Revised Wallbrook Development Traffic Impact Analysis

August 11, 2020

Prepared for:

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Sign-off Sheet

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8/11/2020

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Executive Summary

Wallbrook is a proposed mixed-use development project located along US 401 Business (S. Main Street) in Rolesville, NC. In general, the site encompasses areas along both sides of US 401 Business, between Burlington Mills Road and Hampton Lake Drive/Jonesville Road. This report is a revision of the previous *Wallbrook Development Traffic Impact Analysis* report submitted in February 2020. Some of the land uses and densities from the previous study have been moved onto a new parcel known in this report as the West Site.

It is anticipated that the residential homes to the east of US 401 Business will be the first to develop. The remainder of the site, expected to be completed in 2025, consists of the North Site (West of US 401 Business), the East Site (east of US 401 Business across from Burlington Mills Road), the South Site (east of 401 Business and north of Jonesville Road), and the West Site (west of US 401 Business north of Hampton Lake Dr / Jonesville Rd). The residential parcel of the East Site is anticipated to be completed in 2021. The sites will provide a mix of uses as follows:

<u>North Site</u>

- Medical-Dental Office Building – 60,000 square feet
- Fast-Food Restaurant – 4,500 square feet

<u>South Site</u>

- Shopping Center – 71,400 square feet
- Supermarket – 50,000 square feet
- High-Turnover, Sit-Down Restaurant – 7,500 square feet
- Bank – 4,000 square feet

<u>East Site</u>

- Townhomes – 170 units
- Office Building – 20,000 square feet
- Retail – 18,000 square feet

<u>West Site</u>

- Office Building – 27,000 square feet
- Fast-Food Restaurant – 5,000 square feet
- Gas Station – 16 fuel positions

At full build-out, the development project is anticipated to generate 23,434 new trips per average weekday. In the AM and PM peak hours, the combined redevelopment will generate approximately 885 AM peak hour trips (566 entering and 319 exiting) and 1,161 PM peak hour trips (501 entering and 660 exiting).

Thirteen (13) access points are proposed for the development. Access points A, B, C, D, K, L, and M will connect to US 401 Business, access points E, F, G, H, and I will be connected to realigned Burlington Mills Road, and access point J will be connected Old Burlington Mills Rd. These access points are shown on the site plan in Figure ES-1.

As previously mentioned, this study investigates and evaluates the revised build and build with improvements in terms of projected vehicular traffic conditions, evaluate the ability of the adjacent roadways and multimodal facilities to accommodate the additional traffic, and to recommend transportation improvements needed to mitigate congestion that may result from additional site traffic. This report presents trip generation, trip distribution, traffic analyses, and recommendations for improvements needed to meet anticipated traffic demands. This report examines the following scenarios for the AM and PM peak hours:

- Existing (2019)
- Future Year (2025) No-Build
- Future Year (2025) Build
- Future Year (2025) Build with Improvements

Capacity analyses for the AM and PM peak hours in each scenario were performed for the following intersections:

- US 401 Business at US 401
- US 401 Business at Hampton Lake Drive / Jonesville Road
- US 401 Business at Burlington Mills Road Realigned
- US 401 Business at Burlington Mills Road
- US 401 Business at Rogers Road / Redford Place
- Jonesville Road at Vineyard Pine Lane
- Burlington Mills Road at Old Burlington Mills Road
- US 401 Business at Access A
- US 401 Business at Access B / Access K
- US 401 Business at Access L
- US 401 Business at Access C
- US 401 Business at Access D
- US 401 Business at Access M
- Burlington Mills Road at Access E
- Burlington Mills Road at Access F
- Burlington Mills Road at Access G
- Burlington Mills Road / Virginia Water Drive at Access H
- Burlington Mills Road Realigned at Access I
- Old Burlington Mills Road at Barrington Hall
- Old Burlington Mills Road at Access J

Table ES-1 shows a summary of the delays and levels of service for the study area intersections.

The study shows that the traffic generated by the proposed Wallbrook Development will have a minimal impact on surrounding roadways and intersections with the recommended improvements included to mitigate the site traffic. The signalized intersections operate at an overall LOS of D or better during both peak hours. Approaches for the unsignalized intersections operate at LOS D or better except for the eastbound approach at US 401 Business and Old Burlington Mills Road which operates at LOS E in the AM peak hour.

