Harris Teeter Fuel Center

Traffic Impact Analysis

WARRENTON, VIRGINIA

Prepared for:

HARRIS TEETER

REVISED: SEPTEMBER 8, 2021

VERSION 1: JANUARY 30, 2020

Prepared By:

Kimley»Horn

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EXECUTIVE SUMMARY

This report presents the results of a transportation study for the proposed fuel center located on-site of the existing Harris Teeter Grocery Store in Warrenton, VA. The site parcel (including the existing Harris Teeter Grocery) is approximately 11.67 acres and is zoned as PUD. The fuel center will consist of 8 fueling positions and is anticipated to be completed in 2021.

Intersections were analyzed during the weekday AM and PM peak hours as well as the Saturday midday peak hour. The traffic volumes used in this study include 2019 existing traffic volumes, forecast future traffic volumes without the development of the fuel center but with the application of an annual traffic growth factor, and future traffic with the development of the fuel center for opening year 2021. The weekday traffic counts were conducted at the study area intersections on Thursday, November 21, 2019 from 5:30 AM to 8:30 AM and 4:30 PM to 7:30 PM as well as Saturday, November 16, 2019 from 11:00 AM to 2:00 PM.

Based on the trip generation rates in the ITE Trip Generation Manual, 10th Edition, the proposed development is anticipated to generate 30 primary vehicle trips during the AM peak hour, 80 primary vehicle trips during the PM peak hour, and 74 primary vehicle trips during the Saturday peak hour. The peak hour trips generated by the proposed development were assigned to the site driveway and to the study area streets based on agreed upon trip distributions as documented in the scoping form with Town of Warrenton staff.

Intersection capacity analyses were conducted for 2019 existing, 2021 future without development, 2021 future with development at the study intersections using the Synchro 10 software package. This software uses methodologies in the *Highway Capacity Manual 6th Edition* to determine performance of signalized and unsignalized intersections.

This transportation study shows that the proposed fuel center located on-site of the existing Harris Teeter Grocery Store in Warrenton, VA will have a minimal impact on the study area intersections. There will be no changes in overall intersection levels of service due to the proposed development compared to the future without development scenario.

The capacity analysis of the future conditions with development shows that the increase in delay at the study intersections due to the proposed fuel center are negligible. The proposed development increases the LOS at the following approaches:

- Eastbound approach of Harris Teeter Driveway at Fletcher Drive worsens from LOS A to LOS B during the PM peak hour and the Saturday midday peak hour. The associated delay increases by 0.8 seconds and 0.7 seconds in the PM peak hour and Saturday midday peak hour, respectively.
- Westbound approach of W Lee Highway at Fletcher Drive worsens from LOS A to LOS B during the Saturday midday peak hour. The associated delay increased by 1.0 seconds.

All intersections operate at overall LOS D or better in 2021 future with and without development during the weekday AM and PM and Saturday midday peak hours.

Under the 2021 future with and without conditions, all intersection approaches operate at LOS D or better except for the following:

- Northbound Fletcher Drive at W Lee Highway operates at LOS E during the AM, PM, and Saturday midday peak hours.

- Southbound Fletcher Drive at W Lee Highway operates at LOS F during the AM peak hour and LOS E during the PM and Saturday midday peak hours.
- Eastbound North Hill Drive at Blackwell Road operates at LOS E during the AM, PM, and Saturday midday peak hours.
- Westbound Walker Drive at Blackwell Road operates at LOS E during the AM, PM, and Saturday midday peak hours.

All of these approaches were previously operating at LOS E in 2019 existing conditions.

In addition to the approaches and associated movements noted above, the following movements operate at LOS E or LOS F in 2019 existing conditions, and 2021 future with and without development conditions. The proposed development nominally increases the delay at these congested movements:

- Westbound left-turn lane from W Lee Highway to Fletcher Dr increases in delay by 1.6 seconds in the AM peak hour, decreases in delay by 0.9 seconds in the PM peak hour, and decreases in delay by 0.6 seconds in the Saturday midday peak hour. The slight decreases are likely attributable to the slight redistribution of traffic through the intersection caused by the proposed development. The movement is expected to operate at LOS F during weekday AM and PM and Saturday midday peak hours under 2019 existing conditions and 2021 future with and without development conditions.
- Eastbound left turn lane from W Lee Highway to Fletcher Dr had no change in delay. This movement is expected to operate at LOS F during weekday AM and PM and Saturday midday peak hours under 2019 existing conditions and 2021 future with and without development conditions.

The increase in delay related to the proposed development is less than 2 seconds at the movement, approach and intersection level, indicating negligible effects on the intersection's operations.

No significant queuing is anticipated at any of the study area intersections during typical AM weekday, PM weekday, or Saturday midday peak hour conditions. All queues are anticipated to be less than the available storage length. The existing site entrance will be adequate for the site generated trips. The site generated trips will have a negligible effect on the study area intersections.

1. INTRODUCTION

1.1 PROJECT DESCRIPTION

The proposed development includes a fuel center located on-site of an existing Harris Teeter Grocery Store located at the southwest corner of W Lee Highway at Fletcher Dr in Warrenton, VA. The site parcel (including the existing Harris Teeter Grocery) is approximately 11.67 acres and is zoned as PUD. The fuel center will consist of 8 fueling positions and is anticipated to be completed in 2021. The study area, site location, and study intersections are shown on a map in **Figure 1-1** and a concept site plan graphic is included in **Appendix A.**

Source: Google Earth Pro

Kimley»Horn

Study Area Map

Harris Teeter Fuel Center

Figure 1-1

1.2 METHODOLOGY

A Traffic Study Scoping Agreement was prepared with VDOT and the Town of Warrenton. A copy of the signed scoping agreement form is included in **Appendix B.**

Per the scoping agreement, the following methodology was used in preparation of this study:

- Traffic volume forecasts and capacity analyses were conducted for the weekday AM and PM peak hours as well as Saturday midday peak hour.
- Intersection capacity analyses were based on the Highway Capacity Manual (using the Synchro 10 software package).
- ITE Trip Generation Manual, 10th edition was used to calculate site generated trips. Land use code 944, Gasoline/Service Station, was used in these calculations.
- 2021 was identified as the development horizon year.
- A one (1) percent annual exponential growth rate was agreed upon to grow existing count data to future conditions traffic.
- No approved and unbuilt developments were included in the analysis.
- Trip distribution for the proposed development was based on surrounding land use, population density, and access to local and regional roadways.
- Fifty-eight percent (58%) and forty-eight percent (48%) pass-by was assumed in the weekday AM and PM peak hours, respectively. The lower of the weekday AM and PM pass-by (48%) was assumed for the Saturday midday peak hour. Weekday AM and PM pass-by rates were identified from ITE Trip Generation Handbook.
- Internal capture rates between the proposed fuel center and the existing grocery story were obtained from data collection of similar Harris Teeter fuel station sites. The Town of Warrenton and VDOT approved the usage of these rates on January 9, 2020.
- Existing signal timings were obtained from the Town of Warrenton.

2. EXISTING CONDITIONS

2.1 OVERVIEW

This chapter of the report examines the existing transportation conditions in the project study area. Included are descriptions of the existing transportation network.

2.2 STREET NETWORK

The existing street network examined as part of this study includes Fletcher Drive from W Lee Highway to North Hill Drive and North Hill Drive from Fletcher Drive to Blackwell Road. Two (2) signalized intersections, and two (2) stop-controlled intersections represent the study area. The following is a brief description of the surrounding street network, study intersections, and intersection operations.

STUDY AREA STREETS

W Lee Highway is a four-lane divided roadway that runs east-west through the study area. The current VDOT functional classification is a principal arterial. The posted speed limit is 45 miles per hour (mph).

Fletcher Drive is a two-lane divided roadway, except for an approximate 300-ft section between the two Harris Teeter shopping center driveways where the road is undivided. The roadway runs north-south through the study area and is classified as a major collector. The posted speed limit is 25 mph.

North Hill Drive/Walker Drive is a two-lane undivided roadway west of Blackwell Rd and transitions to a four-lane divided roadway east of Blackwell Road. The roadway runs east-west through the study area. It is classified as a major collector, east of Fletcher Drive. The posted speed limit is 25 mph.

Blackwell Road is primarily a four-lane roadway with a center turn lane within the vicinity of the study area. The roadway runs north-south and is a minor arterial. The posted speed limit is 35 mph.

