RAMEY KEMP & ASSOCIATES
TRANSPORTATION ENGINEERS

RAMEY KEMP & ASSOCIATES, INC.
5808 Faringdon Place, Suite 100
Raleigh, NC 27609
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July 13, 2017

Brandon Jones, PE
Division Engineer
NCDOT
902 N Sandhills Boulevard
Aberdeen, NC 28315
bhjones@ncdot.gov

Subject: **TIA Addendum -** Chatham County Grocery
Chatham County, NC

Dear Mr. Jones,

This letter provides a revised capacity analysis summary for the proposed Chatham County Grocery development to be located in the southwest quadrant of the intersection of US 15-501 and Polks Landing Road in Chatham County, North Carolina. The original Traffic Impact Analysis (TIA) report was submitted by Ramey Kemp & Associates (RKA) in March of 2017. The proposed development will have three site driveways: two along Polks Landing Road, and one aligned with Lystra Road along US 15-501. In the original TIA, the intersection of US 15-501 and Lystra Road / Site Drive 1 was analyzed with and without a synchronized street lane configuration. Per the NCDOT Congestion Management Traffic Impact Analysis Review Report, the NCDOT recommended geometric improvements for three scenarios: synchronized street, reverse synchronized street, and without synchronized street. The Congestion Management Report recommended the addition of a southbound through lane along US 15-501 for all lane configuration scenarios in addition to the original TIA geometric improvements. Please see the attachments for the NCDOT Congestion Management Report.

A meeting was held on June 22nd between the NCDOT, Ramey Kemp & Associates (RKA), and Morgan Property Group (Developer) to discuss the implications and effects of the Congestion Management Report. It was determined at the meeting that the concerns with the traffic lie beyond the previously scoped future build year of 2019 in the original TIA. RKA was tasked with providing an update to the original TIA to recommend the necessary improvements for the roadway network demonstrate that the alternative without the synchronized street could be a viable alternative 10 years from existing conditions (2027 analysis year).

Existing (2017) Peak Hour Conditions

The existing (2017) peak hour traffic used in the original TIA was used for this TIA Addendum. Please refer to Figure 1 for the existing (2017) peak hour traffic.

Background (2027) Peak Hour Conditions

The original TIA studied a build-out year of 2019 and included four (4) adjacent developments. Through coordination with the NCDOT, it was determined that the calculated growth rate of US 15-501 would be used for all traffic movements within the roadway network in addition to the four (4) adjacent developments included in the original TIA for this TIA Addendum. An annual growth rate of 1.7% was applied to the existing (2017) traffic to the future year 2027. Refer to Figure 2 for the projected (2027) peak hour traffic and Figure 3 for the adjacent development traffic.

Background traffic volumes were determined by adding the adjacent development trips to the projected (2027) traffic. Refer to Figure 4 for an illustration of the background (2027) peak hour traffic volumes at the study intersections.

Site Trip Generation and Assignment

The site trip generation, site trip distribution, and site trip assignment used in the original TIA was used for this TIA Addendum. The trip generation summary is shown in Table 1. Refer to Figure 5 for the total peak hour site trips at the study intersections.

Table 1: Trip Generation Summary

Land Use (ITE Code)	Intensity	Daily Traffic (vpd)	AM Peak Hour Trips (vph)		PM Peak Hour Trips (vph)	
			Enter	Exit	Enter	Exit
Shopping Center (820)	12,200 sq. ft.	1,730	27	16	70	76
Supermarket (850)	49,098 sq. ft.	5,020	103	63	237	228
Drive-in Bank (912)	4,000 sq. ft.	600	28	21	49	49
Fast Food with Drive-Thru Window (934)	4,000 sq. ft.	1,990	93	89	68	63
Total Trips		**9,340**	**251**	**189**	**424**	**416**
Pass-By Trips: Shopping Center (34% PM)			--	--	*-25*	*-25*
Pass-By Trips: Supermarket (36% PM)			--	--	*-84*	*-84*
Pass-By Trips: Drive-in Bank (29% AM, 35% PM)			*-8*	*-8*	*-18*	*-18*
Pass-By Trips: Fast Food with Drive-Thru Window (49% AM, 50% PM)			*-45*	*-45*	*-33*	*-33*
Total Pass-By Trips			***-53***	***-53***	***-160***	***-160***
Total Primary Trips			**198**	**136**	**264**	**256**

Combined (2027) Peak Hour Conditions

To estimate the combined (2027) traffic conditions with the site fully built-out, the total site trips were added to the background (2027) traffic volumes. All entering and exiting traffic patterns remain the same as in the original TIA report for the without synchronized street alternative. Refer Figure 6 for the combined (2027) peak hour traffic volumes.

Capacity Analysis

Analysis was performed using the Synchro (Version 9.1) software. Synchro operates using the methodology outlined in the 2010 Highway Capacity Manual to calculate capacity and level of service of the study area intersections. The study intersections were analyzed under combined (2027) traffic conditions with full-movement signalized site access at the

intersection of US 15-501 and Lystra Road to determine the potential impact of the future (2027) traffic. The capacity analysis reports can be found in the attachments.

Table 1: Analysis Summary of US 15-501 and Lystra Road / Site Drive 1

ANALYSIS SCENARIO	APPROACH	LANE CONFIGURATIONS	WEEKDAY AM PEAK HOUR LEVEL OF SERVICE		WEEKDAY PM PEAK HOUR LEVEL OF SERVICE	
			Approach	Overall (seconds)	Approach	Overall (seconds)
Background (2027) Conditions	WB NB SB	1 LT, 1 RT 1 UT, 2 TH, 1 RT 1 LT, 2 TH	E D C	D (40)	F C C	E (61)
Combined (2027) Conditions	**EB** WB NB SB	**1 LT, 1 TH-RT** **2 LT**, **1 TH**, 1 RT 1 UT-**LT**, 2 TH, 1 RT 1 LT, **3 TH**, **1 RT**	E E D C	D (49)	E E E D	D (52)

Improvements to lane configurations shown in bold.

Capacity analysis of background (2027) traffic conditions indicates the intersection of US 15-501 and Lystra Road is expected to operate at an overall LOS D during the weekday AM peak hour and LOS E during the weekday PM peak hour. It should be noted that the Synchro software reports a 95th percentile queue of 385 feet at the westbound left-turn movement during the weekday AM peak hour and a 95th percentile queue of 1279 feet during the weekday PM peak hour. With the anticipated growth and the adjacent development traffic, the westbound left-turn movement is expected to have a volume of 519 during the weekday PM peak hour under background (2027) traffic conditions (without the proposed development traffic). Traditionally, the NCDOT favors the installation of dual left-turn lanes at a volume of 300 vehicles or more.

Under combined (2027) traffic conditions with the development fully-built out and with the necessary improvements, the intersection is expected to operate at an overall LOS D during both the weekday AM and PM peak hours. It should be noted that the westbound approach delay is expected to be reduced by approximately 69% during the weekday PM peak hour with the development fully built out and proposed improvements incorporated. The Synchro software reports a 95th percentile queue of 215 feet at the westbound approach during the weekday AM peak hour and a 95th percentile queue of 397 feet during the weekday PM peak hour. With the additional traffic and new lane configuration from the development fully build-out, the intersection of US 15-501 and Lystra Road is going to operate with a better LOS and delay than if the development was not constructed during the weekday PM peak hour.

The proposed development is not anticipated to increase the traffic volume at the westbound left-turn movement, which would require dual left-turn lanes during the background (2027) peak hour. The proposed development is not only going to provide mitigation for its own site traffic, but it will also provide mitigation for improvements necessary based on the anticipated background growth.

It should be noted that the additional southbound through lane recommended in the Congestion Management Report is also recommended with this lane configuration. At the meeting on June 22nd, the possibility of proportional share was discussed as an option to pursue the appropriate avenues of funding for the additional southbound through lane along US 15-501. It is recommended that the southbound through lane is installed along the frontage of the proposed development. SimTraffic illustrates that this distance is sufficient to accommodate the anticipated future (2027) traffic along US 15-501.

Should the NCDOT require additional storage for the recommended southbound through lane, a proportional share agreement should be established.

Table 2: Analysis Summary of US 15-501 and Polks Landing Road / Williams Corner Site Drive

ANALYSIS SCENARIO	APPROACH	LANE CONFIGURATIONS	WEEKDAY AM PEAK HOUR LEVEL OF SERVICE		WEEKDAY PM PEAK HOUR LEVEL OF SERVICE	
			Approach	Overall (seconds)	Approach	Overall (seconds)
Background (2027) Conditions	EB NBU** SB	1 RT 1 UT-LT 2 TH, 1 RT	C[2] F[1] --	N/A	D[2] F[1] --	N/A
	WB NB SBU*	1 RT 2 TH, 1 RT 1 UT-LT	E[2] -- F[1]	N/A	F[2] -- F[1]***	N/A
Combined (2027) Conditions	EB NBU** SB	1 RT 1 UT-LT 2 TH, 1 RT	C[2] F[1] --	N/A	F[2] F[1] --	N/A
	WB NB SBU*	1 RT 2 TH, 1 RT 1 UT-LT	E[2] -- F[1]	N/A	F[2] -- F[1]***	N/A

*Southbound U-turn analyzed as EB approach due to Synchro limitations.
** Northbound U-turn analyzed as WB approach due to Synchro limitations.
*** Southbound U-turn LOS is assumed during the PM peak hour due to Synchro limitations.
Background improvements associated with the Williams Corner development are shown underlined.
1. Level of service for major-street left-turn movement.
2. Level of service for minor-street approach.

Capacity analysis of background (2027) traffic conditions indicates the eastbound minor-street approach is expected to operate at LOS D or better during both weekday AM and PM peak hours. The westbound approach is expected to operate at LOS E during the weekday AM peak hour and LOS F during the weekday PM peak hour. The southbound and northbound U-turn / left-turn movements are expected to operate at LOS F during both weekday AM and PM peak hours.

Capacity analysis of combined (2027) traffic conditions indicates the eastbound minor-street approach is expected to operate at LOS C during the weekday AM peak hour and LOS F during the weekday PM peak hour. The westbound approach is expected to operate at LOS E during the weekday AM peak hour and LOS F during the weekday PM peak hour. The southbound and northbound U-turn / left-turn movements are expected to operate at LOS F during both weekday AM and PM peak hours.

A traffic signal was considered at this intersection, and combined (2027) traffic volumes were analyzed utilizing the criteria contained in the *Manual on Uniform Traffic Control Devices* (MUTCD). It should be noted that a traffic signal was warranted during the weekday AM and PM peak hours under combined (2027) traffic conditions. It is anticipated that a 4- or 8-hour signal warrant would not be met, which NCDOT favors for the installation of a traffic signal. Additionally, the intersection is less than 800 feet away from the adjacent signalized intersection, which typically is too short of a distance to have a second traffic signal installed.

It should be noted that the high southbound left-turn delays can be attributed to the Williams Corner development, which has not begun construction despite its TIA build year being 2010. If this development continues to delay construction, it is likely that it will not be constructed before the proposed site. Without the additional background traffic associated with this development, the intersection is expected to operate with better LOS and delay than illustrated in Table 4 under all future 2027 traffic conditions. It should also be noted that the Williams Corner development TIA analyzed the intersection of US 15-501 and Polks Landing Drive / Williams Corner Site Drive as a full movement intersection. Under existing (2017) traffic conditions, the intersection operates as a synchronized street intersection (left-over intersection). It is likely that if the Williams Corner development is constructed the trip distribution would be different than illustrated in the TIA that was sealed in 2005, and thus different than the distribution and assignment that was used in this TIA Addendum. It is should be noted that the Williams Corner development alone is expected to add approximately 25% of the total existing (2017) traffic at the intersection of US 15-501 and Lystra Road, while the proposed Chatham County Grocery Development is only expected to add approximately 15% of the total existing (2017) traffic.

Table 3: Analysis Summary of Polks Landing Drive and Site Drive 2

ANALYSIS SCENARIO	APPROACH	LANE CONFIGURATIONS	WEEKDAY AM PEAK HOUR LEVEL OF SERVICE		WEEKDAY PM PEAK HOUR LEVEL OF SERVICE	
			Approach	Overall (seconds)	Approach	Overall (seconds)
Combined (2027) Conditions	EB WB **NB**	1 TH-**RT** 1 **LT**-TH **1 LT-RT**	-- A[1] A[2]	N/A	-- A[1] A[2]	N/A

Improvements to lane configurations shown in bold.

1. Level of service for major-street left-turn movement.
2. Level of service for minor-street approach.

Capacity analysis of combined (2027) traffic conditions indicates the minor-street approach and major-street left-turn movement at the intersection of Polks Landing Drive and Site Drive 2 are expected to operate at LOS A during both weekday AM and PM peak hours.

Table 4: Analysis Summary of Polks Landing Drive and Site Drive 3

ANALYSIS SCENARIO	APPROACH	LANE CONFIGURATIONS	WEEKDAY AM PEAK HOUR LEVEL OF SERVICE		WEEKDAY PM PEAK HOUR LEVEL OF SERVICE	
			Approach	Overall (seconds)	Approach	Overall (seconds)
Combined (2027) Conditions	EB WB **NB**	1 TH-**RT** 1 **LT**-TH **1 LT-RT**	-- A[1] A[2]	N/A	-- A[1] A[2]	N/A

Improvements to lane configuration shown in bold.

1. Level of service for major-street left-turn movement.
2. Level of service for minor-street approach.

Capacity analysis of combined (2027) traffic conditions indicates the minor-street approach and major-street left-turn movement at the intersection of Polks Landing Drive and Site Drive 3 are expected to operate at LOS A during both weekday AM and PM peak hours.

Conclusions

The purpose of this TIA Addendum was to determine the necessary improvements to accommodate projected future (2027) traffic volumes and the traffic generated by the proposed development as a full-movement signalized intersection.

With the additional traffic and new lane configuration from the development fully build-out, the intersection of US 15-501 and Lystra Road is going to operate with a better LOS and delay than if the development was not constructed during the weekday PM peak hour. The proposed development is not anticipated to increase the traffic volume at the westbound left-turn movement, which would require dual left-turn lanes during the background (2027) peak hour. The proposed development is not only going to provide mitigation for its own site traffic, but it will also provide mitigation for improvements necessary based on the anticipated background growth.