Figure ES-1: Site Plan

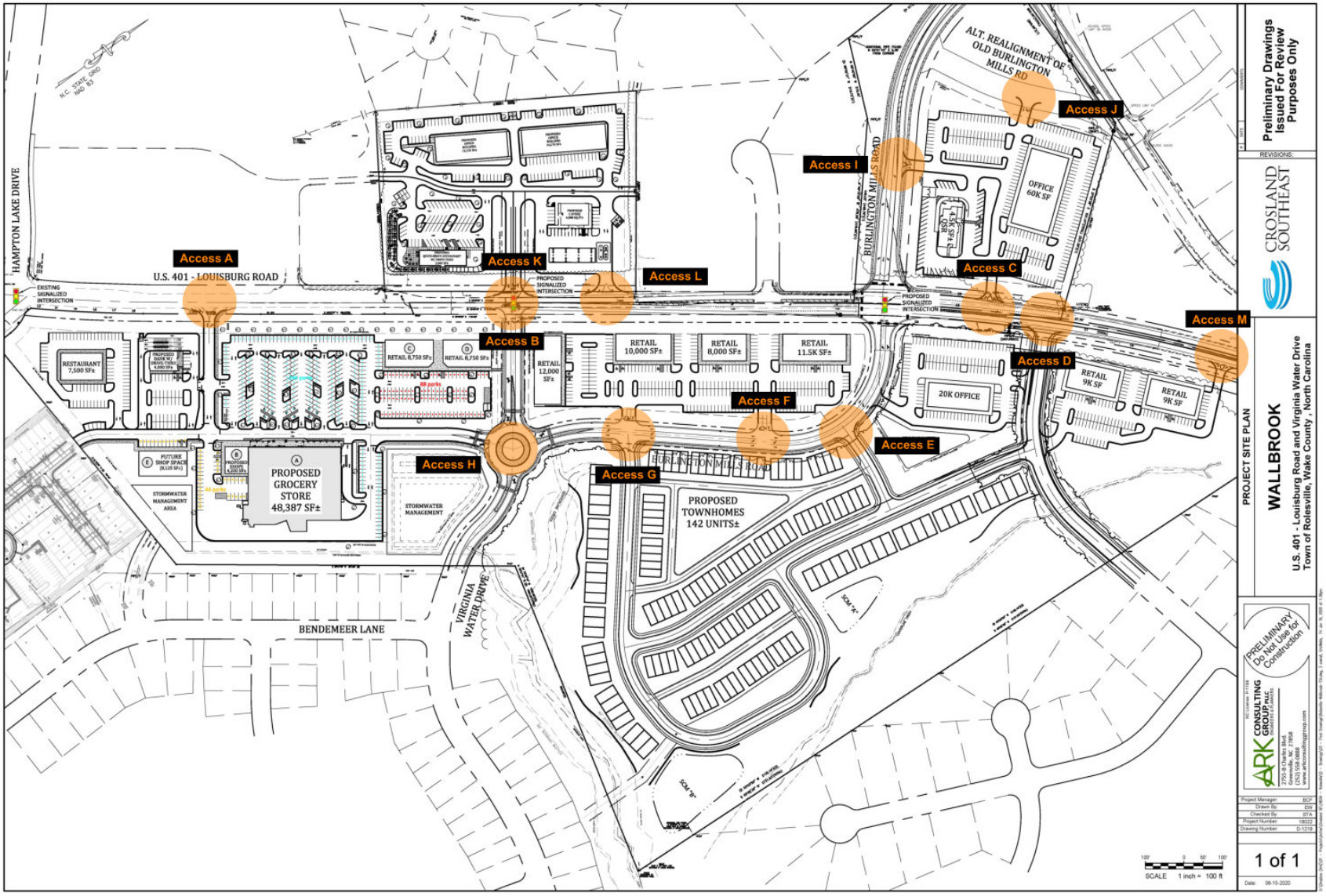


Table ES-1: Level of Service & Delay Summary

Intersection	Intersection Control	Peak Hour	2019 Existing	2025 No-Build	2025 Build	2025 Build Improved
US 401 Business at US 401	Signalized	AM	B (12.7)	C (24.6)	D (37.2)	D (37.2)
		PM	B (12.7)	B (14.3)	B (16.3)	B (16.0)
US 401 Business at Hampton Lake Dr / Jonesville Rd	Signalized	AM	C (25.7)	C (20.5)	C (34.3)	C (34.2)
		PM	C (21.6)	C (25.7)	C (32.3)	C (33.0)
Jonesville Rd at Vineyard Pine Ln	Unsignalized	AM	B (10.2)	B (11.0)	B (11.5)	B (11.5)
		PM	A (9.6)	B (10.2)	B (10.8)	B (10.8)
US 401 Business at Access A	Unsignalized	AM	-	-	D (27.3)	D (27.0)
		PM	-	-	E (45.7)	D (28.0)
US 401 Business at Access B / Access K	Signalized	AM	-	-	C (21.2)	B (20.0)
		PM	-	-	D (53.7)	D (47.1)
Virginia Water Dr at Access H	Unsignalized	AM	-	-	A (8.2)	A (4.0)
		PM	-	-	B (10.2)	A (5.1)
US 401 Business at Access L	Unsignalized	AM	-	-	B (10.2)	B (10.2)
		PM	-	-	B (10.0)	B (10.0)
Burlington Mills Rd at Access G	Unsignalized	AM	-	-	B (10.2)	B (10.2)
		PM	-	-	B (10.6)	B (10.6)
Burlington Mills Rd at Access F	Unsignalized	AM	-	-	A (9.5)	A (9.5)
		PM	-	-	A (9.9)	A (9.9)
Burlington Mills Rd at Access E	Unsignalized	AM	-	-	A (9.5)	A (9.5)
		PM	-	-	A (9.9)	A (9.9)
US 401 Business at Burlington Mills Rd Realigned	Signalized	AM	-	D (38.0)	E (65.4)	D (47.8)
		PM	-	B (18.5)	C (30.9)	C (27.9)
Burlington Mills Rd Realigned at Access I	Unsignalized	AM	-	-	B (10.3)	A (9.1)
		PM	-	-	A (9.3)	A (8.7)
US 401 Business at Access C	Unsignalized	AM	-	-	C (20.1)	B (13.0)
		PM	-	-	C (18.5)	B (12.5)
US 401 Business at Access D	Unsignalized	AM	-	-	C (15.0)	C (15.0)
		PM	-	-	D (27.6)	D (27.6)
US 401 Business at Access M	Unsignalized	AM	-	-	C (15.5)	C (15.5)
		PM	-	-	D (27.4)	D (27.4)
US 401 Business at Burlington Mills Rd (Existing) / Old Burlington Mills Rd (No-Build / Build)	Signalized (Existing), TWSC (No-Build/Build)	AM	B (13.7)	C (20.6)	E (40.4)	E (40.4)
		PM	B (10.5)	B (13.6)	C (20.1)	C (20.1)
Burlington Mills Rd at Barrington Hall Dr	Unsignalized	AM	C (15.2)	B (12.1)	B (12.0)	B (12.0)
		PM	B (10.3)	A (9.7)	A (9.8)	A (9.8)
Old Burlington Mills Rd at Access J	Unsignalized	AM	-	-	C (20.1)	B (13.5)
		PM	-	-	C (18.5)	B (11.4)
Burlington Mills Rd at Old Burlington Mills Rd	Unsignalized	AM	-	B (14.0)	D (32.8)	C (15.7)
		PM	-	A (9.6)	C (15.8)	B (12.3)
US 401 Business at Rogers Rd / Redford Pl	Signalized	AM	C (25.1)	C (30.1)	C (34.6)	C (34.8)
		PM	C (23.4)	C (26.0)	C (32.8)	C (32.4)