STUDY INTERSECTIONS

The vehicular impacts of the proposed development were studied at the following intersections:

1. W Lee Highway at Fletcher Drive (Signalized)
2. Fletcher Drive at Harris Teeter Driveway (Unsignalized)
3. Fletcher Drive at North Hill Drive (Unsignalized)
4. Blackwell Road at North Hill Drive / Walker Drive (Signalized)

The existing lane designations and traffic control at the study intersections are shown in **Figure 2-1.**

Source: Google Earth Pro

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Existing Lane Designations and Traffic Control

Harris Teeter Fuel Center

Figure 2-1

EXISTING TRAFFIC VOLUMES

Traffic counts were conducted on Thursday, November 21, 2019 from 5:30 AM to 8:30 AM and 4:30 PM to 7:30 PM as well as Saturday, November 16, 2019 from 11:00 AM to 2:00 PM. Vehicle, pedestrian, and bicycle movement counts were collected at the following intersections:

- W Lee Highway at Fletcher Drive (Signalized)
- Fletcher Drive at Harris Teeter Driveway (Unsignalized)
- Fletcher Drive at North Hill Drive (Unsignalized)
- Blackwell Road at North Hill Drive / Walker Drive (Signalized)

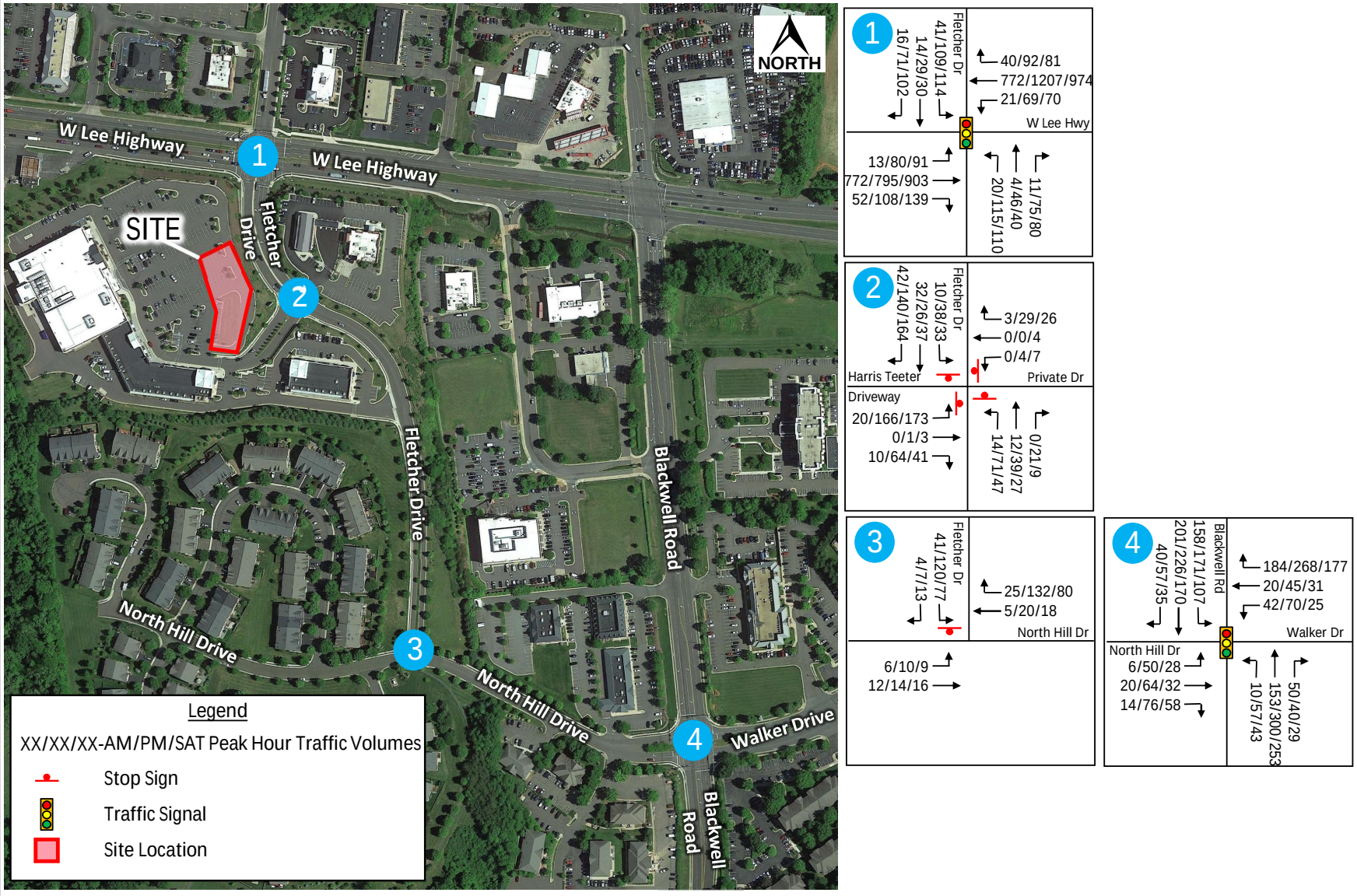
These counts were used to establish a network peak hour by identifying the peak sixty (60) minutes of traffic during which the most traffic is within the entire study area during the weekday AM and PM peak periods. The network peak hours of the study area were identified as 7:30 AM to 8:30 AM during the AM peak period, 4:30 PM to 5:30 PM during the PM peak period, and 11:45 AM to 12:45 PM during the Saturday midday peak period. The weekday AM and PM and Saturday midday peak hour turning movement counts at the study area intersections are summarized in **Figure 2-2**. The full turning movement traffic count data are in **Appendix C.**

EXISTING INTERSECTION CAPACITY ANALYSIS

Intersection capacity analyses were conducted using the existing weekday AM and PM and Saturday midday peak hour turning movement volumes at the study intersections. The capacity analyses were conducted using Synchro and based on methodologies contained in the *Highway Capacity Manual*, *6th Edition* (HCM6) for signalized and unsignalized intersections. According to the HCM, capacity is defined as the maximum number of vehicles that can pass over a road segment or through an intersection within a fixed time duration. Operational conditions are described by a level of service (LOS), which is a qualitative measure that describes the operational conditions of an intersection or street and is an indicator of motorist perceptions within a traffic stream. The HCM defines six (6) levels of service, LOS A through F, with A as the best and F as the worst. **Table 2-1** shows the level of service delay per vehicle for signalized and unsignalized intersections.

Table 2-1: Level of Service and Ranges of Delay

Level of Service (LOS)	Delay per Vehicle (seconds)	
	Signalized intersection	Unsignalized Intersection
A	≤ 10	≤ 10
B	> 10 – 20	> 10 – 15
C	> 20 – 35	> 15 – 25
D	> 35 – 55	> 25 – 35
E	> 55 – 80	> 35 – 50
F	> 80	> 50
Source: *Highway Capacity Manual 6th Edition*		



Source: Google Earth Pro

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2019 Existing Peak Hour Traffic Volumes

Harris Teeter Fuel Center

Figure 2-2

The 2019 existing conditions analyses were based on the existing peak hour turning movement volumes, peak hour factors, lane designations, and traffic control and signal timings at the study intersections.

The results of the 2019 existing intersection capacity analyses are summarized in **Table 2-2**. Analysis results show overall level of service (LOS) and corresponding delay information for each movement, approach, and overall intersection. The LOS for the weekday AM and PM and Saturday midday peak hours under 2019 existing conditions are shown in **Figure 2-3**.The Synchro analysis reports are contained in **Appendix D**.

These capacity analysis results show that under existing conditions, most study intersections and approaches operate at an overall LOS D or better during the AM and PM weekday and Saturday midday peak hours, except for the following:

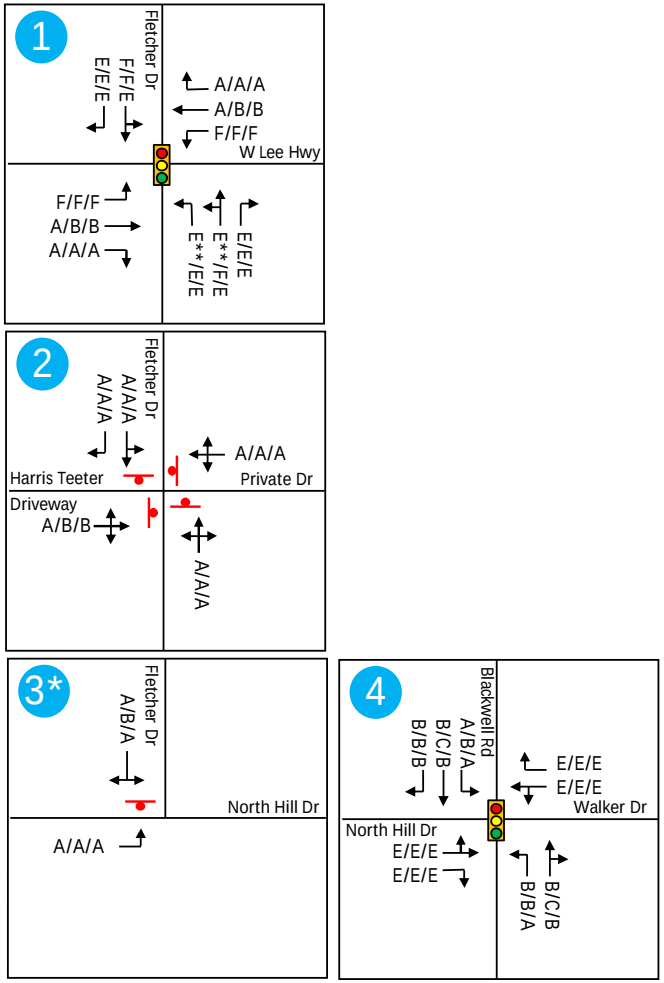
- W Lee Highway at Fletcher Drive
    - Northbound approach is expected to operate at LOS E in the weekday AM and PM and Saturday midday peak hours.
    - Southbound approach is expected to operate at LOS E in the weekday AM and PM and Saturday midday peak hours.
- Blackwell Road at Walker Drive / North Hill Drive
    - Eastbound approach is expected to operate at LOS E in the weekday AM and PM and Saturday midday peak hours.
    - Westbound approach is expected to operate at LOS E in the weekday AM and PM and Saturday midday peak hours.

