WELLS + ASSOCIATES

1420 Spring Hill Road
Suite 610
Tysons, Virginia 22102
703-917-6620
703-917-0739 FAX
www.mjwells.com

HICKORY RIDGE VILLAGE CENTER
TRAFFIC IMPACT AND PARKING DEMAND STUDY
HOWARD COUNTY, MARYLAND

Prepared for:
Kimco Realty Corporation

Prepared by:
Wells + Associates, Inc.

Michael J. Workosky, PTP, TOPS, TSOS
John F. Cavan, P.E., PTOE
John A. Schick

703.917.6620

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I HEREBY CERTIFY THAT THESE DOCUMENTS WERE PREPARED OR APPROVED BY ME, AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MARYLAND, LICENSE NO. 42720, EXPIRATION DATE 11/14/2018

HICKORY RIDGE VILLAGE CENTER
TRAFFIC IMPACT ANALYSIS
HOWARD COUNTY, MARYLAND

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HICKORY RIDGE VILLAGE CENTER

Section 1
INTRODUCTION

Purpose

This report presents the results of a transportation impact and parking demand study conducted and submitted on behalf of Kimco Realty Corporation (the Applicant), in conjunction with its proposed redevelopment of the Hickory Ridge Village Center in Howard County, Maryland. The subject parcel is located on the east side of Cedar Lane and south of Freetown Road as identified on Figure 1-1.

The purpose of this transportation study was to determine the impacts of the proposed redevelopment program on the surrounding road network. It also examines the parking requirements of the facility.

Project Description and Phasing

Hickory Ridge Village Center consists of approximately 97,321 S.F. Gross Leasable Area (GLA) of retail space that is nearly fully occupied. The site is planned to be redeveloped as a mixed-use project that would increase the retail portion by approximately 7,779 S.F. to 105,100 S.F. and construct 230 residential apartments. For purposes of this study, the site was assumed to be constructed in one (1) development phase, with a buildout year of 2020.

In order to accommodate the parking demands of the project, a combination of surface and structured parking would be provided on-site. A total of 789 parking spaces would be provided, with 421 surface spaces for the retail uses and 368 spaces in a structured parking garage to serve the residential units.

Study Objectives

The objectives of this study were to: (1) analyze existing transportation conditions, (2) analyze future transportation conditions without and with the proposed development in year 2020, (3) identify site-transportation impacts and appropriate improvements required to mitigate those impacts, and (4) identify the appropriate parking supply to serve the site.

Study Methodology

This traffic study follows the methodology for traffic impact studies in Downtown Columbia outlined in Chapter 4 of the Howard County Design Manual: Adequate Transportation Facilities Test Evaluation Requirements (County Council Bill No. 47-2010).

Utilizing a four-step process, intersections are evaluated in terms of levels of service and then appropriate mitigation measures are identified to remediate any associated unacceptable traffic impacts. The four-step planning process consists of trip generation, trip distribution, a determination of mode split, and traffic assignment.

Tasks undertaken in this study included the following:

1. A review of the concept plans and other background materials.

2. A field reconnaissance of existing roadway and intersection geometrics, traffic controls, traffic signal phasings/timings, and speed limits.

3. Vehicle and pedestrian movement counts at the 11 study intersections during the weekday AM and PM peak periods, and at the five (5) study intersections on Saturday.

4. Analysis of existing levels of service at the study intersections.

5. Estimation of the number of AM, PM, and Saturday peak hour trips that would be generated by the background developments in the study area, as well as the proposed development at full buildout.

6. Development of traffic forecasts for 2020 without and with the proposed development.

7. Analysis of future levels of service at the study intersections, without and with the proposed project.

Impact Area

The impact area was selected based on the APFO criteria and in coordination with Howard County. The following intersections were included in the study:

1. Cedar Lane/Owen Brown Road.*
2. Cedar Lane/Freetown Road.*
3. Cedar Lane/Site Driveway.**
4. Cedar Lane/Harriet Tubman Lane.*
5. Cedar Lane/Grace Drive/Simpson Mill Road.*

6. Freetown Road/West Side Driveway.**
7. Freetown Road/Middle Site Driveway.**
8. Freetown Road/East Site Driveway.**
9. Freetown Road/Quarterstaff Road.*
10. Quarterstaff Road/Site Driveway.**
11. Freetown Road/Martin Road/Harriet Tubman Lane.*

**Intersection required for APFO purposes.*
***Also evaluated for Saturday conditions.*

The project site is located just north of the Atholton High School. The AM peak hour of adjacent street traffic generally coincides with the school peak hour. Thus, the impact of students and buses are included in the traffic counts and analyses. The school releases in the mid-afternoon and were observed to not impact the PM peak hour or the Saturday midday peak hour.

Figure 1-1
Site Location
Hickory Ridge Village Center
Howard County, Maryland

NORTH

SECTION 2

SITE DEVELOPMENT CONCEPT

Overview

The intent of the redevelopment plan is to create a mixed-use environment that allows for synergy amongst uses and integrates the surrounding neighborhood. Vehicular traffic is served by both Cedar Lane and Freetown Road. A traffic signal exists at the Cedar Lane/Freetown Road intersection with separate left and right turn lanes provided and a painted crosswalk on the south leg of the intersection.

A right-in only site driveway is located on Cedar Lane south of the Freetown Road intersection. The remaining intersections serving the site are located along Freetown Road and Quarterstaff Road and operate under stop sign control.

As part of the site redevelopment, the Applicant proposes to modify the existing right-in only driveway to provide right-in/right-out access. This driveway is primarily designed to serve the future residential building on the eastern portion of the site. The other existing site driveways would remain unchanged.

The site development plan is shown on Figure 2-1.

Public Transportation Facilities

Hickory Ridge Village Center is served by the village-to-Downtown Columbia bus service Orange Route operated by Howard Transit. This route connects to the central transit hub located within The Mall in Columbia approximately two (2) miles northeast of the site. Bus route information is contained in Appendix A.

Bus stops are located on southbound Cedar Lane (sign) north of Freetown Road, on eastbound Freetown Road (sign) east of Cedar Lane, and westbound Freetown Road (shelter) east of Cedar Lane.

Two (2) stops are located within the site. The stop on the southeast side provides a sign while the west side stop provides a sign and bench. These existing stops would remain under the redevelopment plan.

Pedestrian and Bicycle Circulation Routes

Sidewalks/paths are provided along both sides of Cedar Lane with connections to the adjacent neighborhoods. A sidewalk is provided on the south side of Freetown Road

between Cedar Lane and the Middle Site Driveway. East of this driveway, a sidewalk is provided on both the north and south sides.

A marked pedestrian crossing with a median refuge island is located on Freetown Road at the Middle Site Driveway that connects to the Hickory Crest residential neighborhood to the north of the site.

The Howard County Bicycle Master Plan provides a framework to guide Howard County staff and private developers in an effort to improve conditions for bicyclists and promote bicycling as an alternative mode of transportation. While there are currently no bicycle facilities in the vicinity of the site, the Master Plan recommends future facilities along both Cedar Lane and Freetown Road adjacent to the site.

Modal Split

Although the mix of uses and proximity to transit are intended to reduce peak hour trips, no adjustment for non-auto mode share was applied to the Hickory Ridge Village Center site development densities in order to provide a conservative estimate.

Intersection Standard

The Critical Lane Volume (CLV) and Highway Capacity Manual (HCM) techniques were used to evaluate levels of service at the study intersections during the AM, PM, and Saturday peak hours.

The CLV standard for signalized intersections outside of Downtown Columbia is 1,450 (LOS "D"), and applies to all of the study intersections.

The CLV and HCM method (using PTV Vistro) was used at the unsignalized intersections in accordance with Howard County standards. Levels of service descriptions for unsignalized conditions are included in Appendix B.

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Figure 2-1
Site Development Plan

Hickory Ridge Village Center
Howard County, Maryland

PLAN PROVIDED BY: HORD | COPLAN | MACHT

NORTH

SECTION 3
ROADWAY NETWORK, IMPROVEMENTS, PIPELINE DEVELOPMENT, AND GROWTH

Overview

The following sections describe the existing and future roadway network, pipeline development, and background traffic growth assumptions.

Roadway Network Phasing and Implementation

The roadway network adjacent to the Hickory Ridge Village Center would generally remain in its current condition subsequent to the completion of the project. The existing driveways on Freetown Road would remain in their current condition. The existing right-in only driveway on Cedar Lane is proposed to be modified to allow right-in/right-out movements with the redevelopment of the site.

Existing Roadway Network

The following describes the roadways adjacent to the site:

Cedar Lane is a four- lane undivided roadway with a center left turn lane. It provides separate left and right turn lanes at major intersections and a posted speed limit of 35 mph. It is classified by the Howard County General Plan as a minor arterial roadway. This roadway provides primary access between the site and MD Route 32 to the south.

Freetown Road is a two-lane local roadway and is classified by the Howard County General Plan as a major collector with a posted speed limit of 25 mph. All of the intersections along this route operate under stop sign control.

Planned and Programmed Improvements

The Maryland Consolidated Transportation Program (CTP) includes a project, jointly funded by the MSHA and Howard County, to widen northbound Route 29 by one lane from MD 32 north to MD 175. No other road improvements are known to be programmed in the study area.

The existing lane use and traffic controls for the study intersections are depicted on Figure 3-1.

Pipeline Developments

Pipeline projects for inclusion in this traffic study include: (1) an unrecorded previously approved development and (2) a recorded previously approved development. Based on information provided by Howard County, the Simpson Oaks property that consists of 206 single-family residential units was included in this study. The development is located south and west of Hickory Ridge Village Center along Grace Drive west of Cedar Lane and north of Route 32. It was assumed to be fully developed by 2020.

Background Traffic Growth

A background growth rate was calculated for the area based on historical traffic count information along Cedar Lane. This data indicates that a growth rate of approximately 1.0 percent has been experienced. Thus, this rate was applied to existing traffic counts on all non-fixed turning movements at all study intersections over a four-year period from 2016 to 2020 for project buildout. The growth rate information is contained in Appendix C.

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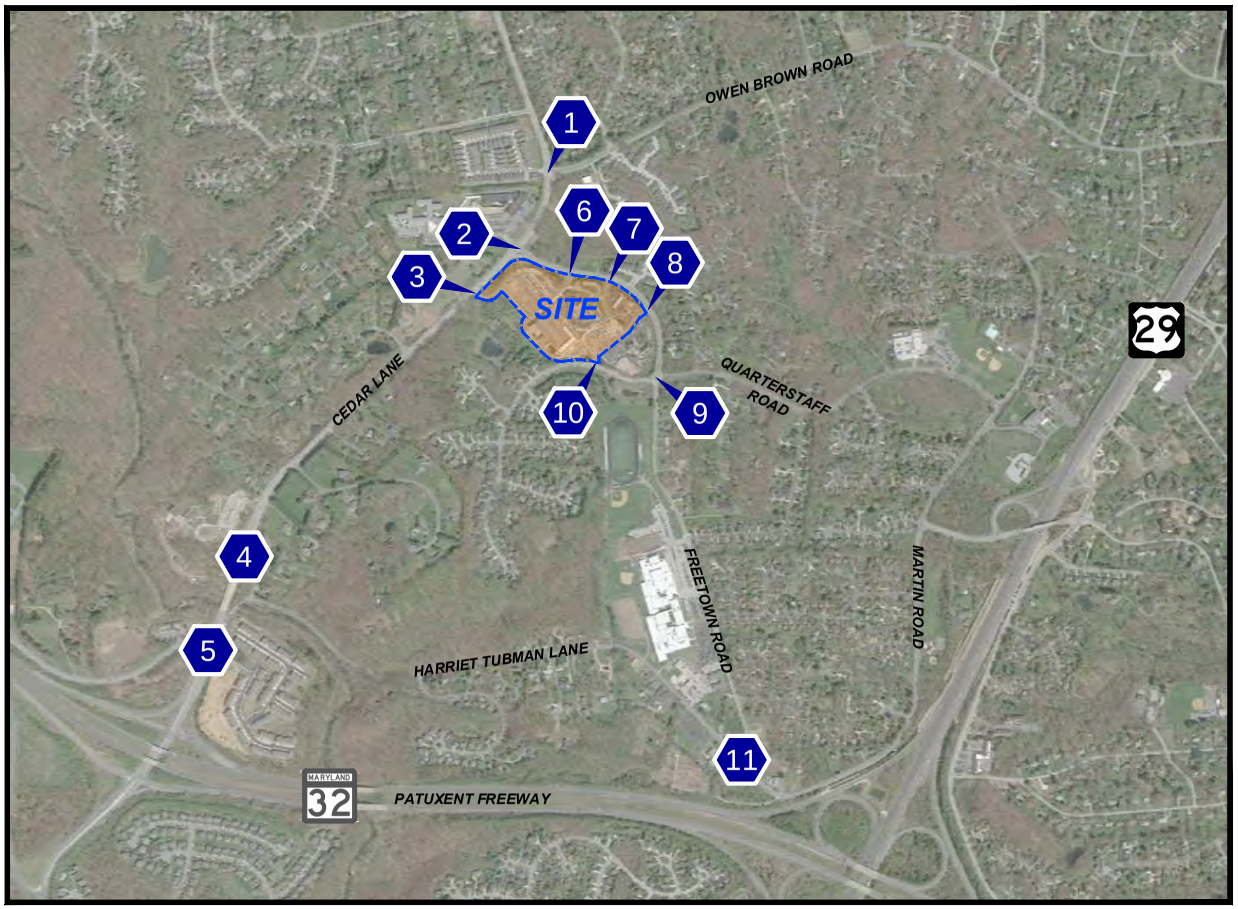
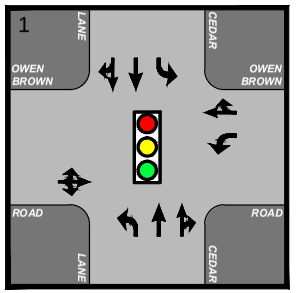
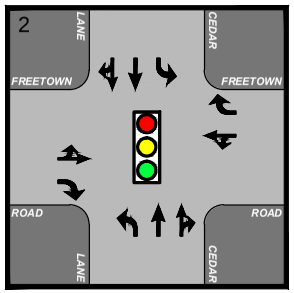
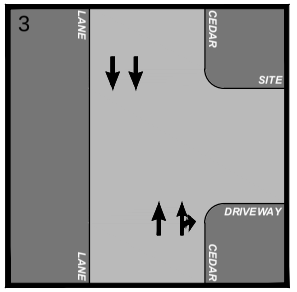
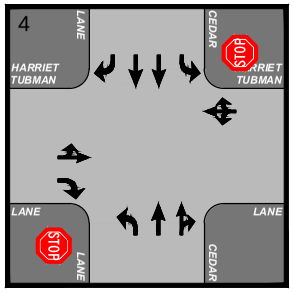
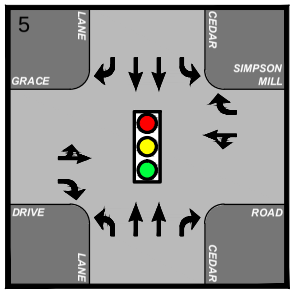


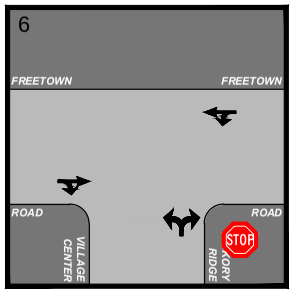


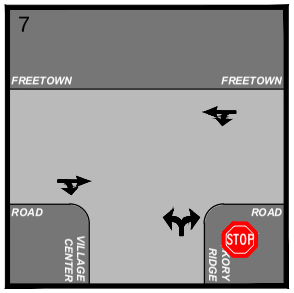


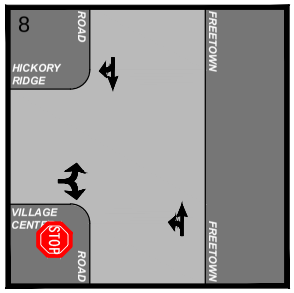


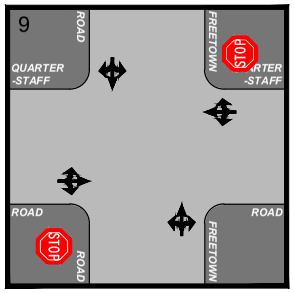


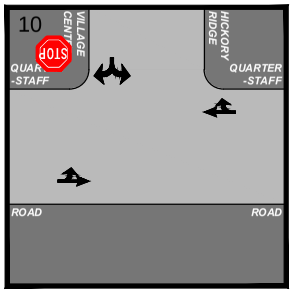












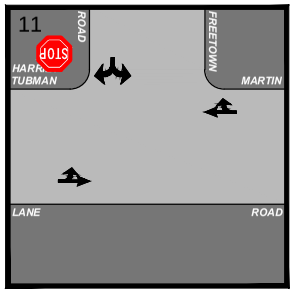


Figure 3-1
Existing Lane Use and Traffic Controls

Hickory Ridge Village Center
Howard County, Maryland

Represents One Travel Lane
Signalized Intersection
Stop Sign

NORTH

SECTION 4
EXISTING (BASELINE) CONDITIONS ANALYSIS

Overview

This section presents an assessment of existing baseline traffic conditions within the study area.

Existing Vehicular and Pedestrian Traffic Counts

Weekday AM, PM, and Saturday midday peak hour vehicular and pedestrian traffic counts at each of the study intersections were collected by Wells + Associates on Thursday, October 6 and Saturday, October 8, (site driveways only) 2016 at the 11 study intersections outlined below:

1. Cedar Lane/Owen Brown Road.*
2. Cedar Lane/Freetown Road.*
3. Cedar Lane/Site Driveway.**
4. Cedar Lane/Harriet Tubman Lane.*
5. Cedar Lane/Grace Drive/Simpson Mill Road.*
6. Freetown Road/West Side Driveway.**
7. Freetown Road/Middle Site Driveway.**
8. Freetown Road/East Site Driveway.**
9. Freetown Road/Quarterstaff Road.*
10. Quarterstaff Road/Site Driveway.**
11. Freetown Road/Martin Road/Harriet Tubman Lane.*

**Intersection required for APFO purposes.*
***Also evaluated for Saturday conditions.*

Copies of the count data are contained in Appendix D.

The peak hour traffic counts indicate that the AM peak hour generally occurs between 7:00 AM and 8:00 AM and the PM peak hour occurs between 5:00 PM and 6:00 PM. The peak hour on Saturday generally occurs between 1:30 PM and 2:30 PM. Traffic volumes were balanced at adjacent intersections.

A summary of the vehicular and pedestrian traffic counts are shown on Figures 4-1 through 4-6.

Capacity Analysis

Capacity/level of service (LOS) analyses were conducted at the study intersections based on the existing lane use and traffic controls shown, baseline traffic counts, and the Howard County methodology for both signalized and unsignalized intersections.

The results are summarized in Table 4-1, and indicate the following:

1. All of the signalized intersections on Cedar Lane at Owen Brown Road, Freetown Road, and Grace Drive/Simpson Road currently operate within acceptable standards (less than a CLV of 1,450) during the AM and PM peak periods. The maximum CLV is realized at the Cedar Lane/Freetown Road intersection during the PM peak hour with a CLV of 1,148.

2. All of the individual turning movements at the unsignalized intersections currently operate at acceptable levels of service (LOS "D" or better) during each of the peak hours studied, with the exception of the side-street movements at the Cedar Lane/Harriet Tubman Lane intersection. The eastbound and westbound side-street approaches operate beyond capacity (at LOS "F") during the AM peak hour (eastbound approach) and the PM peak hour (westbound approach). All other movements operate within acceptable standards.

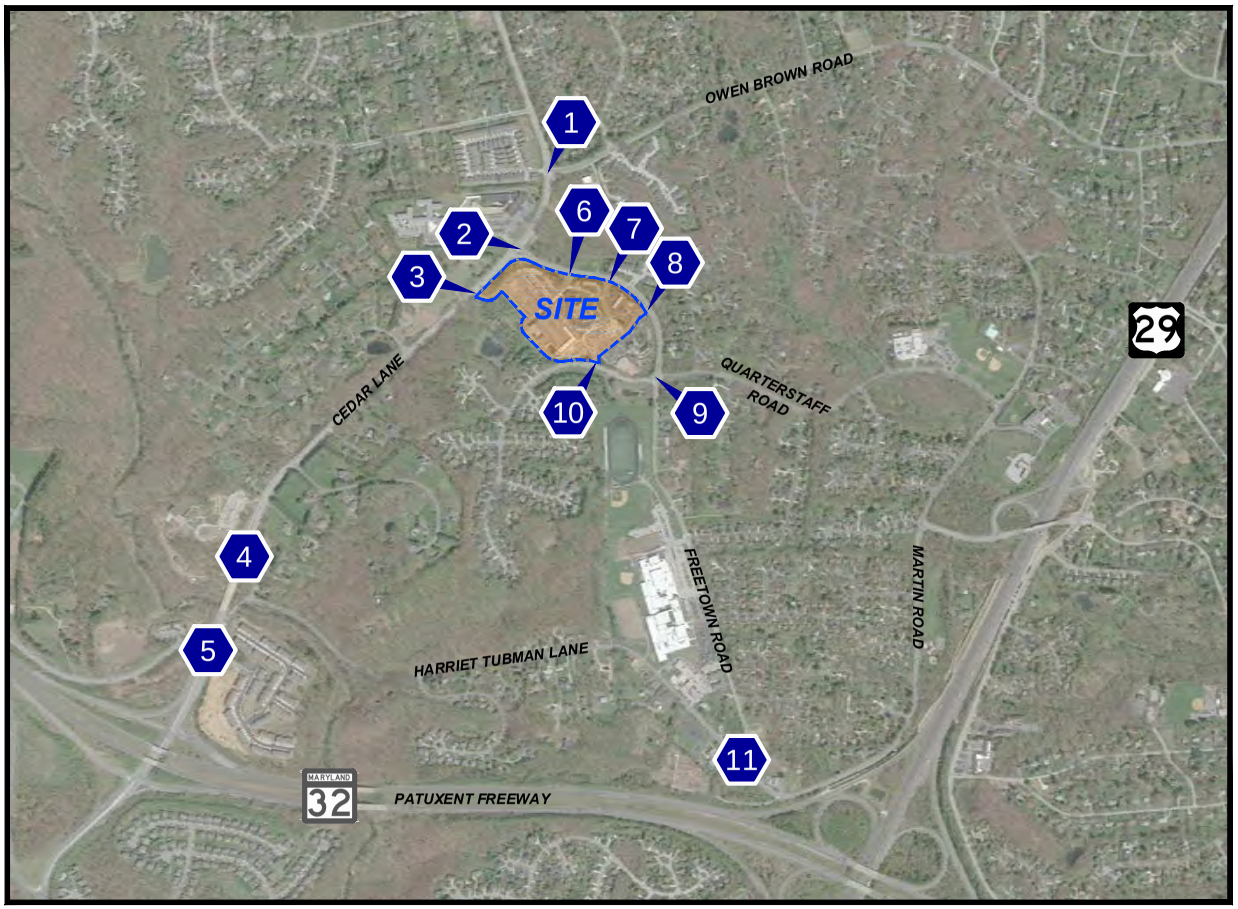
Capacity analysis worksheets for existing conditions are contained in Appendix E.