Based on the findings of this study, specific improvements have been identified and are recommended to be completed as part of the proposed development. These improvements are listed below.

RECOMMENDATIONS

Except where noted, all intersections are recommended to operate under two-way stop control (TWSC), with the site accesses serving as the minor movement(s).

US 401 Business at Access A

Construct Access A as a limited-movement intersection onto US 401 Business restricting southbound and westbound lefts. Construct a northbound right-turn lane with 100 feet of full-width storage.

US 401 Business at Access B/Access K

Construct Access B and Access K as a full-movement signalized intersection onto US 401 Business with an exclusive northbound left-turn lane with 175 feet of storage and appropriate taper, and a northbound right-turn lane with 125 feet of full-width storage and appropriate taper. Construct an exclusive southbound left-turn lane with 350 feet of full-width storage and appropriate taper on US 401 Business. Construct eastbound egress with an exclusive left-turn lane with 225 feet of storage and appropriate taper. Construct westbound egress with an exclusive left-turn lane with full storage and an exclusive shared through & right-turn lane with 100 feet of full-width storage.

US 401 Business at Access L

Construct Access L as a limited-movement intersection onto US 401 Business restricting northbound and eastbound lefts.

US 401 Business at Access C

Construct Access C as a limited-movement intersection on to US 401 Business restricting northbound and eastbound left-turns.

US 401 Business at Access D

Construct Access D as a limited-movement intersection on to US 401 Business allowing all movements but a westbound left. Construct an exclusive southbound left-turn lane with 100 feet of full-width storage and appropriate taper.

US 401 Business at Access M

Construct Access M as a limited-movement intersection on to US 401 Business restricting southbound and westbound left-turns.

Burlington Mills Road at Access E

Construct Access E as a full-movement intersection on Burlington Mills Road.

Burlington Mills Road at Access F

Construct Access F as a full-movement intersection on Burlington Mills Road.

Burlington Mills Road at Access G

Construct Access G as a full-movement intersection on Burlington Mills Road.

Burlington Mills Road / Virginia Water Drive at Access H

Construct Access H as single-lane roundabout on Virginia Water Drive.