Table 2-2: Existing Intersection Capacity Analysis

Intersection	Mvmt	AM Peak		PM Peak		SAT Peak	
		Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
1. W Lee Highway at Fletcher Drive (Signalized)							
Eastbound (W Lee Highway)	L	89.5	F	87.8	F	81.3	F
	T	7.6	A	13.9	B	15.4	B
	R	4.3	A	7.7	A	8.5	A
	Approach	*8.7*	*A*	*19.2*	*B*	*19.8*	*B*
Westbound (W Lee Highway)	L	90.9	F	89.5	F	84.3	F
	T	7.2	A	17.6	B	17.1	B
	R	3.5	A	6.4	A	6.8	A
	Approach	*9.2*	*A*	*20.5*	*C*	*20.6*	*C*
Northbound (Fletcher Drive)	L**	70.8	E	78.6	E	73.6	E
	L/T**	70.8	E	80.6	F	75.2	E
	R	67.5	E	66.8	E	62.5	E
	Approach	*69.7*	*E*	*75.8*	*E*	*70.6*	*E*
Southbound (Fletcher Drive)	L/T	82.8	F	80.4	F	74.4	E
	R	69.9	E	71.0	E	69.1	E
	Approach	*79.9*	*E*	*77.2*	*E*	*72.2*	*E*
Overall Intersection		***12.9***	***B***	***29.0***	***C***	***29.3***	***C***
2. Fletcher Drive at Harris Teeter Driveway (AWSC)							
Eastbound (Harris Teeter Driveway)	L/T/R	7.4	A	10.3	B	10.2	B
Westbound (Private Drive)	L/T/R	6.7	A	7.9	A	8.0	A
Northbound (Fletcher Drive)	L/T/R	7.6	A	9.3	A	8.9	A
Southbound (Fletcher Drive)	L/T	8.0	A	9.1	A	9.0	A
	R	6.9	A	8.6	A	8.8	A
3. Fletcher Drive at North Hill Drive (TWSC)*							
Eastbound (North Hill Drive)	L	7.4	A	7.7	A	7.4	A
Southbound (Fletcher Drive)	L/R	9.0	A	10.5	B	9.6	A
4. Blackwell Road at Walker Drive / North Hill Drive (Signalized)							
Eastbound (North Hill Drive)	L/T	71.6	E	80.0	E	76.9	E
	R	66.7	E	65.1	E	64.9	E
	Approach	*69.9*	*E*	*74.0*	*E*	*71.0*	*E*
Westbound (Walker Drive)	L/T	57.8	E	57.0	E	58.8	E
	R	58.2	E	60.2	E	59.7	E
	Approach	*58.1*	*E*	*59.3*	*E*	*59.5*	*E*
Northbound (Blackwell Road)	L	11.2	B	16.4	B	9.8	A
	T/R	13.3	B	22.0	C	13.5	B
	Approach	*13.2*	*B*	*21.2*	*C*	*13.5*	*B*
Southbound (Blackwell Road)	L	10.0	A	16.6	B	9.9	A
	T	12.1	B	20.9	C	13.3	B
	R	10.7	B	18.4	B	12.0	B
	Approach	*11.1*	*B*	*18.9*	*B*	*12.0*	*B*
Overall Intersection		***27.1***	***C***	***37.8***	***D***	***30.6***	***C***

*Only yielding movements reported for two-way STOP-controlled intersections.
**HCM Report combines left-turn and shared left/through lane groups into one due to insufficient volume.

Source: Google Earth Pro



*Only yielding movements reported for two-way STOP-controlled intersections.
**HCM Report combines left-turn and shared left/through lane groups into one due to insufficient volume.

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2019 Existing Peak Hour Levels of Service

Harris Teeter Fuel Center

Figure 2-3

3. 2021 FUTURE CONDITIONS WITHOUT DEVELOPMENT

This chapter examines future year conditions without the proposed fuel center. Included in this chapter are future traffic volumes and future traffic analysis results without the development. This study analyzes future without development conditions in the year 2021 (the build-out year of the proposed fuel center).

Future weekday AM and PM and Saturday midday peak hour turning movement volumes without development are the future without development volumes that will travel through the study area intersections without the proposed fuel center in 2021. Future without development traffic volumes were forecasted based on an increase of the existing traffic volumes due to general regional traffic growth and traffic generated by nearby approved and unbuilt developments.

3.1 REGIONAL TRAFFIC GROWTH

As outlined in the scoping document, an annual growth rate of one (1) percent was used as a conservative estimate of future growth throughout the study area. Existing (2019) peak hour traffic volumes were increased by the one (1) percent annual growth rate to background (2021) future base volumes.

3.2 2021 APPROVED AND UNBUILT DEVELOPMENTS

No approved and unbuilt developments were included in this traffic analysis.

3.3 2021 FUTURE WITHOUT DEVELOPMENT TRAFFIC VOLUMES

The 2021 peak hour turning movement volumes without the proposed fuel center were calculated by increasing the existing traffic volumes to the year 2021 using the previously mentioned growth rate of one (1) percent. The resulting 2021 future without development peak hour turning movement volumes at the study area intersections are shown in **Figure 3-1.**

FUTURE WITHOUT DEVELOPMENT INTERSECTION CAPACITY ANALYSES

The 2021 future conditions without development analyses were based on the future turning movements. Existing traffic signal operations and timings were maintained through future conditions analysis. The results of the intersection capacity analyses for the AM peak hour, PM peak hour, and Saturday midday peak hour are summarized in **Table 3-1**, **Table 3-2**, **Table 3-3**, respectively. Results of the existing conditions analysis are shown for comparison. Analysis results show overall level of service (LOS) and corresponding delay information for each movement, approach, and overall intersection. The LOS for the weekday AM and PM and Saturday midday peak hours under 2021 future without development are shown in **Figure 3-2.** The Synchro analysis reports are contained in **Appendix D**.

These capacity analysis results show that under future without development conditions, most study intersections and approaches operate at an overall LOS D or better during the AM and PM weekday and Saturday midday peak hours, except for the following:

- W Lee Highway at Fletcher Drive
    - Northbound approach is expected to operate at LOS E in the weekday AM and PM and Saturday midday peak hours.
    - Southbound approach is expected to operate at LOS F in the weekday AM peak hour and LOS E in the PM and Saturday midday peak hours.

- Blackwell Road at Walker Drive / North Hill Drive
    - Eastbound approach is expected to operate at LOS E in the weekday AM and PM and Saturday midday peak hours.
    - Westbound approach is expected to operate at LOS E in the weekday AM and PM and Saturday midday peak hours.

Table 3-1: 2021 Future without Development Intersection Capacity Analysis - AM Peak Hour

Intersection	Mvmt	Existing (2019)		Future without Development (2021)	
		Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
1. W Lee Highway at Fletcher Drive (Signalized)					
Eastbound (W Lee Highway)	L	89.5	F	88.4	F
	T	7.6	A	7.4	A
	R	4.3	A	4.2	A
	Approach	*8.7*	*A*	*8.4*	*A*
Westbound (W Lee Highway)	L	90.9	F	92.5	F
	T	7.2	A	7.2	A
	R	3.5	A	3.5	A
	Approach	*9.2*	*A*	*9.1*	*A*
Northbound (Fletcher Drive)	L**	70.8	E	70.8	E
	L/T**	70.8	E	70.8	E
	R	67.5	E	67.6	E
	Approach	*69.7*	*E*	*69.8*	*E*
Southbound (Fletcher Drive)	L/T	82.8	F	83.1	F
	R	69.9	E	69.9	E
	Approach	*79.9*	*E*	*80.2*	*F*
Overall Intersection		***12.9***	***B***	***12.8***	***B***
2. Fletcher Drive at Harris Teeter Driveway (AWSC)					
Eastbound (Harris Teeter Driveway)	L/T/R	7.4	A	7.4	A
Westbound (Private Drive)	L/T/R	6.7	A	6.6	A
Northbound (Fletcher Drive)	L/T/R	7.6	A	7.6	A
Southbound (Fletcher Drive)	L/T	8.0	A	7.9	*A*
	R	6.9	A	6.9	A
3. Fletcher Drive at North Hill Drive (TWSC)*					
Eastbound (North Hill Drive)	L	7.4	A	7.4	A
Southbound (Fletcher Drive)	L/R	9.0	A	9.0	A
4. Blackwell Road at Walker Drive / North Hill Drive (Signalized)					
Eastbound (North Hill Drive)	L/T	71.6	E	71.6	E
	R	66.7	E	66.7	E
	Approach	*69.9*	*E*	*69.9*	*E*
Westbound (Walker Drive)	L/T	57.8	E	58.2	E
	R	58.2	E	58.7	E
	Approach	*58.1*	*E*	*58.6*	*E*
Northbound (Blackwell Road)	L	11.2	B	10.9	B
	T/R	13.3	B	12.9	B
	Approach	*13.2*	*B*	*12.8*	*B*
Southbound (Blackwell Road)	L	10.0	A	9.7	A
	T	12.1	B	11.7	B
	R	10.7	B	10.4	B
	Approach	*11.1*	*B*	*10.8*	*B*
Overall Intersection		***27.1***	***C***	***27.0***	***C***

*Only yielding movements reported for two-way STOP-controlled intersections.
**HCM Report combines left-turn and shared left/through lane groups into one due to insufficient volume.