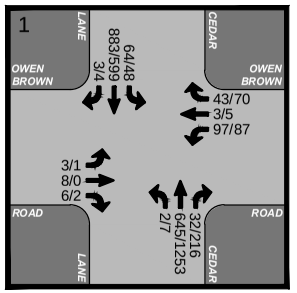
Crash Data Analysis

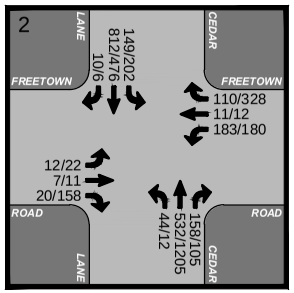
Howard County staff requested that crash data be provided for the Cedar Lane/Freetown Road intersection. Crash data at this location was provided by the Howard County Police Department for a four (4) year period (2012-2015). The crash data is summarized in Table 4-2 and indicates the following:

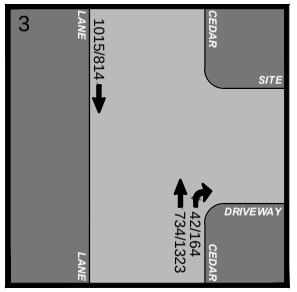
- 72 crashes have occurred at this location in the past four (4) years.
- The most common type of crash, were rear end collisions with 22 of the total 72 crashes (31 percent).
- The total number of crashes remained consistent for most years (15 to 16 per year) with the exception of 2013 when 25 crashes occurred. This increase was related to an increase in head-on and rear-end collisions.

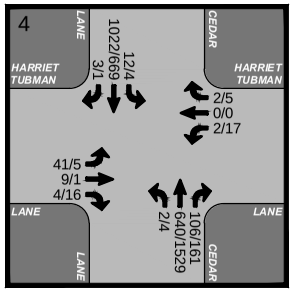
Detailed crash data is provided in Appendix F.

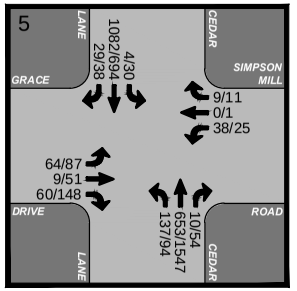


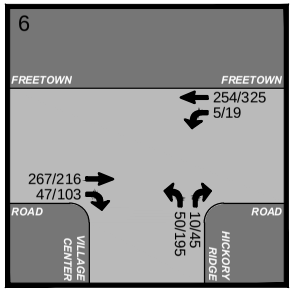


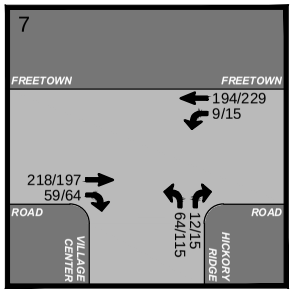


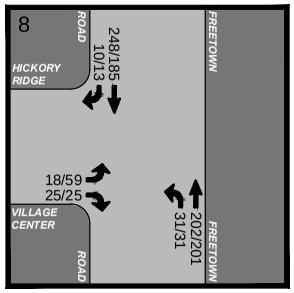


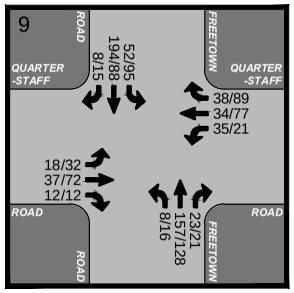


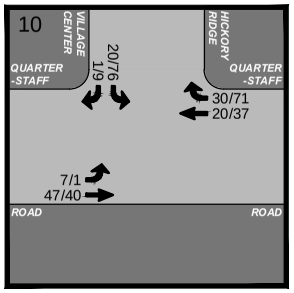












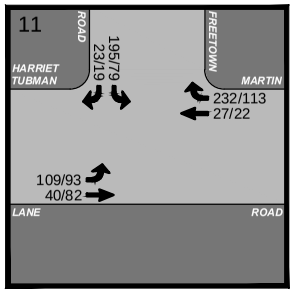


Figure 4-1
Existing Peak Hour Traffic Volumes (Weekday)

Hickory Ridge Village Center

Howard County, Maryland

AM PEAK HOUR
PM PEAK HOUR
000 / 000

NORTH

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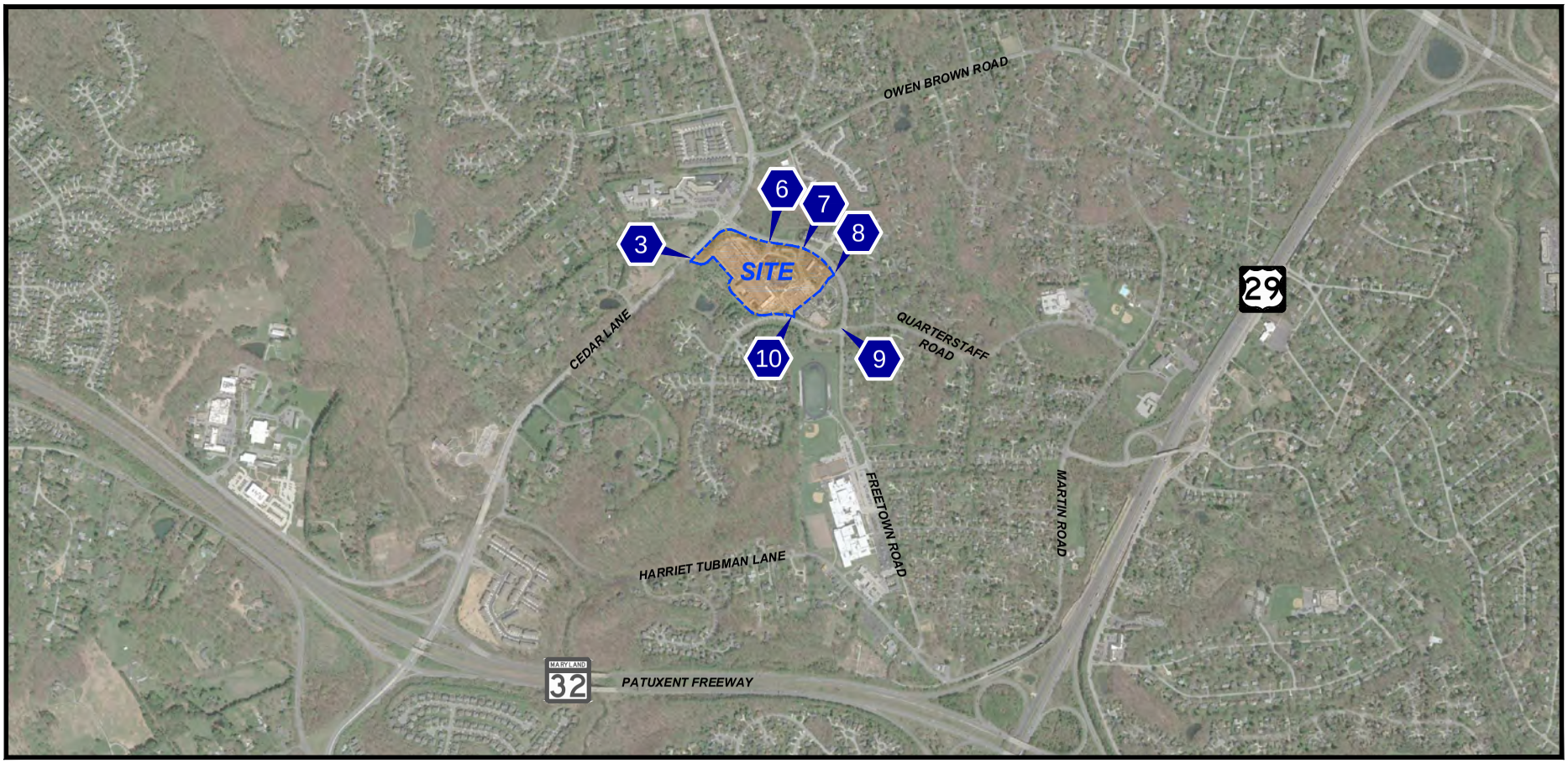

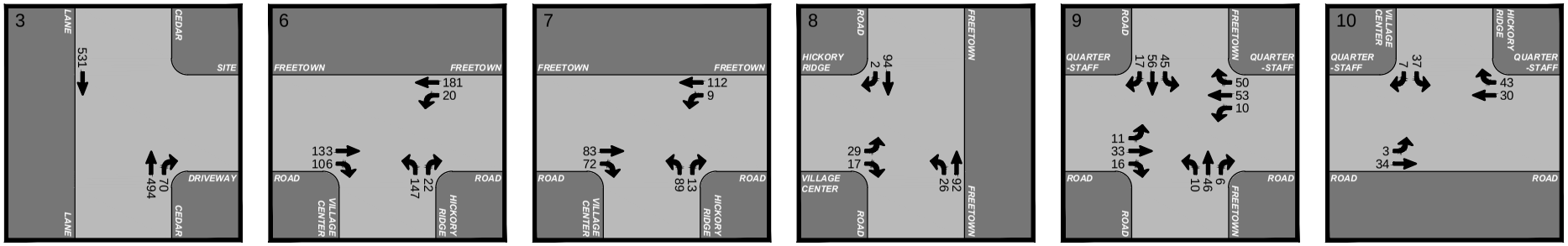

Figure 4-2
Existing Peak Hour Traffic Volumes (Saturday)

Hickory Ridge Village Center
Howard County, Maryland

NORTH

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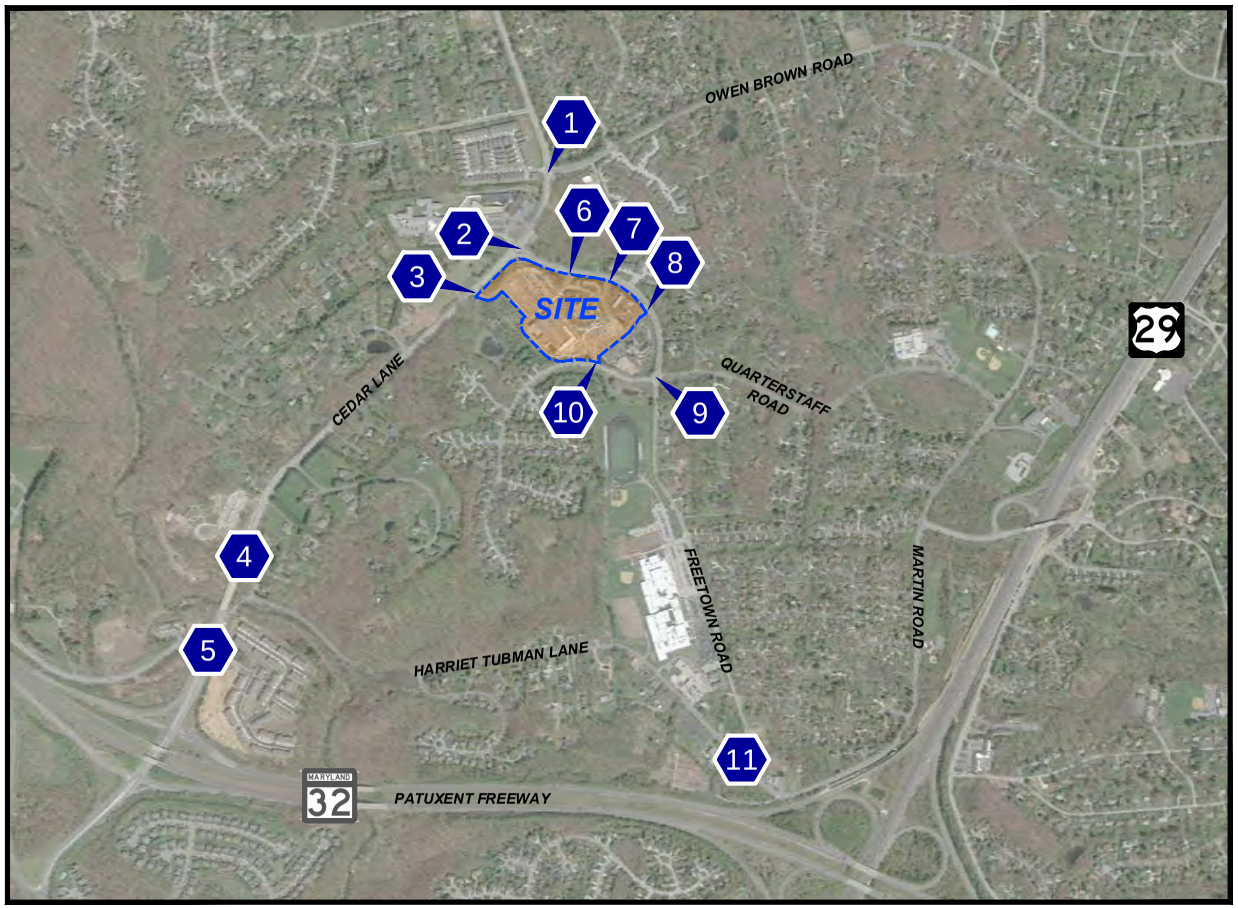

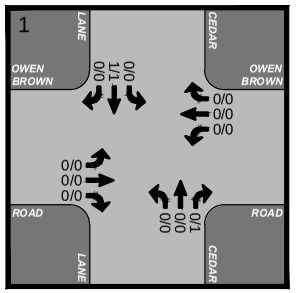

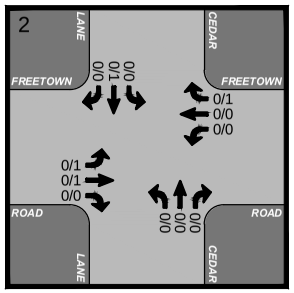

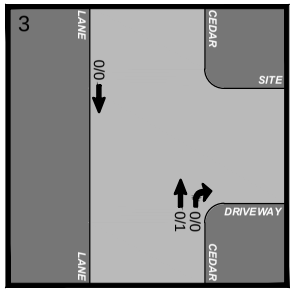

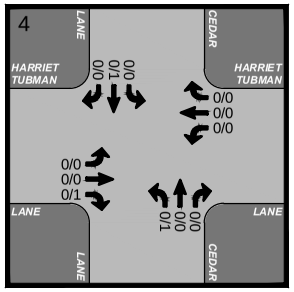

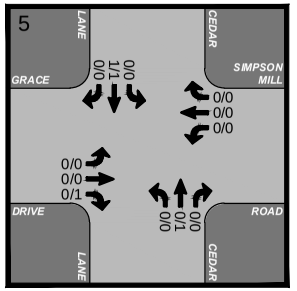

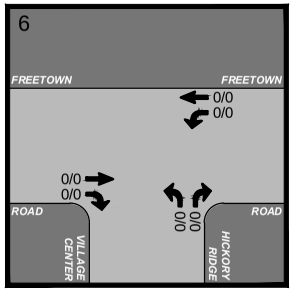

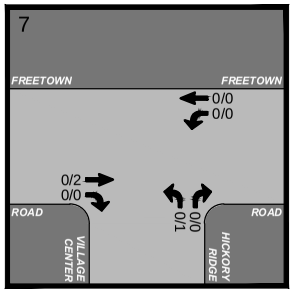

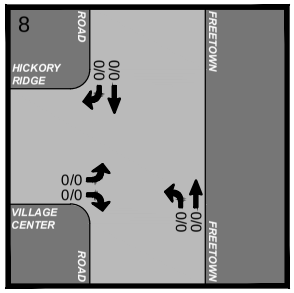

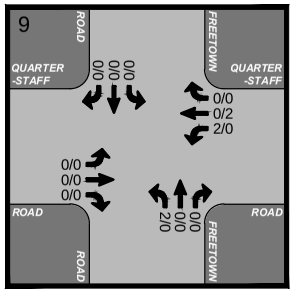

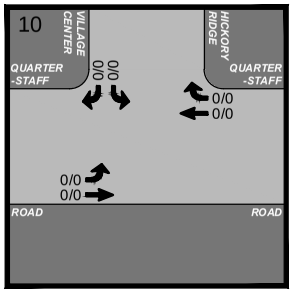

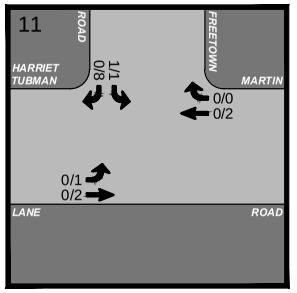

Figure 4-3
Existing Peak Hour Bicycle Counts (Weekday)

Hickory Ridge Village Center
Howard County, Maryland

AM PEAK HOUR
PM PEAK HOUR
000 / 000

NORTH

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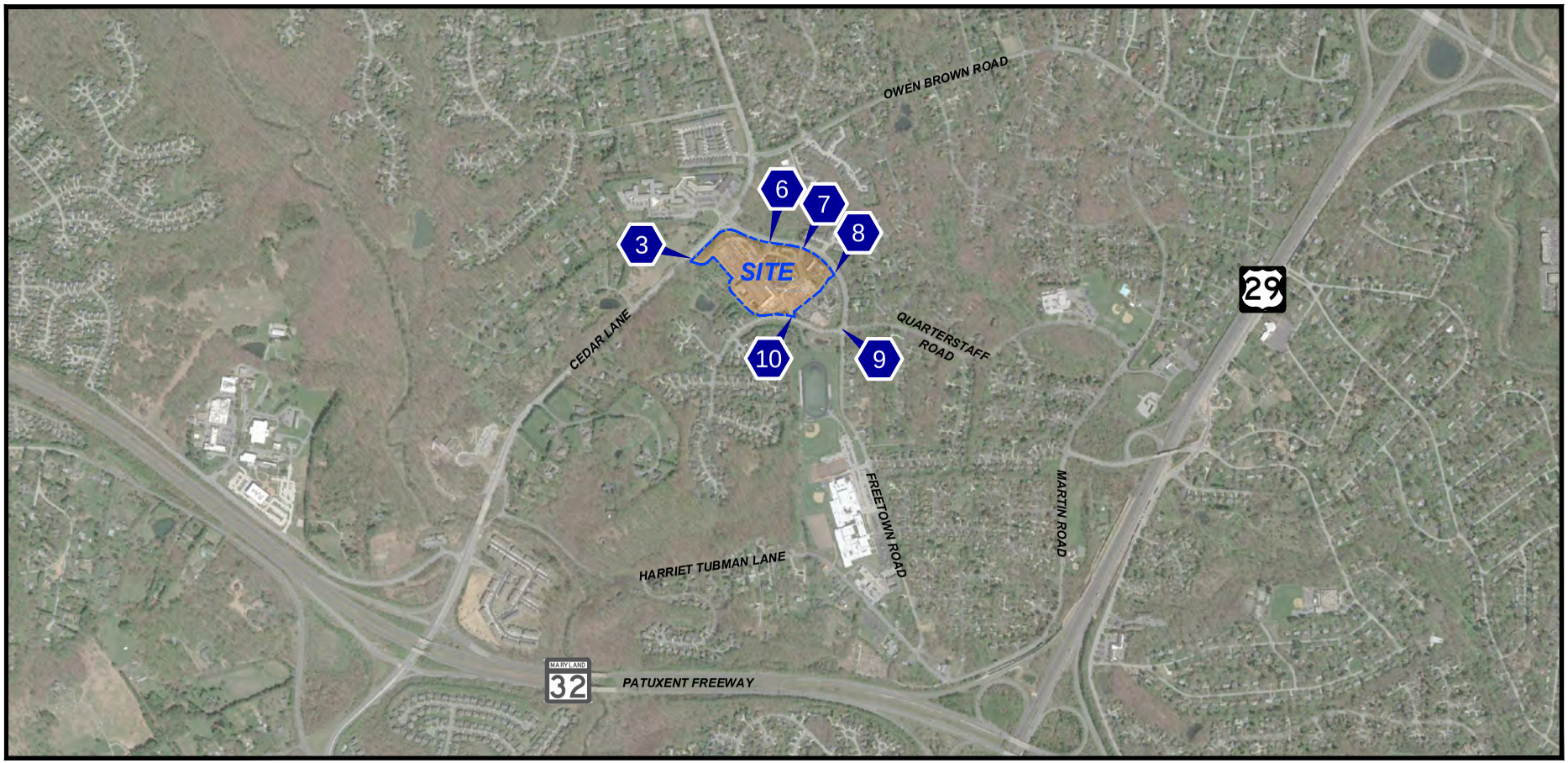


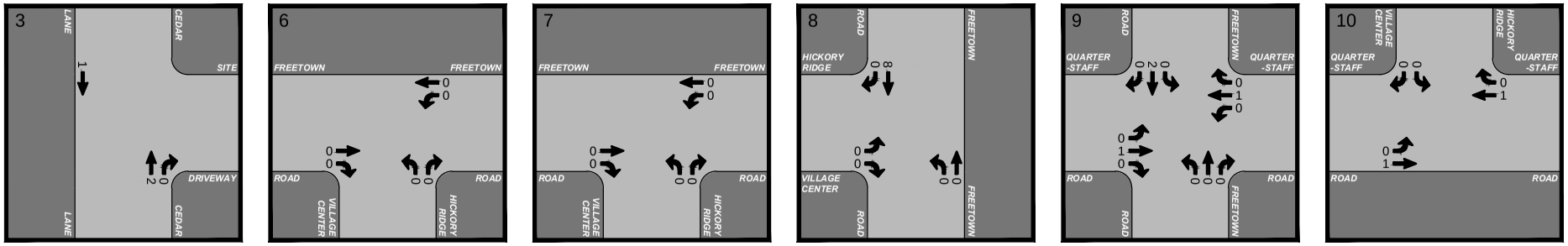
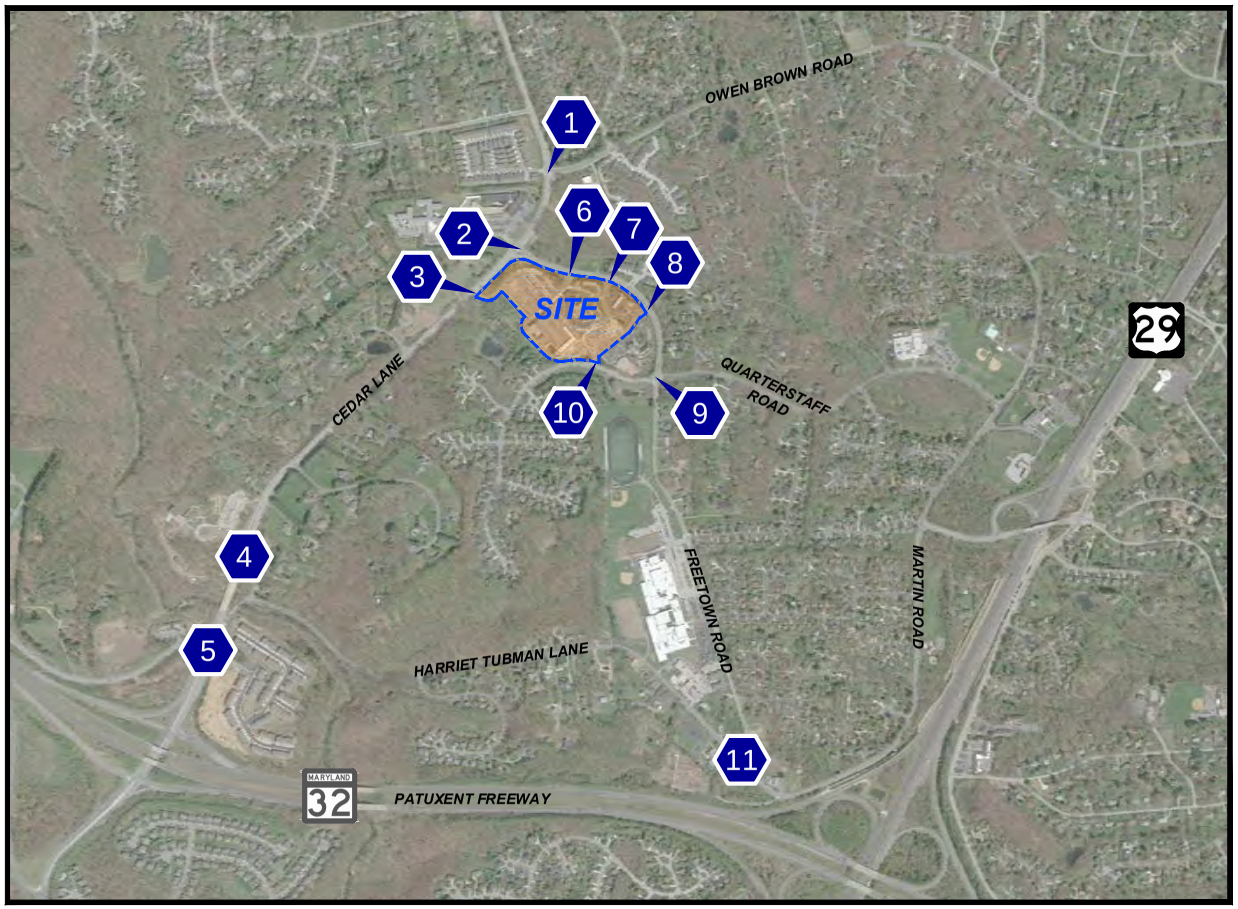
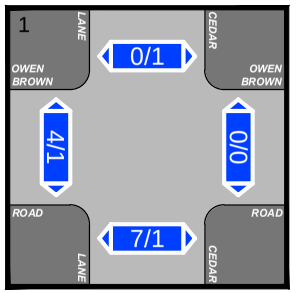