Burlington Mills Road at Access I

Construct Access I as a limited-movement intersection on to Burlington Mills Road restricting eastbound and southbound left-turns. Construct a westbound exclusive right-turn lane that is continuous from receiving the second northbound left-turn lane at US 401 Business and Burlington Mills Road.

Old Burlington Mills Road at Access J

Construct Access J as a full-movement intersection on Old Burlington Mills Road.

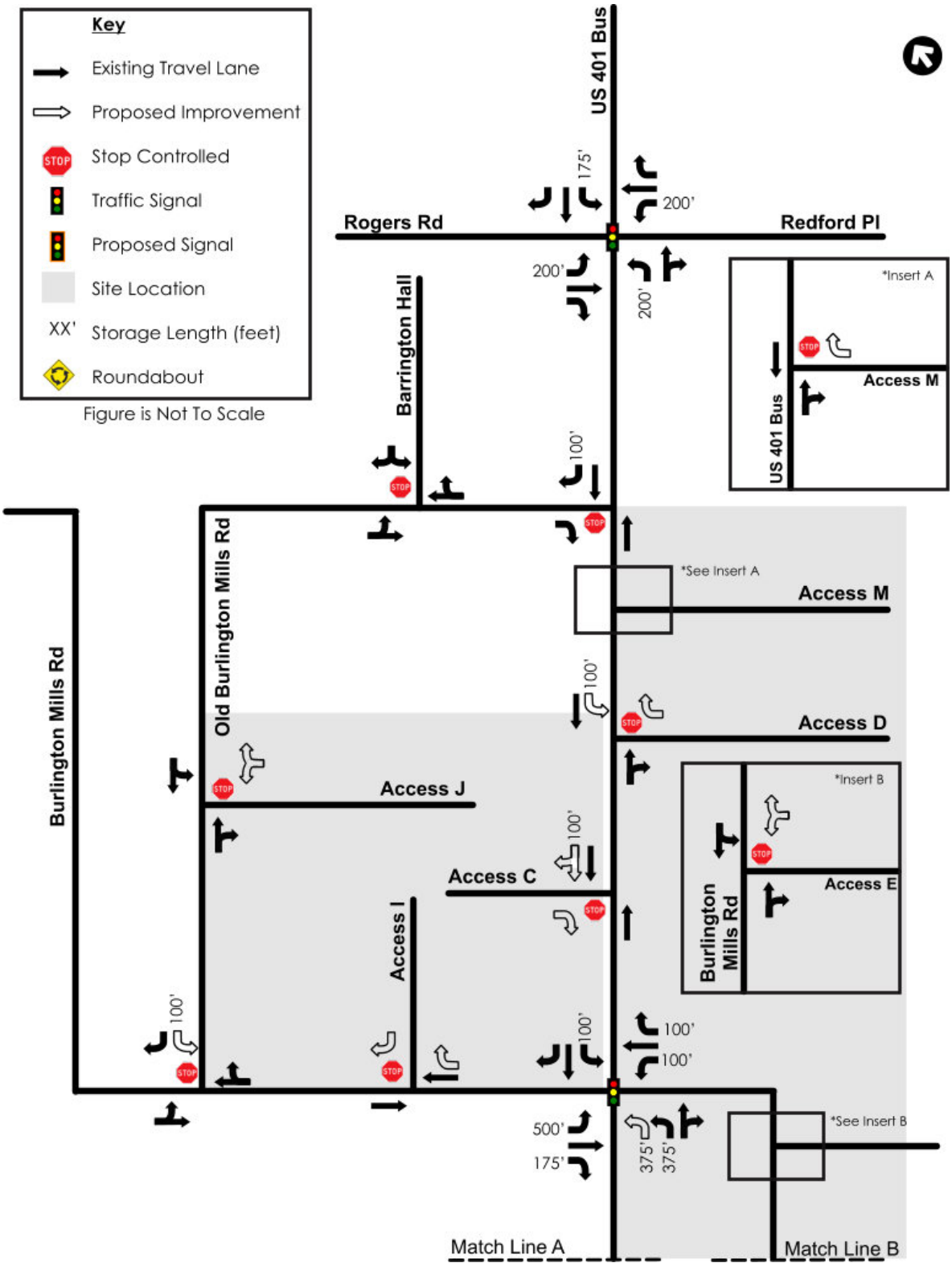
Burlington Mills Road at Old Burlington Mills Road