Table 3-2: 2021 Future without Development Intersection Capacity Analysis - PM Peak Hour

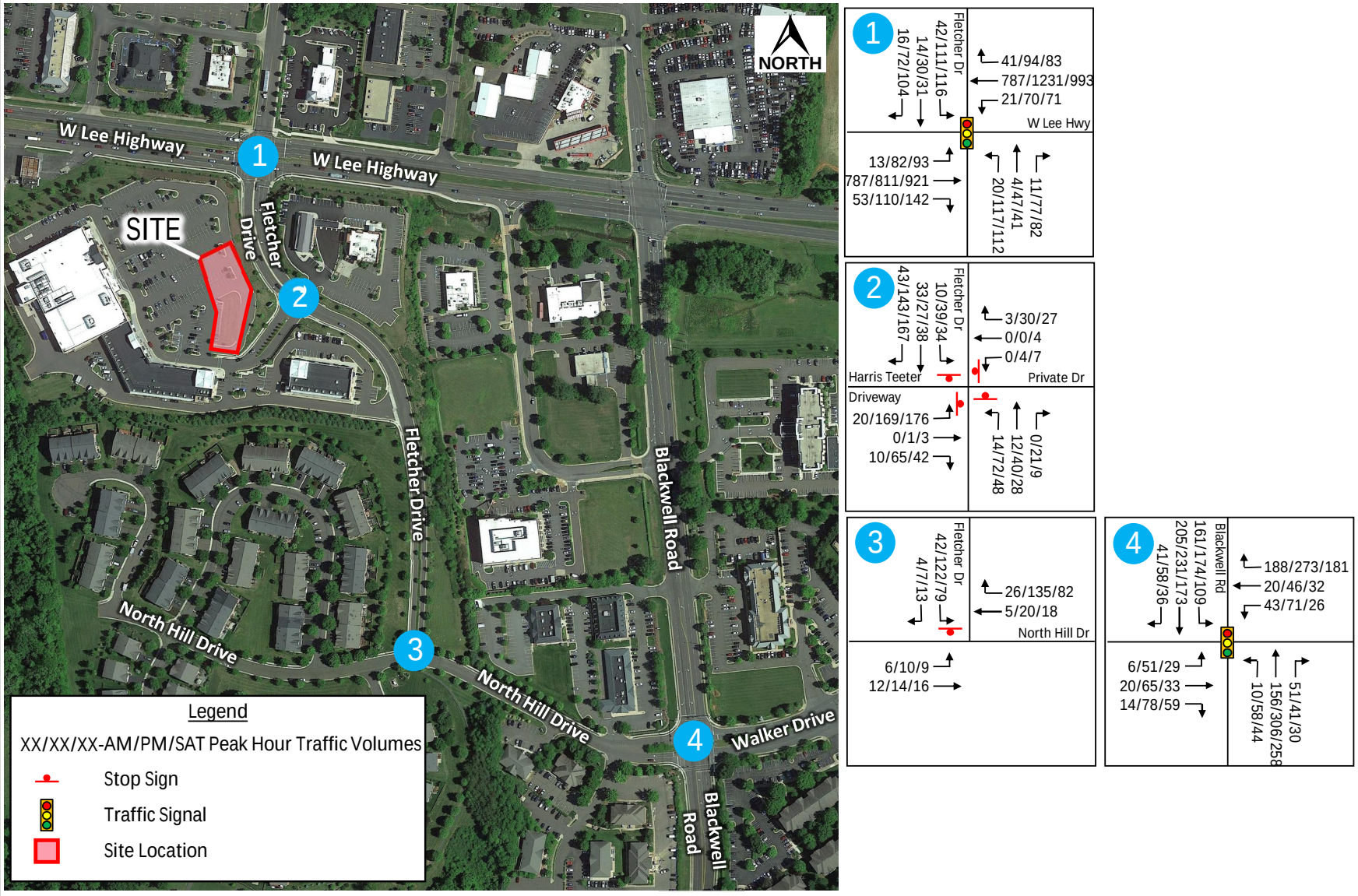
Intersection	Mvmt	Existing (2019)		Future without Development (2021)	
		Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
1. W Lee Highway at Fletcher Drive (Signalized)					
Eastbound (W Lee Highway)	L	87.8	F	87.5	F
	T	13.9	B	14.2	B
	R	7.7	A	7.8	A
	Approach	*19.2*	*B*	*19.6*	*B*
Westbound (W Lee Highway)	L	89.5	F	89.3	F
	T	17.6	B	18.3	B
	R	6.4	A	6.5	A
	Approach	*20.5*	*C*	*21.1*	*C*
Northbound (Fletcher Drive)	L**	78.6	E	78.3	E
	L/T**	80.6	F	80.5	F
	R	66.8	E	66.6	E
	Approach	*75.8*	*E*	*75.6*	*E*
Southbound (Fletcher Drive)	L/T	80.4	F	80.3	F
	R	71.0	E	70.8	E
	Approach	*77.2*	*E*	*77.1*	*E*
Overall Intersection		***29.0***	***C***	***29.5***	***C***
2. Fletcher Drive at Harris Teeter Driveway (AWSC)					
Eastbound (Harris Teeter Driveway)	L/T/R	10.3	B	10.4	B
Westbound (Private Drive)	L/T/R	7.9	A	7.9	A
Northbound (Fletcher Drive)	L/T/R	9.3	A	9.3	A
Southbound (Fletcher Drive)	L/T	9.1	A	9.1	*A*
	R	8.6	A	8.6	A
3. Fletcher Drive at North Hill Drive (TWSC)*					
Eastbound (North Hill Drive)	L	7.7	A	7.7	A
Southbound (Fletcher Drive)	L/R	10.5	B	10.2	B
4. Blackwell Road at Walker Drive / North Hill Drive (Signalized)					
Eastbound (North Hill Drive)	L/T	80.0	E	80.1	F
	R	65.1	E	65.4	E
	Approach	*74.0*	*E*	*74.2*	E
Westbound (Walker Drive)	L/T	57.0	E	57.4	E
	R	60.2	E	60.6	E
	Approach	*59.3*	*E*	*59.7*	E
Northbound (Blackwell Road)	L	16.4	B	15.7	B
	T/R	22.0	C	20.8	C
	Approach	*21.2*	*C*	*20.0*	B
Southbound (Blackwell Road)	L	16.6	B	15.9	B
	T	20.9	C	20.2	C
	R	18.4	B	17.9	B
	Approach	*18.9*	*B*	*18.3*	B
Overall Intersection		***37.8***	***D***	***37.4***	***D***

*Only yielding movements reported for two-way STOP-controlled intersections.
**HCM Report combines left-turn and shared left/through lane groups into one due to insufficient volume.

Table 3-3: 2021 Future without Development Intersection Capacity Analysis - Saturday Peak Hour

Intersection	Mvmt	Existing (2019)		Future without Development (2021)	
		Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
1. W Lee Highway at Fletcher Drive (Signalized)					
Eastbound (W Lee Highway)	L	81.3	F	81.2	F
	T	15.4	B	15.8	B
	R	8.5	A	8.6	A
	Approach	*19.8*	*B*	*20.2*	*C*
Westbound (W Lee Highway)	L	84.3	F	84.1	F
	T	17.1	B	17.6	B
	R	6.8	A	6.9	A
	Approach	*20.6*	*C*	*21.0*	*C*
Northbound (Fletcher Drive)	L**	73.6	E	73.4	E
	L/T**	75.2	E	74.9	E
	R	62.5	E	62.3	E
	Approach	*70.6*	*E*	*70.3*	*E*
Southbound (Fletcher Drive)	L/T	74.4	E	74.2	E
	R	69.1	E	68.9	E
	Approach	*72.2*	*E*	*72.0*	*E*
Overall Intersection		***29.3***	***C***	***29.6***	***C***
2. Fletcher Drive at Harris Teeter Driveway (AWSC)					
Eastbound (Harris Teeter Driveway)	L/T/R	10.2	B	10.2	B
Westbound (Private Drive)	L/T/R	8.0	A	8.0	A
Northbound (Fletcher Drive)	L/T/R	8.9	A	8.9	A
Southbound (Fletcher Drive)	L/T	9.0	A	9.0	*A*
	R	8.8	A	8.8	A
3. Fletcher Drive at North Hill Drive (TWSC)*					
Eastbound (North Hill Drive)	L	7.4	A	7.4	A
Southbound (Fletcher Drive)	L/R	9.6	A	9.6	A
4. Blackwell Road at Walker Drive / North Hill Drive (Signalized)					
Eastbound (North Hill Drive)	L/T	76.9	E	74.9	E
	R	64.9	E	64.3	E
	Approach	*71.0*	*E*	*69.8*	E
Westbound (Walker Drive)	L/T	58.8	E	59.0	E
	R	59.7	E	59.6	E
	Approach	*59.5*	*E*	*59.5*	E
Northbound (Blackwell Road)	L	9.8	A	9.7	A
	T/R	13.5	B	13.2	B
	Approach	*13.5*	*B*	*12.7*	B
Southbound (Blackwell Road)	L	9.9	A	9.8	A
	T	13.3	B	13.1	B
	R	12.0	B	11.9	B
	Approach	*12.0*	*B*	*11.8*	B
Overall Intersection		***30.6***	***C***	***30.4***	***C***

*Only yielding movements reported for two-way STOP-controlled intersections.
**HCM Report combines left-turn and shared left/through lane groups into one due to insufficient volume.



Source: Google Earth Pro

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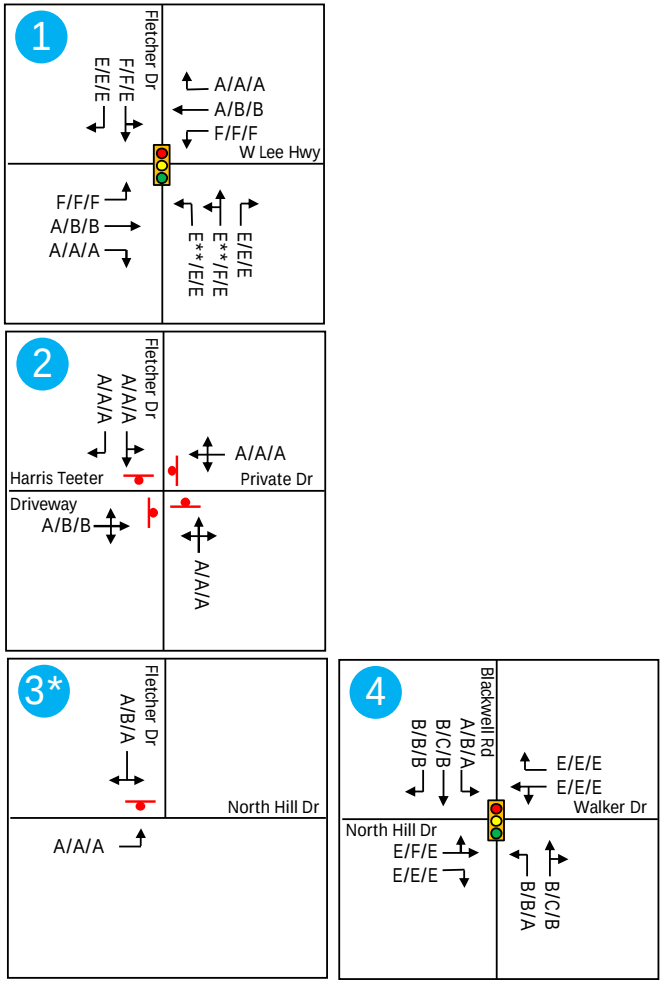
2021 Future without Development Peak Hour Traffic Volumes

Harris Teeter Fuel Center

Figure 3-1

Source: Google Earth Pro



*Only yielding movements reported for two-way STOP-controlled intersections.
**HCM Report combines left-turn and shared left/through lane groups into one due to insufficient volume.