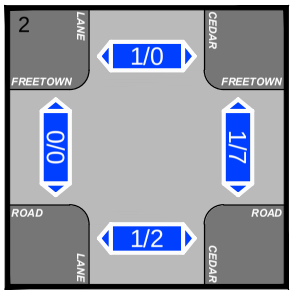
Figure 4-4
Existing Peak Hour Bicycle Counts (Saturday)

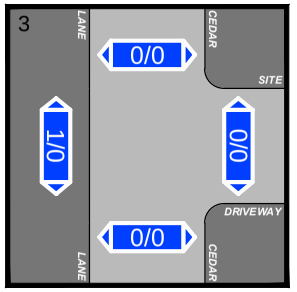
Hickory Ridge Village Center
Howard County, Maryland

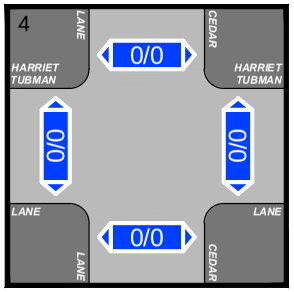
NORTH

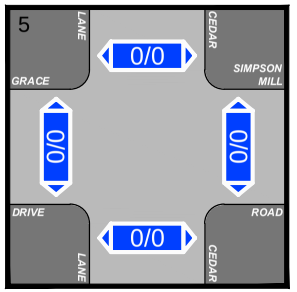


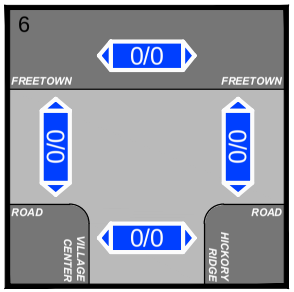


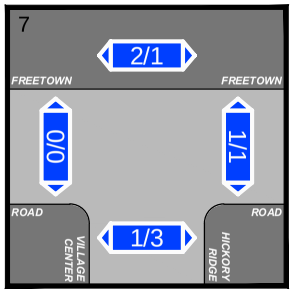


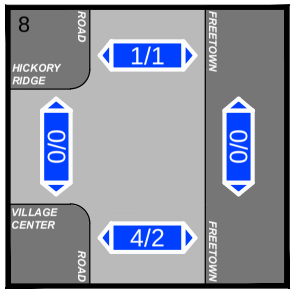


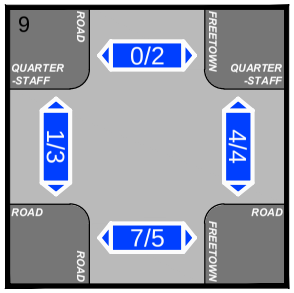


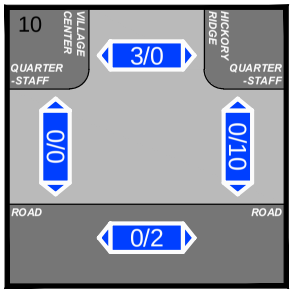












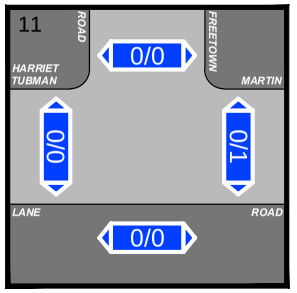


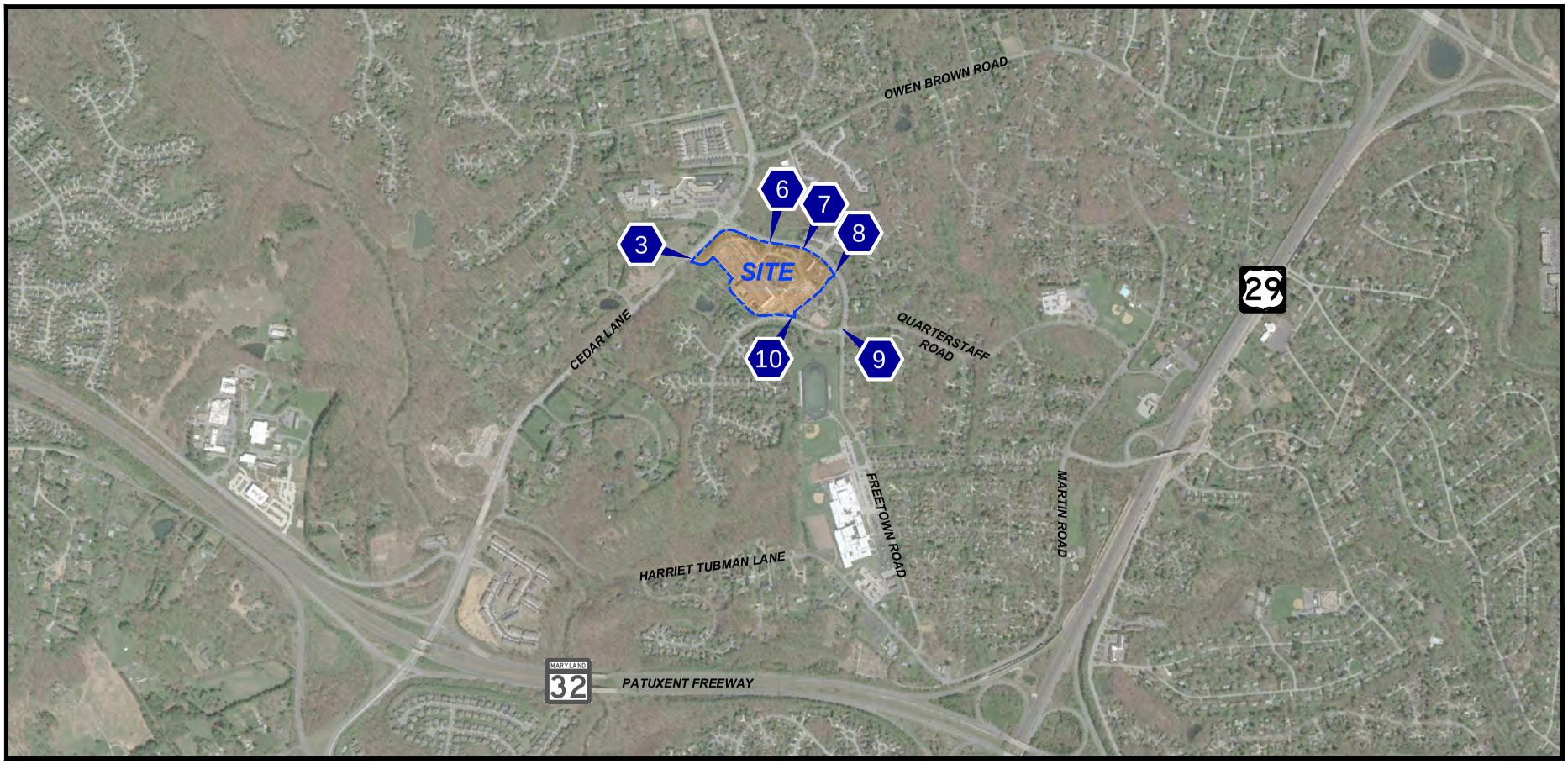
Figure 4-5
Existing Peak Hour Pedestrian Counts (Weekday)

Hickory Ridge Village Center

Howard County, Maryland

AM PEAK HOUR
PM PEAK HOUR
000 / 000

NORTH



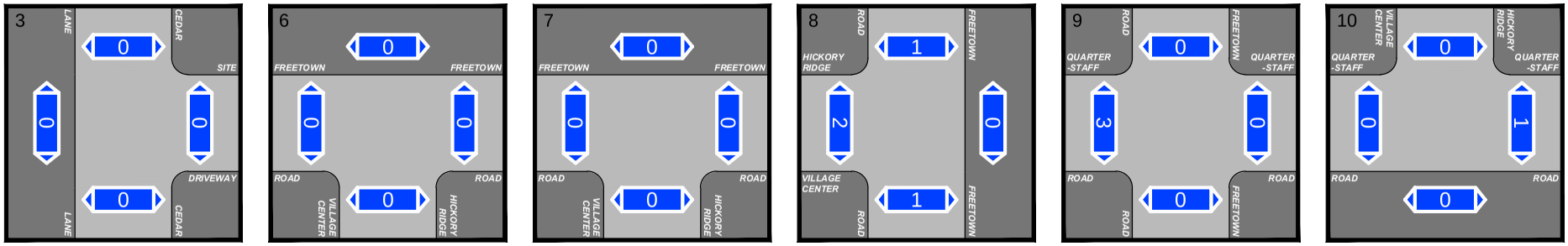


Figure 4-6
Existing Peak Hour Pedestrian Counts (Saturday)

Hickory Ridge Village Center
Howard County, Maryland

NORTH

Table 4-1
Hickory Ridge Village Center
Existing Intersection Level of Service Summary [1]

	Control	Lane Group Approach	Existing Conditions (2016) AM Peak Hour LOS	AM Peak Hour CLV/Delay	PM Peak Hour LOS	PM Peak Hour CLV/Delay	SAT Peak Hour LOS	SAT Peak Hour CLV/Delay
1. Cedar Lane/Owen Brown Road	Signalized	CLV	A	603	A	946	-	-
2. Cedar Lane/Freetown Road	Signalized	CLV	A	742	B	1148	-	-
3. Cedar Lane/Site Driveway	Unsignalized	NBTR SBT WBR	A A -	0.0 0.0 -	A A -	0.0 0.0 -	A A	0.0 0.0
4. Cedar Lane/Harriet Tubman Lane	Unsignalized	NBL NBTR SBL SBT SBR WBLTR EBLTR	B A A A A C F	10.4 0.0 9.3 0.0 0.0 23.5 75.4	A A B A A F D	8.9 0.0 14.7 0.0 0.0 158.4 25.2	- - - - - - -	- - - - - - -
5. Cedar Lane/Grace Drive /Simpson Mill Road	Signalized	CLV	A	843	B	1044	-	-
6. Freetown Road/West Site Driveway	Unsignalized	NBLR EBTR WBLT	B A A	12.8 0.0 0.2	C A A	20.2 0.0 0.4	B A A	11.9 0.0 0.9
7. Freetown Road/Middle Site Driveway	Unsignalized	NBLR EBTR WBLT	B A A	12.1 0.0 0.4	B A A	13.5 0.0 0.5	B A A	10.3 0.0 1.6
8. Freetown Road/East Site Driveway	Unsignalized	WBLR NBLT SBTR	B A A	11.1 1.0 0.0	B A A	11.8 1.0 0.0	A A A	9.2 1.8 0.0
9. Freetown Road/Quarterstaff Road	Unsignalized	NBLTR SBLTR EBLTR WBLTR	A A B B	0.3 1.6 13.8 13.5	A A C B	0.7 3.7 16.3 14.1	- - - -	- - - -
10 Quarterstaff Road/Site Driveway	Unsignalized	SBLR SBLT NBTR	A A A	9.1 1.0 0.0	A A A	9.5 0.2 0.0	A A A	9.0 1.6 0.0
11. Freetown Road/Martin Road /Harriet Tubman Lane	Unsignalized	WBLR NBTR SBLT	C A A	15.0 0.0 5.9	B A A	11.5 0.0 4.1	- - -	- - -

Notes : 1. Capacity analysis based on Howard County Design Manual and the Highway Capacity Manual methodology, using PTV Vistro

Table 4-2
Hickory Ridge Village Center
Cedar Lane/Freetown Road Crash Data Summary (1)

Crash Type	2012 Crashes	2013 Crashes	2014 Crashes	2015 Crashes	Total Crashes (2012-2015)	Percent of Total
Head On	3	7	3	3	16	22%
Rear End	3	8	6	5	22	31%
Single Vehicle	2	1	1	0	4	6%
Same Direction Left Turn	1	0	1	0	2	3%
Same Direction Right Turn	2	1	0	1	4	6%
Straight Movement Angle	1	3	0	3	7	10%
Angle Meets Right Turn	1	1	0	1	3	4%
Angle Meets Left Turn	0	1	1	1	3	4%
Side Swipe	0	0	1	1	2	3%
Collision with Deer	0	1	0	0	1	1%
Opposite Direction	0	1	0	0	1	1%
Other (Unknown)	3	1	2	1	7	10%
Total	**16**	**25**	**15**	**16**	**72**	**100%**

Notes:
1. Traffic accident data provided by the Howard County Police Department.

SECTION 5
ANALYSIS OF FUTURE CONDITIONS WITHOUT PROPOSED DEVELOPMENT

Overview

For the purposes of this analysis, it was assumed that the proposed development would be constructed by 2020. In order to develop background traffic forecasts without the proposed development, a composite of existing traffic, increases in traffic associated with regional growth, and increases in traffic associated with other approved but not yet constructed (pipeline) developments was used.

Regional Growth

As discussed previously, a 1.0 percent annually compounded growth rate was applied to the existing traffic volumes in the study area. This rate was applied to all non-fixed turning movements at all intersections for each of the horizon year of 2020. The resultant regional growth volumes for these conditions are shown on Figures 5-1 and 5-2.

Pipeline Projects

Pipeline projects for inclusion in this traffic study include: (1) an unrecorded previously approved development and (2) a recorded previously approved development. As identified by Howard County, the Simpson Oaks development (206 SFD units) was included in this study. Refer to Figure 5-3 for the pipeline development location.

Based on Institute of Transportation Engineers (ITE) Trip Generation manual, 9th Edition rates, this project is expected to generate a total of 154 new AM peak hour trips, 201 new PM peak hour trips, and 192 Saturday peak hour trips as summarized on Table 5-1.

Pipeline trips were assigned to the road network based on previously approved traffic studies. The isolated traffic assignments for this project are shown on Figures 5-4 and 5-5.

Background Traffic Forecasts

The existing volumes were combined with the regional growth volumes and the pipeline site trips which result in the background traffic forecasts without the development. These are summarized on Figures 5-6 and 5-7.

Capacity Analysis

Capacity analyses were prepared for the study intersections using the existing lane use and traffic controls and the 2020 background traffic forecasts without the proposed development.

The results of analyses are shown on Table 5-2 and are consistent with those reported under existing conditions, with slight increases in CLV and intersection delay. All of the signalized intersections on Cedar Lane would continue to operate within acceptable standards during the weekday AM and PM peak hours, with CLV's less than 1,450.

The turning movements at the remaining unsignalized intersections would continue to operate within acceptable levels during all of the periods studied, with the exception of the side-street movements at the Cedar Lane/Harriet Tubman Lane intersection that would continue to operate beyond capacity during the AM and/or PM peak hours, similar to existing conditions.

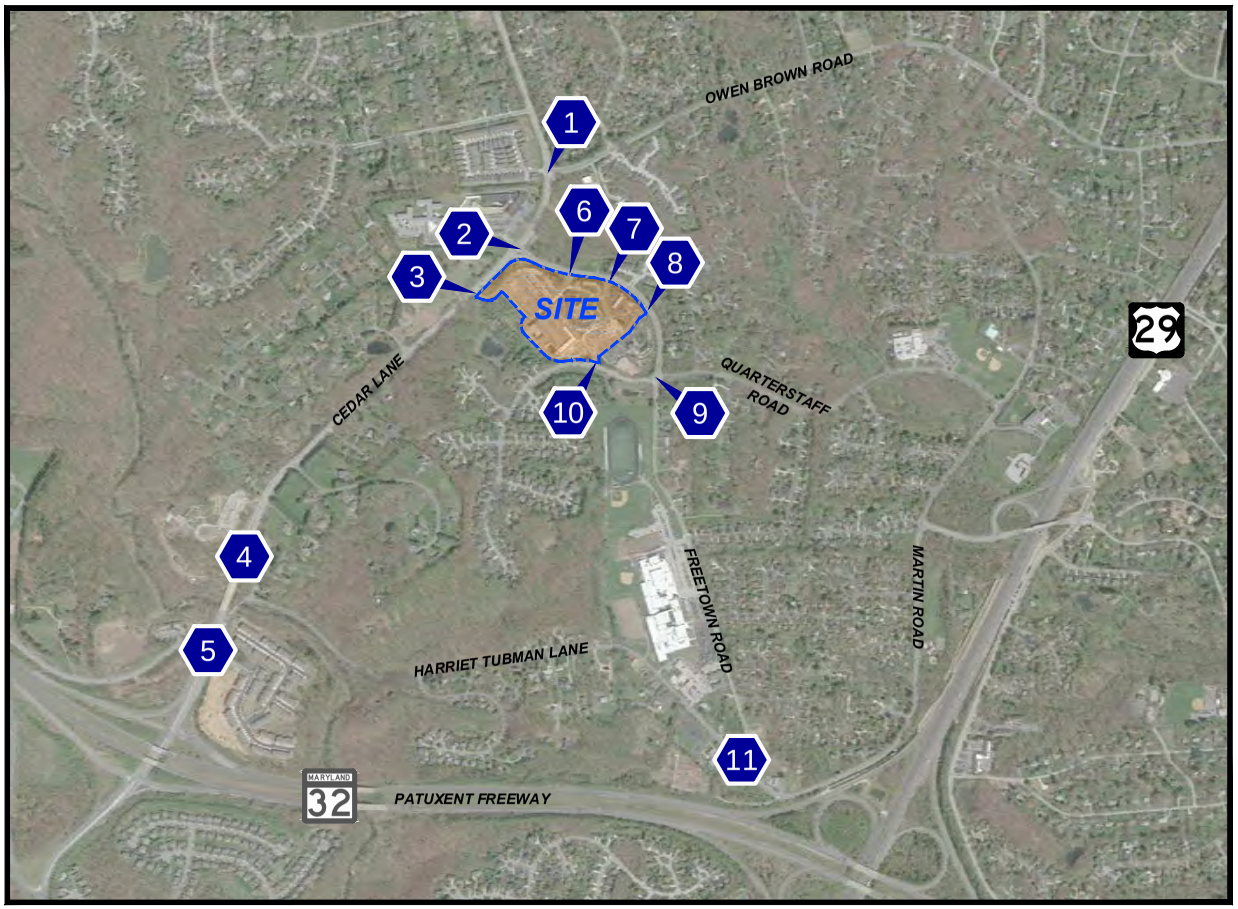
The capacity analysis worksheets are contained in Appendix G.

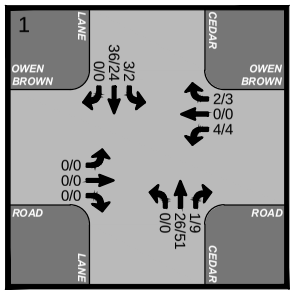
Table 5-1
Hickory Ridge Village Center
Pipeline Trip Generation Analysis (1)

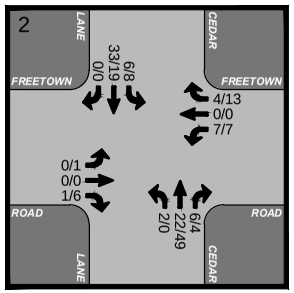
Development	ITE Land Use Code	Amount	Units	AM Peak Hour			PM Peak Hour			SAT Peak Hour		
				In	Out	Total	In	Out	Total	In	Out	Total
Simpson Oaks (2)												
Single Family Homes	210	206	DU	39	115	154	127	74	201	104	88	192
Total Pipeline Trips				**39**	**115**	**154**	**127**	**74**	**201**	**104**	**88**	**192**

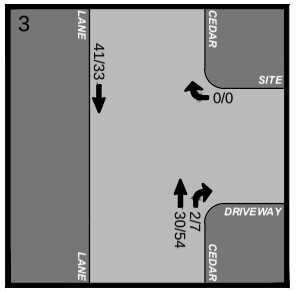
Notes:

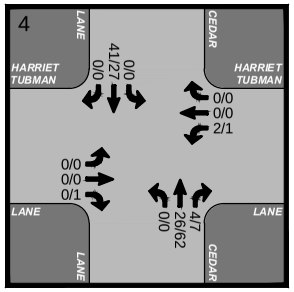
1. Trip generation based on Institute of Transportation Engineers Trip Generation Manual, 9th Edition.
2. Information provided by Howard County.