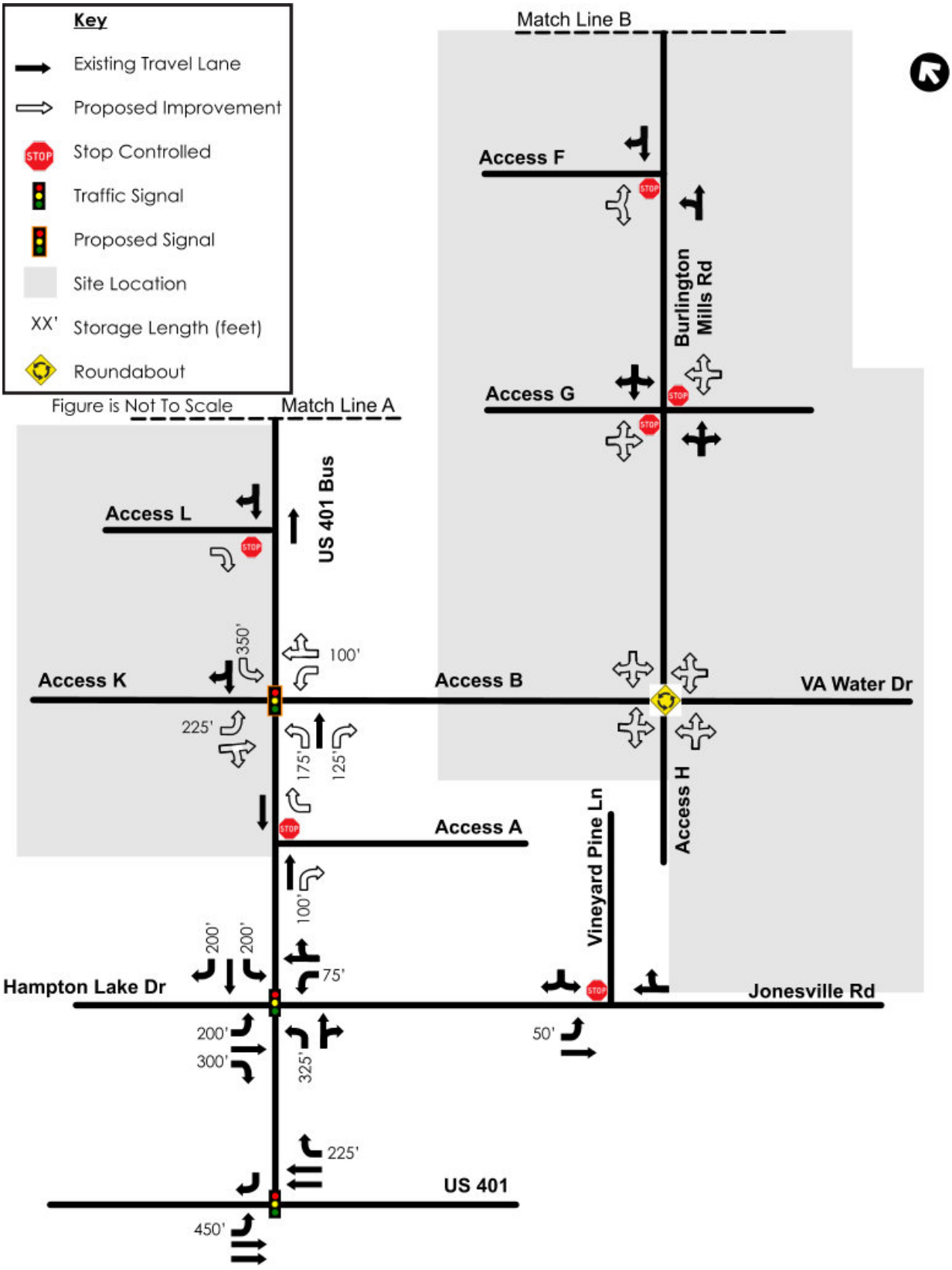
Construct an exclusive southbound left-turn lane with 100 feet of full-width storage and appropriate taper.

US 401 Business at Burlington Mills Road Realigned

Construct dual northbound exclusive left-turn lanes with 375 feet of full-width storage and appropriate taper. Construct an exclusive westbound left-turn lane and an exclusive westbound right-turn lane, both with 100 feet of full-width storage and appropriate taper. Construct an exclusive eastbound left-turn lane with 500 feet of full-width storage and appropriate taper and an exclusive eastbound right-turn lane with 175 feet of full-width storage and appropriate taper. Construct an exclusive southbound left-turn lane with 100 feet of full-width storage and appropriate taper and an exclusive southbound right-turn lane with at least 250 feet of full-width storage and appropriate taper. The southbound right-turn lane should start at least 100 feet prior to the US 401 Business at Access C intersection.