Kimley»Horn

2021 Future without Development Peak Hour Levels of Service

Harris Teeter Fuel Center

Figure 3-2

4. 2021 FUTURE CONDITIONS WITH DEVELOPMENT

This chapter examines 2021 future conditions with the new proposed fuel center. Included in this chapter are the trip generation, distribution, and assignment for the proposed site, and future traffic volumes and traffic analysis results with the development.

4.1 SITE ACCESS

Site access will utilize the existing Harris Teeter site access: one (1) full-access intersection along Fletcher Drive. From the driveway on Fletcher Drive, the site plan proposes to introduce a one-way entry to the fuel center that will navigate customers to the fueling stations through a more direct route than traversing the drive aisles of the rest of the shopping center. This will reduce conflicts with other parking patrons of the adjacent uses. Access will also be provided directly from the drive aisles of Harris Teeter, which is likely to have significant customer overlap with the fuel center. No additional conflicting movements are anticipated with the addition of the proposed fuel center.

4.2 SITE TRIP GENERATION

Trip generation rates for the proposed development were obtained from the Institute of Transportation Engineer's (ITE) Trip Generation Manual, 10th Edition. Land use categories and descriptions were reviewed from this manual to determine which category has comparable characteristics and traffic patterns as the proposed fuel center. After careful review, land use code 944, Gasoline/Service Station was selected for trip generation calculations.

Internal capture percentages were applied to the total external trips to the site to account for trips generated by an individual land use that then remain internal to the site for a different land use. An example of such would be stopping by the existing Harris Teeter and then additionally stopping by the proposed fuel center, within the same trip. Internal capture was estimated from data collected at similar existing Harris Teeter Grocery Store and Fuel Centers. This internal capture data collection is summarized in **Appendix E.**

Pass-by percentages, obtained from ITE Trip Generation Handbook, 3rd Edition, were applied to the total external trips to the site, minus the internal capture, to account for traffic passing the site on adjacent streets that make an intermediate stop on the way from an origin to a primary trip destination. An example of such would be stopping by the proposed fuel center on the way from work to home in the evening. The lowest pass-by of the AM and PM peak period was applied to the Saturday peak period, as agreed upon in the scoping document. **Table 4-1** shows the primary site generated trips, including the internal capture and pass-by reductions.

Table 4-1: Proposed Site Trip Generation

ITE Code	Land Use Setting/ Location	Density		AM Peak Hour			PM Peak Hour			SAT Peak Hour			Daily
				Enter	Exit	Total	Enter	Exit	Total	Enter	Exit	Total	
944	Gasoline/ Service Station	8	f.p.	41	41	82	56	56	112	51	51	102	1,376
Internal Capture Trips (11% AM,28% PM,28% SAT)				-5	-5	-10	-16	-16	-32	-14	-14	-28	---
Pass-by Trips (58% AM,42% PM,42% SAT)				*-21*	*-21*	*-42*	*-17*	*-17*	*-34*	*-16*	*-16*	*-32*	---
Primary Trips (Total External minus Pass-by)				15	15	30	23	23	46	21	21	42	1,376

4.3 TRIP DISTRIBUTION

The weekday AM and PM and Saturday midday peak hour trips generated by the proposed fuel center were assigned to the study area streets based on surrounding land uses, population density, and transportation network improvements. The resulting distribution of site generated trips is summarized in **Table 4-2** and shown in **Figure 4-1**.

Table 4-2: 2021 Trip Distribution of Site Generated Traffic

Direction	Percentage Trips AM/PM/SAT Peaks
To/From the East on W Lee Highway	20%
To/From the West on W Lee Highway	35%
To/From the North on Fletcher Drive	10%
To/From the West on North Hill Drive	2%
To/From the East on North Hill Drive	16%
To/From the South on Blackwell Road	17%

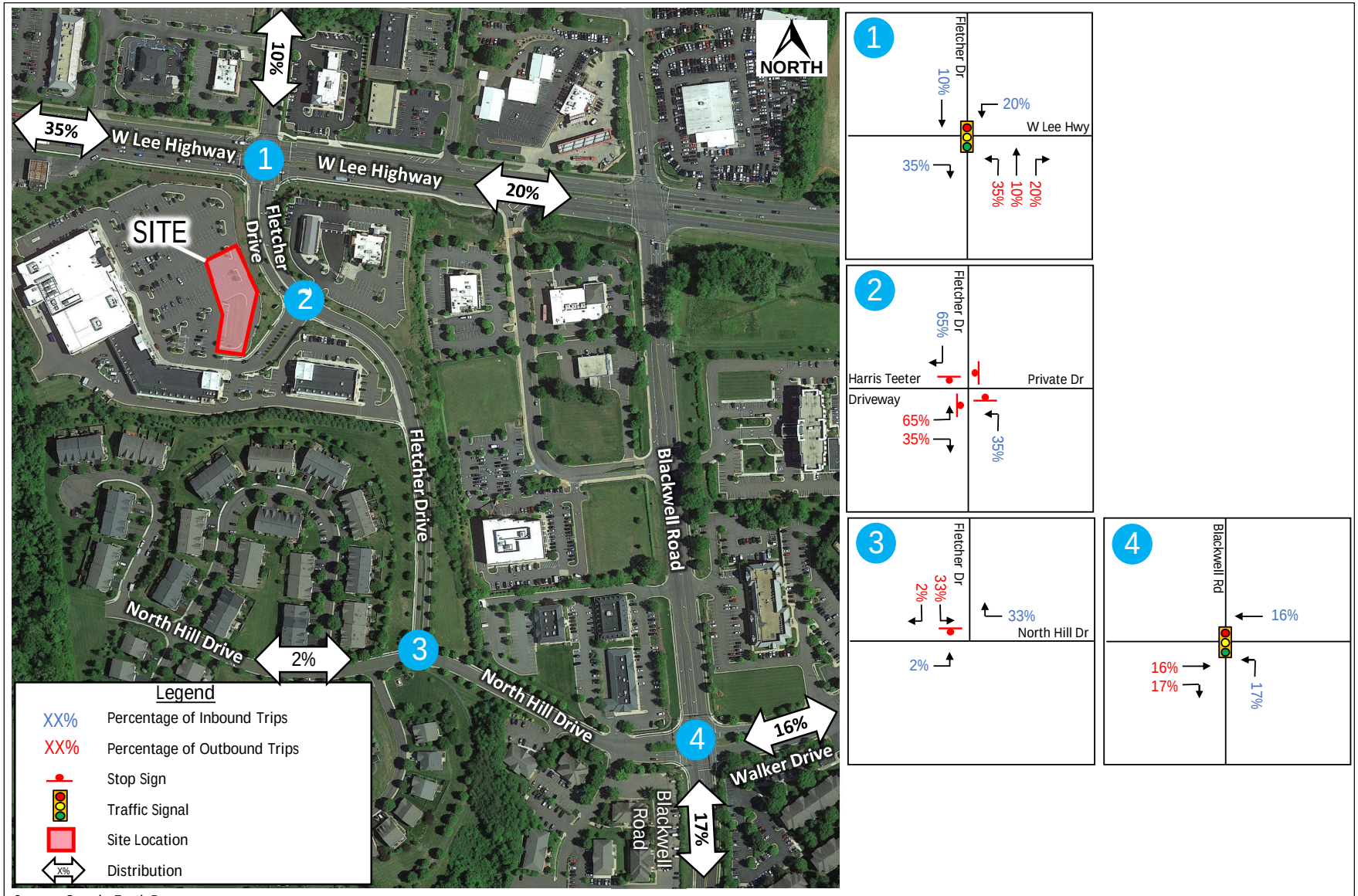
4.4 TRIP ASSIGNMENT

The site generated trips for this study were assigned to the study area intersections according to the distribution shown in **Table 4-2.** The site generated peak hour assignment is shown in **Figure 4-1**. The resulting primary site generated peak hour trips are shown in **Figure 4-2**.

Additionally, pass-by trips were distributed amongst the study area intersections. Thirty-five percent (35%) of the pass-by trips were assumed to enter the site along Fletcher Drive from the south and sixty-five percent (65%) were assumed to enter the site along Fletcher Drive from the north. The resulting pass-by trips are shown in **Figure 4-3**

4.5 TOTAL FUTURE WITH DEVELOPMENT TRAFFIC VOLUMES

The total 2021 future with development peak hour traffic volumes were calculated by adding the net new site generated trips, including the primary and pass-by trips, to the 2021 future without development volumes. The resulting total future peak hour traffic volumes with development are shown on **Figure 4-4**.