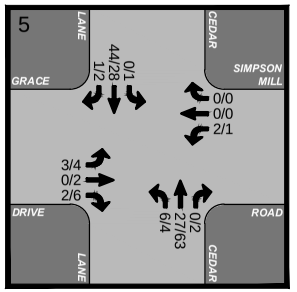


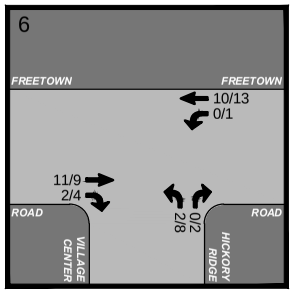


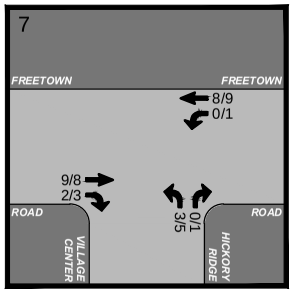


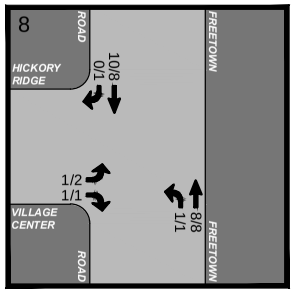


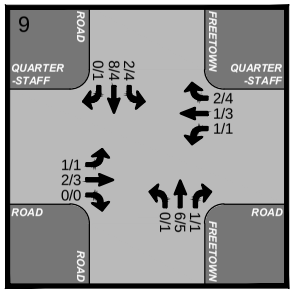


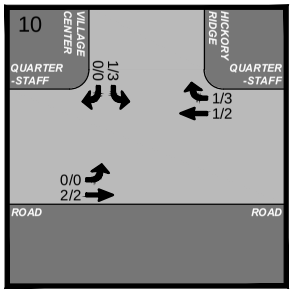












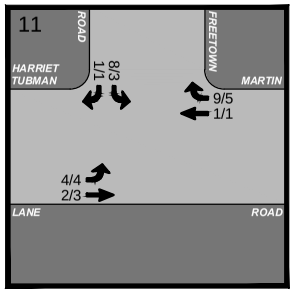


Figure 5-1
Regional Traffic Growth (Weekday)

Hickory Ridge Village Center

Howard County, Maryland

AM PEAK HOUR
PM PEAK HOUR
000 / 000

NORTH

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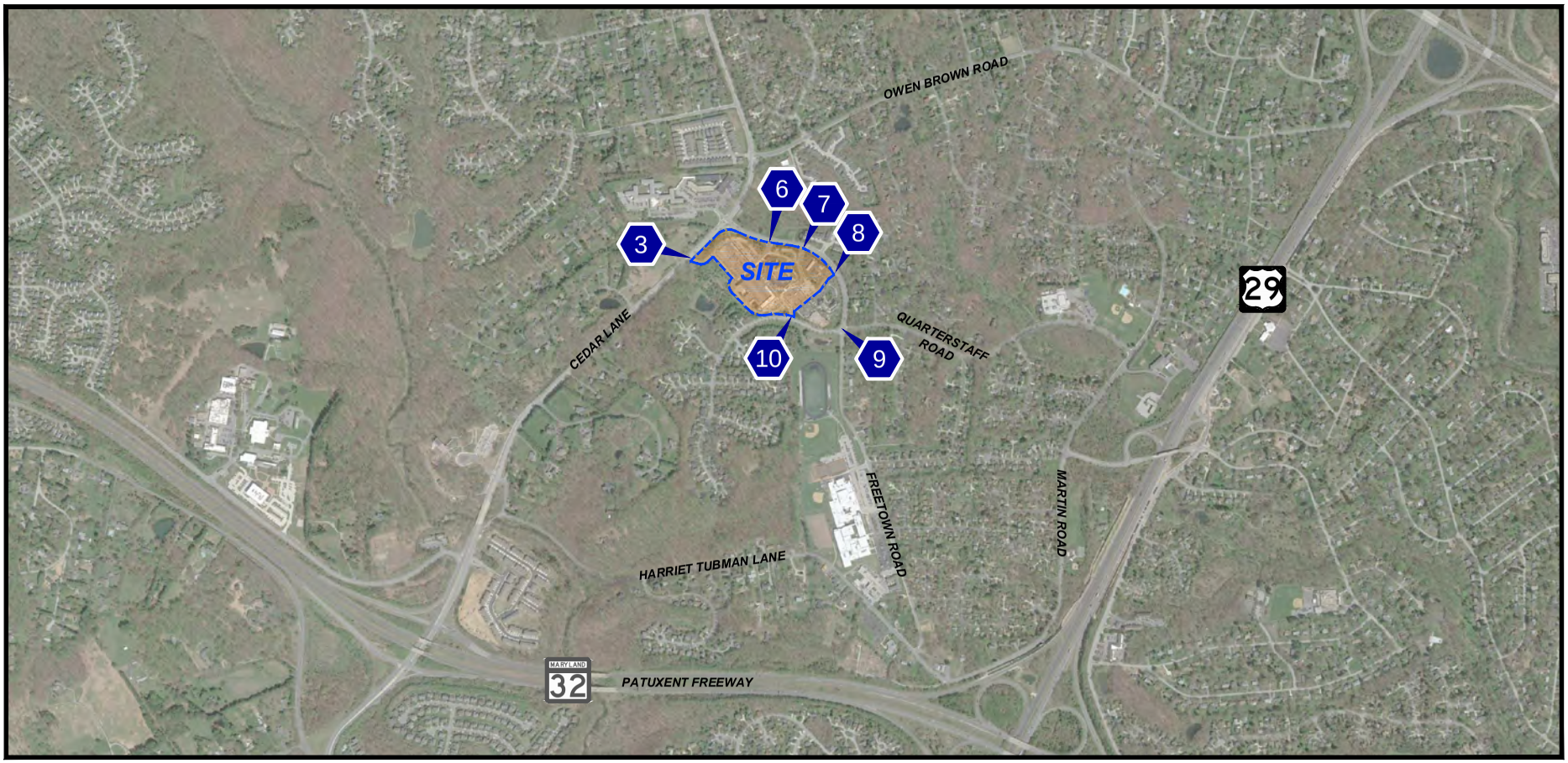

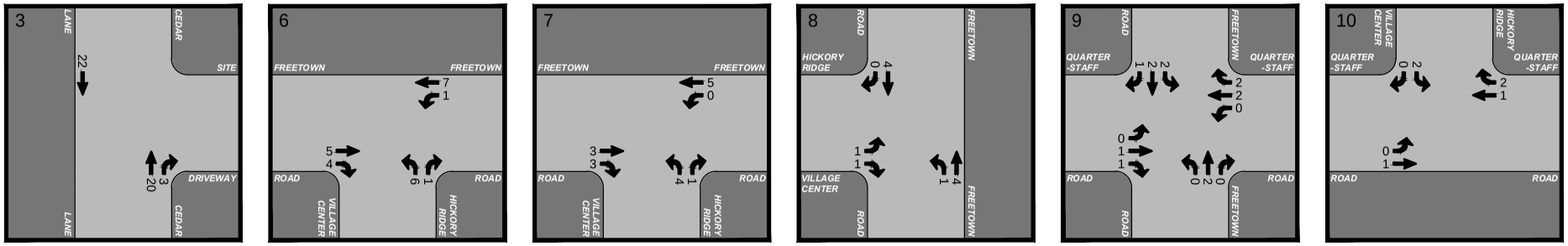

Figure 5-2
Regional Traffic Growth (Saturday)

Hickory Ridge Village Center
Howard County, Maryland

NORTH

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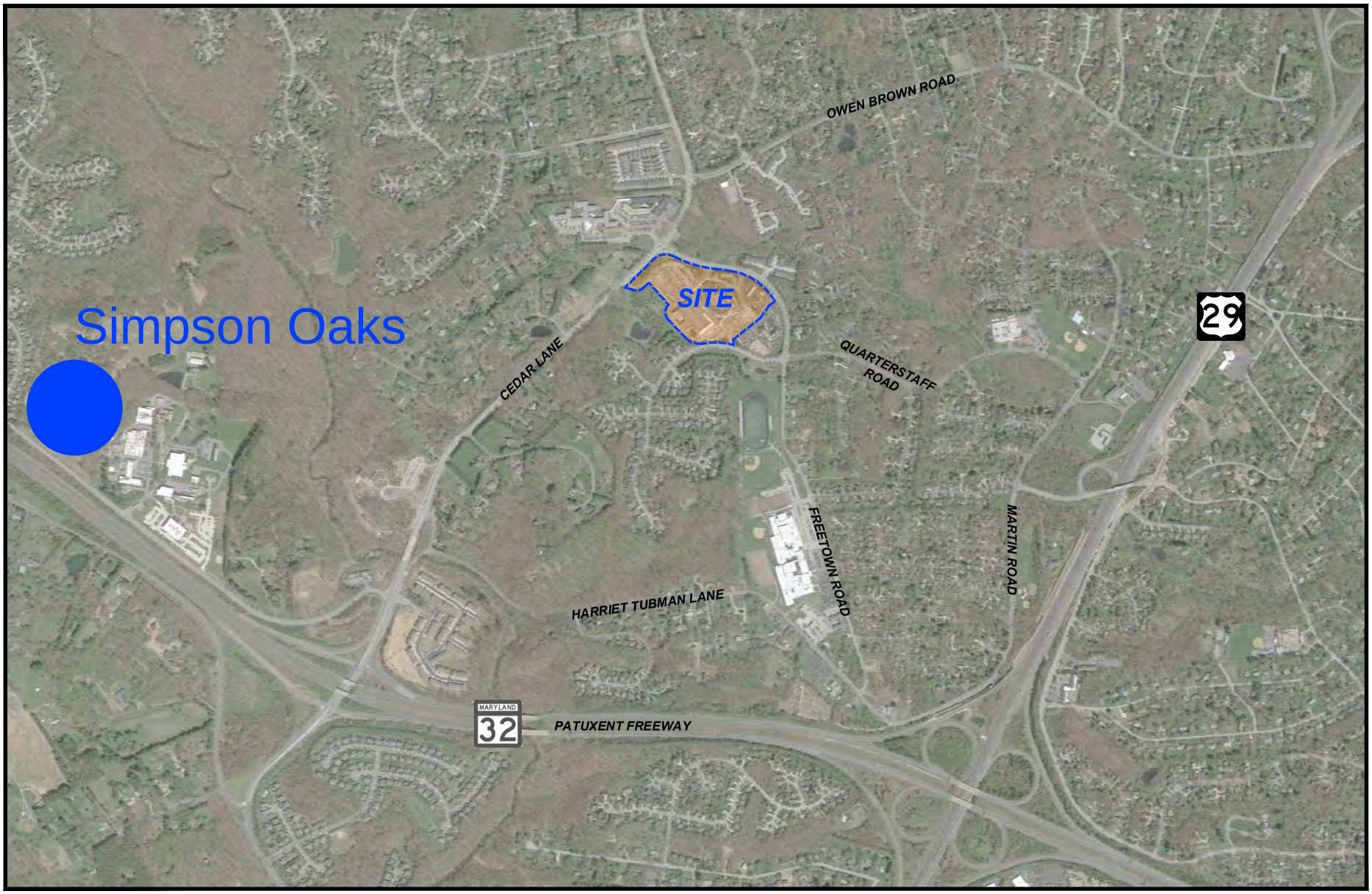
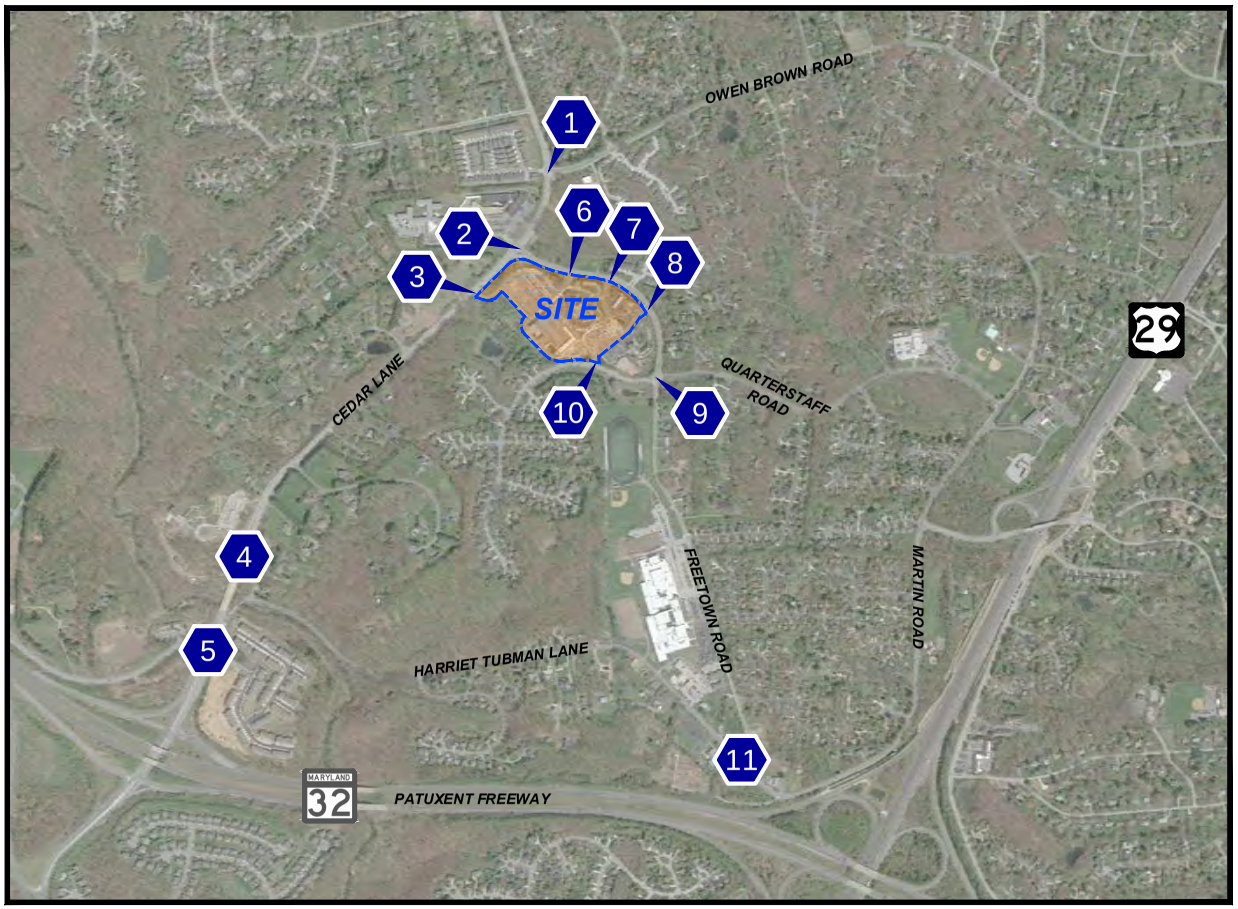


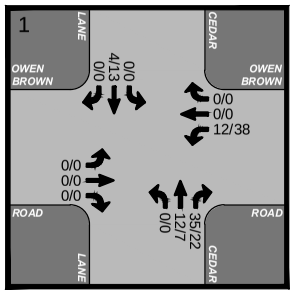
Figure 5-3
Pipeline Development Location

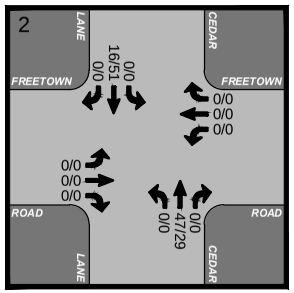
Hickory Ridge Village Center
Howard County, Maryland

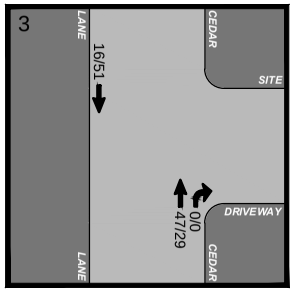
NORTH

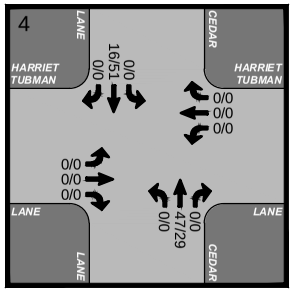
JCP

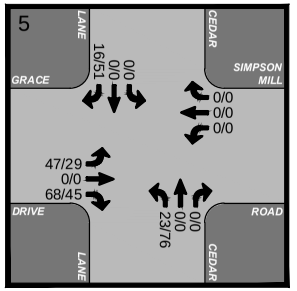


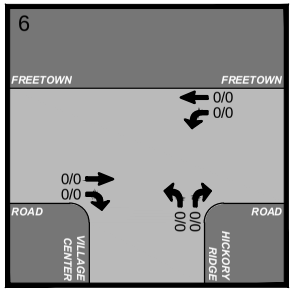


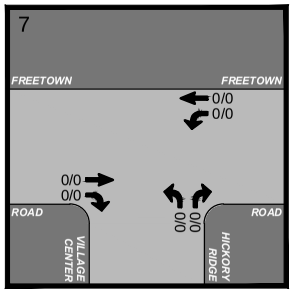


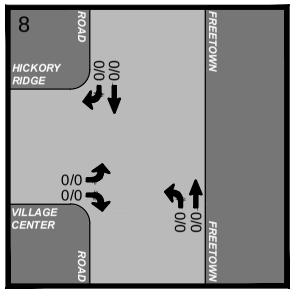


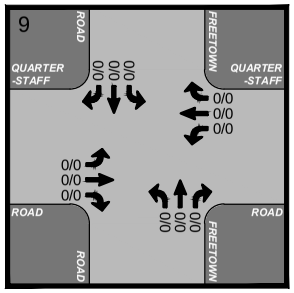


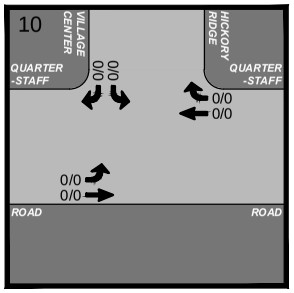












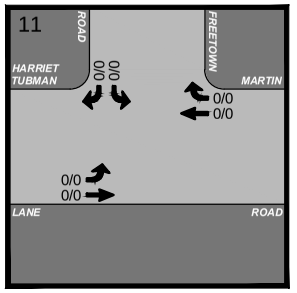


Figure 5-4
Pipeline Traffic Volumes (Weekday)

Hickory Ridge Village Center

Howard County, Maryland

AM PEAK HOUR
PM PEAK HOUR
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NORTH

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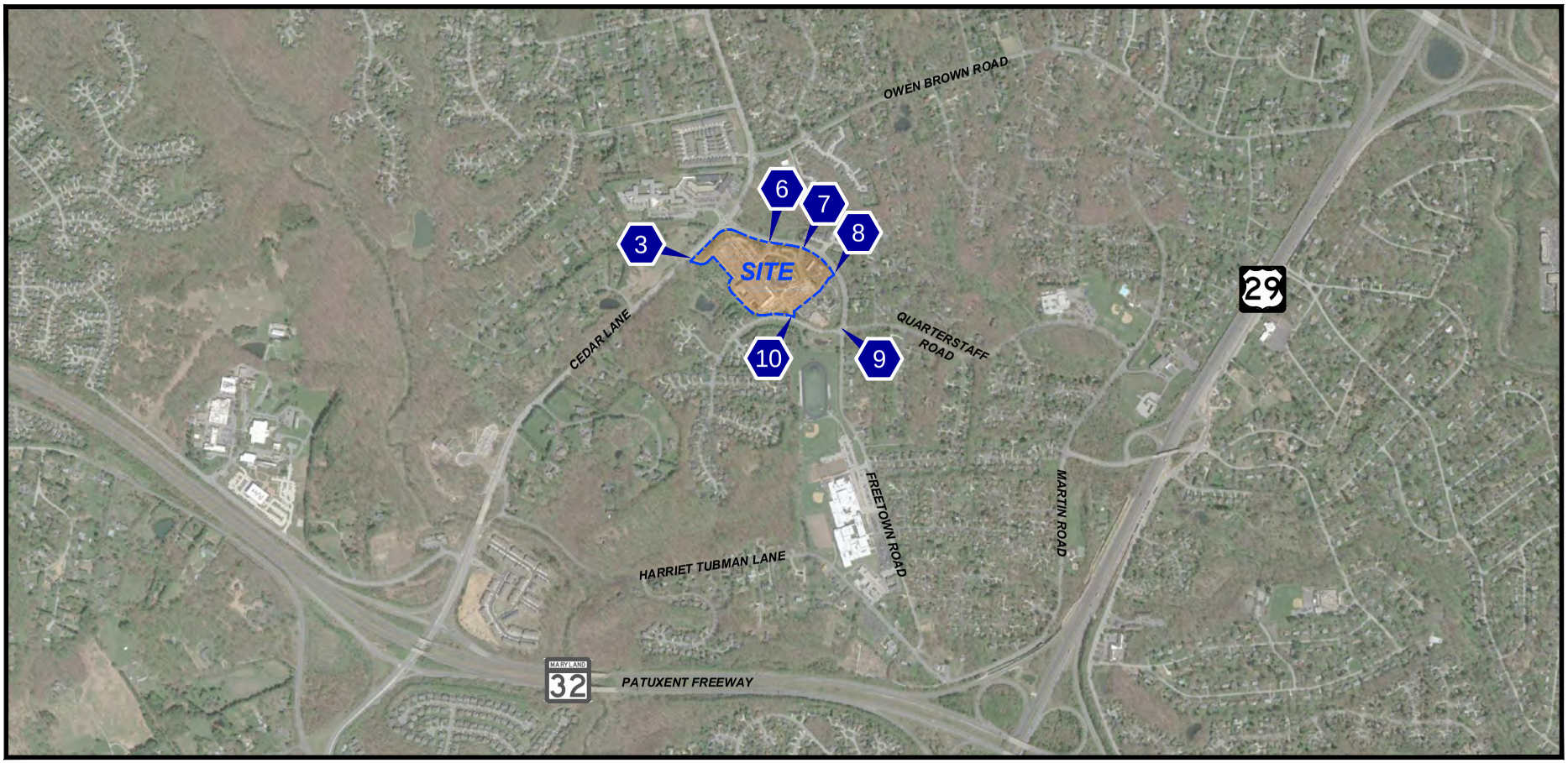


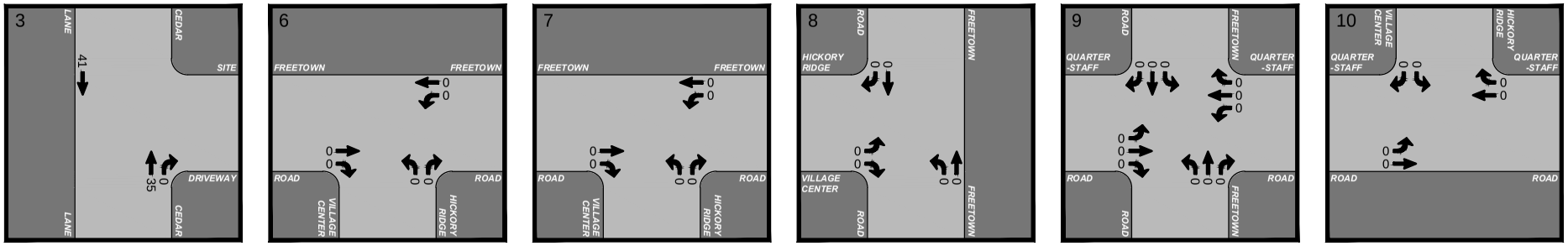
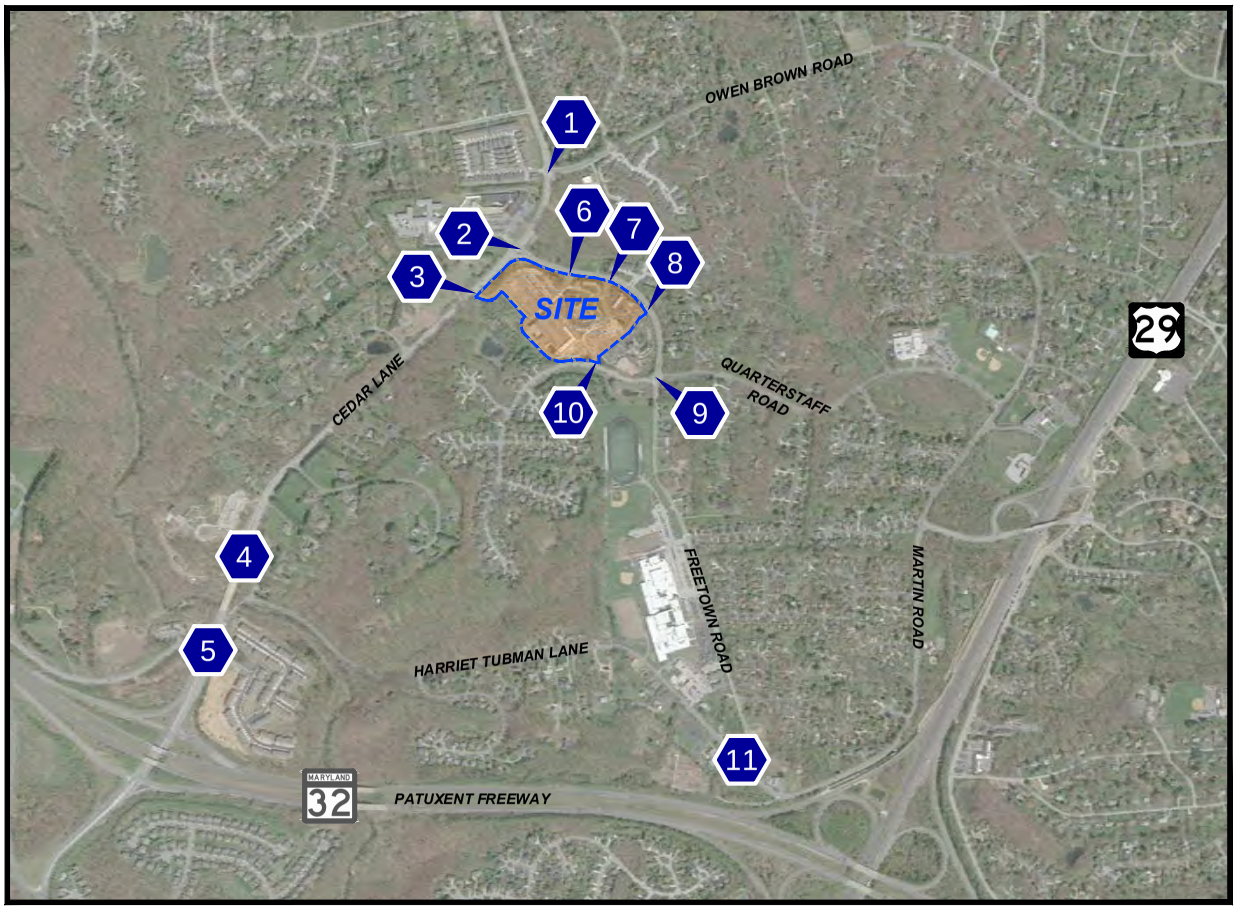
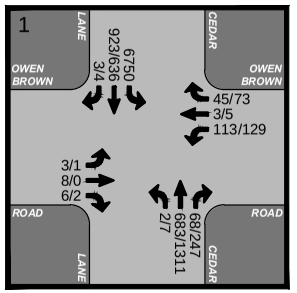