Figure ES-2: Recommended Improvements




Key
Existing Travel Lane
Proposed Improvement
Stop Controlled
Traffic Signal
Proposed Signal
Site Location
XX' Storage Length (feet)
Roundabout
Figure is Not To Scale
Match Line A
Match Line B
US 401 Bus
Burlington Mills Rd
Access F
Access G
Access L
Access K
Access B
Access A
Access H
VA Water Dr
Vineyard Pine Ln
Jonesville Rd
Hampton Lake Dr
US 401
350'
100'
225'
175'
125'
100'
200'
200'
75'
200'
300'
325'
50'
225'
450'

1.0 INTRODUCTION

The purpose of this report is to evaluate the traffic impacts of the proposed Wallbrook Development located in Rolesville, NC. This development is located along US 401 Business between Burlington Mills Road and Hampton Lake Drive / Jonesville Road. The development's location is shown in Figure 1. This report is a revision of the previous *Wallbrook Development Traffic Impact Analysis* report submitted in February 2020. Some of the land uses and densities from the previous study have been moved onto a new parcel known in this report as the West Site.

This site is bounded by Burlington Mills Road and Hampton Lake Drive / Jonesville Road. Currently, the 68.54-acre site consists of undeveloped forested land. Construction of the site is anticipated to be completed in 2025; therefore, the analysis year will be 2025. At full build-out the site is envisioned to provide the following land uses and densities:

- 170 townhomes.
- 60,000 square feet of medical-dental offices.
- 50,000 square feet of grocery store.
- 17,000 square feet of restaurants.
- 4,000 square feet of a bank.
- 16 fuel position gas station.
- 89,400 square feet of retail.
- 47,000 square feet of office.

The proposed development is to be bisected by public roadways (US 401 Business, Burlington Mills Road) resulting in North, South, East, and West sites comprising the full site.

The North site consists of 60,000 square feet of medical-dental office, and a 4,500 square foot restaurant located west of US 401 Business between Old Burlington Mills Road and Realigned Burlington Mills Road. The South site consists of 71,400 square feet of retail space, a 50,000 square foot grocery store, a 4,000 square foot bank, and a 7,500-foot restaurant, bordered by US 401 Business to the west and Burlington Mills Road to the north and east. The East site consists of 170 townhomes, 20,000 square feet of office space, and 18,000 square feet of retail space in the area bounded by US 401 Business and Burlington Mills Road. The West site consists of 27,000 square feet of office space, a 5,000 square foot fast food restaurant, and a 16-fuel position gas station.

Figure 2 shows the conceptual site plan prepared by ARK Consulting, with 13 access points shown.

The purpose of this report is to evaluate the development in terms of projected vehicular traffic conditions, evaluate the ability of the adjacent roadways to accommodate the additional traffic, and to recommend transportation improvements needed to mitigate congestion that may result from additional site traffic. This report presents trip generation, trip distribution, traffic analyses, and recommendations for improvements needed to meet anticipated traffic demands. The analysis examines the AM and PM peak hours for the 2019 Existing, 2025 No-Build, 2025 Build, and 2025 Build with Improvements.