It should be noted that the additional southbound through lane recommended in the Congestion Management Report is also recommended with this lane configuration. At the meeting on June 22nd, the possibility of proportional share was discussed as an option to pursue the appropriate avenues of funding for the additional southbound through lane along US 15-501. It is recommended that the southbound through lane is installed along the frontage of the proposed development. SimTraffic illustrates that this distance is sufficient to accommodate the anticipated future (2027) traffic along US 15-501. Should the NCDOT require additional storage for the recommended southbound through lane, a proportional share agreement should be established.

With the improvements recommended in this TIA Addendum, the intersection of US 15-501 and Lystra Road is expected to operate with less delay during the weekday PM peak hour than it would if the development was not constructed.

Recommendations

Based on the findings of this study, specific geometric improvements have been identified and are recommended to accommodate future traffic conditions. See a more detailed description of the recommended improvements below. Refer to Figure 7 for an illustration of the recommended lane configuration.

US 15-501 and Lystra Road / Site Drive 1

- Provide site access via an eastbound approach with one (1) ingress lane and two (2) egress lanes striped as one (1) left-turn lane with at least 250 feet of storage and appropriate taper, and one (1) shared through-right turn lane.
- Provide an additional southbound through lane on US 15-501 starting approximately 600 feet before the intersection with Lystra Road and extending the length of the proposed development property along US 15-501.
- Provide an exclusive southbound right-turn lane on US 15-501 with at least 50 feet of storage and appropriate taper.
- Restripe and widen the westbound pavement to provide two (2) left-turn lanes with at least 200 feet of storage each and appropriate taper, one (1) through lane, and one (1) right-turn lane with at least 100 feet of storage and appropriate taper.
- Develop a signal modification plan to accommodate the new eastbound leg and lane geometrics.

Polks Landing Drive and Site Drive 2

- Provide site access via a northbound approach with one (1) ingress lane and one (1) egress lane.
- Provide stop control for the northbound approach.

Polks Landing Drive and Site Drive 3

- Provide site access via a northbound approach with one (1) ingress lane and one (1) egress lane.
- Provide stop control for the northbound approach.

Please contact us with any questions or comments at (919) 872-5115.

Thank You,
Ramey Kemp & Associates, Inc.

Joshua T. Reinke, P.E.
Transportation Engineer

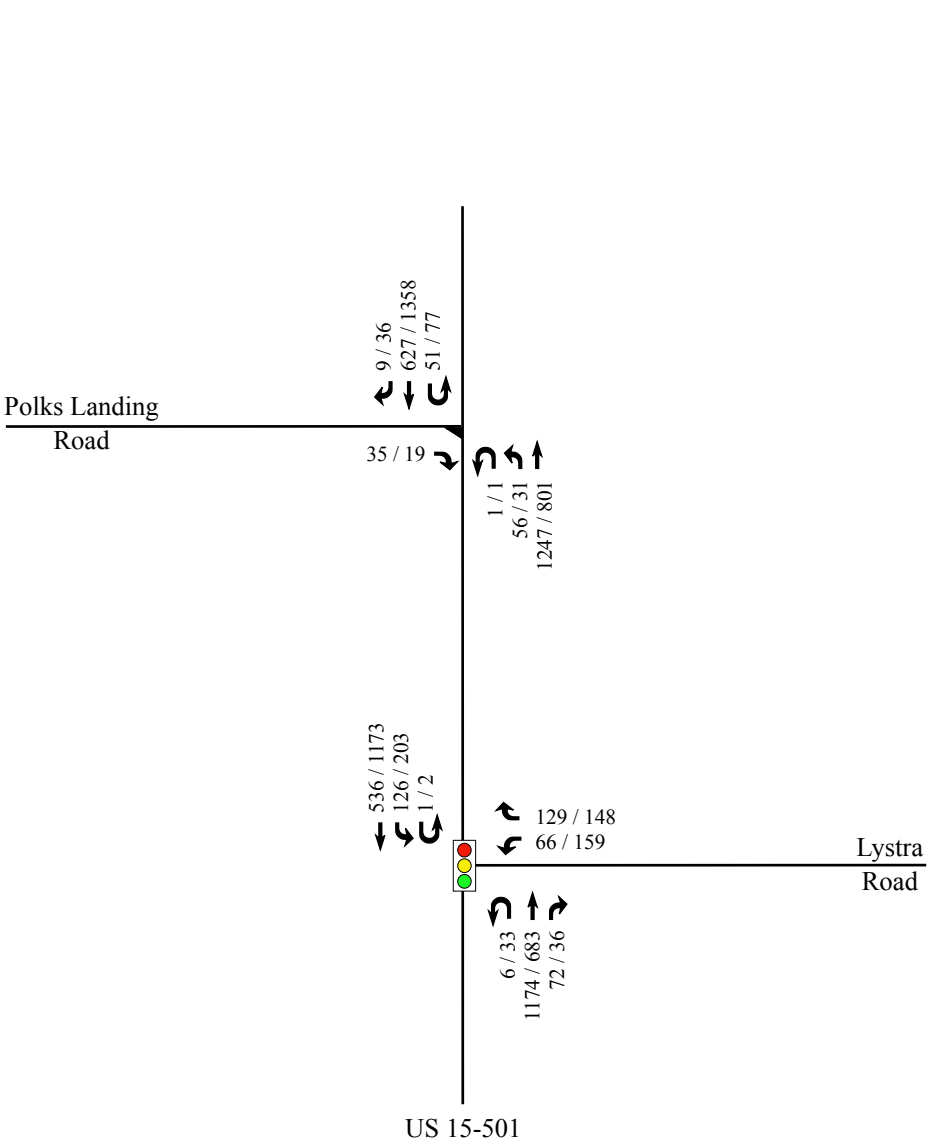
Attachments: Figures
Congestion Management Report
Capacity Analysis Reports

cc: Jeff Surrency, Morgan Property Group

TECHNICAL APPENDIX

APPENDIX A

FIGURES



LEGEND

- Left-Over Intersection
- Signalized Intersection
- X / Y → AM / PM Peak Hour Traffic

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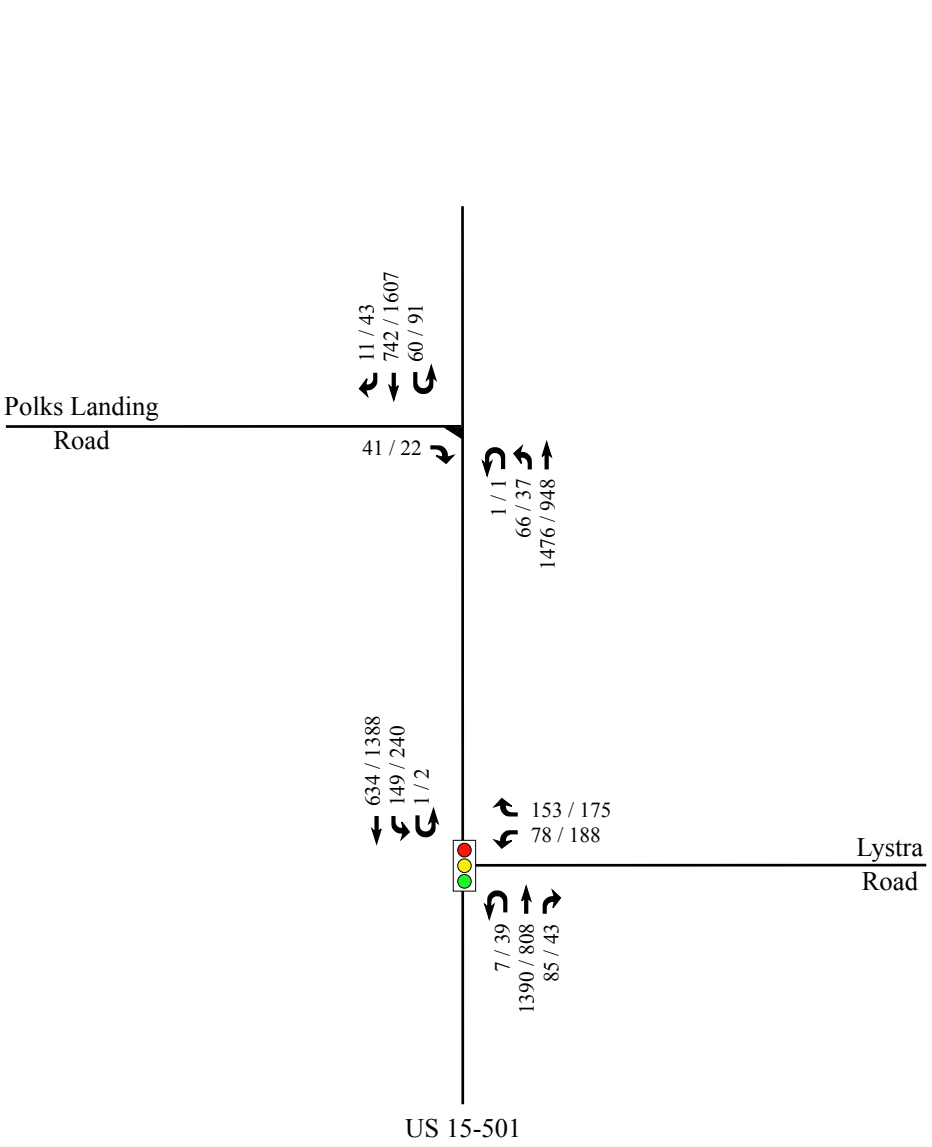
TRANSPORTATION ENGINEERS

Chatham County
Grocery Store
Chatham County, NC

Existing (2017)
Peak Hour Traffic Volumes

Scale: Not to Scale

Figure 1



LEGEND

- Left-Over Intersection
- Signalized Intersection
- X / Y → AM / PM Peak Hour Traffic

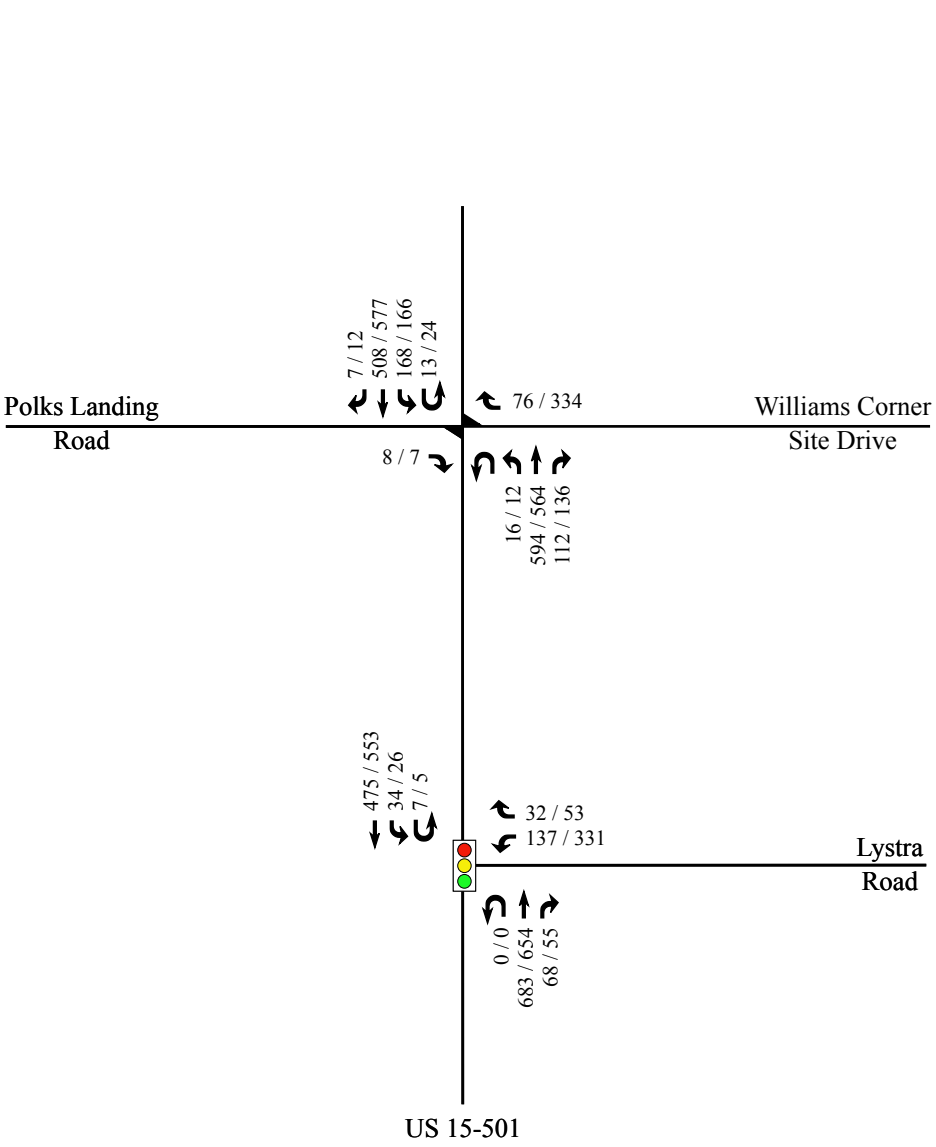
RAMEY KEMP & ASSOCIATES
TRANSPORTATION ENGINEERS

Chatham County
Grocery Store
Chatham County, NC

Projected (2027)
Peak Hour Traffic Volumes

Scale: Not to Scale

Figure 2



LEGEND

- Left-Over Intersection
- Signalized Intersection
- X / Y → AM / PM Peak Hour Traffic