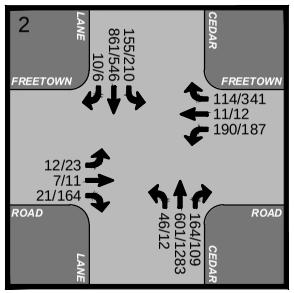
Figure 5-5
Pipeline Traffic Volumes (Saturday)

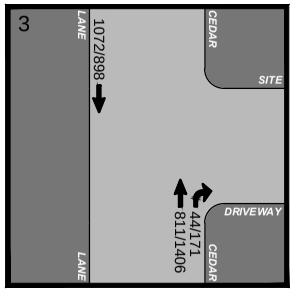
Hickory Ridge Village Center
Howard County, Maryland

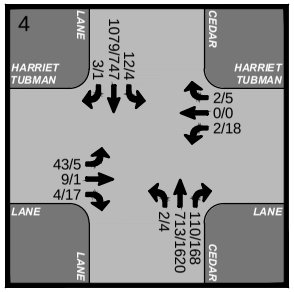
NORTH

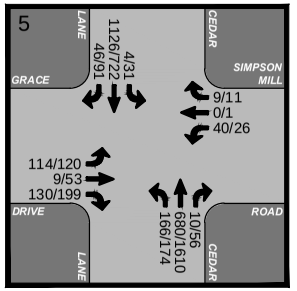


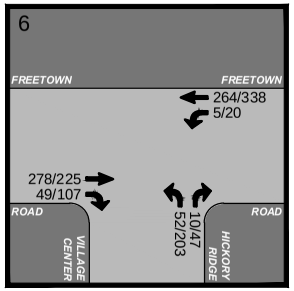


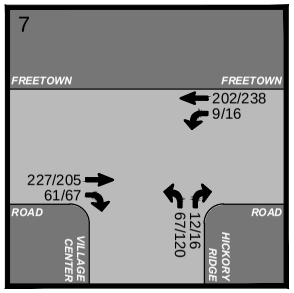


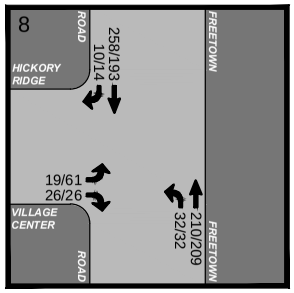


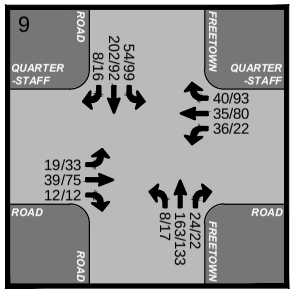


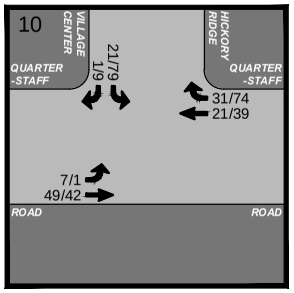












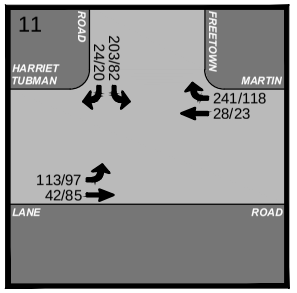


Figure 5-6
2020 Background Peak Hour Traffic Forecasts (Weekday)

Hickory Ridge Village Center
Howard County, Maryland

AM PEAK HOUR
PM PEAK HOUR
000 / 000

NORTH

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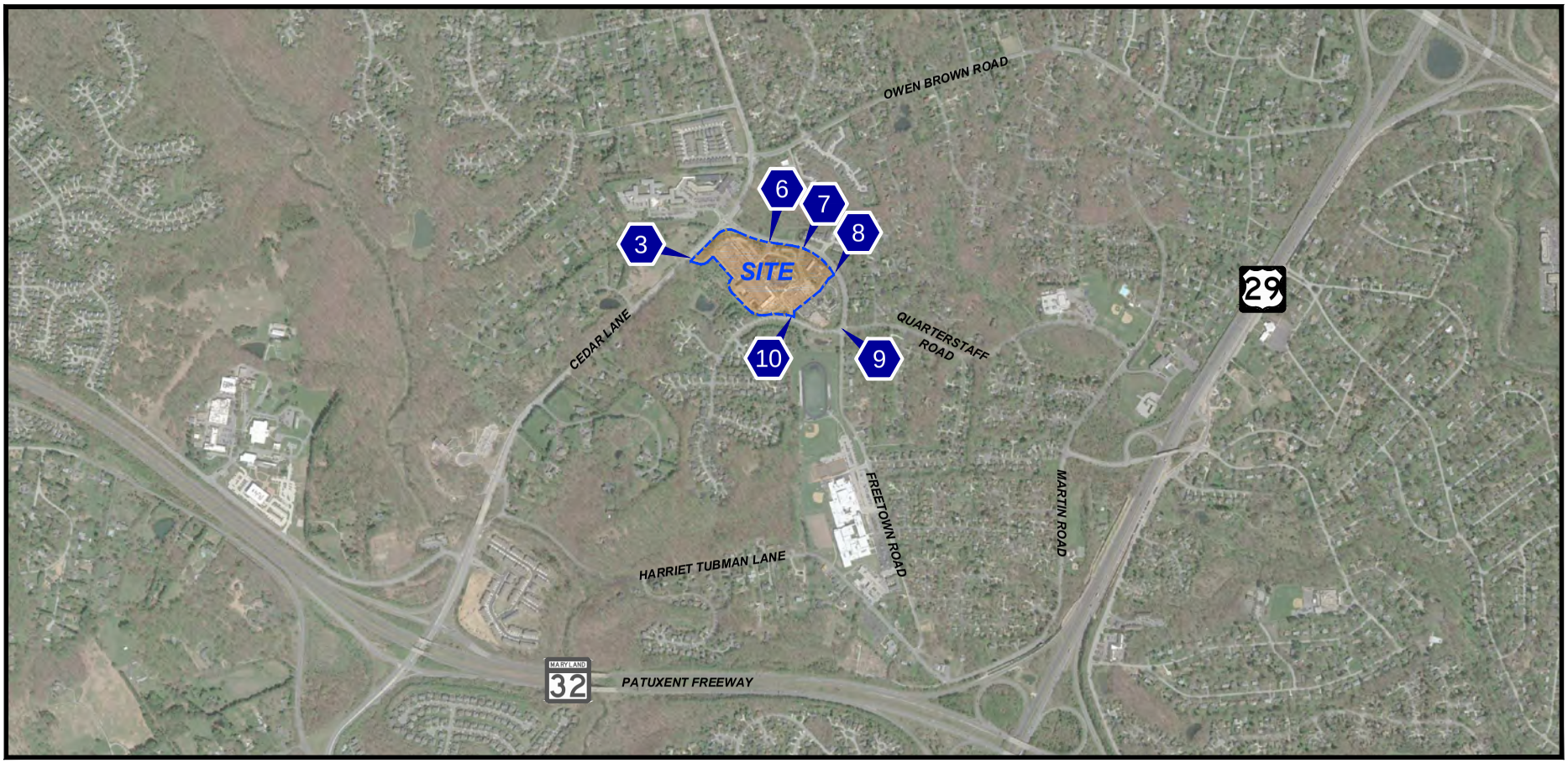


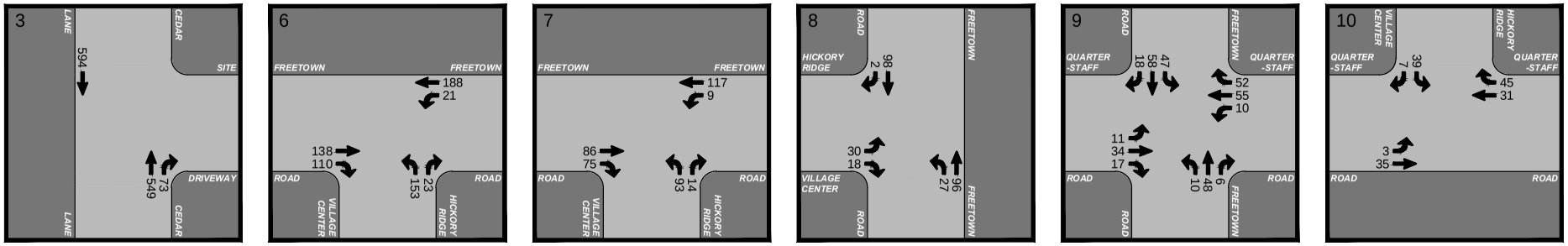


Figure 5-7
2020 Background Peak Hour Traffic Forecasts (Saturday)

Hickory Ridge Village Center
Howard County, Maryland

NORTH

Table 5-2
Hickory Ridge Village Center
Background Intersection Level of Service Summary [1]

	Control	Lane Group Approach	Existing Conditions (2016)						Background Conditions (2020)					
			AM Peak Hour		PM Peak Hour		SAT Peak Hour		AM Peak Hour		PM Peak Hour		SAT Peak Hour	
			LOS	CLV/Delay	LOS	CLV/Delay	LOS	CLV/Delay	LOS	CLV/Delay	LOS	CLV/Delay	LOS	CLV/Delay
1. Cedar Lane/Owen Brown Road	Signalized	CLV	A	603	A	946	-	-	A	641	B	1039	-	-
2. Cedar Lane/Freetown Road	Signalized	CLV	A	742	B	1148	-	-	A	796	C	1209	-	-
3. Cedar Lane/Site Driveway	Unsignalized	NBTR	A	0.0	A	0.0	A	0.0	A	0.0	A	0.0	A	0.0
		SBT	A	0.0	A	0.0	A	0.0	A	0.0	A	0.0	A	0.0
		WBR	-	-	-	-			-	-	-	-	-	-
4. Cedar Lane/Harriet Tubman Lane	Unsignalized	NBL	B	10.4	A	8.9	-	-	B	10.6	A	9.9	-	-
		NBTR	A	0.0	A	0.0	-	-	A	0.0	A	0.0	-	-
		SBL	A	9.3	B	14.7	-	-	A	9.6	C	15.5	-	-
		SBT	A	0.0	A	0.0	-	-	A	0.0	A	0.0	-	-
		SBR	A	0.0	A	0.0	-	-	A	0.0	A	0.0	-	-
		WBLTR	C	23.5	F	158.4	-	-	D	27.2	F	276.2	-	-
		EBLTR	F	75.4	D	25.2	-	-	F	110.8	D	29.8	-	-
5. Cedar Lane/Grace Drive /Simpson Mill Road	Signalized	CLV	A	843	B	1044	-	-	A	948	B	1101	-	-
6. Freetown Road/West Site Driveway	Unsignalized	NBLR	B	12.8	C	20.2	B	11.9	B	13.1	C	22.1	B	12.1
		EBTR	A	0.0	A	0.0	A	0.0	A	0.0	A	0.0	A	0.0
		WBLT	A	0.2	A	0.4	A	0.9	A	0.2	A	0.5	A	1.0
7. Freetown Road/Middle Site Driveway	Unsignalized	NBLR	B	12.1	B	13.5	B	10.3	B	12.4	B	13.9	B	10.4
		EBTR	A	0.0	A	0.0	A	0.0	A	0.0	A	0.0	A	0.0
		WBLT	A	0.4	A	0.5	A	1.6	A	0.3	A	0.5	A	1.6
8. Freetown Road/East Site Driveway	Unsignalized	WBLR	B	11.1	B	11.8	A	9.2	B	11.2	B	12.0	A	9.0
		NBLT	A	1.0	A	1.0	A	1.8	A	1.0	A	1.0	A	1.8
		SBTR	A	0.0	A	0.0	A	0.0	A	0.0	A	0.0	A	0.0
9. Freetown Road/Quarterstaff Road	Unsignalized	NBLTR	A	0.3	A	0.7	-	-	A	0.3	A	0.7	-	-
		SBLTR	A	1.6	A	3.7	-	-	A	1.6	A	3.7	-	-
		EBLTR	B	13.8	C	16.3	-	-	B	14.2	C	17.1	-	-
		WBLTR	B	13.5	B	14.1	-	-	B	13.8	B	14.6	-	-
10 Quarterstaff Road/Site Driveway	Unsignalized	SBLR	A	9.1	A	9.5	A	9.0	A	9.1	A	9.5	A	9.3
		SBLT	A	1.0	A	0.2	A	1.6	A	0.9	A	2.0	A	5.1
		NBTR	A	0.0	A	0.0	A	0.0	A	0.0	A	0.0	A	0.0
11. Freetown Road/Martin Road /Harriet Tubman Lane	Unsignalized	WBLR	C	15.0	B	11.5	-	-	C	15.7	B	11.7	-	-
		NBTR	A	0.0	A	0.0	-	-	A	0.0	A	0.0	-	-
		SBLT	A	5.9	A	4.1	-	-	A	5.9	A	4.1	-	-

Notes : 1. Capacity analysis based on Howard County Design Manual and the Highway Capacity Manual methodology, using PTV Vistro.

SECTION 6
TRIP GENERATION, DISTRIBUTION, AND ASSIGNMENT

Overview

This section summarizes the vehicle trip generation and traffic distribution analyses for the project at buildout in 2020.

Development Program

Hickory Ridge Village Center currently consists of approximately 97,321 S.F. Gross Leasable Area (GLA) of retail space within the core area. This portion of the site is planned to be redeveloped as a mixed-use project that would slightly increase the retail portion by 7,779 S.F. to 105,100 S.F. and construct 230 residential apartments.

Additional land uses exist adjacent to Hickory Ridge Village Center that are not included in the proposed redevelopment but share the same access points. These uses include a gas station with convenience mart and carwash, an assisted living, and daycare center.

Site Trip Generation

The total number of vehicle trips generated by the development is comprised of both internal (occurring within the confines of the site) and external trips. The trip generation is summarized in Table 6-1 and is described in detail below.

Total Trips

The number of trips that would be generated by the total development was estimated based on the Institute of Transportation Engineers' (ITE), Trip Generation, 9th Edition manual. The trip generation included in Table 6-1 shows the estimates for the existing Hickory Ridge Village Center and the adjacent uses.

Internal Capture

The mixed-use nature of the project is expected to create internal trips amongst uses. These trips were determined consistent with ITE methodology as presented in previously prepared traffic studies. Detailed summaries are contained in Appendix H.

Non-Auto Mode Split

As previously mentioned, no adjustments for non-auto mode share was made to provide a conservative estimate.

Pass-by Trip Reductions

Passby trips were estimated for the Hickory Ridge Village Center in accordance with ITE published rates. These trips were assumed to be drawn from Cedar Lane. The average rate was applied for the PM (34 percent) and Saturday peak hour (26 percent) given the amount of retail space that currently exists.

Net New External Vehicle Trips

The net new trips expected to be generated by the retail uses were calculated based on the observed rates. The traffic expected to be generated by the adjacent uses that share the site driveways were subtracted from the driveway counts. The resultant trips were used to develop a rate for the core retail area. These rates were applied to the proposed redevelopment and added to the traffic expected to be generated by the residential building in order to identify the net new vehicle trips generated by the site.

As shown on Table 6-1, existing core area retail uses currently generate 224 AM peak hour trips, 564 PM peak hour trips, and 332 peak hour trips on Saturday. The combined retail and residential uses are expected to generate 357 AM peak hour trips, 647 PM peak hour trips, and 374 peak hour trips on Saturday.

Thus, the combined retail and residential uses are expected to generate 133 net new AM peak hour trips (33 in and 100 out), 82 net new PM peak hour trips (56 in and 26 out), and 43 net new peak hour trips on Saturday (22 in and 21 out), subsequent to the redevelopment.

The net new trips generated by the retail uses would be just slightly higher than the currently occupied retail space. Thus, the majority of net new vehicle trips that would be added to the road network would be residential trips.

Site Trip Distribution and Assignment

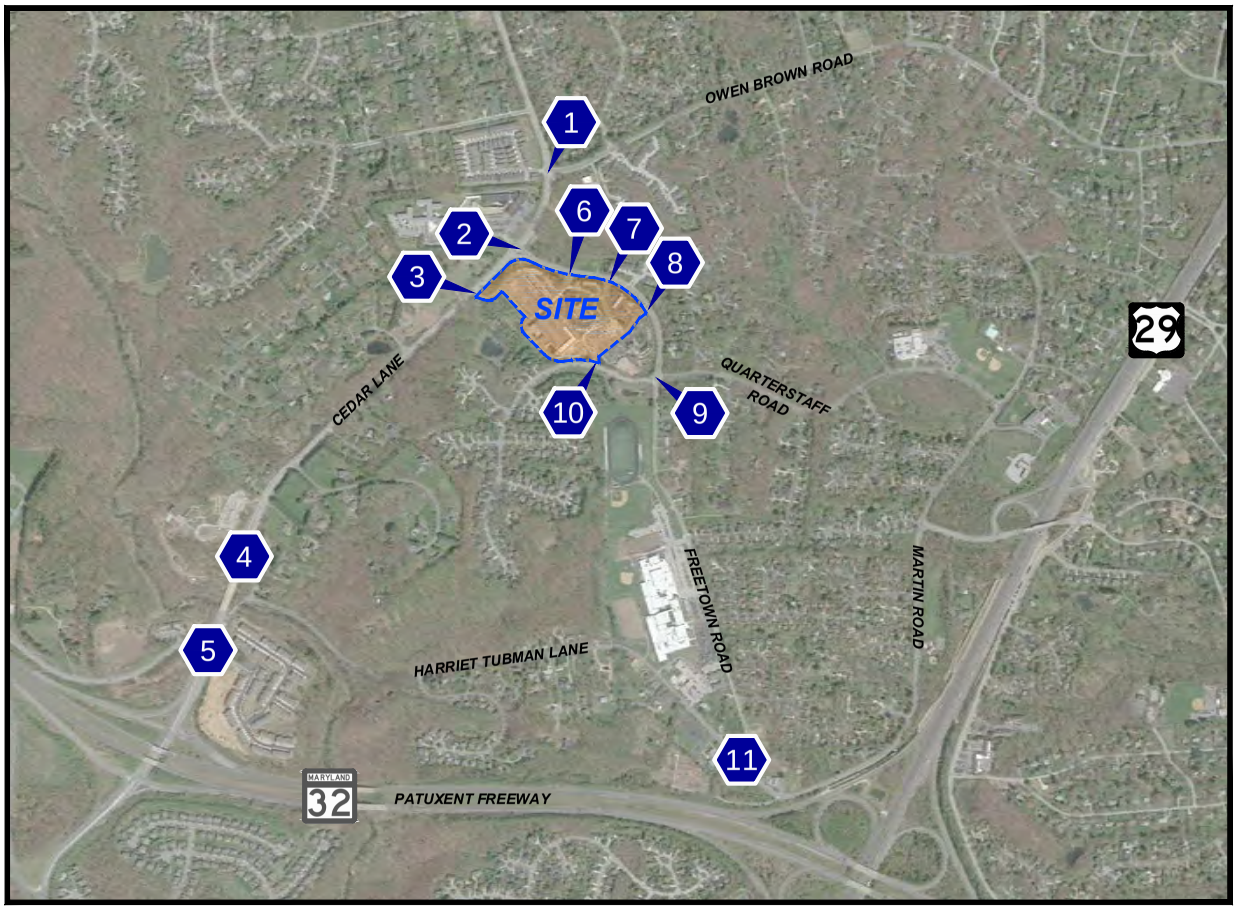
The retail trips associated with the existing Hickory Ridge Village Center were removed from the roadway network. The net new peak hour trips associated with the redeveloped site were then distributed onto the roadway network utilizing similar distributions and the new access scheme, and are shown on Figures 6-1 and 6-2. Pass-by trips are shown on Figures 6-3 and 6-4. Isolated traffic assignments are contained in Appendix I.