Figure 1: Site Location and Study Area Map

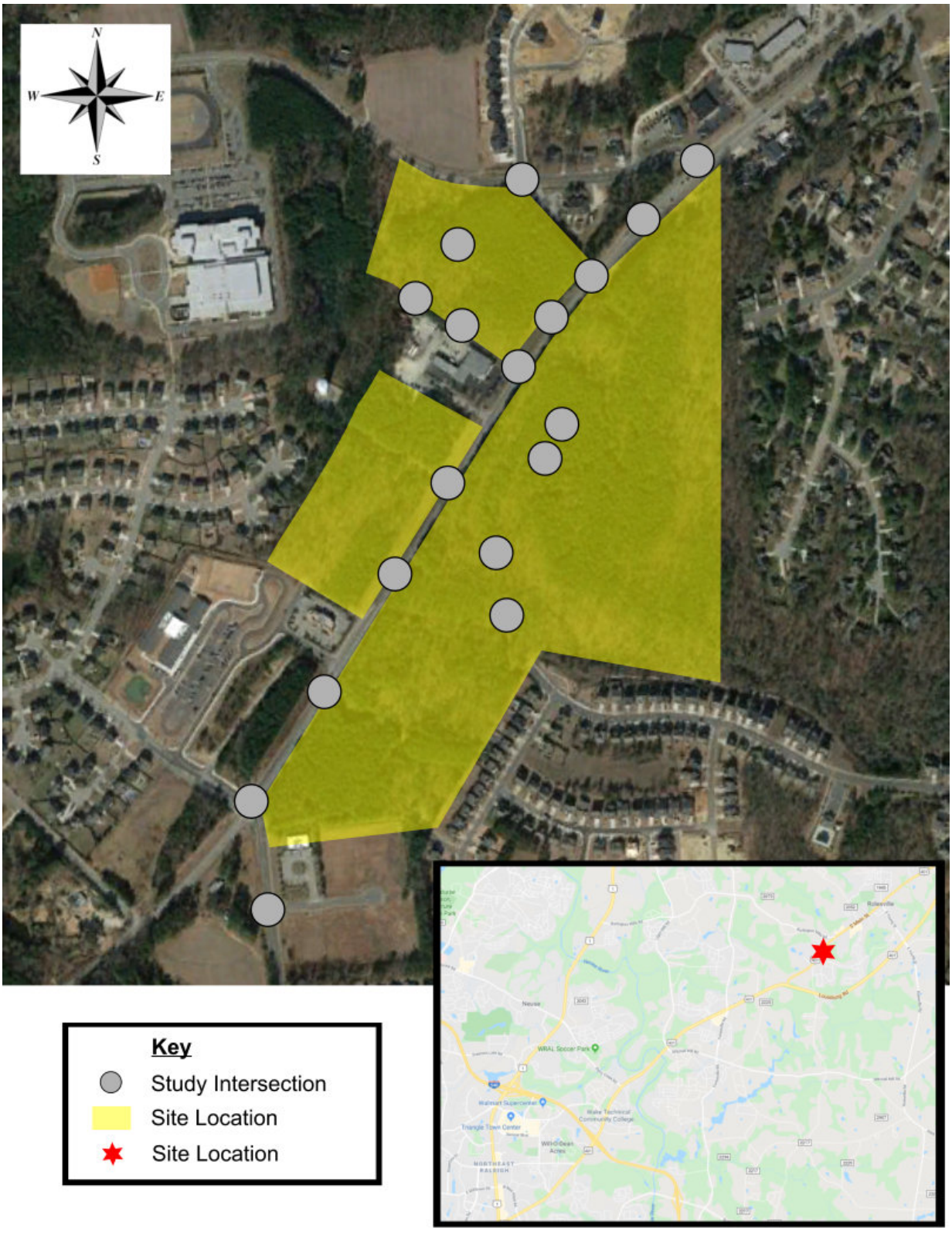
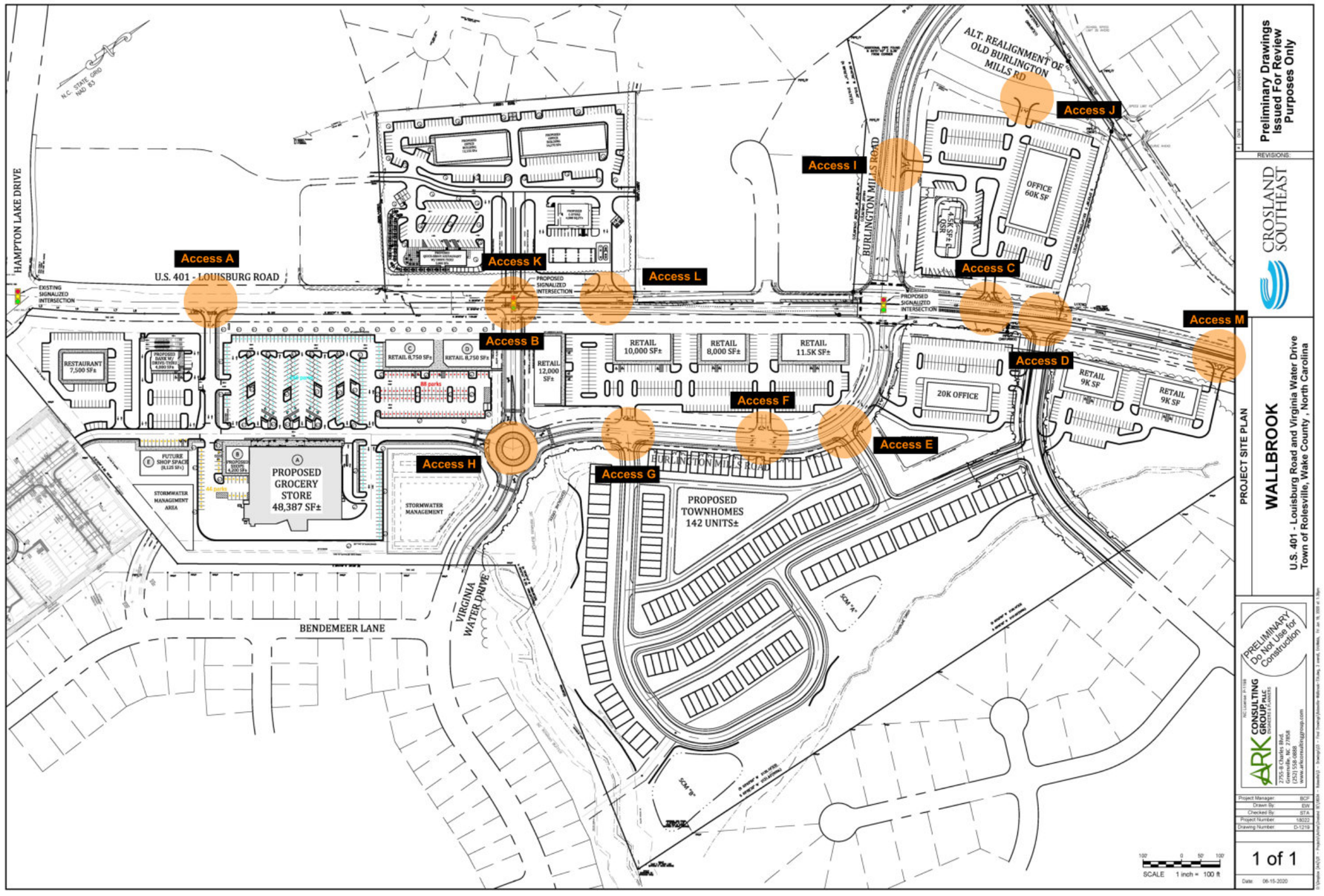