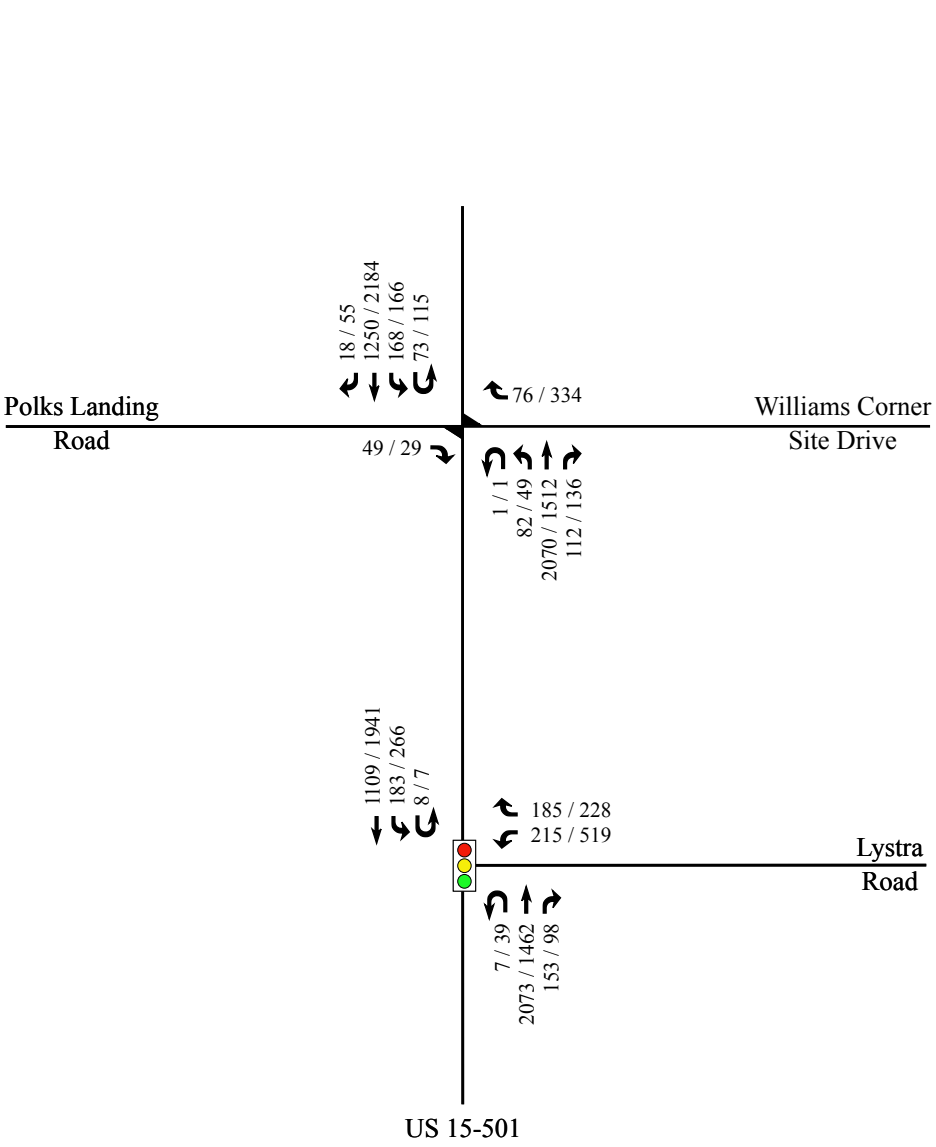
RAMEY KEMP & ASSOCIATES
TRANSPORTATION ENGINEERS

Chatham County
Grocery Store
Chatham County, NC

Total Adjacent Development
Traffic Volumes

Scale: Not to Scale

Figure 3



LEGEND

- Left-Over Intersection
- Signalized Intersection
- X / Y → AM / PM Peak Hour Traffic

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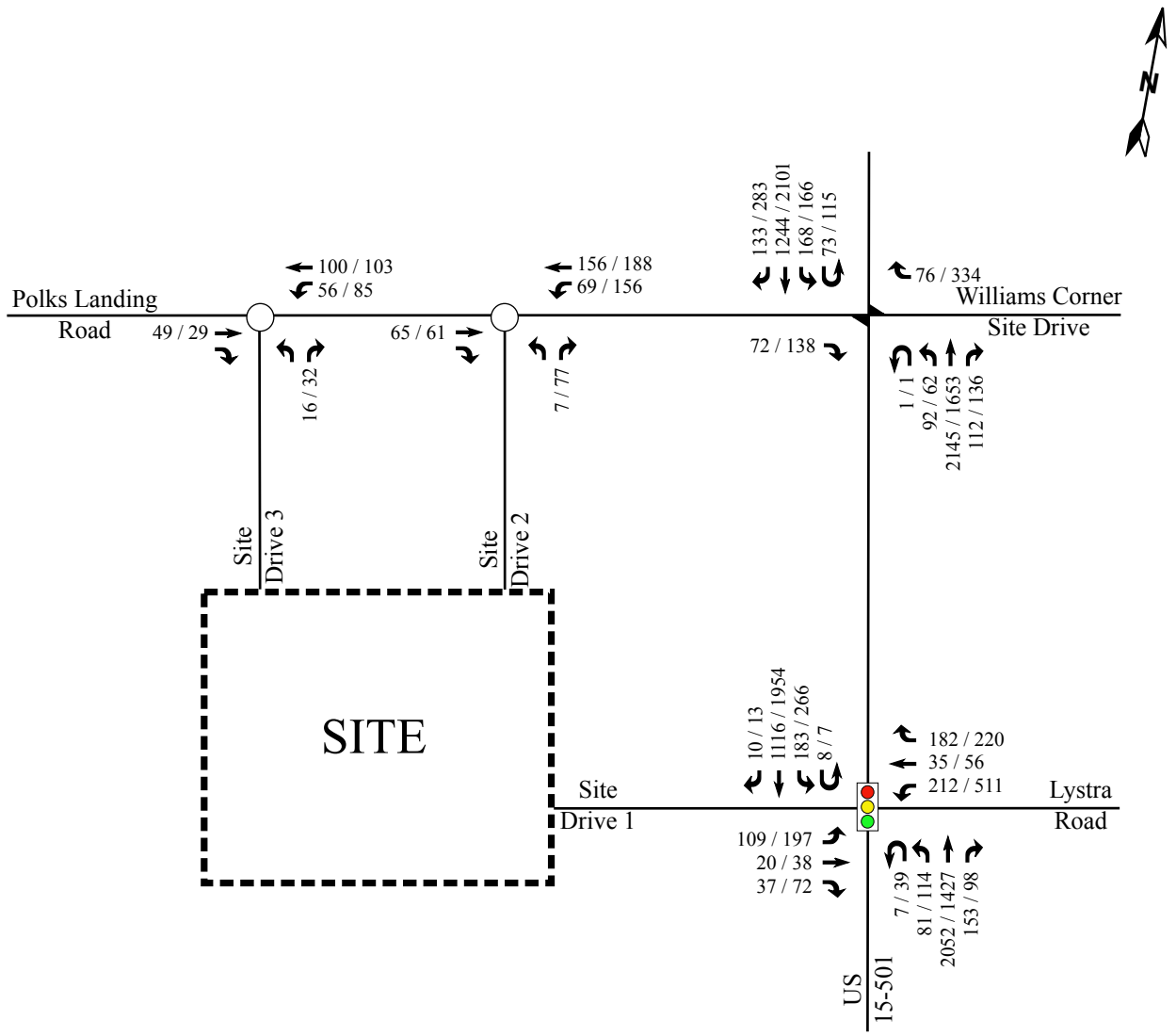
Chatham County
Grocery Store
Chatham County, NC

Background (2027)
Peak Hour Traffic Volumes

Scale: Not to Scale

Figure 4



LEGEND

- Unsignalized Intersection
- Left-Over Intersection
- Signalized Intersection
- X / Y → AM / PM Peak Hour Traffic

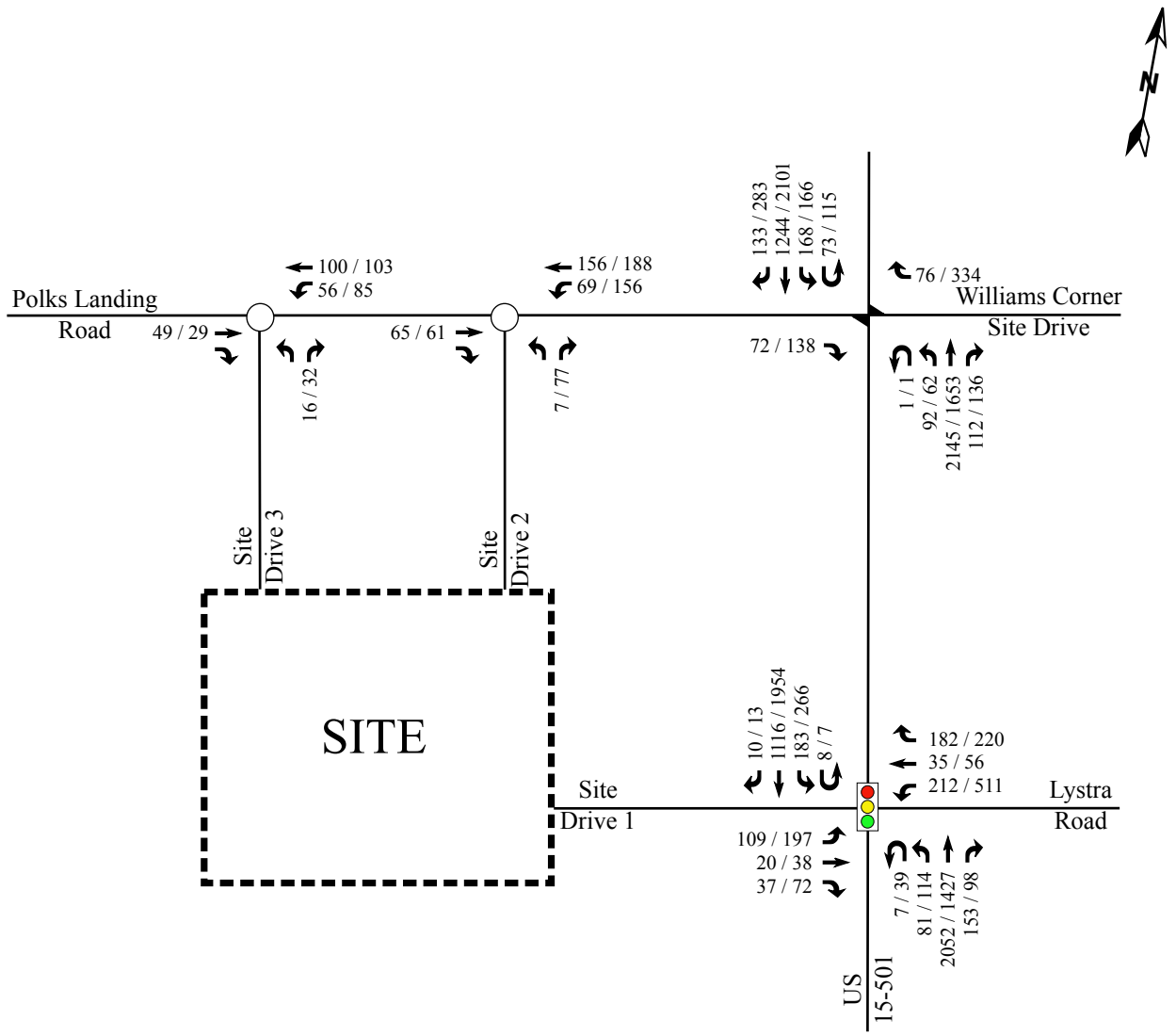
RAMEY KEMP & ASSOCIATES
TRANSPORTATION ENGINEERS

Chatham County
Grocery Store
Chatham County, NC

Combined (2027)
Peak Hour Traffic Volumes

Scale: Not to Scale

Figure 6



LEGEND

- Unsignalized Intersection
- Left-Over Intersection
- Signalized Intersection
- X / Y → AM / PM Peak Hour Traffic

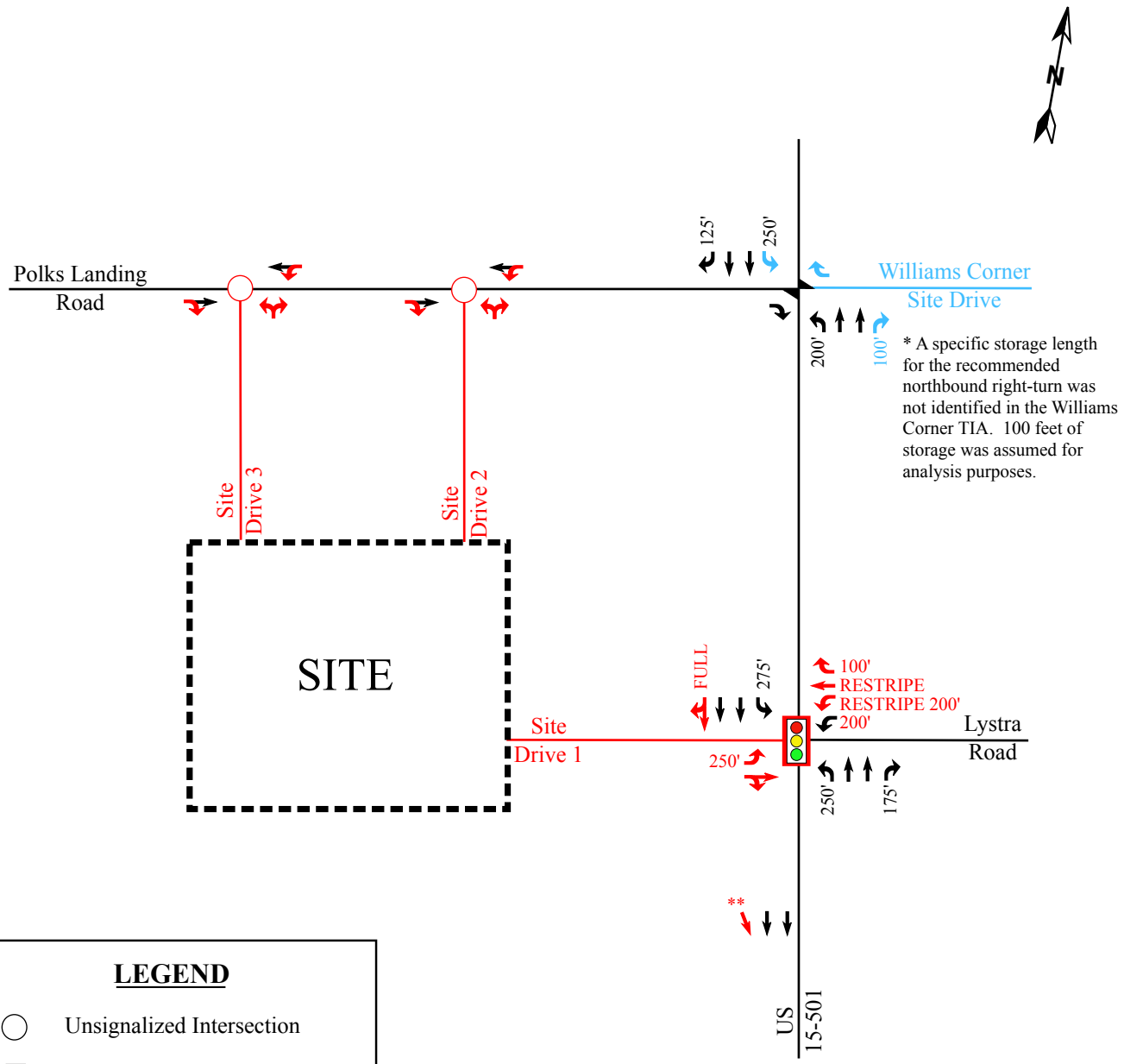
RAMEY KEMP & ASSOCIATES
TRANSPORTATION ENGINEERS

Chatham County
Grocery Store
Chatham County, NC

Combined (2027)
Peak Hour Traffic Volumes

Scale: Not to Scale

Figure 6



** The proposed southbound through lane is reommended to extend the length of the proposed development propert along US 15-501.