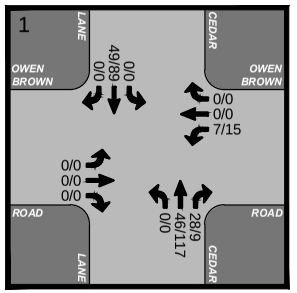
Table 6-1
Hickory Ridge Village Center
Site Trip Generation Analysis

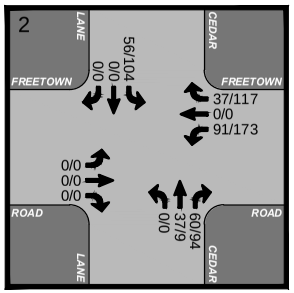
Development	ITE Land Use Code	Amount	Units	AM Peak Hour In	AM Peak Hour Out	AM Peak Hour Total	PM Peak Hour In	PM Peak Hour Out	PM Peak Hour Total	Saturday Peak Hour In	Saturday Peak Hour Out	Saturday Peak Hour Total
Existing Driveway Counts (1)				237	201	438	481	627	1,108	345	316	661
Adjacent Uses (2)												
Gas/Service Station with Convenience Mart and Car Wash	946	10	Positions	51	51	102	68	67	135	90	89	179
Assisted Living	254	60	Beds	5	3	8	6	7	13	9	11	20
Day Care Center	565	8,500	SF	55	49	104	49	56	105	9	5	14
Subtotal (Adjacent Uses)				111	103	214	123	130	253	108	105	213
Existing Development Program (Hickory Ridge Center)												
Retail (Counts minus Adjacent Uses)		97,321	SF	126	98	224	358	497	855	237	211	448
Observed Trip Generation Rate Per 1,000 SF				*1.29*	*1.01*	*2.30*	*3.68*	*5.11*	*8.79*	*2.44*	*2.17*	*4.60*
Existing Site Pass-By Trips (AM: 0% / PM: 34% / SAT: 26%) (3)				*0*	*0*	*0*	*(122)*	*(169)*	*(291)*	*(62)*	*(55)*	*(116)*
Existing Site Net New Site Trips				**126**	**98**	**224**	**236**	**328**	**564**	**175**	**156**	**332**
Proposed Development Program												
Retail	Observed Rate	105,100	SF	136	106	242	387	537	923	256	228	484
Internal to Residential (4)				*(1)*	*0*	*(1)*	*(21)*	*(44)*	*(65)*	*(14)*	*(16)*	*(30)*
Subtotal				135	106	241	366	493	858	242	212	454
Pass-By Trips (AM: 0% / PM: 34% / SAT: 26%) (3)				*0*	*0*	*0*	*(124)*	*(168)*	*(292)*	*(63)*	*(55)*	*(118)*
Expanded Retail Net New Site Trips				135	106	241	241	325	567	179	157	336
Apartments (2)	220	230	D.U.	24	93	117	95	50	145	34	34	68
Internal to Retail (4)				*0*	*(1)*	*(1)*	*(44)*	*(21)*	*(65)*	*(16)*	*(14)*	*(30)*
Residential Net New Site Trips				24	92	116	51	29	80	18	20	38
Proposed Site Net New Site Trips				**159**	**198**	**357**	**292**	**354**	**647**	**197**	**177**	**374**
Difference (Existing vs Proposed)				**33**	**100**	**133**	**56**	**26**	**82**	**22**	**21**	**43**

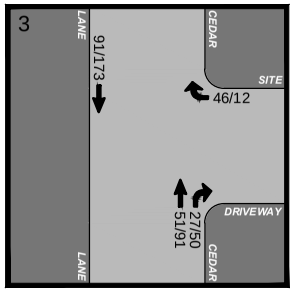
Notes:

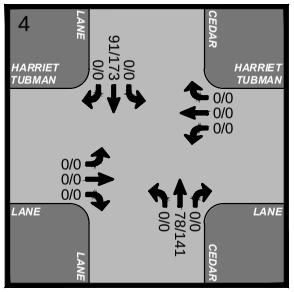
1. Based on traffic counts collected by W+A on Thursday, October 6, 2016 and Saturday, October 8, 2016.
2. Trip generation based on Institute of Transportation Engineers Trip Generation Manual, 9th Edition.
3. Pass-by percentage consistent with ITE's Trip Generation Handbook.
4. Internal synergy based on rates presented in ITE's Trip Generation Handbook.

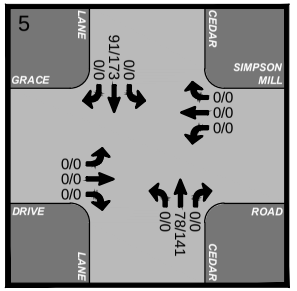


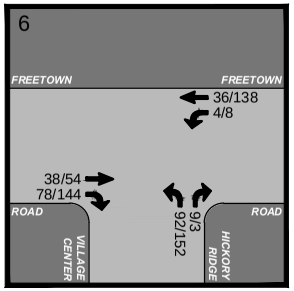


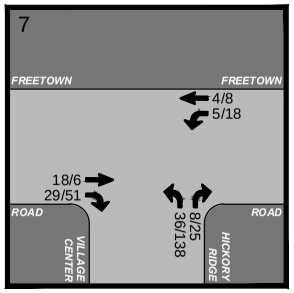


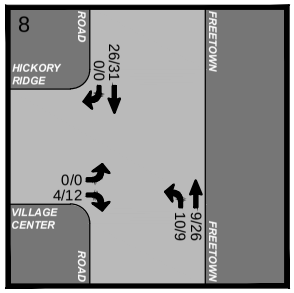


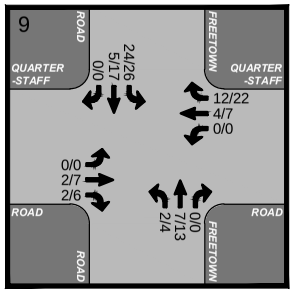


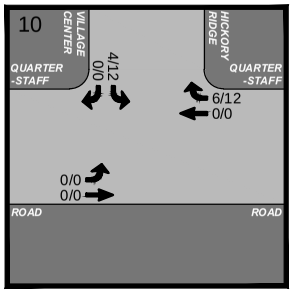












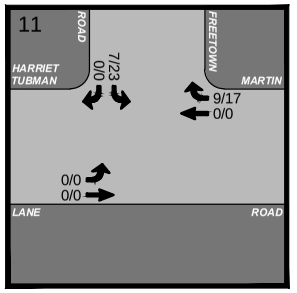


Figure 6-1
Net New Site Generated Trips (Weekday)

Hickory Ridge Village Center

Howard County, Maryland

AM PEAK HOUR
PM PEAK HOUR
000 / 000

NORTH

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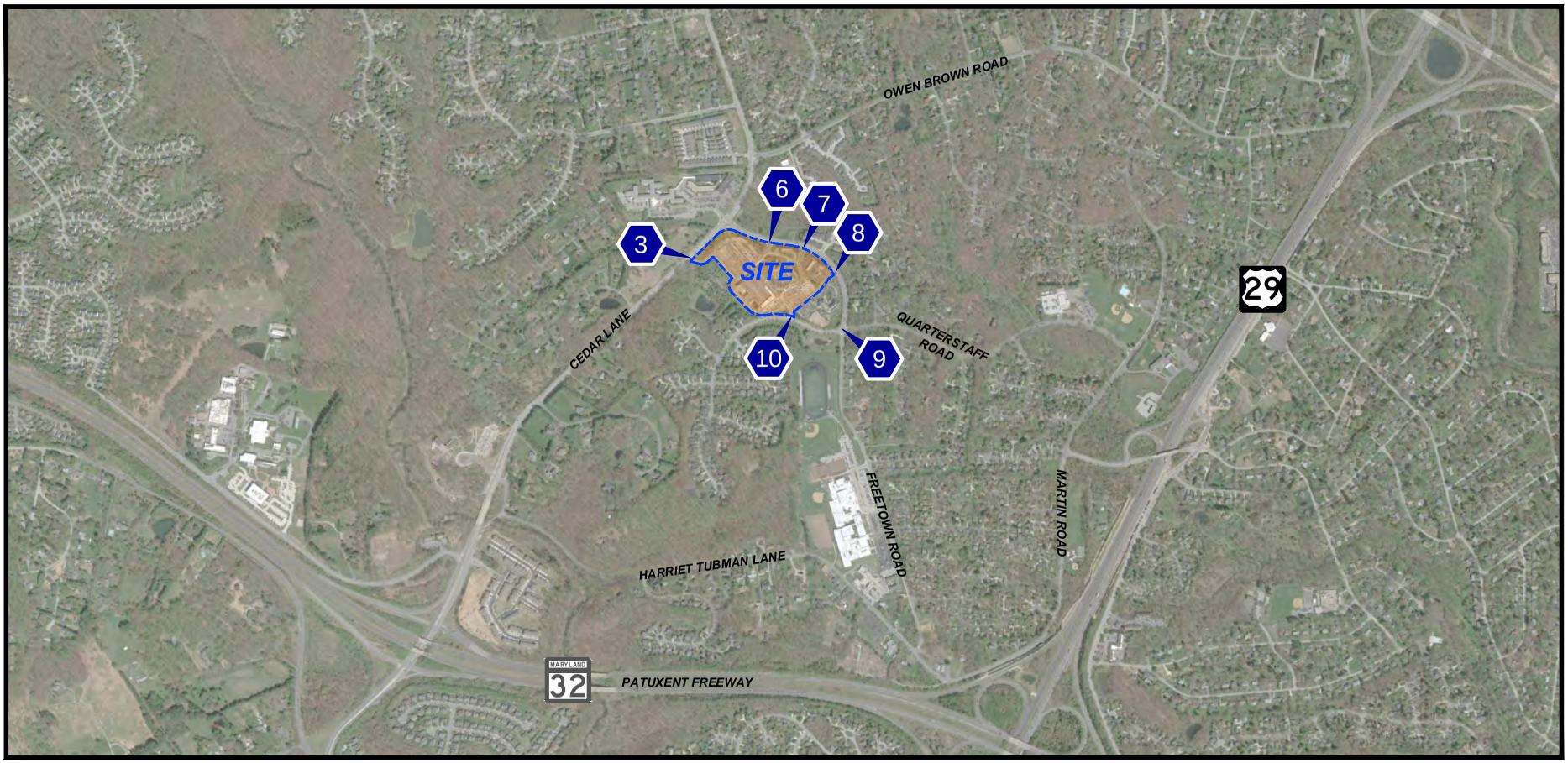


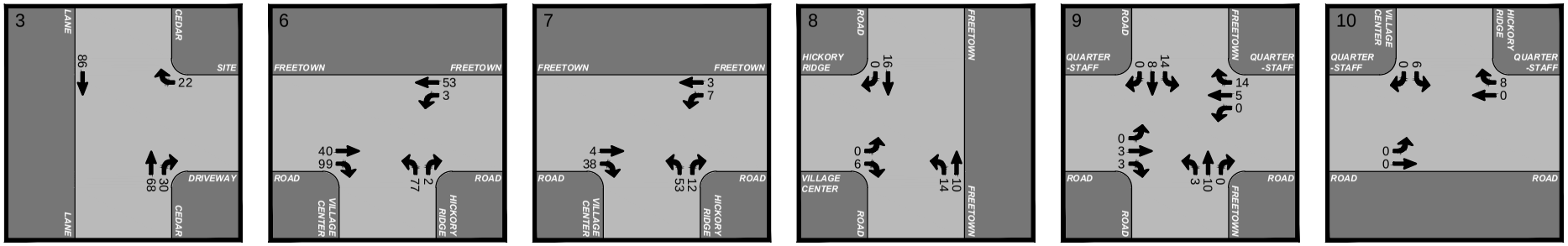
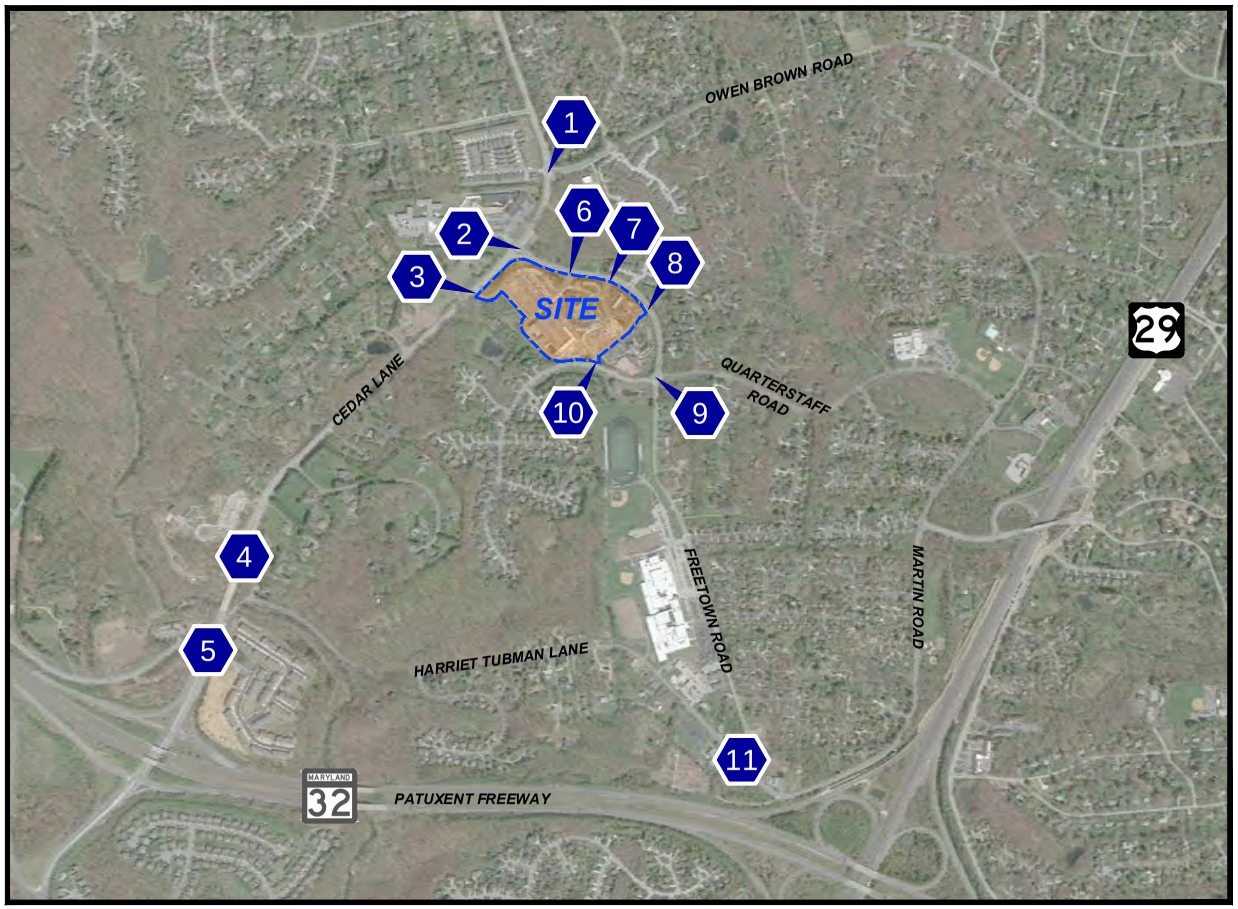
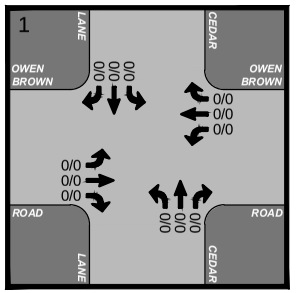


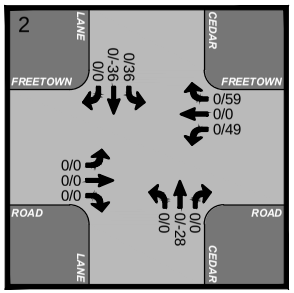
Figure 6-2
Net New Site Generated Trips (Saturday)

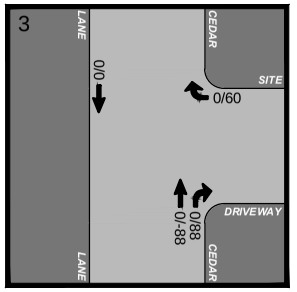
Hickory Ridge Village Center
Howard County, Maryland

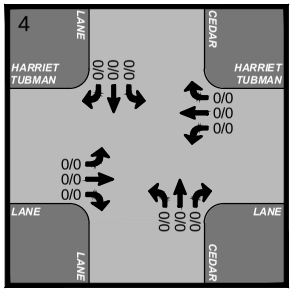
NORTH

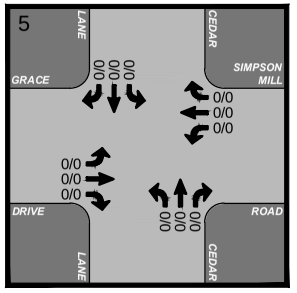


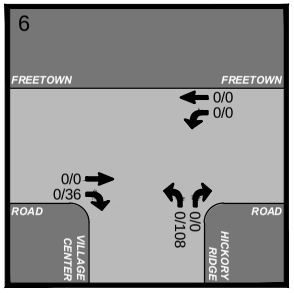


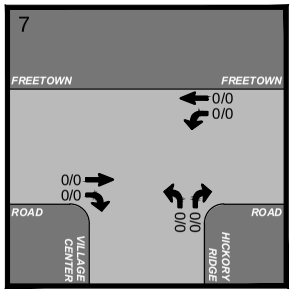


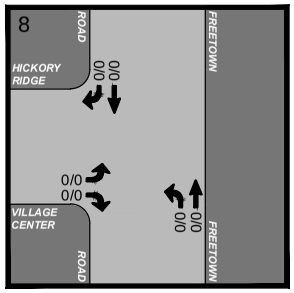


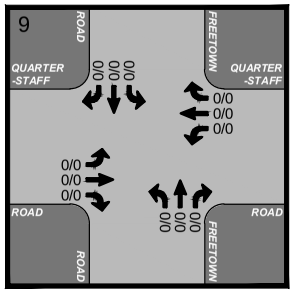


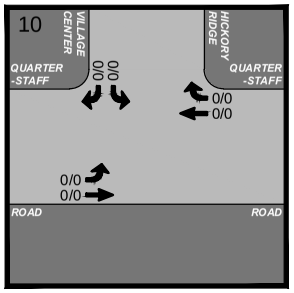












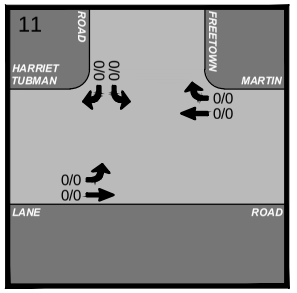


Figure 6-3
Retail Pass-By Trips (Weekday)

Hickory Ridge Village Center

Howard County, Maryland

AM PEAK HOUR
PM PEAK HOUR
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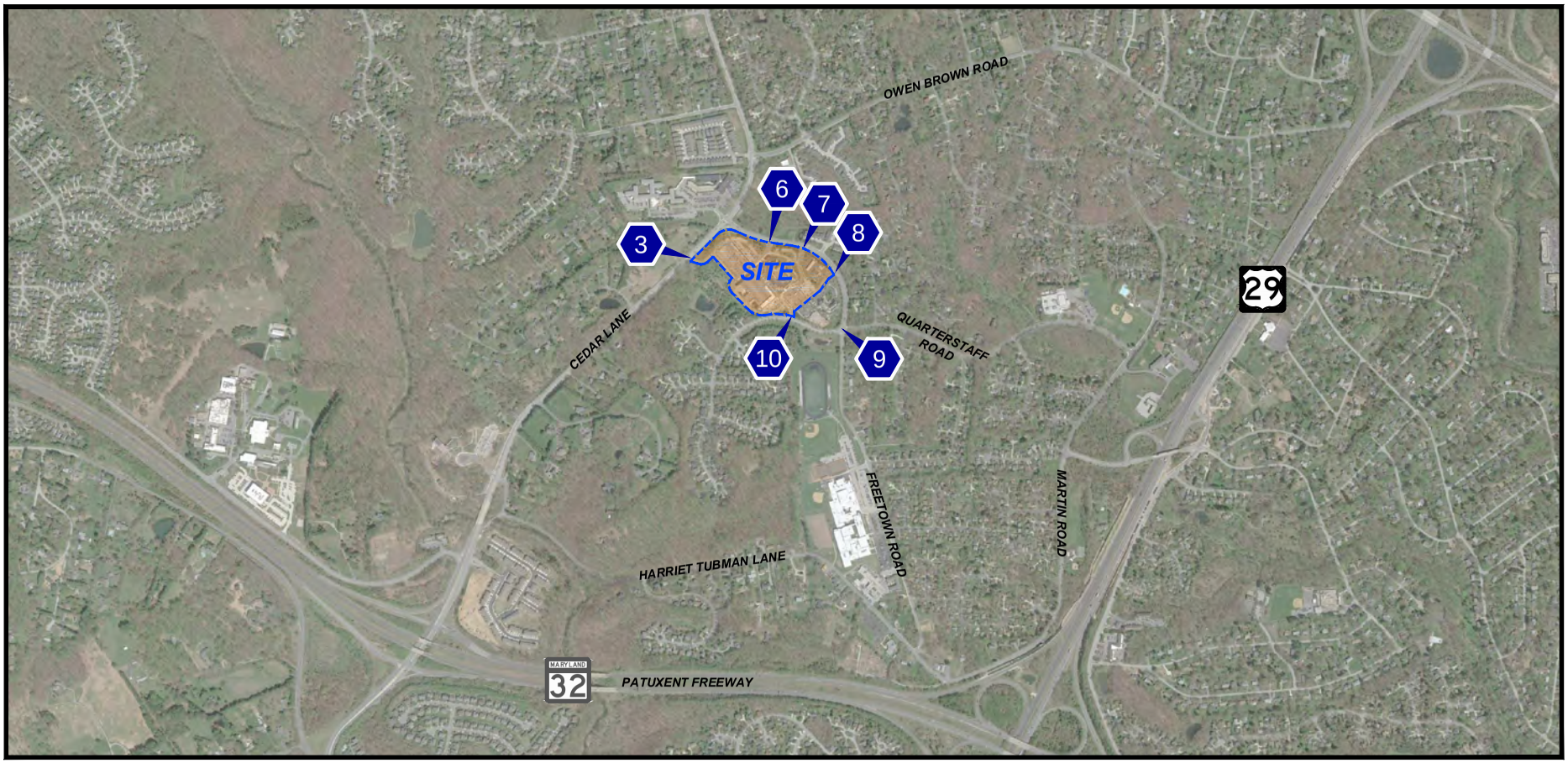


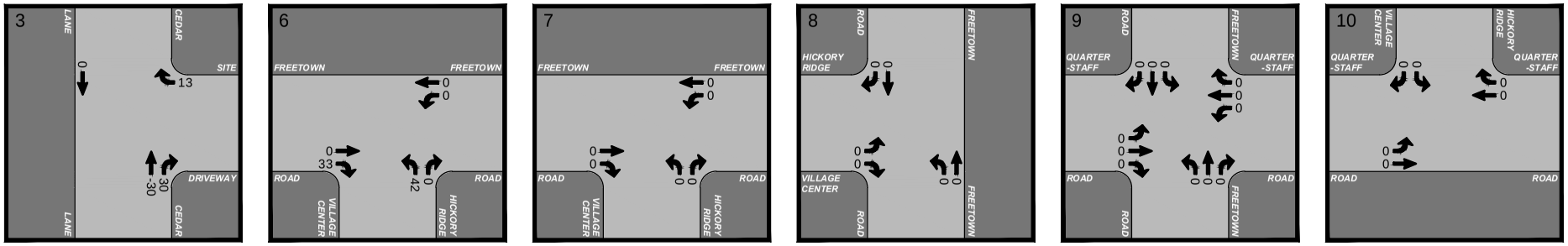


Figure 6-4
Retail Pass-By Trips (Saturday)

Hickory Ridge Village Center
Howard County, Maryland

NORTH

SECTION 7
ANALYSIS OF FUTURE CONDITIONS WITH PROPOSED DEVELOPMENT

Overview

This section presents an assessment of future conditions in 2020 with the development of the Hickory Ridge Village Center and the anticipated traffic mitigation measures required to accommodate the new site-generated vehicle trips.

Traffic Forecasts

Total future traffic forecasts for future conditions were developed by modifying the background traffic forecasts and adding the net new site-generated trip assignments associated with Hickory Ridge Village Center, and is shown on Figures 7-1 and 7-2. The planned lane use and traffic control is shown on Figure 7-3.

Capacity Analysis

Capacity analyses were prepared for the study intersections using the total future traffic forecasts and the future lane use and traffic control shown discussed previously. The results are summarized on Table 7-1 and discussed in the following sections. Capacity analysis summaries are contained in Appendix J.