Source: Google Earth Pro

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2021 Directional Distribution and Trip Assignment of Site Generated Trips

Harris Teeter Fuel Center

Figure 4-1

Source: Google Earth Pro

Kimley»Horn

2021 Primary Site Generated Peak Hour Trips

Harris Teeter Fuel Center

Figure 4-2

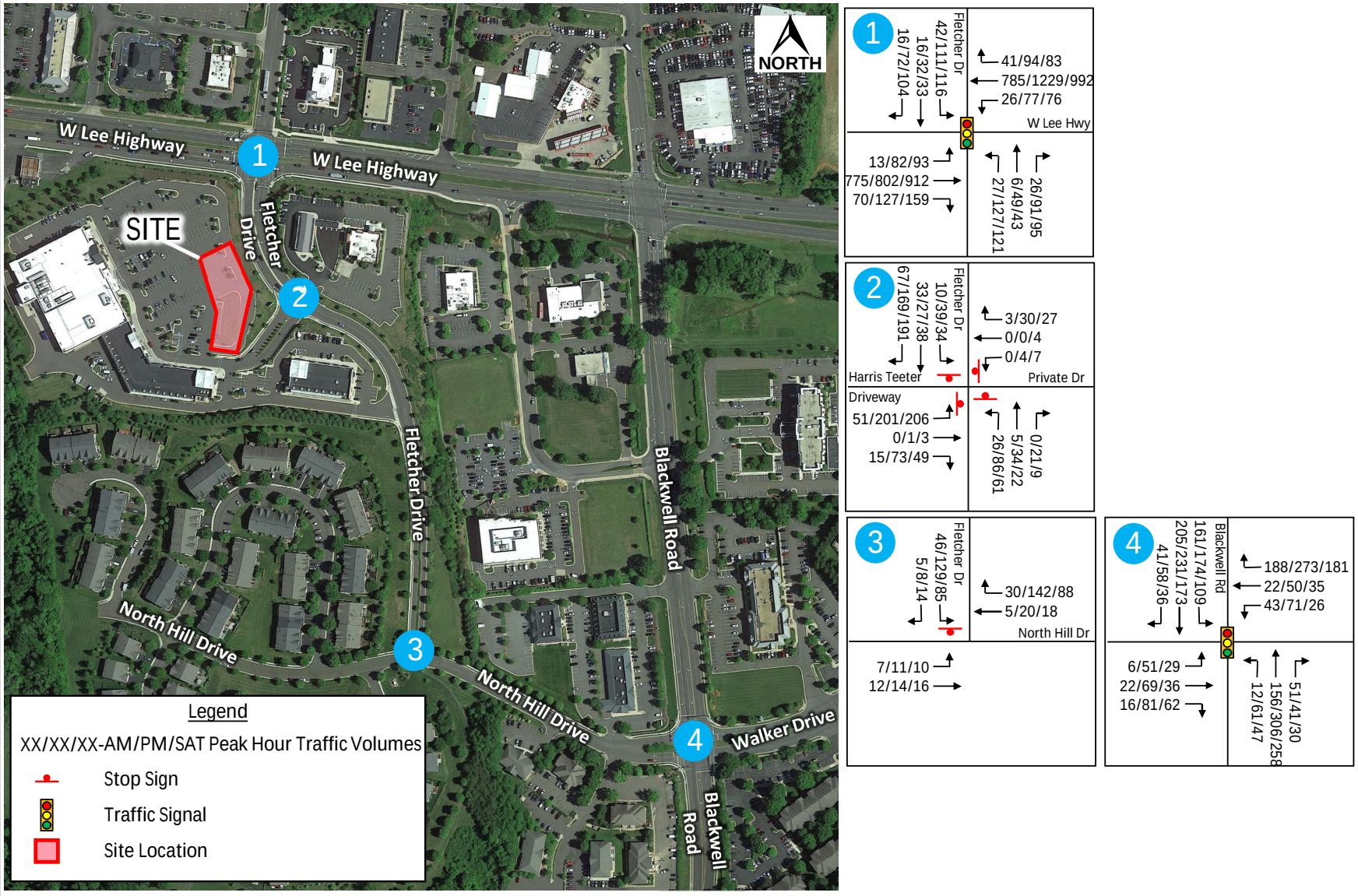
Source: Google Earth Pro

Kimley»Horn

2021 Pass-By Peak Hour Trips

Harris Teeter Fuel Center

Figure 4-3



Source: Google Earth Pro

Kimley»Horn

2021 Future with Development Peak Hour Traffic Volumes

Harris Teeter Fuel Center

Figure 4-4

FUTURE WITH DEVELOPMENT INTERSECTION CAPACITY ANALYSES

Capacity analyses were performed for 2021 future with development traffic volumes with the proposed fuel center. The analyses were based on the 2021 future without development scenario geometry, traffic control, and signal timing at the study area intersections.

The results of the intersection capacity analyses for the AM peak hour, PM peak hour, and Saturday midday peak hour are summarized in **Table 4-3**, **Table 4-4**, **Table 4-5**, respectively. Results of the existing conditions analysis and the future without development are shown for comparison. Analysis results show overall level of service (LOS) and corresponding delay information for each movement, approach, and overall intersection. The LOS for the weekday AM and PM and Saturday midday peak hours under 2021 future with development conditions are shown in **Figure 4-5**. Complete analysis results and Synchro HCM reports are provided in **Appendix D.**

The capacity analysis of the future conditions with development show that the increase in delay at the study intersections due to the proposed fuel center negligible. The proposed development worsens the LOS at the following movements:

- Eastbound approach of Harris Teeter Driveway at Fletcher Drive worsens from LOS A to LOS B during the PM peak hour and the Saturday midday peak hour. The associated delay increases by 0.8 seconds and 0.7 seconds in the PM peak hour and Saturday midday peak hour, respectively.
- Westbound approach of W Lee Highway at Fletcher Drive worsens from LOS A to LOS B during the Saturday midday peak hour. The associated delay increased by 1.0 seconds.

All intersections operate at overall LOS D or better in 2021 future conditions with and without development during the weekday AM and PM and Saturday midday peak hours.

Under the 2021 future with and without development, all intersection approaches operated at LOS D or better except for the following:

- Northbound Fletcher Drive at W Lee Highway operates at LOS E during the AM, PM, and Saturday midday peak hours.
- Southbound Fletcher Drive at W Lee Highway operates at LOS F during the AM peak hour and LOS E during the PM and Saturday midday peak hours.
- Eastbound North Hill Drive at Blackwell Road operates at LOS E during the AM, PM, and Saturday midday peak hours.
- Westbound Walker Drive at Blackwell Road operates at LOS E during the AM, PM, and Saturday midday peak hours.

All of these approaches were previously operating at LOS E in 2019 existing conditions.

In addition to the approaches and associated movements noted above, the following movements operate at LOS E or LOS F in 2019 existing conditions, and 2021 future with and without development conditions. The proposed development nominally increases the delay at these congested movements:

- Westbound left-turn lane from W Lee Highway to Fletcher Dr increases in delay by 1.6 seconds in the AM peak hour, decreases in delay by 0.9 seconds in the PM peak hour, and decreases in delay by 0.6 seconds in the Saturday midday peak hour. The slight decreases are likely attributable to the slight redistribution of traffic through the intersection caused by the proposed development. The movement is expected to operate at LOS F during weekday AM and PM and

Saturday midday peak hours under 2019 existing conditions and 2021 future with and without development conditions.

- Eastbound left turn lane from W Lee Highway to Fletcher Dr had no change in delay. This movement is expected to operate at LOS F during weekday AM and PM and Saturday midday peak hours under 2019 existing conditions and 2021 future with and without development conditions.

The increase in delay related to the proposed development is less than 2 seconds at the movement, approach and intersection level, indicating negligible effects on the intersection's operations.

Table 4-3: 2021 Future with Development Capacity Analysis – AM Peak Hour

Intersection	Mvmt	Existing (2019)		Future without Development (2021)		Future with Development (2021)	
		Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
1. W Lee Highway at Fletcher Drive (Signalized)							
Eastbound (W Lee Highway)	L	89.5	F	88.4	F	88.4	F
	T	7.6	A	7.4	A	8.0	A
	R	4.3	A	4.2	A	4.4	A
	Approach	*8.7*	*A*	*8.4*	*A*	*8.9*	*A*
Westbound (W Lee Highway)	L	90.9	F	92.5	F	95.0	F
	T	7.2	A	7.2	A	7.6	A
	R	3.5	A	3.5	A	3.8	A
	Approach	*9.2*	*A*	*9.1*	*A*	*10.1*	*B*
Northbound (Fletcher Drive)	L**	70.8	E	70.8	E	70.7	E
	L/T**	70.8	E	70.8	E	70.6	E
	R	67.5	E	67.6	E	67.4	E
	Approach	*69.7*	*E*	*69.8*	*E*	*69.3*	*E*
Southbound (Fletcher Drive)	L/T	82.8	F	83.1	F	82.8	F
	R	69.9	E	69.9	E	69.6	E
	Approach	*79.9*	*E*	*80.2*	*F*	*80.0*	*E*
Overall Intersection		***12.9***	***B***	***12.8***	***B***	***14.3***	***B***
2. Fletcher Drive at Harris Teeter Driveway (AWSC)							
Eastbound (Harris Teeter Driveway)	L/T/R	7.4	A	7.4	A	7.8	A
Westbound (Private Drive)	L/T/R	6.7	A	6.6	A	6.7	A
Northbound (Fletcher Drive)	L/T/R	7.6	A	7.6	A	7.8	A
Southbound (Fletcher Drive)	L/T	8.0	A	7.9	A	8.0	A
	R	6.9	A	6.9	A	7.1	A
3. Fletcher Drive at North Hill Drive (TWSC)*							
Eastbound (North Hill Drive)	L	7.4	A	7.4	A	7.4	A
Southbound (Fletcher Drive)	L/R	9.0	A	9.0	A	9.0	A
4. Blackwell Road at Walker Drive / North Hill Drive (Signalized)							
Eastbound (North Hill Drive)	L/T	71.6	E	71.6	E	71.6	E
	R	66.7	E	66.7	E	66.2	E
	Approach	*69.9*	*E*	*69.9*	E	*69.7*	E
Westbound (Walker Drive)	L/T	57.8	E	58.2	E	58.3	E
	R	58.2	E	58.7	E	57.7	E
	Approach	*58.1*	*E*	*58.6*	E	*58.6*	E
Northbound (Blackwell Road)	L	11.2	B	10.9	B	10.8	B
	T/R	13.3	B	12.9	B	13.0	B
	Approach	*13.2*	*B*	*12.8*	B	*12.8*	B
Southbound (Blackwell Road)	L	10.0	A	9.7	A	10.0	A
	T	12.1	B	11.7	B	12.0	B
	R	10.7	B	10.4	B	10.6	B
	Approach	*11.1*	*B*	*10.8*	B	*11.0*	B
Overall Intersection		***27.1***	***C***	***27.0***	***C***	***27.3***	***C***

*Only yielding movements reported for two-way STOP-controlled intersections.
**HCM Report combines left-turn and shared left/through lane groups into one due to insufficient volume.