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Chatham County
Grocery Store
Chatham County, NC

Recommended
Lane Configurations

Scale: Not to Scale

Figure 7

APPENDIX B

CONGESTION MANAGEMENT REPORT

AND

EMAIL CORRESPONDANCE

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

ROY COOPER
GOVERNOR

JAMES H. TROGDON, III
SECRETARY

June 1, 2017

Chatham County Grocery Store

Traffic Impact Analysis Review Report

Congestion Management Section

TIA Project: SC-2017-056
Division: 8
County: Chatham

Clarence B. Bunting, IV, P.E. Project Engineer
Charles V. Sorrell

Mailing Address:
NC DEPARTMENT OF TRANSPORTATION
TRANSPORTATION MOBILITY & SAFETY DIVISION
1561 MAIL SERVICE CENTER
RALEIGH, NC 27699-1561

Telephone: (919) 814-5000
Fax: (919) 771-2745
Customer Service: 1-877-368-4968

Website: www.ncdot.gov

Location:
750 N. GREENFIELD PARKWAY
GARNER, NC 27529

Chatham County Grocery Store

SC-2017-056	Chatham	June 1, 2017

Per your request, the Congestion Management Section (CMS) of the Transportation Mobility and Safety Division has completed a review of the subject site. The comments and recommendations contained in this review are based on data for background conditions presented in the sealed Traffic Impact Analysis (TIA) and are subject to the approval of the local District Engineer's Office and appropriate local authorities.

Date Initially Received by CMS	5/2/17	Date of Site Plan	N/A
Date of Complete Information	5/5/17		
Date of Preliminary Review	5/9/17	Date of Sealed TIA	3/23/17

Proposed Development

According to the TIA, the proposed Chatham County Grocery Store is to be located on US 15-501 in Chatham County. The TIA states the development is to be constructed by 2019 and is to consist of the following:

Land Use	Land Use Code	Size
Shopping Center	820	12,200 sq.ft
Supermarket	850	49,098 sq.ft
Drive-In Bank	912	4,000 sq.ft.
Fast Food with Drive-Thru	934	4,000 sq.ft.

Trip Generation - Unadjusted Volumes During a Typical Weekday

	IN	OUT	TOTAL
AM Peak Hour	251	189	440
PM Peak Hour	424	416	840
Daily Trips			9,340

Requested Access Points

Driveway	Public Roadway	Access Type
Site Drive 1	US 15-501	All-Movement
Site Drive 2	Parks Landing Road	All-Movement
Site Drive 3	Parks Landing Road	All-Movement

General Reference

For reference to various documents applicable to this review please reference the following link: *http://www.ncdot.org/doh/preconstruct/traffic/teppl/Topics/C-37/C-37.html*

Once the driveway permit has been approved and issued, a copy of the final driveway permit requirements should be forwarded to this office. If we can provide further assistance, please contact the Congestion Management Section.

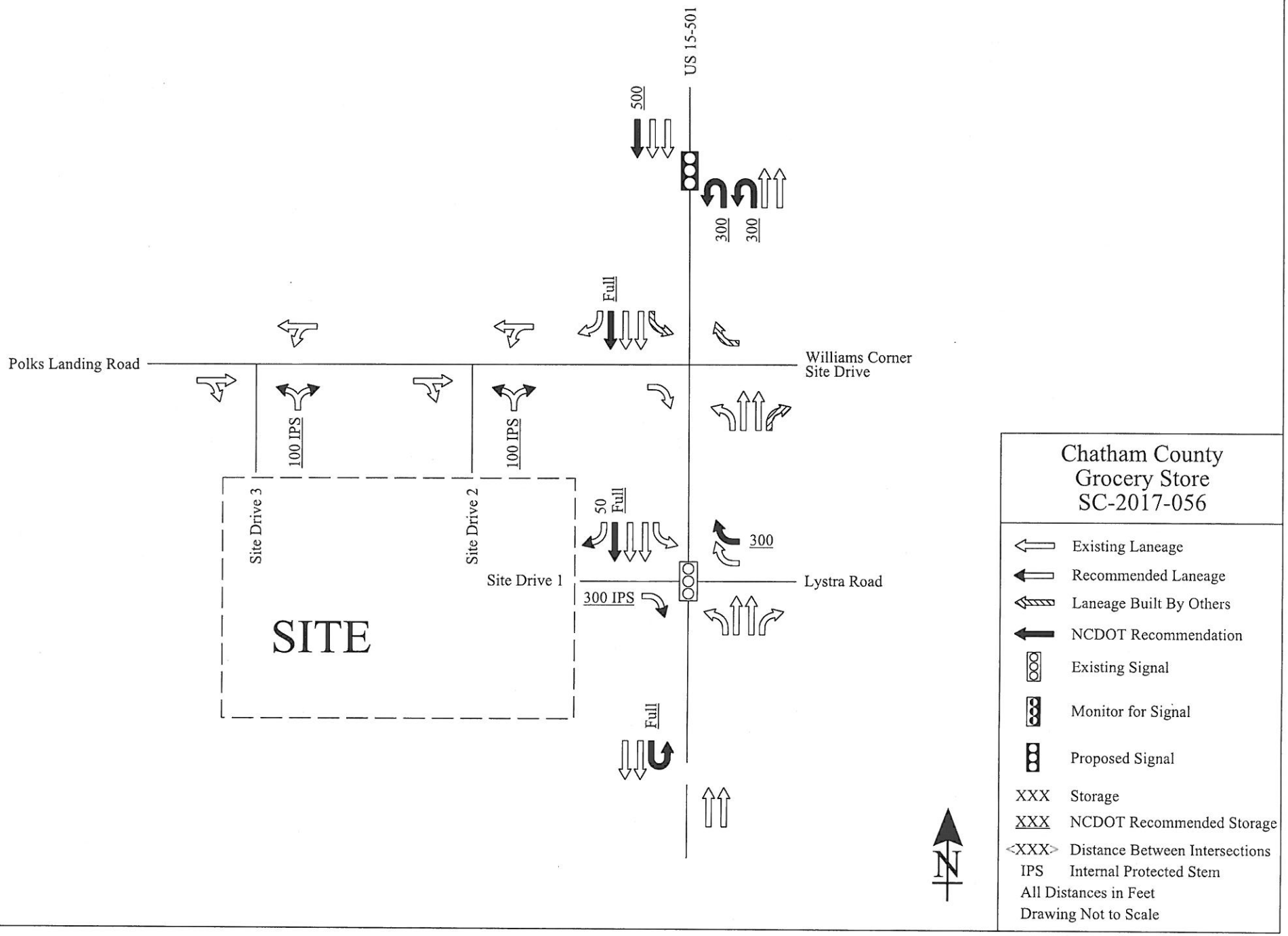
Improvements By Others

The analysis includes background improvements by others. If these improvements are not in place at the time of construction, the site should provide these improvements or analysis demonstrating mitigation is not necessary.

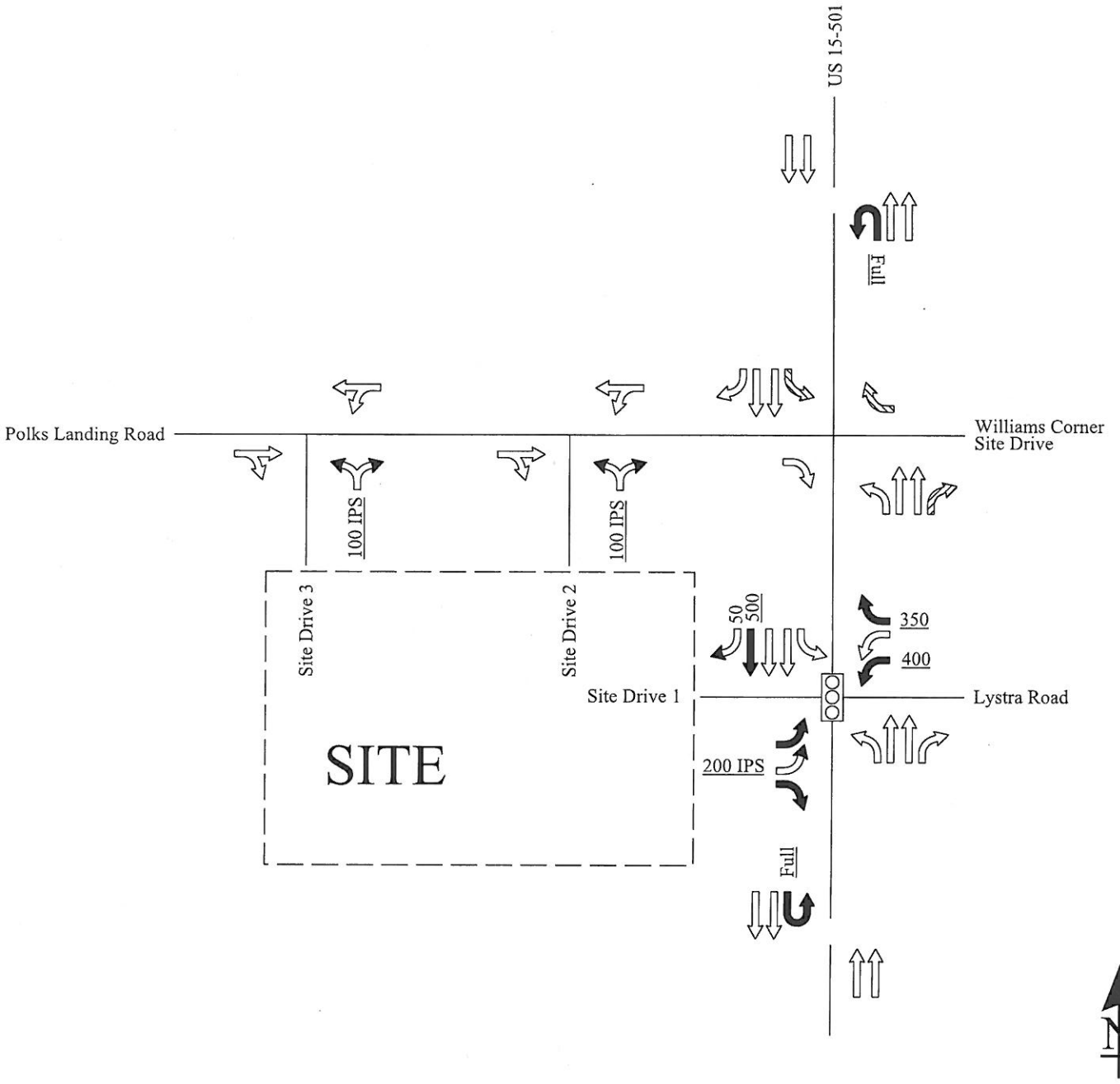
Signalization

We defer to the District Engineer, the Division Traffic Engineer, and the Regional Traffic Engineer for final decisions regarding signalization.

Synchronized Street



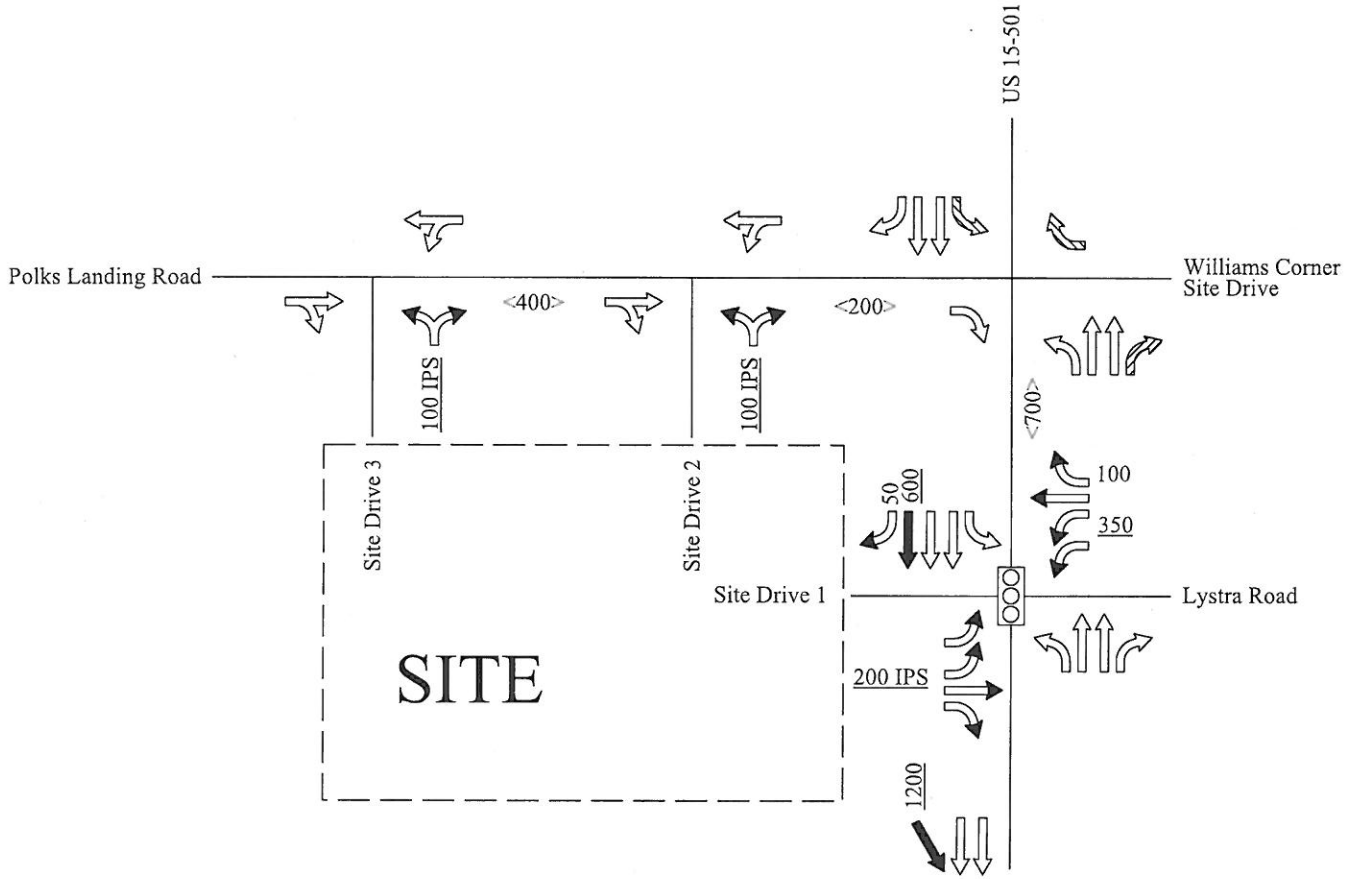
Reverse Synchronized Street



Chatham County
Grocery Store
SC-2017-056

- Existing Laneage
- Recommended Laneage
- Laneage Built By Others
- NCDOT Recommendation
- Existing Signal
- Monitor for Signal
- Proposed Signal
- XXX Storage
- XXX NCDOT Recommended Storage
- <XXX> Distance Between Intersections
- IPS Internal Protected Stem
- All Distances in Feet
- Drawing Not to Scale