The results of the total future analysis are consistent with the results of the background conditions and indicate that all of the off-site signalized intersections would continue to operate at acceptable levels of service (with CLV's less than 1,450) during both the AM and PM peak hours, without further improvements.

In addition, the analyses indicate that all movements at the unsignalized intersections, including the site driveways, would operate at acceptable levels of service (LOS "D" or better) during all analysis periods, with the exception of the side-street movements at the Cedar Lane/Harriet Tubman intersection that would continue to operate at LOS "F", consistent with background conditions.

Since the side-street movements are expected to operate beyond capacity at the Cedar Lane/Harriet Tubman intersection, a preliminary review of the peak hour traffic signal warrants was made. The results are contained in Appendix K, and indicate that none of the warrants for signalization would not be met at this intersection.

As the plan progresses through the development stages, the Applicant will coordinate with Howard County in order to continue to encourage transit use (by maintaining the existing

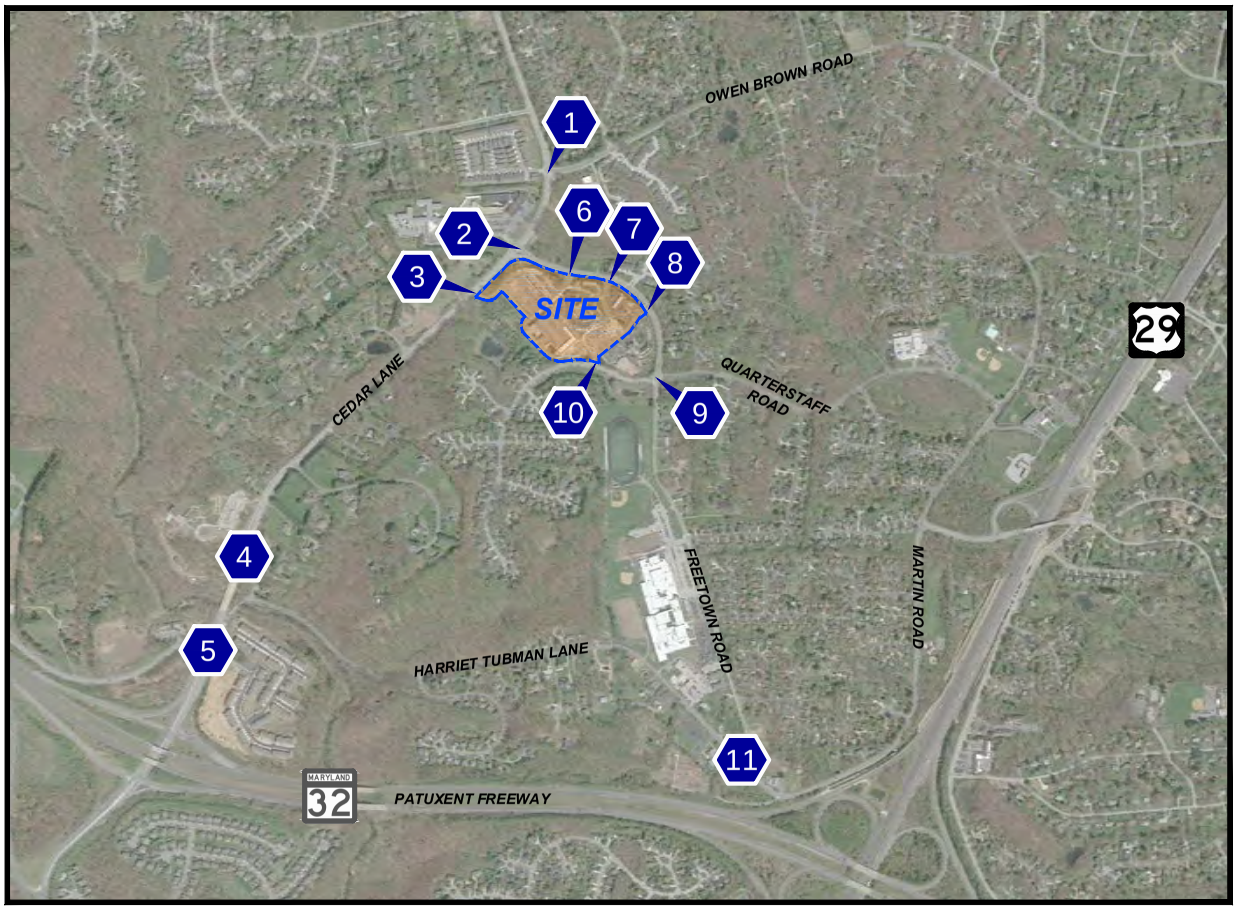
transit stops) and enhance or improve access from the surrounding communities by walking and bicycle.

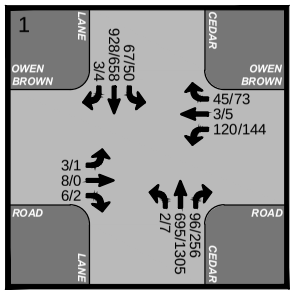
Evaluation of Proposed Driveway Conversion

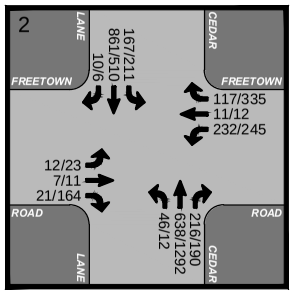
As discussed at the traffic scoping meeting, Howard County requested a review of the proposed Cedar Lane access that is proposed to be converted to allow right-out movements and its impacts to operations along northbound Cedar Lane. The review evaluated whether providing a free-flow right turn lane would be needed that would connect to the existing channelized right at the Cedar Lane/Freetown Road intersection.

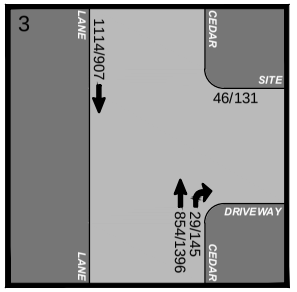
The projected right turn volume exiting the site is expected to be fewer than 150 vehicles during any of the peak hours studied. This volume is well within capacity limits for a standard lane and is expected to operate at acceptable levels of service during these periods. In addition, providing the lane would create a weave section between the driveway and Freetown Road. Since a separate northbound right turn lane is not required for capacity purposes at Freetown Road, the right-out movement is anticipated to operate at acceptable levels of service, and the addition of a lane would create a weave section, this modification is not recommended. It is also noted that since Freetown Road west of Cedar Lane is not a through route and only serves the Howard County Health Park, it is unlikely that a significant number of peak hour trips would exit Hickory Ridge Village Center and turn left into the Health Park.

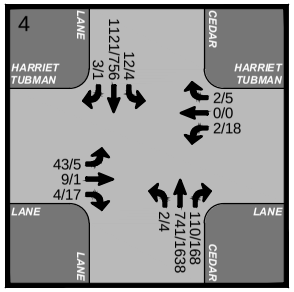
The conversion of the existing right-in driveway to allow right-out movements would exceed 200 peak hour vehicles during the PM peak hour only. While this meets the criteria for a high-volume driveway, the capacity analyses suggest that a separate right turn lane on Cedar Lane would not be required.

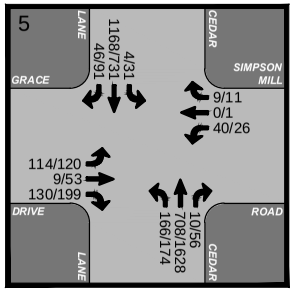


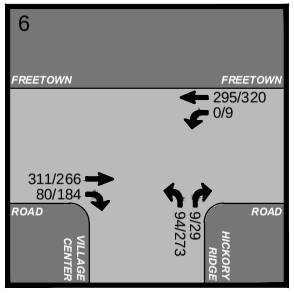


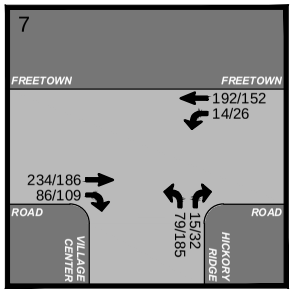


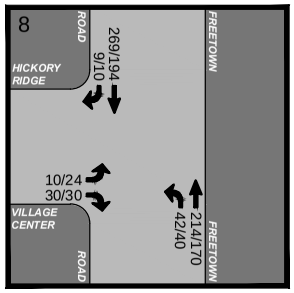


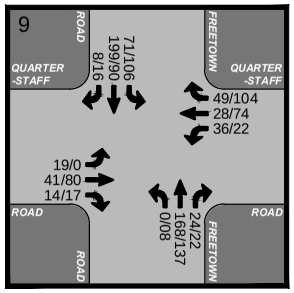


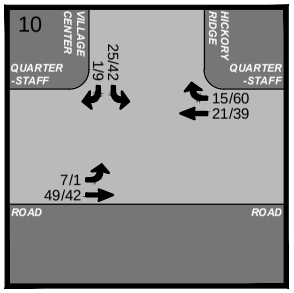












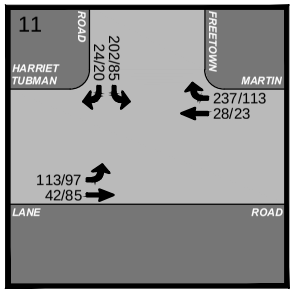


Figure 7-1
2020 Total Future Peak Hour Traffic Forecasts (Weekday)

Hickory Ridge Village Center
Howard County, Maryland

AM PEAK HOUR
PM PEAK HOUR
000 / 000

NORTH

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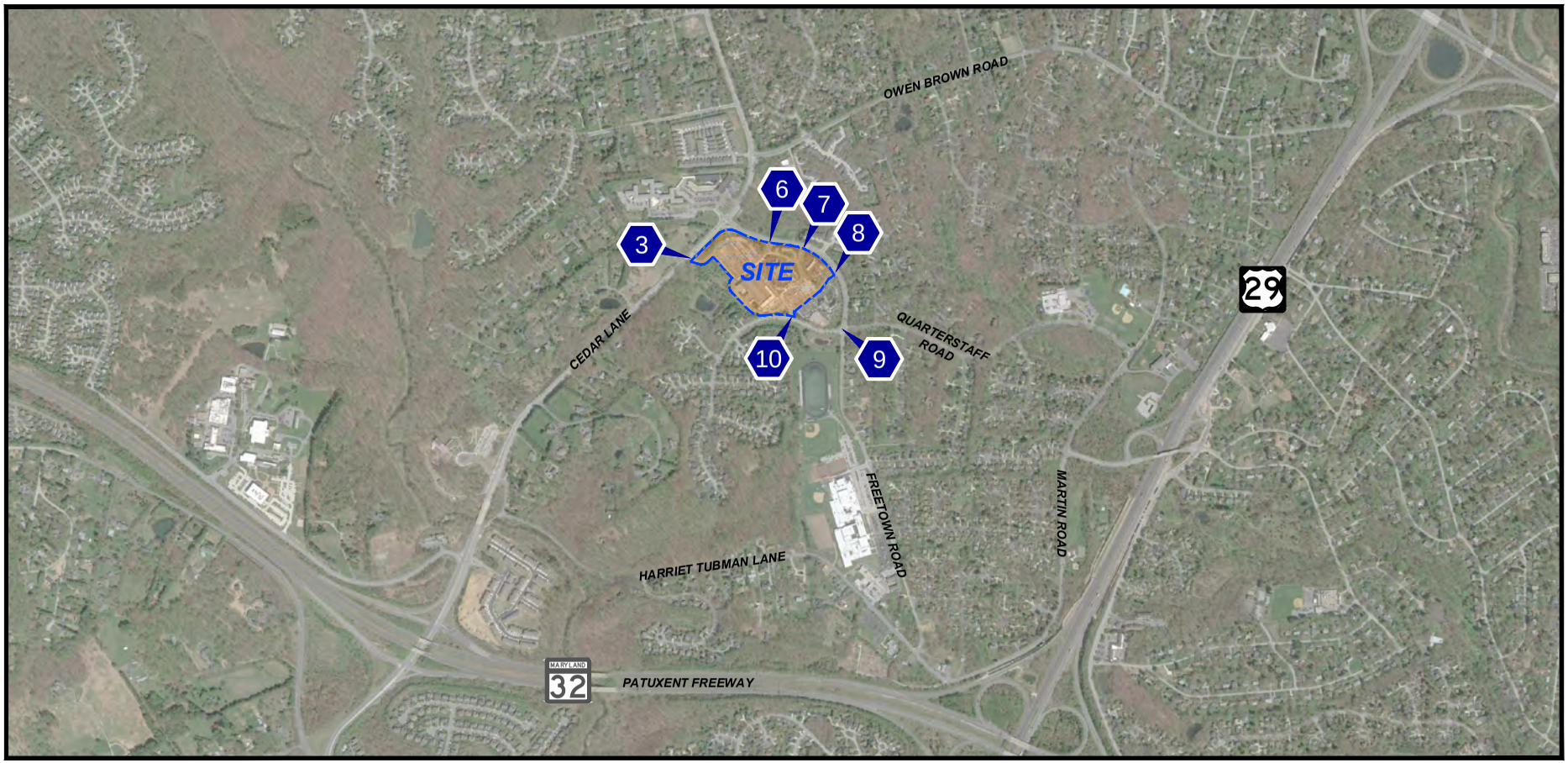

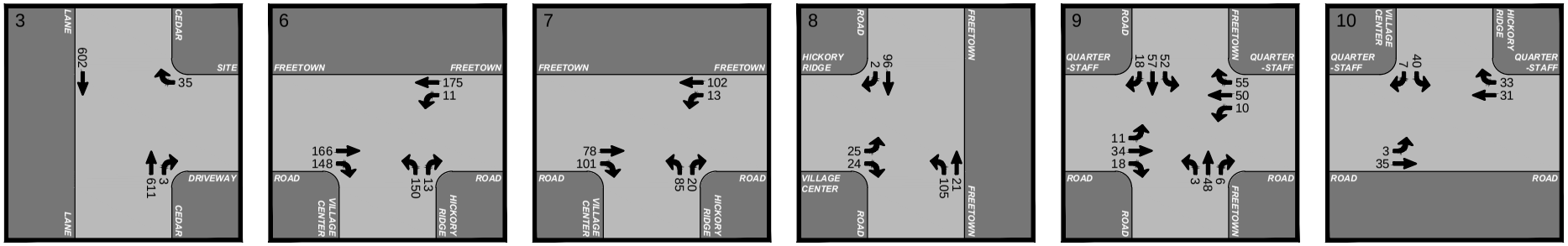

Figure 7-2
2020 Total Future Peak Hour Traffic Forecasts (Saturday)

Hickory Ridge Village Center
Howard County, Maryland

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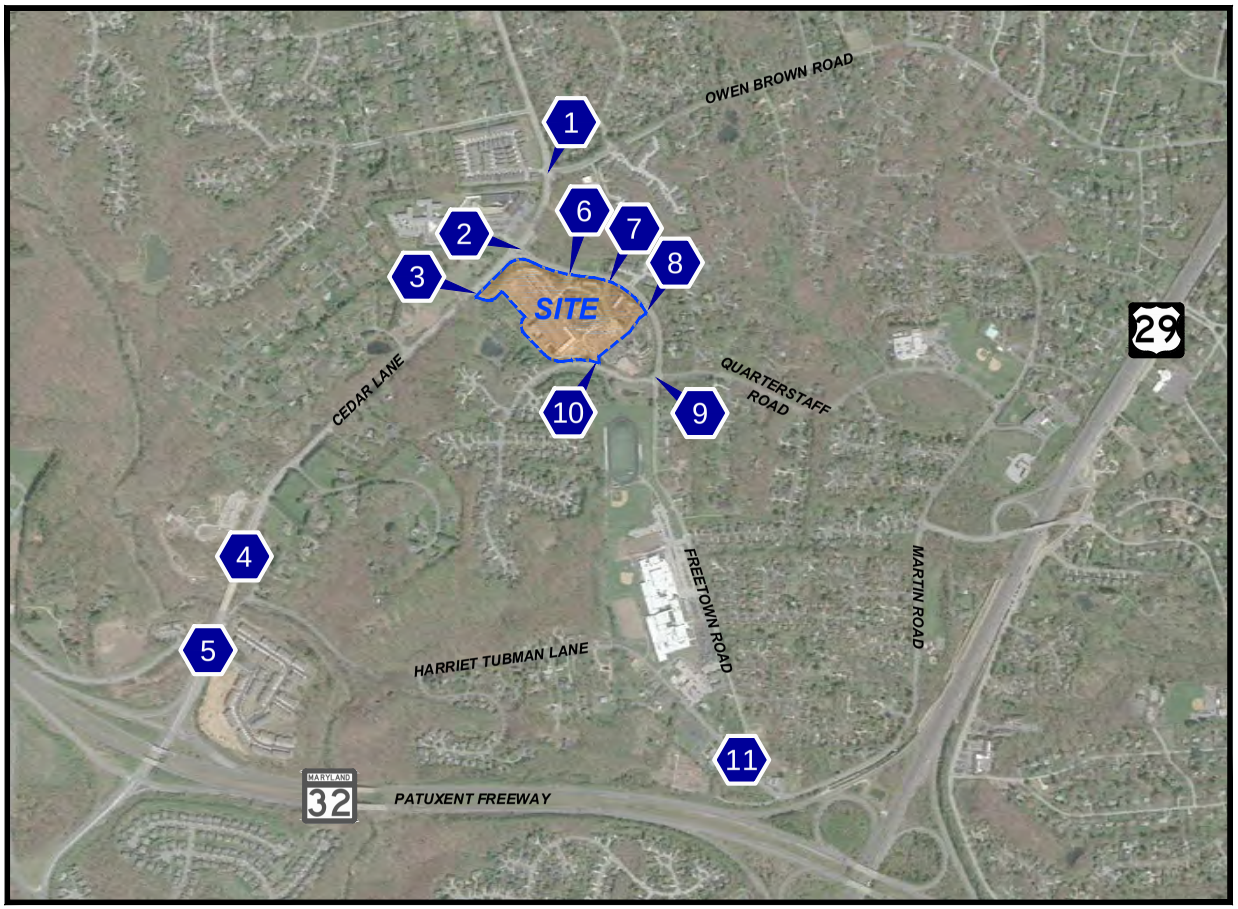

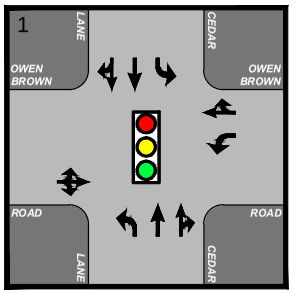

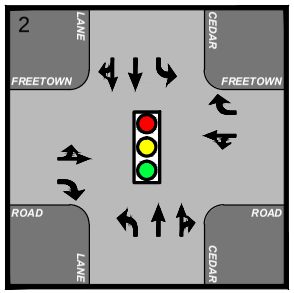

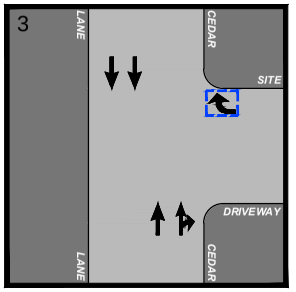

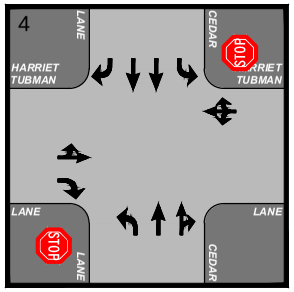

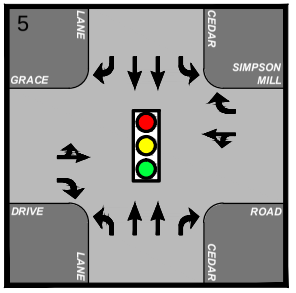

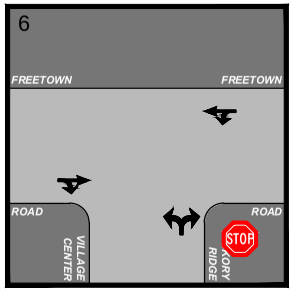

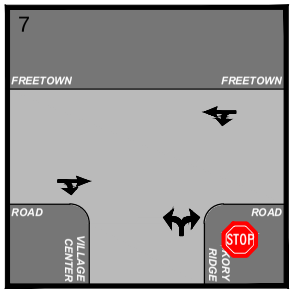

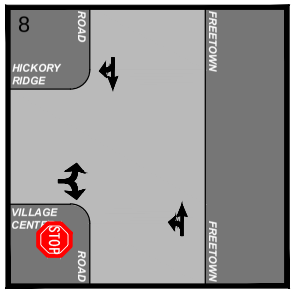

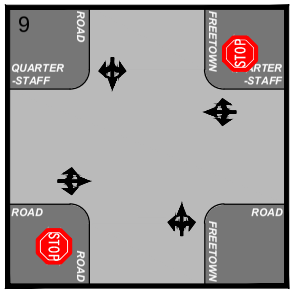

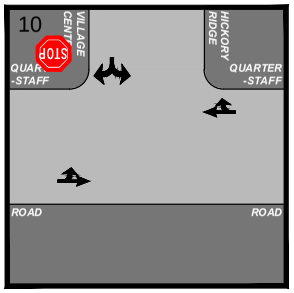

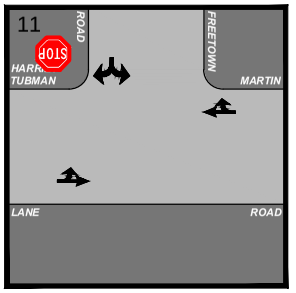

Figure 7-3
Future Lane Use and Traffic Controls
Hickory Ridge Village Center
Howard County, Maryland

Represents One Travel Lane
Signalized Intersection
Stop Sign
Planned Improvement

NORTH

Table 7-1
Hickory Ridge Village Center
Total Future Intersection Level of Service Summary [1]