Table 4-4: 2021 Future with Development Capacity Analysis – PM Peak Hour

Intersection	Mvmt	Existing (2019)		Future without Development (2021)		Future with Development (2021)	
		Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
1. W Lee Highway at Fletcher Drive (Signalized)							
Eastbound (W Lee Highway)	L	87.8	F	87.5	F	87.5	F
	T	13.9	B	14.2	B	15.0	B
	R	7.7	A	7.8	A	8.2	A
	Approach	*19.2*	*B*	*19.6*	*B*	*20.0*	*B*
Westbound (W Lee Highway)	L	89.5	F	89.3	F	88.4	F
	T	17.6	B	18.3	B	18.9	B
	R	6.4	A	6.5	A	6.7	A
	Approach	*20.5*	*C*	*21.1*	*C*	*21.9*	*C*
Northbound (Fletcher Drive)	L**	78.6	E	78.3	E	77.7	E
	L/T**	80.6	F	80.5	F	80.0	E
	R	66.8	E	66.6	E	66.0	E
	Approach	*75.8*	*E*	*75.6*	*E*	*74.8*	*E*
Southbound (Fletcher Drive)	L/T	80.4	F	80.3	F	80.2	F
	R	71.0	E	70.8	E	70.5	E
	Approach	*77.2*	*E*	*77.1*	*E*	*77.0*	*E*
Overall Intersection		***29.0***	***C***	***29.5***	***C***	***30.4***	***C***
2. Fletcher Drive at Harris Teeter Driveway (AWSC)							
Eastbound (Harris Teeter Driveway)	L/T/R	10.3	B	10.4	B	11.4	B
Westbound (Private Drive)	L/T/R	7.9	A	7.9	A	8.1	A
Northbound (Fletcher Drive)	L/T/R	9.3	A	9.3	A	9.8	A
Southbound (Fletcher Drive)	L/T	9.1	A	9.1	A	9.4	A
	R	8.6	A	8.6	A	9.1	A
3. Fletcher Drive at North Hill Drive (TWSC)*							
Eastbound (North Hill Drive)	L	7.7	A	7.7	A	7.7	A
Southbound (Fletcher Drive)	L/R	10.5	B	10.2	B	10.3	B
4. Blackwell Road at Walker Drive / North Hill Drive (Signalized)							
Eastbound (North Hill Drive)	L/T	80.0	E	80.1	F	79.9	E
	R	65.1	E	65.4	E	65.2	E
	Approach	*74.0*	*E*	*74.2*	E	*74.0*	E
Westbound (Walker Drive)	L/T	57.0	E	57.4	E	57.6	E
	R	60.2	E	60.6	E	60.6	E
	Approach	*59.3*	*E*	*59.7*	E	*59.6*	E
Northbound (Blackwell Road)	L	16.4	B	15.7	B	15.9	B
	T/R	22.0	C	20.8	C	21.0	C
	Approach	*21.2*	*C*	*20.0*	B	*20.2*	C
Southbound (Blackwell Road)	L	16.6	B	15.9	B	16.1	B
	T	20.9	C	20.2	C	20.4	C
	R	18.4	B	17.9	B	18.1	B
	Approach	*18.9*	*B*	*18.3*	B	*18.5*	B
Overall Intersection		***37.8***	***D***	***37.4***	***D***	***37.6***	***D***

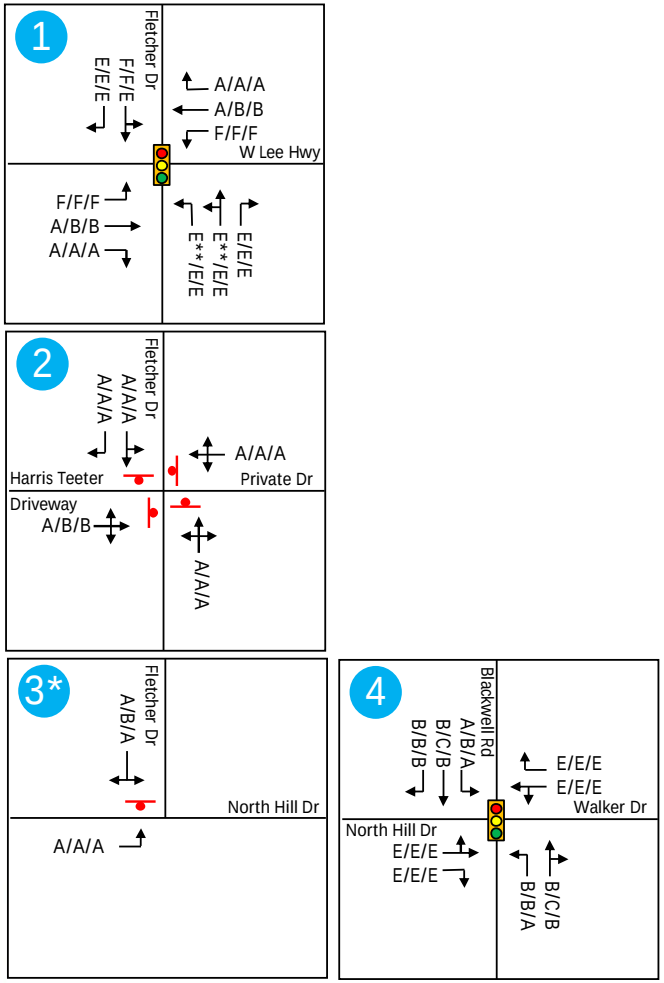
*Only yielding movements reported for two-way STOP-controlled intersections.
**HCM Report combines left-turn and shared left/through lane groups into one due to insufficient volume.

Table 4-5: 2021 Future with Development Capacity Analysis – Saturday Peak Hour

Intersection	Mvmt	Existing (2019)		Future without Development (2021)		Future with Development (2021)	
		Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
1. W Lee Highway at Fletcher Drive (Signalized)							
Eastbound (W Lee Highway)	L	81.3	F	81.2	F	81.2	F
	T	15.4	B	15.8	B	16.7	B
	R	8.5	A	8.6	A	8.6	A
	Approach	*19.8*	*B*	*20.2*	*C*	*21.3*	*C*
Westbound (W Lee Highway)	L	84.3	F	84.1	F	83.5	F
	T	17.1	B	17.6	B	18.4	B
	R	6.8	A	6.9	A	7.3	A
	Approach	*20.6*	*C*	*21.0*	*C*	*21.9*	*C*
Northbound (Fletcher Drive)	L**	73.6	E	73.4	E	71.5	E
	L/T**	75.2	E	74.9	E	72.7	E
	R	62.5	E	62.3	E	61.3	E
	Approach	*70.6*	*E*	*70.3*	*E*	*68.4*	*E*
Southbound (Fletcher Drive)	L/T	74.4	E	74.2	E	74.1	E
	R	69.1	E	68.9	E	68.6	E
	Approach	*72.2*	*E*	*72.0*	*E*	*71.9*	*E*
Overall Intersection		***29.3***	***C***	***29.6***	***C***	***30.7***	***C***
2. Fletcher Drive at Harris Teeter Driveway (AWSC)							
Eastbound (Harris Teeter Driveway)	L/T/R	10.2	B	10.2	B	11.1	B
Westbound (Private Drive)	L/T/R	8.0	A	8.0	A	8.2	A
Northbound (Fletcher Drive)	L/T/R	8.9	A	8.9	A	9.2	A
Southbound (Fletcher Drive)	L/T	9.0	A	9.0	A	9.2	A
	R	8.8	A	8.8	A	9.3	A
3. Fletcher Drive at North Hill Drive (TWSC)*							
Eastbound (North Hill Drive)	L	7.4	A	7.4	A	7.4	A
Southbound (Fletcher Drive)	L/R	9.6	A	9.6	A	9.7	A
4. Blackwell Road at Walker Drive / North Hill Drive (Signalized)							
Eastbound (North Hill Drive)	L/T	76.9	E	74.9	E	75.6	E
	R	64.9	E	64.3	E	64.3	E
	Approach	*71.0*	*E*	*69.8*	*E*	*70.1*	*E*
Westbound (Walker Drive)	L/T	58.8	E	59.0	E	59.1	E
	R	59.7	E	59.6	E	59.6	E
	Approach	*59.5*	*E*	*59.5*	*E*	*59.5*	*E*
Northbound (Blackwell Road)	L	9.8	A	9.7	A	9.7	A
	T/R	13.5	B	13.2	B	13.2	B
	Approach	*13.5*	*B*	*12.7*	B	*12.7*	B
Southbound (Blackwell Road)	L	9.9	A	9.8	A	9.8	A
	T	13.3	B	13.1	B	13.1	B
	R	12.0	B	11.9	B	11.9	B
	Approach	*12.0*	*B*	*11.8*	B	*11.9*	B
Overall Intersection		***30.6***	***C***	***30.4***	***C***	***30.7***	***C***

*Only yielding movements reported for two-way STOP-controlled intersections.
**HCM Report combines left-turn and shared left/through lane groups into one due to insufficient volume.