Without Synchronized Street



Chatham County
Grocery Store
SC-2017-056

- Existing Laneage
- Recommended Laneage
- Laneage Built By Others
- NCDOT Recommendation
- Existing Signal
- Monitor for Signal
- Proposed Signal
- XXX Storage
- XXX NCDOT Recommended Storage
- <XXX> Distance Between Intersections
- IPS Internal Protected Stem
- All Distances in Feet
- Drawing Not to Scale

Caroline Bojarski

From: Richardson, Justin T <jtrichardson@ncdot.gov>
Sent: Thursday, June 29, 2017 9:54 AM
To: Caroline Bojarski
Cc: Joshua Reinke; Jones, Brandon H
Subject: RE: Chatham County Grocery Proposed Growth Rate to 2027

Caroline,

NCDOT would ask that you use the same growth rate for the turning movements. Knowing that the growth rates for Lystra Rd. already exceeds the forecasted rates, we ask you use the %1.7 plus the approved traffic for this analysis. Please let me know if you have any questions.

Thanks

Justin Richardson
Assistant District Supervisor
Division 8- District 1

336 318 4000 office
336 318 4010 fax
jtrichardson@ncdot.gov

P.O. Box 1164
300 DOT Drive
Asheboro, North Carolina 27205-1164

From: Caroline Bojarski [mailto:cbojarski@rameykemp.com]
Sent: Wednesday, June 28, 2017 4:30 PM
To: Richardson, Justin T <jtrichardson@ncdot.gov>
Cc: Joshua Reinke <jreinke@rameykemp.com>; Jones, Brandon H <bhjones@ncdot.gov>
Subject: RE: Chatham County Grocery Proposed Growth Rate to 2027

Justin,

We understand using the 1.7% annual growth rate for the through movements along US 15-501 in addition to the adjacent developments; however, we do feel that using the 1.7% annual growth rate for the turning movements on US 15-501 and side streets (Lystra and Polks Landing) would be excessive. We are including all of the known future traffic in the turning movements with the adjacent developments, which is what the growth rate is ultimately supposed to be accounting for. With two of the four adjacent developments included in the TIA already 7-8 years behind construction schedule, it is unlikely that an additional 1.7% annual growth of development would be fully-constructed before 2027. We believe that a 1.0% annual growth rate in addition to the adjacent developments would yield conservative results.

We are proposing to use the recommended 1.7% annual growth rate along the through movements on US 15-501 and a 1.0% growth rate for US 15-501 turning movements and side streets (Lystra and Polks Landing).

Please let us know if this is a reasonable compromise.

Thanks!

Caroline Bojarski, EI
Transportation Associate

RAMEY KEMP & ASSOCIATES
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From: Richardson, Justin T [mailto:jtrichardson@ncdot.gov]
Sent: Wednesday, June 28, 2017 1:19 PM
To: Caroline Bojarski <cbojarski@rameykemp.com>
Cc: Joshua Reinke <jreinke@rameykemp.com>; Jones, Brandon H <bhjones@ncdot.gov>
Subject: RE: Chatham County Grocery Proposed Growth Rate to 2027

Carolina,

After speaking with our congestion folks, NCDOT would request you use a growth rate of %1.7 to %2 for this analysis. Please include the background traffic on in addition on top of this rate. We have concerns due to the increase interest in development in this area. the historical growth rate is in line with the 1.7 to 2 percent growth rate and this includes the recession. We do not wont to underestimate the growth rate for this area. Please let me know if you have any questions.

Thanks

Justin Richardson
Assistant District Supervisor
Division 8- District 1

336 318 4000 office
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300 DOT Drive
Asheboro, North Carolina 27205-1164

From: Caroline Bojarski [mailto:cbojarski@rameykemp.com]
Sent: Tuesday, June 27, 2017 5:38 PM
To: Richardson, Justin T <jtrichardson@ncdot.gov>
Cc: Joshua Reinke <jreinke@rameykemp.com>
Subject: Chatham County Grocery Proposed Growth Rate to 2027

Justin,

We are proposing to grow the through traffic along US 15-501 by an annual growth rate of 1.0% and all turning movements by an annual growth rate of 0.5% from 2017 to 2027 along with the inclusion of the four adjacent developments used in the original TIA. Below is our reasoning and explanation:

We used the NCDOT published AADT counts and Traffic Forecasting Utility (TFU) workbook to determine the best way to grow the traffic to 2027. Please note that the guidelines outlined within the workbook regarding outliers was used for the purposes of this analysis.

US 15-501

The following are the growth rate options / methods that we have determined:

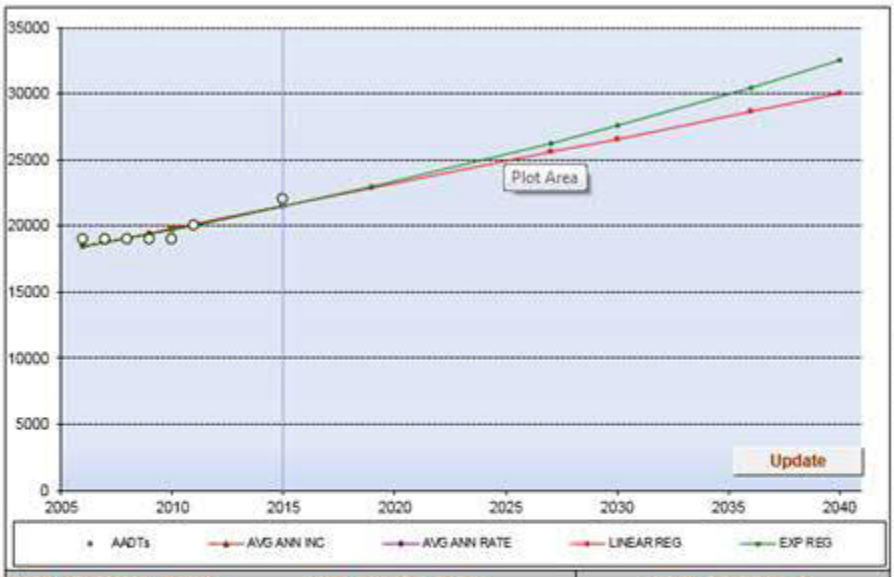
- The Original TIA: annual growth rate of 3% + four adjacent developments. If we used this method from 2017-2027, the AADT would be approximately 28,000 (from 3%) + ~10,000 (adj. development AADT) = 38,000
- The Historical Growth Rate: ~1.7% with an R-squared of 0.8 (as shown in the chart below). If we used this growth rate (without any adjacent development traffic) from 2017-2027, the 2027 AADT would be approximately 24,500
- Proposed growth for 2027: A growth rate of 1.0% for all through movements and 0.5% for all turning movements along US 15-501 from 2017-2027, the 2027 AADT would be ~23,000 + ~10,000 adjacent development AADT = 33,000

To find the ADT that would be used in the TIA, the ADT immediately south of Lystra Road along 15-501 was calculated based on the existing traffic counts conducted in February of 2017 assuming that the AADT is 10% of the peak hour traffic. The Adjacent development ADT was calculated as a low rough estimate based on the adjacent development trip generation, estimation of completion, and trip distribution from their respective TIAs and the methodology used in the original TIA.

Additionally, the proposed 1% growth rate with adjacent developments will put 15-501 at ~36,000 AADT in 2040 which is very close to the US 15-501 Corridor Study conducted by Stantec which predicted an AADT of 36,400 north of Lystra and 32,600 south of Lystra.

AADT TREND ANALYSIS

#1 -- US 15-501 S OF SR 1532



HISTORIC DATA		STATISTICAL RESULTS	
Year	AADT	LINEAR REG:	340.4
2006	19000	LINEAR %:	1.73%
2007	19000	EXPONENTIAL REG:	1.68%
2008	19000		
2009	19000		
2010	19000	R-SQUARED	
2011	20000	LINEAR:	0.8069
2015	22000	EXPONENTIAL:	0.8091

NUMBER OF DATA POINTS: 7

Print All

SHOW HISTORIC DATA:	SHOW FUTURE DATA:	SHOW STATION #:	
☑ LINEAR REGRESSION	☑ LINEAR REGRESSION	1- US 15-501 S OF SR 1532	
☑ EXPONENTIAL REGRESSION	☑ EXPONENTIAL REGRESSION	YEARS:	2015
		#1	2019
☑ HISTORIC DATA		#2	2027
		#3	2030
		#4	2036
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION / TRANSP. PLANNING BRANC		#5	2040

FUTURE PROJECTIONS:

Avg Ann Inc	Avg Ann Rate	Linear Reg	Exp Reg
22000	22000	21468	21451
23333	23481	22830	22934
26000	26749	25553	26213
27000	28089	26574	27561
29000	30973	28617	30467
30333	33056	29979	32572

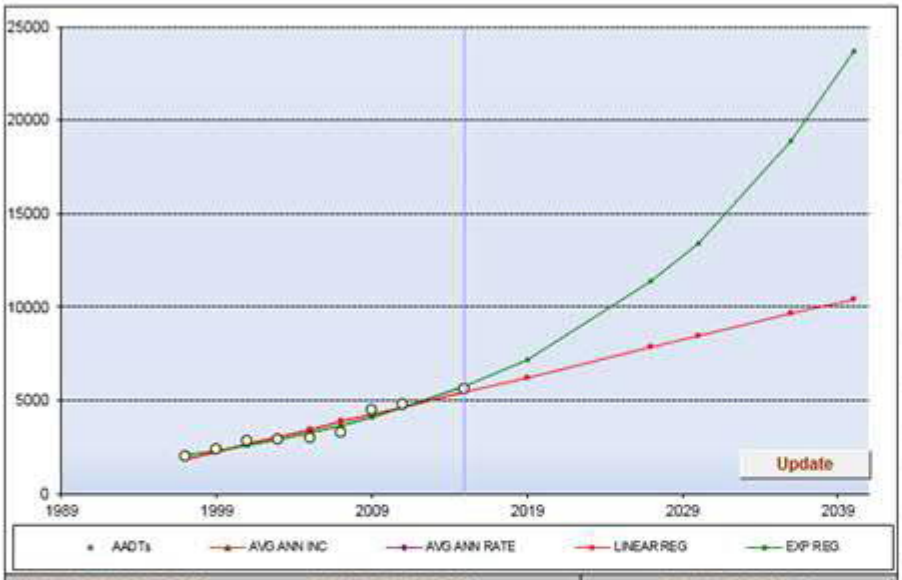
Chatham County Grocery Store
Long Range Growth Data

Lystra Road

The historical annual growth rate along Lystra Road is calculated at ~6.2% with an R-squared value of 0.94 (see graph below). The four adjacent developments included in the original TIA are equivalent to an annual growth rate of approximately 6.3% with a 2027 build-out year. Williams Corner alone is expected to add over 3,000 daily trips to Lystra Road. Without any additional growth Lystra will meet the 2040 forecast of 7,000 AADT based on the existing traffic counts and adjacent developments. Although the adjacent development traffic is expected to account for more than the historical growth / projected growth, we are proposing to grow all of the traffic along Lystra Road 0.5% from 2017-2027 to remain conservative.

AADT TREND ANALYSIS

#1 -- SR 1721 E OF US 15-501



HISTORIC DATA		STATISTICAL RESULTS	
Year	AADT	LINEAR REG:	199.8
1997	2000	LINEAR %:	6.21%
1999	2400	EXPONENTIAL REG:	5.83%
2001	2800		
2003	2900		
2005	3000	R-SQUARED	
2007	3300	LINEAR:	0.9401
2009	4500	EXPONENTIAL:	0.9597
2011	4800		
2015	5600		
		NUMBER OF DATA POINTS:	
			9

Print All

SHOW HISTORIC DATA:	SHOW FUTURE DATA:	SHOW STATION #:	
☑ LINEAR REGRESSION	☑ LINEAR REGRESSION	1- SR 1721 E OF US 15-501	
☑ EXPONENTIAL REGRESSION	☑ EXPONENTIAL REGRESSION	YEARS:	2015
		#1	2019
☑ HISTORIC DATA		#2	2027
		#3	2030
		#4	2036
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION / TRANSP. PLANNING BRANC		#5	2040

FUTURE PROJECTIONS:

Avg Ann Inc	Avg Ann Rate	Linear Reg	Exp Reg
5600	5600	5431	5745
6400	7040	6230	7206
8000	11125	7828	11338
8600	13207	8427	13438
9800	18615	9626	18877
10600	23401	10425	23677

Chatham County Grocery Store
Long Range Growth Data

The original TIA was extremely conservative as it anticipated an approximate 35-39% annual background growth within a 2-year build-out. We understand that using a more aggressive growth rate is typical for TIAs; however, for a 10-year projection it is not realistic to use such an aggressive growth rate. Although from comparison the adjacent developments included in the original TIA would be an adequate amount of growth. To keep the study conservative, we are proposing an additional 1.0% annual growth rate along all US 15-501 through movements from 2017 to 2027 in addition to the adjacent development traffic. We are proposing to use a growth rate of 0.5% for all turning movements and minor-street movements from 2017 to 2027 in addition to the adjacent development traffic.