	Control	Lane Group Approach	Existing Conditions (2016)						Background Conditions (2020)						Total Future Conditions (2020)					
			AM Peak Hour		PM Peak Hour		SAT Peak Hour		AM Peak Hour		PM Peak Hour		SAT Peak Hour		AM Peak Hour		PM Peak Hour		SAT Peak Hour	
			LOS	CLV/Delay	LOS	CLV/Delay	LOS	CLV/Delay	LOS	CLV/Delay	LOS	CLV/Delay	LOS	CLV/Delay	LOS	CLV/Delay	LOS	CLV/Delay	LOS	CLV/Delay
1. Cedar Lane/Owen Brown Road	Signalized	CLV	A	603	A	946	-	-	A	641	B	1039	-	-	A	651	B	1056	-	-
2. Cedar Lane/Freetown Road	Signalized	CLV	A	742	B	1148	-	-	A	796	C	1209	-	-	A	899	D	1314	-	-
3. Cedar Lane/Site Driveway	Unsignalized	NBTR	A	0.0	A	0.0	A	0.0	A	0.0	A	0.0	A	0.0	A	0.0	A	0.0	A	0.0
		SBT	A	0.0	A	0.0	A	0.0	A	0.0	A	0.0	A	0.0	A	0.0	A	0.0	A	0.0
		WBR	-	-	-	-			-	-	-	-	-	-	B	12.0	C	21.9	B	10.5
4. Cedar Lane/Harriet Tubman Lane	Unsignalized	NBL	B	10.4	A	8.9	-	-	B	10.6	A	9.9	-	-	B	10.8	A	9.3	-	-
		NBTR	A	0.0	A	0.0	-	-	A	0.0	A	0.0	-	-	A	0.0	A	0.0	-	-
		SBL	A	9.3	B	14.7	-	-	A	9.6	C	15.5	-	-	A	6.7	C	15.8	-	-
		SBT	A	0.0	A	0.0	-	-	A	0.0	A	0.0	-	-	A	0.0	A	0.0	-	-
		SBR	A	0.0	A	0.0	-	-	A	0.0	A	0.0	-	-	A	0.0	A	0.0	-	-
		WBLTR	C	23.5	F	158.4	-	-	D	27.2	F	276.2	-	-	D	29.3	F	301.7	-	-
		EBLTR	F	75.4	D	25.2	-	-	F	110.8	D	29.8	-	-	F	140.3	D	30.6	-	-
5. Cedar Lane/Grace Drive /Simpson Mill Road	Signalized	CLV	A	843	B	1044	-	-	A	948	B	1101	-	-	A	971	B	1111	-	-
6. Freetown Road/West Site Driveway	Unsignalized	NBLR	B	12.8	C	20.2	B	11.9	B	13.1	C	22.1	B	12.1	C	15.4	D	34.6	B	12.2
		EBTR	A	0.0	A	0.0	A	0.0	A	0.0	A	0.0	A	0.0	A	0.0	A	0.0	A	0.0
		WBLT	A	0.2	A	0.4	A	0.9	A	0.2	A	0.5	A	1.0	A	0.0	A	0.2	A	0.5
7. Freetown Road/Middle Site Driveway	Unsignalized	NBLR	B	12.1	B	13.5	B	10.3	B	12.4	B	13.9	B	10.4	B	12.8	B	15.1	B	10.3
		EBTR	A	0.0	A	0.0	A	0.0	A	0.0	A	0.0	A	0.0	A	0.0	A	0.0	A	0.0
		WBLT	A	0.4	A	0.5	A	1.6	A	0.3	A	0.5	A	1.6	A	0.5	A	1.2	A	2.3
8. Freetown Road/East Site Driveway	Unsignalized	WBLR	B	11.1	B	11.8	A	9.2	B	11.2	B	12.0	A	9.0	B	10.8	A	10.7	A	9.0
		NBLT	A	1.0	A	1.0	A	1.8	A	1.0	A	1.0	A	1.8	A	1.3	A	1.5	A	2.4
		SBTR	A	0.0	A	0.0	A	0.0	A	0.0	A	0.0	A	0.0	A	0.0	A	0.0	A	0.0
9. Freetown Road/Quarterstaff Road	Unsignalized	NBLTR	A	0.3	A	0.7	-	-	A	0.3	A	0.7	-	-	A	0.0	A	0.4	-	-
		SBLTR	A	1.6	A	3.7	-	-	A	1.6	A	3.7	-	-	A	2.0	A	3.9	-	-
		EBLTR	B	13.8	C	16.3	-	-	B	14.2	C	17.1	-	-	B	14.6	B	14.2	-	-
		WBLTR	B	13.5	B	14.1	-	-	B	13.8	B	14.6	-	-	B	13.7	B	14.4	-	-
10 Quarterstaff Road/Site Driveway	Unsignalized	SBLR	A	9.1	A	9.5	A	9.0	A	9.1	A	9.5	A	9.3	A	9.1	A	9.2	A	9.0
		SBLT	A	1.0	A	0.2	A	1.6	A	0.9	A	2.0	A	5.1	A	0.9	A	0.2	A	1.6
		NBTR	A	0.0	A	0.0	A	0.0	A	0.0	A	0.0	A	0.0	A	0.0	A	0.0	A	0.0
11. Freetown Road/Martin Road /Harriet Tubman Lane	Unsignalized	WBLR	C	15.0	B	11.5	-	-	C	15.7	B	11.7	-	-	C	15.6	B	11.7	-	-
		NBTR	A	0.0	A	0.0	-	-	A	0.0	A	0.0	-	-	A	0.0	A	0.0	-	-
		SBLT	A	5.9	A	4.1	-	-	A	5.9	A	4.1	-	-	A	5.9	A	4.1	-	-

Notes : 1. Capacity analysis based on Howard County Design Manual and the Highway Capacity Manual methodology, using PTV Vistro.

SECTION 8
PARKING DEMAND ANALYSIS

Overview

This section presents a parking demand study for the Hickory Ridge Village Center. It includes existing and proposed conditions.

Methodology

The parking demand study was prepared based on an assessment of current parking conditions and other data collected at similar facilities. Parking occupancy counts were collected at the site and adjusted to reflect design hour conditions through sales data provided by the owner. These results were then compared to other counts collected at similar locations and used to determine the appropriate number of parking spaces needed to serve the site.

In addition, a reduction in the residential parking supply is proposed. The proposed parking ratio is similar to others recently approved in the area and consistent with census data.

Site Information

The core area of the Hickory Ridge Village Center is currently occupied by a variety of retail and restaurant uses totaling 97,321 square feet (S.F.) that is nearly fully occupied and includes a Giant grocery store. The adjacent parcels were excluded from the analysis consistent with the traffic analyses. When complete, the building would include a total of 105,100 S.F. of space with a similar mix of retail and restaurant uses and 230 apartments.

A total of 789 parking spaces will be provided on-site that includes 421 surface spaces for retail uses at 4.0 per 1,000 S.F. and 368 structured spaces for the residential uses at 1.6 per dwelling unit. The 368 structured spaces will be dedicated for residents and residential visitors at all times.

Background Data

The currently approved site plan estimated the parking requirement based on a parking ratio of 5.0 spaces per 1,000 S.F. for the retail/restaurant uses. A modification to this rate is proposed on observed data at the existing shopping center augmented with empirical

data collected at similar facilities. In addition, a reduction in the residential parking rate is also proposed.

Data Collection

Parking occupancy counts were collected at the Hickory Ridge Village Center on Thursday, October 6, 2016 from 7:00 AM to 8:00 PM and on Saturday October 8, 2016 from 10:00 AM to 3:00 PM and were recorded at 60-minute intervals. The results are summarized on Table 8-1 and indicate that the peak hour 12:00 PM on both days. On Thursday, a total of 262 spaces were occupied, equating to a parking ratio of 2.69 spaces per 1,000 S.F. The peak hour on Saturday showed a parking occupancy of 217 spaces, reflecting a ratio of 2.23 spaces per 1,000 S.F. The detailed count information is contained in Appendix L.

Supplemental Data

The collected data was augmented with information previously collected by W+A at similar facilities in March 2013 and April 2016. Parking occupancy counts and data from Wilde Lake Village Center, Timonium Crossing, and the Kings Contrivance were also used since they are similar in size and nature to the Hickory Ridge Village Center. Details of these centers are contained in Appendix M.

Design Hour Parking Ratio

The parking occupancy counts from Hickory Ridge Village Center, Wilde Lake Village Center, Timonium Crossing, and Kings Contrivance were combined in order to identify the design hour parking demand ratio for the retail/restaurant uses. A summary of the parking counts is shown on Table 8-2.

Monthly variation in parking demand was determined for each location by utilizing monthly revenue provided by the owner. This data was used to identify the factor needed to project the design hour month from the month when the data was collected, and is shown on Table 8-3.

The monthly factor was applied to each of the study locations based on the existing count and monthly adjustment factor for both weekdays and weekends. As shown on Table 8-4, Hickory Ridge Village Center would have a maximum parking ratio of 2.89 spaces per 1,000 S.F. on weekdays and 2.39 spaces per 1,000 S.F. on weekends. Since this maximum demand represents parking occupancy, a 10 percent practical capacity factor was applied in order to project the design hour parking ratio. This factor accounts for fluctuations in parking demand and provides additional spaces for turnover and traffic circulation. The results

indicate that the forecasted design hour parking ratio would be 3.21 spaces per 1,000 S.F. on weekdays and 2.66 spaces on weekends for the Hickory Ridge Village Center.

The recommended ratio of 3,48 spaces per 1,000 S.F. for weekdays and 2.98 spaces per 1,000 S.F. for weekends was derived based on the average of each of the studied locations.

Applying the design hour ratio to the proposed Hickory Ridge Village Center would result in a minimum requirement of 366 spaces provided for retail and restaurant uses. Based on the proposed parking supply of 421 spaces, a surplus of 55 spaces, or 13 percent) would exist.

Table 8-1
Hickory Ridge Village Center
Hickory Ridge Village Center Existing Parking Occupancy Summary [(1)]

	Hickory Ridge Village Center					
	Parking Supply = 489 spaces Occupied SF = 97,321 S.F. (GLA)					
	Thursday, October 6, 2016			Saturday, October 8, 2016		
Hour	Parking Occupancy	Rate per Occ. S.F.	Observed Percent Occupied	Parking Occupancy	Rate per Occ. S.F.	Observed Percent Occupied
5:00 AM						
6:00 AM	16	0.16	3%			
7:00 AM	33	0.34	7%			
8:00 AM	53	0.54	11%			
9:00 AM	78	0.80	16%			
10:00 AM	120	1.23	25%	112	1.15	23%
11:00 AM	190	1.95	39%	173	1.78	35%
12:00 PM	**262**	**2.69**	**54%**	**217**	**2.23**	**44%**
1:00 PM	256	2.63	52%	208	2.14	43%
2:00 PM	194	1.99	40%	182	1.87	37%
3:00 PM	197	2.02	40%	179	1.84	37%
4:00 PM	210	2.16	43%			
5:00 PM	220	2.26	45%			
6:00 PM	227	2.33	46%			
7:00 PM	209	2.15	43%			
8:00 PM						
9:00 PM						
10:00 PM						
11:00 PM						
Maximum	**262**	**2.69**	**12:00 PM**	**217**	**2.23**	**12:00 PM**

Notes: (1) Based on counts collected by W+A on October 6 and 8, 2016.

Table 8-2
Hickory Ridge Village Center
Existing Parking Occupancy Summary for Similar Sites [1]

	Hickory Ridge Village Center Parking Supply = 489 spaces Total SF = 97,321 S.F. (GLA)				**Wilde Lake Villlage Center** Parking Supply = 253 spaces Occupied SF = [2] 56,150 S.F. (GLA)				**Timonium Crossing** [3] Parking Supply = 259 spaces Occupied SF = [2] 51,836 S.F. (GLA)				**Kings Contrivance** Parking Supply = 521 spaces Total SF = 119,117 S.F. (GLA)			
	Thursday October 6, 2016		Saturday, October 8, 2016		Thursday, April 7, 2016		Saturday, April 9, 2016		Thursday, March 14 , 2013		Saturday, March 16 , 2013		Thursday, March 14 , 2013		Saturday, March 16 , 2013	
Hour	Parking Occupancy	Rate per Occ. S.F.	Parking Occupancy	Rate per Occ. S.F.	Parking Occupancy	Rate per Occ. S.F.	Parking Occupancy	Rate per Occ. S.F.	Parking Occupancy	Rate per Occ. S.F.	Parking Occupancy	Rate per Occ. S.F.	Parking Occupancy	Rate per S.F.	Parking Occupancy	Rate per S.F.
5:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7:00 AM	16	0.16	-	-	60	1.07	-	-	21	0.41	-	-	47	0.39	-	-
8:00 AM	33	0.34	-	-	96	1.71	-	-	57	1.10	-	-	81	0.68	-	-
9:00 AM	53	0.54	-	-	128	2.28	133	2.37	85	1.64	63	1.22	151	1.27	131	1.10
10:00 AM	78	0.80	112	1.15	150	2.67	151	2.69	128	2.47	95	1.83	195	1.64	166	1.39
11:00 AM	120	1.23	173	1.78	146	2.60	124	2.21	135	2.60	95	1.83	241	2.02	211	1.77
12:00 PM	190	1.95	**217**	**2.23**	171	3.05	137	2.44	121	2.33	103	1.99	312	2.62	248	2.08
1:00 PM	**262**	**2.69**	208	2.14	165	2.94	96	1.71	127	2.45	93	1.79	**324**	**2.72**	194	1.63
2:00 PM	256	2.63	182	1.87	162	2.89	116	2.07	**137**	**2.64**	**103**	**1.99**	277	2.33	**254**	**2.13**
3:00 PM	194	1.99	179	1.84	160	2.85	126	2.24	136	2.62	95	1.83	263	2.21	234	1.96
4:00 PM	197	2.02	-	-	144	2.56	131	2.33	121	2.33	84	1.62	257	2.16	232	1.95
5:00 PM	210	2.16	-	-	125	2.23	121	2.15	106	2.04	57	1.10	254	2.13	232	1.95
6:00 PM	220	2.26	-	-	126	2.24	130	2.32	115	2.22	44	0.85	273	2.29	215	1.80
7:00 PM	227	2.33	-	-	**174**	**3.10**	171	3.05	97	1.87	31	0.60	304	2.55	206	1.73
8:00 PM	209	2.15	-	-	131	2.33	**178**	**3.17**	60	1.16	-	-	250	2.10	-	-
9:00 PM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10:00 PM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11:00 PM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Maximum	**262**	**2.69**	**217**	**2.23**	**174**	**3.10**	**178**	**3.17**	**137**	**2.64**	**103**	**1.99**	**324**	**2.72**	**254**	**2.13**

Notes: (1) Based on counts collected by W+A on in 2013 and 2016.
(2) Occupied SF used since a portion of the site was under construction when the counts were collected.
(3) Occupied SF used since 15 percent of office space (7,963 S.F.) is currently vacant.

Table 8-3
Hickory Ridge Village Center
Seasonal Variation in Parking Demand [1]

	Unadjusted Distributions Development			Monthly Adjustment Factors for March Counts		Monthly Adjustment Factors for April Counts				Monthly Adjustment Factor for October Counts
Month	Hickory Ridge	Timonium	Kings Contrivance	Timonium	Kings Contrivance	Hickory Ridge	Timonium	Kings Contrivance	Average (Wilde Lake)	Hickory Ridge
January	93%	64%	89%	0.77	0.93	1.02	0.85	0.98	0.95	1.00
February	90%	88%	90%	1.05	0.93	1.00	1.16	0.99	1.05	0.97
March	91%	84%	96%	**1.00**	**1.00**	1.01	1.11	1.06	1.06	0.98
April	91%	76%	91%	0.90	0.95	**1.00**	**1.00**	**1.00**	**1.00**	0.97
May	95%	84%	92%	1.00	0.96	1.05	1.11	1.01	1.06	1.02
June	93%	68%	94%	0.81	0.97	1.03	0.90	1.03	0.98	1.00
July	89%	48%	89%	0.58	0.92	0.98	0.64	0.97	0.86	0.95
August	89%	58%	89%	0.70	0.92	0.98	0.77	0.97	0.91	0.95
September	89%	84%	87%	1.00	0.91	0.98	1.11	0.96	1.01	0.96
October	93%	65%	84%	0.78	0.87	1.03	0.87	0.92	0.94	**1.00**
November	92%	69%	89%	0.82	0.93	1.01	0.91	0.98	0.97	0.98
December	100%	100%	100%	1.20	1.04	1.10	1.32	1.10	1.17	1.07

Notes: (1) Based on datÁ ÔÁÏÁÔ provided by Kimco Realty Corporation.

Table 8-4
Hickory Ridge Village Center
Forecasted Parking Requirements for Commercial Uses

Development	Max. Existing Parking Occupancy [1] (Spaces per 1,000 S.F.) Weekday	Saturday	Monthly Adjustment Factor for Peak Month Weekday/Saturday	Based on Revenue Information [3] Max Parking Ratio (Spaces per 1,000 S.F.) Weekday	Saturday	Design Hour Parking Ratio [4] (Spaces per 1,000 S.F.) Weekday	Saturday
Hickory Ridge Village Center	2.69	2.23	1.07	2.89	2.39	3.21	2.66
Wilde Lake Village Center [2]	3.10	3.17	1.17	3.64	3.72	4.04	4.13
Timonium Crossing	2.64	1.99	1.20	3.16	2.38	3.51	2.64
Kings Contrivance	2.72	2.13	1.04	2.83	2.22	3.14	2.47
Averages	**2.79**	**2.38**		**3.13**	**2.68**	**3.48**	**2.98**

Hickory Ridge Village Center - Retail Parking Summary

Retail/Restaurant Space	105,100	S.F.
Proposed Parking Ratio	3.48	spaces/1,000 S.F.
Recommended Parking Supply	366	spaces
Parking Provided	421	spaces
Difference	55	spaces
Percent Difference	13%	

Notes: 1. Based on Counts by Wells + Associates.
2. Excludes CVS and construction traffic.
3. Revenue info provided by Kimco Realty Corporation.
4. Reflects 10 percent design hour adjustment.

Residential Parking

Based on the Howard County Zoning Ordinance, a parking ratio of 2.30 spaces per unit would be required to serve the residential portion of the site. This would result in a parking requirement of 529 spaces. The site is proposed to utilize a parking ratio of 1.60 spaces per unit that would result in a total requirement of 368 spaces. Thus, a request to reduce residential parking ratio by 161 spaces, or 30 percent is requested, as shown on Table 8-5.

In order to determine if the proposed parking ratio is adequate, a review of the census data in the surrounding area was made. As shown on Table 8-6, a total of 17 census tracts were evaluated, and indicate that the average auto ownership is 1.39 spaces per unit for renter owned units. This ratio is slightly higher within the tract that includes the Hickory Ridge Village Center that reflects a rate of 1.48 vehicles per rental unit. In addition, the proposed rate is similar to that recently approved for the Wilde Lake Village Center that provides 1.51 spaces per unit.

Based on the census data and the recently approved project, the proposed parking ratio of 1.60 spaces per unit would adequately serve both resident and visitor demand. While most visitors would be accommodated within the garage, any overflow demand could utilize the retail parking that would have excess parking during the evening hours.

A summary of the parking analysis for both the retail and residential portions of the site is shown on Table 8-7.

Table 8-5
Hickory Ridge Village Center
US Census Tract Data Summary [1]

Census Tract	Renter Occupied Households	No vehicle available	1 vehicle available	2 vehicles available	3 vehicles available	4 vehicles available	5 or more vehicles available	Average Ratio
Census Tract 6023.02, Howard County, Maryland	737	21	317	329	0	54	16	1.72
Census Tract 6054.01, Howard County, Maryland	1,360	65	853	402	40	0	0	1.31
Census Tract 6054.02, Howard County, Maryland	1,921	312	900	544	165	0	0	1.29
Census Tract 6055.02, Howard County, Maryland	721	29	479	196	17	0	0	1.28
Census Tract 6055.03, Howard County, Maryland	997	116	488	335	0	58	0	1.39
Census Tract 6055.05, Howard County, Maryland	251	16	84	125	26	0	0	1.64
Census Tract 6056.01, Howard County, Maryland	1,305	158	691	371	85	0	0	1.29
Census Tract 6056.02, Howard County, Maryland [2]	768	118	355	164	73	58	0	1.48
Census Tract 6066.01, Howard County, Maryland	94	16	41	0	37	0	0	1.62
Census Tract 6066.03, Howard County, Maryland	1,207	179	560	370	98	0	0	1.32
Census Tract 6066.04, Howard County, Maryland	362	43	153	114	52	0	0	1.48
Census Tract 6066.06, Howard County, Maryland	1,112	43	721	348	0	0	0	1.27
Census Tract 6066.07, Howard County, Maryland	196	57	72	54	13	0	0	1.12
Census Tract 6067.04, Howard County, Maryland	693	180	294	171	13	13	22	1.21
Census Tract 6067.06, Howard County, Maryland	201	51	95	42	0	0	13	1.21
Census Tract 6067.07, Howard County, Maryland	517	30	225	216	46	0	0	1.54
Census Tract 6068.04, Howard County, Maryland	425	53	156	211	5	0	0	1.40
Average	**757**	**87**	**381**	**235**	**39**	**11**	**3**	**1.39**

Notes: (1) Source: 2009-2013 American Community Survey 5-Year Estimates.
(2) Site location tract.

Table 8-6
Hickory Ridge Village Center
Residential Parking Summary

Number of Units	230	D.U.
Parking Ratio [1]:	2.30	spaces/DU
Total Parking Required	529	spaces
Proposed Parking Ratio [2]:	1.60	spaces/DU
Parking Required	368	spaces
Difference	161	spaces
Percent Difference	30%	

Notes: 1. Based Section 133 of the Howard County Zoning Ordinance.
2. Based on Censis data and similar projects.

Table 8-7
Hickory Ridge Village Center
Parking Demand Analysis Summary

Retail/Restaurant (Core Area)	105,100	S.F.
Design Hour Parking Ratio [1]	3.48	spaces/1,000 S.F.
Parking Required	366	spaces
Parking Provided	421	spaces
Difference	55	spaces
Percent Difference	13%	
Residential	230	D.U.
Proposed Parking Ratio [2]	1.60	spaces/unit
Parking Required	368	spaces
Overall Site Totals		
Total Parking Required	734	spaces
Total Parking Provided	789	spaces
Difference	55	spaces

Notes: 1. Based on parking demand study.
2. Reflects proposed reduction.

Section 9
CONCLUSIONS AND RECOMMENDATIONS

The following summarizes the results of this traffic impact study:

1. The proposed Hickory Ridge Village Center would renovate and expand the existing core area of the shopping center (97,321 S.F.) by approximately 7,779 S.F. to a total of 105,100 S.F. and construct 230 residential apartments. The site renovations were was assumed to be complete by 2020. These modifications would create a more mixed-use setting that would promote internal trips and encourage more trips made by walking and biking from the surrounding community.

2. All of the existing intersections surrounding the site currently operate within acceptable capacity thresholds during both the weekday AM and PM peak hours, with the exception of the side-street movements at the Cedar Lane/Harriet Tubman Lane intersection. The eastbound and westbound side-street approaches operate beyond capacity (at LOS "F") during the AM peak hour (eastbound approach) and the PM peak hour (westbound approach. All of the movements at the site driveways operate at acceptable levels during the weekday and Saturday peak hours.

3. The proposed changes are anticipated to add 133 net new AM peak hour trips, 82 net new PM peak hour trips, and 43 peak hour trips on Saturday to the road network subsequent to the redevelopment.

4. The results of the future capacity analyses indicate that all of the study intersections would continue to operate within acceptable thresholds during both the AM and PM peak hours, with the exception of the side-street approaches of the Cedar Lane/Harriet Tubman Lane intersection. While these side-street maneuvers would experience peak hour delays, warrants for signalization would not be met at this location.

5. All of site driveways would continue to operate at acceptable levels of service during the weekday and Saturday peak hours under stop sign control, without additional roadway improvements or traffic mitigation. This includes the proposed conversion of the existing right-in only driveway on Cedar Lane to allow right-in/right-out maneuvers.

6. As the plan progresses through the development stages, the Applicant will coordinate with Howard County in order to continue to encourage transit use (by maintaining the existing transit stops) and enhance or improve access from the surrounding communities by walking and bicycle.

7. The results of the parking analyses indicate that the proposed parking ratio of 4.0 spaces per 1,000 S.F. would adequately accommodate the anticipated retail and restaurant uses with the site redevelopment. This ratio is based on the existing site

activity and observed data collected at other similar centers. Based on the analysis, the retail uses would require a minimum of 366 parking spaces for retail and restaurant uses. Based on the proposed parking supply of 421 spaces, a surplus of 55 spaces, or 13 percent) would exist.

8. The proposed reduction in the residential parking ratio to 1.60 spaces per unit (368 spaces) would adequately serve both residents and visitors of the 230-unit apartments. This is based on a review of census data in the area that indicated an average auto ownership rate of 1.39 vehicles per unit and is consistent with the parking ratio recently approved for the Wilde Lake Village Center of 1.51 spaces per unit.