control Delay (c)	U 97	0	0	0	175			
Lane LOS	ο. <i>ι</i> Δ	0.0	0.0	0.0	17.0 C			
Annroach Delay (s)	01		0.0		17 5			
Approach LOS	0.1		0.0		C			
Intersection Summary								
Average Delay			0.8					
Intersection Capacity Utilization	n		38.1%	IC	U Level c	of Service	А	
Analysis Period (min)			15					

	٦	-	-	•	1	1		
Movement	EBL	EBT	WBT	WBR	SBL	SBR		
Lane Configurations	۲	1	<b>†</b>	7	¥		•	
Volume (veh/h)	17	377	300	25	15	10		
Sign Control		Free	Free		Stop			
Grade		0%	0%		0%			
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90		
Hourly flow rate (vph)	19	419	333	28	17	11		
Pedestrians								
Lane Width (ft)								
Walking Speed (ft/s)								
Percent Blockage								
Right turn flare (ven)		Nana	Mana					
Median type		None	None					
linetroom signal (#)								
nX platoon unblocked								
vC. conflicting volume	361				790	333		
vC1_stage 1 conf vol	001				700	000		
vC2, stage 2 conf vol								
vCu, unblocked vol	361				790	333		
tC, single (s)	4.1				6.4	6.2		
tC, 2 stage (s)								
tF (s)	2.2				3.5	3.3		
p0 queue free %	98				95	98		
cM capacity (veh/h)	1198				353	708		
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1			
Volume Total	19	419	333	28	28			
Volume Left	19	0	0	0	17			
Volume Right	0	0	0	28	11			
cSH	1198	1700	1700	1700	442			
Volume to Capacity	0.02	0.25	0.20	0.02	0.06			
Queue Length 95th (ft)	1	0	0	0	5			
Control Delay (s)	8.1	0.0	0.0	0.0	13.7			
Lane LOS	A		• •		B			
Approach Delay (s)	0.3		0.0		13.7			
Approach LOS					В			
Intersection Summary								
Average Delay			0.6					
Intersection Capacity Utiliz	zation		29.8%	IC	U Level o	of Service		
Analysis Period (min)			15					