Please let us know if you have any questions or concerns.

Thanks!

Caroline Bojarski, EI
Transportation Associate

RAMEY KEMP & ASSOCIATES
TRANSPORTATION ENGINEERS

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APPENDIX C

CAPACITY ANALYSIS CALCULATIONS

US 15-501

&

LYSTRA ROAD / SITE DRIVE 1

Lane Group	WBL	WBR	NBU	NBT	NBR	SBU	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	215	185	7	2073	153	8	183	1109
Future Volume (vph)	215	185	7	2073	153	8	183	1109
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	100	0	250		200		250	
Storage Lanes	1	1	1		1		1	
Taper Length (ft)	100		100				100	
Lane Util. Factor	1.00	1.00	1.00	0.95	1.00	0.95	1.00	0.95
Frt		0.850			0.850			
Flt Protected	0.950		0.950				0.950	
Satd. Flow (prot)	1770	1583	1770	3539	1583	0	1770	3539
Flt Permitted	0.950		0.201				0.033	
Satd. Flow (perm)	1770	1583	374	3539	1583	0	61	3539
Right Turn on Red		Yes			Yes			
Satd. Flow (RTOR)		149			65			
Link Speed (mph)	45			55				55
Link Distance (ft)	3512			3465				422
Travel Time (s)	53.2			43.0				5.2
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	239	206	8	2303	170	9	203	1232
Shared Lane Traffic (%)								
Lane Group Flow (vph)	239	206	8	2303	170	0	212	1232
Turn Type	Prot	Perm	D.Pm	NA	Perm	pm+pt	pm+pt	NA
Protected Phases	8			2		1	1	6
Permitted Phases		8	6		2	6	6	
Detector Phase	8	8	6	2	2	1	1	6
Switch Phase								
Minimum Initial (s)	7.0	7.0	14.0	14.0	14.0	7.0	7.0	14.0
Minimum Split (s)	13.1	13.1	20.4	20.4	20.4	12.9	12.9	20.4
Total Split (s)	40.0	40.0	120.0	120.0	120.0	25.0	25.0	120.0
Total Split (%)	21.6%	21.6%	64.9%	64.9%	64.9%	13.5%	13.5%	64.9%
Maximum Green (s)	33.9	33.9	113.6	113.6	113.6	19.1	19.1	113.6
Yellow Time (s)	3.0	3.0	5.3	5.3	5.3	3.0	3.0	5.3
All-Red Time (s)	3.1	3.1	1.1	1.1	1.1	2.9	2.9	1.1
Lost Time Adjust (s)	-1.1	-1.1	-1.4	-1.4	-1.4		-0.9	-1.4
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0		5.0	5.0
Lead/Lag				Lag	Lag	Lead	Lead	
Lead-Lag Optimize?				Yes	Yes	Yes	Yes	
Vehicle Extension (s)	1.0	1.0	6.0	6.0	6.0	1.0	1.0	6.0
Minimum Gap (s)	1.0	1.0	4.0	4.0	4.0	1.0	1.0	4.0
Time Before Reduce (s)	0.0	0.0	15.0	15.0	15.0	0.0	0.0	15.0
Time To Reduce (s)	0.0	0.0	30.0	30.0	30.0	0.0	0.0	30.0
Recall Mode	None	None	Min	Min	Min	None	None	Min
Act Effct Green (s)	27.7	27.7	139.2	115.2	115.2		139.2	139.2
Actuated g/C Ratio	0.16	0.16	0.79	0.65	0.65		0.79	0.79
v/c Ratio	0.87	0.55	0.03	1.00	0.16		0.92	0.44
Control Delay	101.4	25.8	5.4	49.3	8.4		97.3	7.2
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0
Total Delay	101.4	25.8	5.4	49.3	8.4		97.3	7.2

Lane Group	WBL	WBR	NBU	NBT	NBR	SBU	SBL	SBT
LOS	F	C	A	D	A		F	A
Approach Delay	66.4			46.4				20.4
Approach LOS	E			D				C
Queue Length 50th (ft)	276	59	2	~1427	45		197	224
Queue Length 95th (ft)	385	150	8	#1702	88		#380	306
Internal Link Dist (ft)	3432			3385				342
Turn Bay Length (ft)	100		250		200		250	
Base Capacity (vph)	350	433	296	2304	1053		241	2805
Starvation Cap Reductn	0	0	0	0	0		0	0
Spillback Cap Reductn	0	0	0	0	0		0	0
Storage Cap Reductn	0	0	0	0	0		0	0
Reduced v/c Ratio	0.68	0.48	0.03	1.00	0.16		0.88	0.44

Intersection Summary

Area Type: Other
Cycle Length: 185
Actuated Cycle Length: 176.9
Natural Cycle: 140
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 1.00
Intersection Signal Delay: 39.8 Intersection LOS: D
Intersection Capacity Utilization 92.3% ICU Level of Service F
Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: US 15-501 & Lystra Road

Lane Group	WBL	WBR	NBU	NBT	NBR	SBU	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	519	228	39	1462	98	7	266	1941
Future Volume (vph)	519	228	39	1462	98	7	266	1941
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	100	0	250		200		250	
Storage Lanes	1	1	1		1		1	
Taper Length (ft)	100		100				100	
Lane Util. Factor	1.00	1.00	1.00	0.95	1.00	0.95	1.00	0.95
Frt		0.850			0.850			
Flt Protected	0.950		0.950				0.950	
Satd. Flow (prot)	1770	1583	1770	3539	1583	0	1770	3539
Flt Permitted	0.950		0.035				0.050	
Satd. Flow (perm)	1770	1583	65	3539	1583	0	93	3539
Right Turn on Red		Yes			Yes			
Satd. Flow (RTOR)		116			59			
Link Speed (mph)	45			55				55
Link Distance (ft)	3512			3465				397
Travel Time (s)	53.2			43.0				4.9
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	577	253	43	1624	109	8	296	2157
Shared Lane Traffic (%)								
Lane Group Flow (vph)	577	253	43	1624	109	0	304	2157
Turn Type	Prot	Perm	D.Pm	NA	Perm	pm+pt	pm+pt	NA
Protected Phases	8			2		1	1	6
Permitted Phases		8	6		2	6	6	
Detector Phase	8	8	6	2	2	1	1	6
Switch Phase								
Minimum Initial (s)	7.0	7.0	14.0	14.0	14.0	7.0	7.0	14.0
Minimum Split (s)	13.1	13.1	20.4	20.4	20.4	12.9	12.9	20.4
Total Split (s)	40.0	40.0	120.0	120.0	120.0	25.0	25.0	120.0
Total Split (%)	21.6%	21.6%	64.9%	64.9%	64.9%	13.5%	13.5%	64.9%
Maximum Green (s)	33.9	33.9	113.6	113.6	113.6	19.1	19.1	113.6
Yellow Time (s)	3.0	3.0	5.3	5.3	5.3	3.0	3.0	5.3
All-Red Time (s)	3.1	3.1	1.1	1.1	1.1	2.9	2.9	1.1
Lost Time Adjust (s)	-1.1	-1.1	-1.4	-1.4	-1.4		-0.9	-1.4
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0		5.0	5.0
Lead/Lag				Lag	Lag	Lead	Lead	
Lead-Lag Optimize?				Yes	Yes	Yes	Yes	
Vehicle Extension (s)	1.0	1.0	6.0	6.0	6.0	1.0	1.0	6.0
Minimum Gap (s)	1.0	1.0	4.0	4.0	4.0	1.0	1.0	4.0
Time Before Reduce (s)	0.0	0.0	15.0	15.0	15.0	0.0	0.0	15.0
Time To Reduce (s)	0.0	0.0	30.0	30.0	30.0	0.0	0.0	30.0
Recall Mode	None	None	Min	Min	Min	None	None	Min
Act Effct Green (s)	35.3	35.3	115.3	90.0	90.0		115.3	115.3
Actuated g/C Ratio	0.22	0.22	0.72	0.56	0.56		0.72	0.72
v/c Ratio	1.48	0.58	0.93	0.82	0.12		1.10	0.85
Control Delay	272.8	37.7	142.2	32.2	7.5		127.8	20.1
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0
Total Delay	272.8	37.7	142.2	32.2	7.5		127.8	20.1

Lane Group	WBL	WBR	NBU	NBT	NBR	SBU	SBL	SBT
LOS	F	D	F	C	A		F	C
Approach Delay	201.1			33.3				33.4
Approach LOS	F			C				C
Queue Length 50th (ft)	~831	129	34	702	23		~299	787
Queue Length 95th (ft)	#1279	266	#84	786	52		#585	875
Internal Link Dist (ft)	3432			3385				317
Turn Bay Length (ft)	100		250		200		250	
Base Capacity (vph)	389	438	57	2557	1160		277	3103
Starvation Cap Reductn	0	0	0	0	0		0	0
Spillback Cap Reductn	0	0	0	0	0		0	0
Storage Cap Reductn	0	0	0	0	0		0	0
Reduced v/c Ratio	1.48	0.58	0.75	0.64	0.09		1.10	0.70

Intersection Summary

Area Type: Other
Cycle Length: 185
Actuated Cycle Length: 160.7
Natural Cycle: 130
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 1.48
Intersection Signal Delay: 60.9 Intersection LOS: E
Intersection Capacity Utilization 106.6% ICU Level of Service G
Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: US 15-501 & Lystra Road

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBU	SBL
Lane Configurations												
Traffic Volume (vph)	109	20	37	212	35	182	7	81	2052	153	8	183
Future Volume (vph)	109	20	37	212	35	182	7	81	2052	153	8	183
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	250		100	200		100		250		200		250
Storage Lanes	1		0	2		1		1		1		1
Taper Length (ft)	100			200				100				100
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	1.00	0.95	1.00	0.95	1.00	0.91	1.00
Frt		0.902				0.850				0.850		
Flt Protected	0.950			0.950				0.950				0.950
Satd. Flow (prot)	1770	1680	0	3433	1863	1583	0	1770	3539	1583	0	1770
Flt Permitted	0.732			0.950				0.950				0.950
Satd. Flow (perm)	1364	1680	0	3433	1863	1583	0	1770	3539	1583	0	1770
Right Turn on Red			Yes			Yes				Yes		
Satd. Flow (RTOR)		41				137				112		
Link Speed (mph)		30			45				55			
Link Distance (ft)		696			3512				829			
Travel Time (s)		15.8			53.2				10.3			
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	121	22	41	236	39	202	8	90	2280	170	9	203
Shared Lane Traffic (%)												
Lane Group Flow (vph)	121	63	0	236	39	202	0	98	2280	170	0	212
Turn Type	D.P+P	NA		Prot	NA	Perm	Prot	Prot	NA	pm+ov	Prot	Prot
Protected Phases	7	4		3	8		5	5	2	3	1	1
Permitted Phases	8					8				2		
Detector Phase	7	4		3	8	8	5	5	2	3	1	1
Switch Phase												
Minimum Initial (s)	7.0	7.0		7.0	7.0	7.0	7.0	7.0	14.0	7.0	7.0	7.0
Minimum Split (s)	14.0	14.0		13.1	13.1	13.1	14.0	14.0	20.4	13.1	12.9	12.9
Total Split (s)	14.0	14.0		15.3	15.3	15.3	20.0	20.0	98.5	15.3	22.2	22.2
Total Split (%)	9.3%	9.3%		10.2%	10.2%	10.2%	13.3%	13.3%	65.7%	10.2%	14.8%	14.8%
Maximum Green (s)	7.0	7.0		9.2	9.2	9.2	13.0	13.0	92.1	9.2	16.3	16.3
Yellow Time (s)	5.0	5.0		3.0	3.0	3.0	5.0	5.0	5.3	3.0	3.0	3.0
All-Red Time (s)	2.0	2.0		3.1	3.1	3.1	2.0	2.0	1.1	3.1	2.9	2.9
Lost Time Adjust (s)	-2.0	-2.0		-1.1	-1.1	-1.1		-2.0	-1.4	-1.4		-0.9
Total Lost Time (s)	5.0	5.0		5.0	5.0	5.0		5.0	5.0	4.7		5.0
Lead/Lag	Lead	Lag		Lead	Lag	Lag	Lead	Lead	Lag	Lead	Lead	Lead
Lead-Lag Optimize?	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0		1.0	1.0	1.0	3.0	3.0	6.0	1.0	1.0	1.0
Minimum Gap (s)	3.0	3.0		1.0	1.0	1.0	3.0	3.0	4.0	1.0	1.0	1.0
Time Before Reduce (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	15.0	0.0	0.0	0.0
Time To Reduce (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	30.0	0.0	0.0	0.0
Recall Mode	None	None		None	None	None	None	None	Max	None	None	None
Act Effct Green (s)	18.9	9.0		12.7	9.9	9.9		13.8	93.5	111.5		17.2
Actuated g/C Ratio	0.13	0.06		0.08	0.07	0.07		0.09	0.62	0.75		0.11
v/c Ratio	0.62	0.45		0.81	0.32	0.87		0.60	1.03	0.14		1.04
Control Delay	72.2	40.3		88.2	73.9	56.6		80.9	55.6	2.5		137.8
Queue Delay	0.0	0.0		0.0	0.0	0.0		0.0	0.0	0.0		0.0
Total Delay	72.2	40.3		88.2	73.9	56.6		80.9	55.6	2.5		137.8