Source: Google Earth Pro



*Only yielding movements reported for two-way STOP-controlled intersections.
**HCM Report combines left-turn and shared left/through lane groups into one due to insufficient volume.

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2021 Future with Development Peak Hour Levels of Service

Harris Teeter Fuel Center

Figure 4-5

5. QUEUING ANALYSIS

The queueing analyses were conducted using Synchro 10 methodology to determine the 95th percentile queues for each approach. The resulting 95th percentile queues are summarized in **Table 5-1.** No significant queuing is anticipated at any of the study area intersections during typical AM weekday, PM weekday, or Saturday midday peak hour conditions. All queues are anticipated to be less than the available storage length. The existing site entrance will be adequate for the site generated trips. The site generated trips will have a negligible effect on the study area intersections.

Table 5-1: Queuing Analysis

Intersection	Mvmt	Existing Storage Length (ft)	2019 Existing Conditions			2021 Future without Conditions			2021 Future with Development Conditions		
			AM Peak	PM Peak	SAT Peak	AM Peak	PM Peak	SAT Peak	AM Peak	PM Peak	SAT Peak
			95th Queue (ft)			95th Queue (ft)			95th Queue (ft)		
1. W Lee Highway at Fletcher Drive (Signalized)											
Eastbound (W Lee Highway)	L	200	40	142	151	39	145	153	39	145	153
	T	-	263	368	442	260	380	456	264	384	460
	R	350	0	25	29	0	25	29	6	27	31
Westbound (W Lee Highway)	L	215	54	126	124	54	127	126	62	137	131
	T	-	153	653	503	252	680	520	257	688	525
	R	310	2	12	10	3	13	10	3	13	11
Northbound (Fletcher Drive)	L	400*	37	148	133	38	149	135	47	158	143
	L/T	400*	37	150	136	38	152	140	47	161	145
	R	110	0	32	30	0	31	30	0	33	32
Southbound (Fletcher Drive)	L/T	-	106	215	213	107	218	217	109	221	219
	R	165	0	22	53	0	23	56	0	23	56
2. Fletcher Drive at Harris Teeter Driveway (AWSC)											
Eastbound (Harris Teeter Driveway)	L/T/R	-	3	38	35	3	38	35	8	50	45
Westbound (Private Drive)	L/T/R	-	0	3	5	0	3	5	0	5	5
Northbound (Fletcher Drive)	L/T/R	-	3	18	10	3	18	10	3	20	13
Southbound (Fletcher Drive)	L/T	400*	5	10	10	5	10	10	5	10	10
	R	400*	5	18	23	5	18	23	8	25	28
3. Fletcher Drive at North Hill Drive (TWSC)											
Eastbound (North Hill Drive)	L	-	0	0	0	0	0	0	0	0	0
Southbound (Fletcher Drive)	L/R	-	5	18	10	5	15	10	5	18	10
4. Blackwell Road at Walker Drive / North Hill Drive (Signalized)											
Eastbound (North Hill Drive)	L/T	760*	61	197	113	63	198	116	65	202	120
	R	80	0	23	35	0	25	34	0	27	36
Westbound (Walker Drive)	L/T	-	116	198	108	117	198	109	120	202	113
	R	-	59	66	66	67	74	68	67	74	68
Northbound (Blackwell Road)	L	120	9	48	28	9	47	28	10	49	30
	T/R	-	65	157	96	64	154	96	65	156	97
Southbound (Blackwell Road)	L	180	78	124	59	78	122	59	79	123	60
	T	-	134	206	121	134	204	120	136	206	121
	R	300	0	6	0	0	6	0	0	6	0

**Storage Length is restricted by next intersection*

AWSC = All-way STOP-Controlled unsignalized intersection (Assume a vehicle is 25 feet long)

TWSC = Two-way STOP-Controlled unsignalized intersection (Assume a vehicle is 25 feet long)

6. CONCLUSIONS

This transportation study shows that the proposed fuel center located on-site of the existing Harris Teeter Grocery Store in Warrenton, VA will have a negligible impact on the study area intersections. There will be no changes in overall intersection levels of service due to the proposed development compared to the future without development scenario.

The capacity analysis of the future conditions with development show that the increase in delay at the study intersections due to the proposed fuel center is negligible. The proposed development increases the LOS at the following approaches:

- Eastbound approach of Harris Teeter Driveway at Fletcher Drive worsens from LOS A to LOS B during the PM peak hour and the Saturday midday peak hour. The associated delay increases by 0.8 seconds and 0.7 seconds in the PM peak hour and Saturday midday peak hour, respectively.
- Westbound approach of W Lee Highway at Fletcher Drive worsens from LOS A to LOS B during the Saturday midday peak hour. The associated delay increased by 1.0 seconds.

All intersections operate at overall LOS D or better in 2021 future with and without development during the weekday AM and PM and Saturday midday peak hours.

Under the 2021 future with and without development conditions, all intersection approaches operate at LOS D or better except for the following:

- Northbound Fletcher Drive at W Lee Highway operates at LOS E during the AM, PM, and Saturday midday peak hours.
- Southbound Fletcher Drive at W Lee Highway operates at LOS F during the AM peak hour and LOS E during the PM and Saturday midday peak hours.
- Eastbound North Hill Drive at Blackwell Road operates at LOS E during the AM, PM, and Saturday midday peak hours.
- Westbound Walker Drive at Blackwell Road operates at LOS E during the AM, PM, and Saturday midday peak hours.

All of these approaches were previously operating at LOS E in 2019 existing conditions.

In addition to the approaches and associate movements noted above, the following movements operate at LOS E or LOS F in 2019 existing conditions and 2021 future with or without development conditions. The proposed development nominally increases the delay at these congested movements:

- Westbound left-turn lane from W Lee Highway to Fletcher Dr increases in delay by 1.6 seconds in the AM peak hour, decreases in delay by 0.9 seconds in the PM peak hour, and decreases in delay by 0.6 seconds in the Saturday midday peak hour. The slight decreases are likely attributable to the slight redistribution of traffic through the intersection caused by the proposed development. The movement is expected to operate at LOS F during weekday AM and PM and Saturday midday peak hours under 2019 existing conditions and 2021 future with and without development conditions.
- Eastbound left turn lane from W Lee Highway to Fletcher Dr had no change in delay. This movement is expected to operate at LOS F during weekday AM and PM and Saturday midday peak hours under 2019 existing conditions and 2021 future with and without development conditions.

The increase in delay related to the proposed development is less than 2 seconds at the movement, approach and intersection level, indicating negligible effects on the intersection's operations.

No significant queuing is anticipated at any of the study area intersections during typical AM weekday, PM weekday, or Saturday midday peak hour conditions. All queues are anticipated to be less than the available storage length. The existing site entrance will be adequate for the site generated trips. The site generated trips will have a negligible effect on the study area intersections.

Appendix A

Concept Site Plan

Appendix B

Scoping Form

Appendix C

Existing Traffic Counts

Appendix D

Traffic Analysis HCM Reports

Appendix E

Internal Capture Data Collection

VDOT Comment Responses
January 28, 2022

General:

1. Applicant should clarify what would be the largest vehicle accessing the site and provide an Autoturn analysis as part of the site plan submission. Given the location of the fueling tanks, the analysis should include vehicle turning movements exiting/entering the site as well as its internal circulation within the parking lot. (LU)

   Response: Comment addressed.

2. Page 22, Section 4.1 of the TIS should include a description of the new right-in only that is being proposed within the existing private street that serves Harris Teeter. (LU)

   Response: Comment addressed.

3. The Town of Warrenton should consider a future study to try to mitigate the existing low LOS at the intersections. (LU)

   Response: This comment is not applicable to the TIS.

4. In Tables 3-1, 3-2, and 3-3 several of the "Future without Development" movement delays are lower than the existing delay. In most cases, the differences are minor, but in some cases, the difference is approximately 1 second. Additionally, the overall intersection delay was reduced for the future movements for 2 of the 4 intersections. It does not seem reasonable that the traffic volumes increased, but the delay went down without any improvements being made. (TE)

   Response: The analysis has been revised, and the delay decreases remain from existing to future conditions. The delay decreases are due to the adjustment of the peak hour factors in future conditions analysis, based on minimums provided by TOSAM guidance. The increase in some peak hour factors resulted in slight modifications to the future without development results.

5. In Tables 4-3, 4-4, and 4-5, several of the "Future with Development" movements are lower than the "Future without Development" movements. It does not seem reasonable that the traffic volumes increased, but the delay went down without any improvements being made. (TE)

   Response: The redistribution of volumes at the signalized intersections, resulting from the future development conditions, caused the actuated signals to reallocate the green time for a few phases. This resulted in some movements receiving more green allocation than in the future without development conditions, which improved the delay of some movements by a nominal amount.

6. Per TOSAM, the PHF for future Synchro model scenarios (i.e. No-Build and Build) in urban environments should be the higher of the existing conditions or 0.92; is there a reason this was not the case in the Future without Development (No-Build) and Future (Build) scenarios? (PL)

   Response: The analysis has been revised to reflect the appropriate PHF per TOSAM guidance.

7. The Existing PM and Sat Synchro model scenarios should use the estimated PHFs from the turning movement counts per TOSAM. (PL)

   Response: The analysis has been revised to reflect the appropriate PHF per TOSAM guidance.

8. Page 35, Table 5-1: “Sat” appears incorrectly labelled as “PM” for 2021

   Response: Comment addressed.