Lane Group	SBT	SBR
Lane Configurations	↑↑↑	↱
Traffic Volume (vph)	1116	10
Future Volume (vph)	1116	10
Ideal Flow (vphpl)	1900	1900
Storage Length (ft)		50
Storage Lanes		1
Taper Length (ft)		
Lane Util. Factor	0.91	1.00
Frt		0.850
Flt Protected		
Satd. Flow (prot)	5085	1583
Flt Permitted		
Satd. Flow (perm)	5085	1583
Right Turn on Red		Yes
Satd. Flow (RTOR)		131
Link Speed (mph)	55	
Link Distance (ft)	334	
Travel Time (s)	4.1	
Peak Hour Factor	0.90	0.90
Adj. Flow (vph)	1240	11
Shared Lane Traffic (%)		
Lane Group Flow (vph)	1240	11
Turn Type	NA	Perm
Protected Phases	6	
Permitted Phases		6
Detector Phase	6	6
Switch Phase		
Minimum Initial (s)	14.0	14.0
Minimum Split (s)	20.4	20.4
Total Split (s)	100.7	100.7
Total Split (%)	67.1%	67.1%
Maximum Green (s)	94.3	94.3
Yellow Time (s)	5.3	5.3
All-Red Time (s)	1.1	1.1
Lost Time Adjust (s)	-1.4	-1.4
Total Lost Time (s)	5.0	5.0
Lead/Lag	Lag	Lag
Lead-Lag Optimize?	Yes	Yes
Vehicle Extension (s)	6.0	6.0
Minimum Gap (s)	4.0	4.0
Time Before Reduce (s)	15.0	15.0
Time To Reduce (s)	30.0	30.0
Recall Mode	Max	Max
Act Effct Green (s)	97.0	97.0
Actuated g/C Ratio	0.65	0.65
v/c Ratio	0.38	0.01
Control Delay	12.8	0.0
Queue Delay	0.0	0.0
Total Delay	12.8	0.0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBU	SBL
LOS	E	D		F	E	E		F	E	A		F
Approach Delay		61.3			73.7				53.0			
Approach LOS		E			E				D			
Queue Length 50th (ft)	108	21		~121	37	63		93	~1256	15		~224
Queue Length 95th (ft)	176	72		#215	78	#207		158	#1383	36		#395
Internal Link Dist (ft)		616			3432				749			
Turn Bay Length (ft)	250			200		100		250		200		250
Base Capacity (vph)	196	139		291	127	236		177	2212	1208		203
Starvation Cap Reductn	0	0		0	0	0		0	0	0		0
Spillback Cap Reductn	0	0		0	0	0		0	0	0		0
Storage Cap Reductn	0	0		0	0	0		0	0	0		0
Reduced v/c Ratio	0.62	0.45		0.81	0.31	0.86		0.55	1.03	0.14		1.04

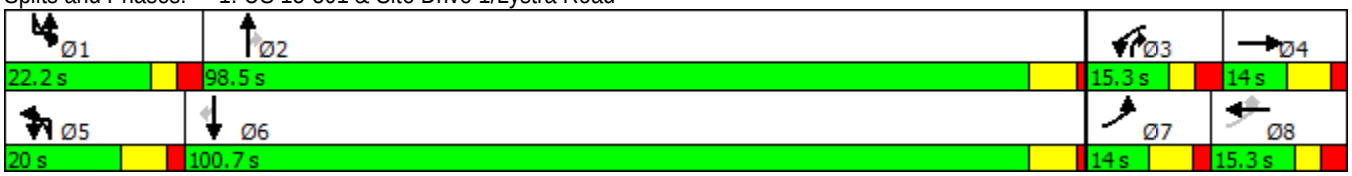
Intersection Summary

Area Type: Other
Cycle Length: 150
Actuated Cycle Length: 149.6
Natural Cycle: 150
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 1.04
Intersection Signal Delay: 48.5 Intersection LOS: D
Intersection Capacity Utilization 101.3% ICU Level of Service G
Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: US 15-501 & Site Drive 1/Lystra Road



Lane Group	SBT	SBR
LOS	B	A
Approach Delay	30.8	
Approach LOS	C	
Queue Length 50th (ft)	201	0
Queue Length 95th (ft)	230	0
Internal Link Dist (ft)	254	
Turn Bay Length (ft)		50
Base Capacity (vph)	3295	1072
Starvation Cap Reductn	0	0
Spillback Cap Reductn	0	0
Storage Cap Reductn	0	0
Reduced v/c Ratio	0.38	0.01

Intersection Summary

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBU	SBL
Lane Configurations												
Traffic Volume (vph)	197	38	72	511	56	220	39	114	1427	98	7	266
Future Volume (vph)	197	38	72	511	56	220	39	114	1427	98	7	266
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	250		100	200		100		250		200		250
Storage Lanes	1		0	2		1		1		1		1
Taper Length (ft)	100			200				100				100
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	1.00	0.95	1.00	0.95	1.00	0.91	1.00
Frt		0.902				0.850				0.850		
Flt Protected	0.950			0.950				0.950				0.950
Satd. Flow (prot)	1770	1680	0	3433	1863	1583	0	1770	3539	1583	0	1770
Flt Permitted	0.717			0.950				0.950				0.950
Satd. Flow (perm)	1336	1680	0	3433	1863	1583	0	1770	3539	1583	0	1770
Right Turn on Red			Yes			Yes				Yes		
Satd. Flow (RTOR)		52				219				132		
Link Speed (mph)		30			45				55			
Link Distance (ft)		696			3512				843			
Travel Time (s)		15.8			53.2				10.5			
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	219	42	80	568	62	244	43	127	1586	109	8	296
Shared Lane Traffic (%)												
Lane Group Flow (vph)	219	122	0	568	62	244	0	170	1586	109	0	304
Turn Type	D.P+P	NA		Prot	NA	Perm	Prot	Prot	NA	pm+ov	Prot	Prot
Protected Phases	7	4		3	8		5	5	2	3	1	1
Permitted Phases	8					8				2		
Detector Phase	7	4		3	8	8	5	5	2	3	1	1
Switch Phase												
Minimum Initial (s)	7.0	7.0		7.0	7.0	7.0	7.0	7.0	14.0	7.0	7.0	7.0
Minimum Split (s)	14.0	14.0		13.1	13.1	13.1	14.0	14.0	20.4	13.1	12.9	12.9
Total Split (s)	14.0	14.0		28.0	28.0	28.0	22.0	22.0	69.0	28.0	29.0	29.0
Total Split (%)	10.0%	10.0%		20.0%	20.0%	20.0%	15.7%	15.7%	49.3%	20.0%	20.7%	20.7%
Maximum Green (s)	7.0	7.0		21.9	21.9	21.9	15.0	15.0	62.6	21.9	23.1	23.1
Yellow Time (s)	5.0	5.0		3.0	3.0	3.0	5.0	5.0	5.3	3.0	3.0	3.0
All-Red Time (s)	2.0	2.0		3.1	3.1	3.1	2.0	2.0	1.1	3.1	2.9	2.9
Lost Time Adjust (s)	-2.0	-2.0		-1.1	-1.1	-1.1		-2.0	-1.4	-1.4		-0.9
Total Lost Time (s)	5.0	5.0		5.0	5.0	5.0		5.0	5.0	4.7		5.0
Lead/Lag	Lead	Lag		Lead	Lag	Lag	Lead	Lead	Lag	Lead	Lead	Lead
Lead-Lag Optimize?	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0		1.0	1.0	1.0	3.0	3.0	6.0	1.0	1.0	1.0
Minimum Gap (s)	3.0	3.0		1.0	1.0	1.0	3.0	3.0	4.0	1.0	1.0	1.0
Time Before Reduce (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	15.0	0.0	0.0	0.0
Time To Reduce (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	30.0	0.0	0.0	0.0
Recall Mode	None	None		None	None	None	None	None	Max	None	None	None
Act Effct Green (s)	32.0	9.0		23.0	23.0	23.0		16.6	64.0	92.3		24.0
Actuated g/C Ratio	0.23	0.06		0.16	0.16	0.16		0.12	0.46	0.66		0.17
v/c Ratio	0.66	0.78		1.01	0.20	0.55		0.81	0.98	0.10		1.00
Control Delay	56.1	68.4		97.6	52.6	14.3		88.4	55.7	0.9		109.7
Queue Delay	0.0	0.0		0.0	0.0	0.0		0.0	0.0	0.0		0.0
Total Delay	56.1	68.4		97.6	52.6	14.3		88.4	55.7	0.9		109.7

Lane Group	SBT	SBR
Lane Configurations		
Traffic Volume (vph)	1954	13
Future Volume (vph)	1954	13
Ideal Flow (vphpl)	1900	1900
Storage Length (ft)		50
Storage Lanes		1
Taper Length (ft)		
Lane Util. Factor	0.91	1.00
Frt		0.850
Flt Protected		
Satd. Flow (prot)	5085	1583
Flt Permitted		
Satd. Flow (perm)	5085	1583
Right Turn on Red		Yes
Satd. Flow (RTOR)		188
Link Speed (mph)	55	
Link Distance (ft)	334	
Travel Time (s)	4.1	
Peak Hour Factor	0.90	0.90
Adj. Flow (vph)	2171	14
Shared Lane Traffic (%)		
Lane Group Flow (vph)	2171	14
Turn Type	NA	Perm
Protected Phases	6	
Permitted Phases		6
Detector Phase	6	6
Switch Phase		
Minimum Initial (s)	14.0	14.0
Minimum Split (s)	20.4	20.4
Total Split (s)	76.0	76.0
Total Split (%)	54.3%	54.3%
Maximum Green (s)	69.6	69.6
Yellow Time (s)	5.3	5.3
All-Red Time (s)	1.1	1.1
Lost Time Adjust (s)	-1.4	-1.4
Total Lost Time (s)	5.0	5.0
Lead/Lag	Lag	Lag
Lead-Lag Optimize?	Yes	Yes
Vehicle Extension (s)	6.0	6.0
Minimum Gap (s)	4.0	4.0
Time Before Reduce (s)	15.0	15.0
Time To Reduce (s)	30.0	30.0
Recall Mode	Max	Max
Act Effct Green (s)	71.4	71.4
Actuated g/C Ratio	0.51	0.51
v/c Ratio	0.84	0.02
Control Delay	33.1	0.0
Queue Delay	0.0	0.0
Total Delay	33.1	0.0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBU	SBL
LOS	E	E		F	D	B		F	E	A		F
Approach Delay		60.5			71.2				55.4			
Approach LOS		E			E				E			
Queue Length 50th (ft)	168	63		~272	49	20		153	735	0		~281
Queue Length 95th (ft)	251	#170		#397	94	104		#271	#912	13		#477
Internal Link Dist (ft)		616			3432				763			
Turn Bay Length (ft)	250			200		100		250		200		250
Base Capacity (vph)	333	156		563	306	443		214	1617	1088		303
Starvation Cap Reductn	0	0		0	0	0		0	0	0		0
Spillback Cap Reductn	0	0		0	0	0		0	0	0		0
Storage Cap Reductn	0	0		0	0	0		0	0	0		0
Reduced v/c Ratio	0.66	0.78		1.01	0.20	0.55		0.79	0.98	0.10		1.00

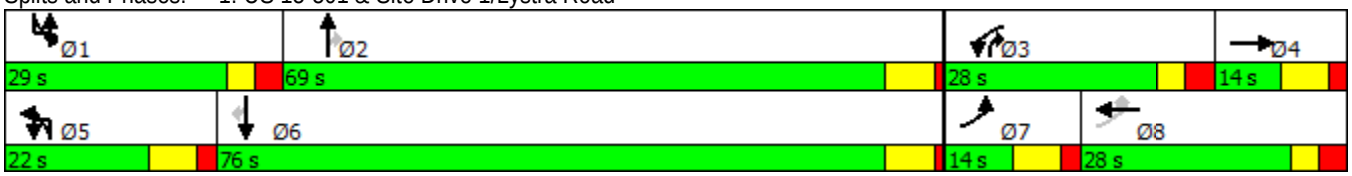
Intersection Summary

Area Type: Other
Cycle Length: 140
Actuated Cycle Length: 140
Natural Cycle: 140
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 1.01
Intersection Signal Delay: 52.4 Intersection LOS: D
Intersection Capacity Utilization 95.8% ICU Level of Service F
Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: US 15-501 & Site Drive 1/Lystra Road



Lane Group	SBT	SBR
LOS	C	A
Approach Delay	42.3	
Approach LOS	D	
Queue Length 50th (ft)	607	0
Queue Length 95th (ft)	675	0
Internal Link Dist (ft)	254	
Turn Bay Length (ft)		50
Base Capacity (vph)	2593	899
Starvation Cap Reductn	0	0
Spillback Cap Reductn	0	0
Storage Cap Reductn	0	0
Reduced v/c Ratio	0.84	0.02

Intersection Summary

APPENDIX D

CAPACITY ANALYSIS CALCULATIONS

US 15-501

&

POLKS LANDING ROAD / WILLIAMS CORNER

SITE DRIVE

Intersection

Int Delay, s/veh 4.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	49	1	82	0	0	0	0	0	1250	18
Future Vol, veh/h	0	0	49	1	82	0	0	0	0	0	1250	18
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	0	-	-	-	-	-	-	-	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	-	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	54	1	91	0	0	0	0	0	1389	20

Major/Minor	Minor2			Minor1			Major2		
Conflicting Flow All	-	-	694	694	1389	-	-	-	0
Stage 1	-	-	-	0	0	-	-	-	-
Stage 2	-	-	-	694	1389	-	-	-	-
Critical Hdwy	-	-	6.94	7.54	6.54	-	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	6.54	5.54	-	-	-	-
Follow-up Hdwy	-	-	3.32	3.52	4.02	-	-	-	-
Pot Cap-1 Maneuver	0	0	385	329	141	0	0	-	-
Stage 1	0	0	-	-	-	0	0	-	-
Stage 2	0	0	-	399	208	0	0	-	-
Platoon blocked, %								-	-
Mov Cap-1 Maneuver	-	-	385	282	141	-	-	-	-
Mov Cap-2 Maneuver	-	-	-	282	141	-	-	-	-
Stage 1	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	343	208	-	-	-	-

Approach	EB	WB	SB
HCM Control Delay, s	15.9	68.2	0
HCM LOS	C	F	

Minor Lane/Major Mvmt	EBLn1	WBLn1	SBT	SBR
Capacity (veh/h)	385	142	-	-
HCM Lane V/C Ratio	0.141	0.649	-	-
HCM Control Delay (s)	15.9	68.2	-	-
HCM Lane LOS	C	F	-	-
HCM 95th %tile Q(veh)	0.5	3.5	-	-

Intersection

Int Delay, s/veh 227.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	73	168	0	0	0	76	0	2070	112	0	0	0
Future Vol, veh/h	73	168	0	0	0	76	0	2070	112	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	0	-	-	0	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	-	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	81	187	0	0	0	84	0	2300	124	0	0	0

Major/Minor	Minor2			Minor1			Major1		
Conflicting Flow All	1150	2300	-	-	-	1150	-	0	0
Stage 1	0	0	-	-	-	-	-	-	-
Stage 2	1150	2300	-	-	-	-	-	-	-
Critical Hdwy	7.54	6.54	-	-	-	6.94	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.54	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.52	4.02	-	-	-	3.32	-	-	-
Pot Cap-1 Maneuver	153	~ 38	0	0	0	192	0	-	-
Stage 1	-	-	0	0	0	-	0	-	-
Stage 2	211	~ 72	0	0	0	-	0	-	-
Platoon blocked, %								-	-
Mov Cap-1 Maneuver	86	~ 38	-	-	-	192	-	-	-
Mov Cap-2 Maneuver	86	~ 38	-	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-	-	-	-
Stage 2	118	~ 72	-	-	-	-	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	$ 2343.5	37.7	0
HCM LOS	F	E	

Minor Lane/Major Mvmt	NBT	NBR	EBLn1	WBLn1
Capacity (veh/h)	-	-	46	192
HCM Lane V/C Ratio	-	-	5.821	0.44
HCM Control Delay (s)	-	-	$ 2343.5	37.7
HCM Lane LOS	-	-	F	E
HCM 95th %tile Q(veh)	-	-	31	2

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection

Int Delay, s/veh 13.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	29	1	49	0	0	0	0	0	2184	55
Future Vol, veh/h	0	0	29	1	49	0	0	0	0	0	2184	55
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	0	-	-	-	-	-	-	-	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	-	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	32	1	54	0	0	0	0	0	2427	61

Major/Minor	Minor2			Minor1			Major2		
Conflicting Flow All	-	-	1213	1213	2427	-	-	-	0
Stage 1	-	-	-	0	0	-	-	-	-
Stage 2	-	-	-	1213	2427	-	-	-	-
Critical Hdwy	-	-	6.94	7.54	6.54	-	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	6.54	5.54	-	-	-	-
Follow-up Hdwy	-	-	3.32	3.52	4.02	-	-	-	-
Pot Cap-1 Maneuver	0	0	174	138	~ 32	0	0	-	-
Stage 1	0	0	-	-	-	0	0	-	-
Stage 2	0	0	-	193	62	0	0	-	-
Platoon blocked, %								-	-
Mov Cap-1 Maneuver	-	-	174	112	~ 32	-	-	-	-
Mov Cap-2 Maneuver	-	-	-	112	~ 32	-	-	-	-
Stage 1	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	157	62	-	-	-	-

Approach	EB	WB	SB
HCM Control Delay, s	30.3	$ 622.7	0
HCM LOS	D	F	

Minor Lane/Major Mvmt	EBLn1	WBLn1	SBT	SBR
Capacity (veh/h)	174	32	-	-
HCM Lane V/C Ratio	0.185	1.736	-	-
HCM Control Delay (s)	30.3	$ 622.7	-	-
HCM Lane LOS	D	F	-	-
HCM 95th %tile Q(veh)	0.7	6.3	-	-

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection

Int Delay, s/veh 22.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	115	166	0	0	0	334	0	1512	136	0	0	0
Future Vol, veh/h	115	166	0	0	0	334	0	1512	136	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	0	-	-	0	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	-	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	128	184	0	0	0	371	0	1680	151	0	0	0

Major/Minor	Minor2			Minor1			Major1		
Conflicting Flow All	840	1680	-	-	-	840	-	0	0
Stage 1	0	0	-	-	-	-	-	-	-
Stage 2	840	1680	-	-	-	-	-	-	-
Critical Hdwy	7.54	6.54	-	-	-	6.94	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.54	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.52	4.02	-	-	-	3.32	-	-	-
Pot Cap-1 Maneuver	258	~ 94	0	0	0	~ 309	0	-	-
Stage 1	-	-	0	0	0	-	0	-	-
Stage 2	326	~ 150	0	0	0	-	0	-	-
Platoon blocked, %								-	-
Mov Cap-1 Maneuver	-	~ 94	-	-	-	~ 309	-	-	-
Mov Cap-2 Maneuver	-	~ 94	-	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-	-	-	-
Stage 2	-	~ 150	-	-	-	-	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s		153.2	0
HCM LOS	-	F	

Minor Lane/Major Mvmt	NBT	NBR	EBLn1	WBLn1
Capacity (veh/h)	-	-	-	309
HCM Lane V/C Ratio	-	-	-	1.201
HCM Control Delay (s)	-	-	-	153.2
HCM Lane LOS	-	-	-	F
HCM 95th %tile Q(veh)	-	-	-	16.3

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection

Int Delay, s/veh 5.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	72	1	92	0	0	0	0	0	1244	133
Future Vol, veh/h	0	0	72	1	92	0	0	0	0	0	1244	133
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	0	-	-	-	-	-	-	-	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	-	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	80	1	102	0	0	0	0	0	1382	148

Major/Minor	Minor2			Minor1			Major2		
Conflicting Flow All	-	-	691	691	1382	-	-	-	0
Stage 1	-	-	-	0	0	-	-	-	-
Stage 2	-	-	-	691	1382	-	-	-	-
Critical Hdwy	-	-	6.94	7.54	6.54	-	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	6.54	5.54	-	-	-	-
Follow-up Hdwy	-	-	3.32	3.52	4.02	-	-	-	-
Pot Cap-1 Maneuver	0	0	387	331	143	0	0	-	-
Stage 1	0	0	-	-	-	0	0	-	-
Stage 2	0	0	-	401	210	0	0	-	-
Platoon blocked, %								-	-
Mov Cap-1 Maneuver	-	-	387	263	143	-	-	-	-
Mov Cap-2 Maneuver	-	-	-	263	143	-	-	-	-
Stage 1	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	318	210	-	-	-	-

Approach	EB	WB	SB
HCM Control Delay, s	16.7	76.5	0
HCM LOS	C	F	

Minor Lane/Major Mvmt	EBLn1	WBLn1	SBT	SBR
Capacity (veh/h)	387	144	-	-
HCM Lane V/C Ratio	0.207	0.718	-	-
HCM Control Delay (s)	16.7	76.5	-	-
HCM Lane LOS	C	F	-	-
HCM 95th %tile Q(veh)	0.8	4.2	-	-

Intersection

Int Delay, s/veh 252.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	73	168	0	0	0	76	0	2145	112	0	0	0
Future Vol, veh/h	73	168	0	0	0	76	0	2145	112	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	0	-	-	0	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	-	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	81	187	0	0	0	84	0	2383	124	0	0	0

Major/Minor	Minor2			Minor1			Major1		
Conflicting Flow All	1192	2383	-	-	-	1192	-	0	0
Stage 1	0	0	-	-	-	-	-	-	-
Stage 2	1192	2383	-	-	-	-	-	-	-
Critical Hdwy	7.54	6.54	-	-	-	6.94	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.54	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.52	4.02	-	-	-	3.32	-	-	-
Pot Cap-1 Maneuver	143	~ 34	0	0	0	180	0	-	-
Stage 1	-	-	0	0	0	-	0	-	-
Stage 2	199	~ 65	0	0	0	-	0	-	-
Platoon blocked, %								-	-
Mov Cap-1 Maneuver	~ 76	~ 34	-	-	-	180	-	-	-
Mov Cap-2 Maneuver	~ 76	~ 34	-	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-	-	-	-
Stage 2	106	~ 65	-	-	-	-	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	$ 2681.5	41.5	0
HCM LOS	F	E	

Minor Lane/Major Mvmt	NBT	NBR	EBLn1	WBLn1
Capacity (veh/h)	-	-	41	180
HCM Lane V/C Ratio	-	-	6.531	0.469
HCM Control Delay (s)	-	-	$ 2681.5	41.5
HCM Lane LOS	-	-	F	E
HCM 95th %tile Q(veh)	-	-	31.5	2.2

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection

Int Delay, s/veh 20.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	138	1	62	0	0	0	0	0	2101	283
Future Vol, veh/h	0	0	138	1	62	0	0	0	0	0	2101	283
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	0	-	-	-	-	-	-	-	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	-	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	153	1	69	0	0	0	0	0	2334	314

Major/Minor	Minor2			Minor1			Major2		
Conflicting Flow All	-	-	1167	1167	2334	-	-	-	0
Stage 1	-	-	-	0	0	-	-	-	-
Stage 2	-	-	-	1167	2334	-	-	-	-
Critical Hdwy	-	-	6.94	7.54	6.54	-	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	6.54	5.54	-	-	-	-
Follow-up Hdwy	-	-	3.32	3.52	4.02	-	-	-	-
Pot Cap-1 Maneuver	0	0	187	149	~ 36	0	0	-	-
Stage 1	0	0	-	-	-	0	0	-	-
Stage 2	0	0	-	206	69	0	0	-	-
Platoon blocked, %								-	-
Mov Cap-1 Maneuver	-	-	187	27	~ 36	-	-	-	-
Mov Cap-2 Maneuver	-	-	-	27	~ 36	-	-	-	-
Stage 1	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	37	69	-	-	-	-

Approach	EB	WB	SB
HCM Control Delay, s	77.3	$ 681.7	0
HCM LOS	F	F	

Minor Lane/Major Mvmt	EBLn1	WBLn1	SBT	SBR
Capacity (veh/h)	187	36	-	-
HCM Lane V/C Ratio	0.82	1.944	-	-
HCM Control Delay (s)	77.3	$ 681.7	-	-
HCM Lane LOS	F	F	-	-
HCM 95th %tile Q(veh)	5.8	7.7	-	-

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection

Int Delay, s/veh 30.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	115	166	0	0	0	334	0	1653	136	0	0	0
Future Vol, veh/h	115	166	0	0	0	334	0	1653	136	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	0	-	-	0	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	-	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	128	184	0	0	0	371	0	1837	151	0	0	0

Major/Minor	Minor2			Minor1			Major1		
Conflicting Flow All	918	1837	-	-	-	918	-	0	0
Stage 1	0	0	-	-	-	-	-	-	-
Stage 2	918	1837	-	-	-	-	-	-	-
Critical Hdwy	7.54	6.54	-	-	-	6.94	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.54	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.52	4.02	-	-	-	3.32	-	-	-
Pot Cap-1 Maneuver	227	~ 75	0	0	0	~ 274	0	-	-
Stage 1	-	-	0	0	0	-	0	-	-
Stage 2	292	~ 125	0	0	0	-	0	-	-
Platoon blocked, %								-	-
Mov Cap-1 Maneuver	-	~ 75	-	-	-	~ 274	-	-	-
Mov Cap-2 Maneuver	-	~ 75	-	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-	-	-	-
Stage 2	-	~ 125	-	-	-	-	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s		217.7	0
HCM LOS	-	F	

Minor Lane/Major Mvmt	NBT	NBR	EBLn1	WBLn1
Capacity (veh/h)	-	-	-	274
HCM Lane V/C Ratio	-	-	-	1.354
HCM Control Delay (s)	-	-	-	217.7
HCM Lane LOS	-	-	-	F
HCM 95th %tile Q(veh)	-	-	-	19.3

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

APPENDIX E

CAPACITY ANALYSIS CALCULATIONS

POLKS LANDING ROAD

&

SITE DRIVE 2

Intersection

Int Delay, s/veh 2

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	65	4	69	156	4	7
Future Vol, veh/h	65	4	69	156	4	7
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	72	4	77	173	4	8

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	77	0	401	74
Stage 1	-	-	-	-	74	-
Stage 2	-	-	-	-	327	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1522	-	605	988
Stage 1	-	-	-	-	949	-
Stage 2	-	-	-	-	731	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1522	-	571	988
Mov Cap-2 Maneuver	-	-	-	-	571	-
Stage 1	-	-	-	-	949	-
Stage 2	-	-	-	-	690	-

Approach	EB	WB	NB
HCM Control Delay, s	0	2.3	9.7
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	781	-	-	1522	-
HCM Lane V/C Ratio	0.016	-	-	0.05	-
HCM Control Delay (s)	9.7	-	-	7.5	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0	-	-	0.2	-

Intersection	
Int Delay, s/veh	4

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	61	4	156	188	4	77
Future Vol, veh/h	61	4	156	188	4	77
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	68	4	173	209	4	86

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	72	0	626	70
Stage 1	-	-	-	-	70	-
Stage 2	-	-	-	-	556	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1528	-	448	993
Stage 1	-	-	-	-	953	-
Stage 2	-	-	-	-	574	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1528	-	391	993
Mov Cap-2 Maneuver	-	-	-	-	391	-
Stage 1	-	-	-	-	953	-
Stage 2	-	-	-	-	501	-

Approach	EB	WB	NB
HCM Control Delay, s	0	3.5	9.3
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	923	-	-	1528	-
HCM Lane V/C Ratio	0.098	-	-	0.113	-
HCM Control Delay (s)	9.3	-	-	7.7	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.3	-	-	0.4	-

APPENDIX F

CAPACITY ANALYSIS CALCULATIONS

POLKS LANDING ROAD

&

SITE DRIVE 3

Intersection

Int Delay, s/veh 2.6

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	49	4	56	100	4	16
Future Vol, veh/h	49	4	56	100	4	16
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	54	4	62	111	4	18

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	59	0	293	57
Stage 1	-	-	-	-	57	-
Stage 2	-	-	-	-	236	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1545	-	698	1009
Stage 1	-	-	-	-	966	-
Stage 2	-	-	-	-	803	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1545	-	668	1009
Mov Cap-2 Maneuver	-	-	-	-	668	-
Stage 1	-	-	-	-	966	-
Stage 2	-	-	-	-	768	-

Approach	EB	WB	NB
HCM Control Delay, s	0	2.7	9
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	916	-	-	1545	-
HCM Lane V/C Ratio	0.024	-	-	0.04	-
HCM Control Delay (s)	9	-	-	7.4	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.1	-	-	0.1	-

Intersection	
Int Delay, s/veh	3.7

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	29	4	85	103	4	32
Future Vol, veh/h	29	4	85	103	4	32
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	32	4	94	114	4	36

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	37	0	337	34
Stage 1	-	-	-	-	34	-
Stage 2	-	-	-	-	303	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1574	-	658	1039
Stage 1	-	-	-	-	988	-
Stage 2	-	-	-	-	749	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1574	-	616	1039
Mov Cap-2 Maneuver	-	-	-	-	616	-
Stage 1	-	-	-	-	988	-
Stage 2	-	-	-	-	701	-

Approach	EB	WB	NB
HCM Control Delay, s	0	3.4	8.9
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	965	-	-	1574	-
HCM Lane V/C Ratio	0.041	-	-	0.06	-
HCM Control Delay (s)	8.9	-	-	7.4	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.1	-	-	0.2	-