Figure 2: Proposed Site Plan



2.0 INVENTORY OF TRAFFIC CONDITIONS

2.1 STUDY AREA

Stantec coordinated with the Town of Rolesville and the North Carolina Department of Transportation (NCDOT) Division 5, District 1 to determine the appropriate study area and assumptions for this study. The final scoping document is included in the Appendix. The following intersections were agreed upon to be analyzed to determine the associated impacts of the proposed development.

- US 401 Business at US 401 *existing signalized intersection*
- US 401 Business at Hampton Lake Drive / Jonesville Road *existing signalized intersection*
- US 401 Business at Burlington Mills Road *existing signalized intersection*
- US 401 Business at Rogers Road / Redford Place *existing signalized intersection*
- Jonesville Road at Vineyard Pine Lane *existing two-way stop-controlled intersection*
- Burlington Mills Road at Barrington Hall *existing two-way stop-controlled intersection*

As part of the Locally Administered Projects Program (LAPP), Burlington Mills Road will be realigned south of its current location and connect with an extended Virginia Water Drive. It is proposed to be constructed in 2021 and a signal installed; Old Burlington Mills Road and US 401 Business will remain and become stop controlled.

The proposed development is envisioned to construct the following intersections and driveways:

- US 401 Business at Access A *proposed two-way stop-controlled driveway*
- US 401 Business at Access B/Access K *proposed signalized intersection*
- US 401 Business at Access C *proposed two-way stop-controlled driveway*
- US 401 Business at Access D *proposed two-way stop-controlled driveway*
- US 401 Business at Access L *proposed two-way stop-controlled driveway*
- US 401 Business at Access M *proposed two-way stop-controlled driveway*
- Burlington Mills Road at Access E *proposed two-way stop-controlled driveway*
- Burlington Mills Road at Access F *proposed two-way stop-controlled driveway*
- Burlington Mills Road at Access G *proposed two-way stop-controlled driveway*
- BMR/Virginia Water Drive at Access H *proposed all-way stop-controlled driveway*
- Burlington Mills Realigned at Access I *proposed two-way stop-controlled driveway*
- Burlington Mills Road at Old Burlington Mills Road *proposed two-way stop-controlled driveway*
- Old Burlington Mills Road at Access J *proposed two-way stop-controlled driveway*

Figure 3 shows a diagram of the existing lane configurations, geometry, and traffic control features in the study area.

2.2 EXISTING ROADWAY CONDITIONS

Table 1 provides a detailed description of the existing study area roadway network. All functional classification and average annual daily traffic (AADT) information, where available, was obtained from NCDOT via the NCDOT.gov website.

Table 1: Existing Conditions

Road Name	Road Number	Primary Cross-Section	Functional Classification[1]	2018 AADT[2] (vpd)	Speed Limit (mph)	Maintenance Agency
Louisburg Road / S. Main Street	US 401 Business	3-Lane Section	Other Principal Arterial	12,000	35	NCDOT
Rolesville Bypass	US 401	4-Lane Divided	Other Principal Arterial	21,250	55	NCDOT
Hampton Lake Drive	N/A	2-Lane Undivided	Local Road	None Provided	25	Private
Jonesville Road	SR 2226	2-Lane Undivided	Local Road	3,100	35	NCDOT
Burlington Mills Road	SR 2051	2-Lane Undivided	Major Collector	3,700	35	NCDOT
Rogers Road	SR 2052	5-Lane Section	Local Road	None Provided	45	NCDOT
Redford Place	N/A	3-Lane Section	Local Road	None Provided	25	Town of Rolesville
Vineyard Pine Lane	N/A	2-Lane Undivided	Local Road	None Provided	25	Private
Barrington Hall Drive	N/A	2-Lane Undivided	Local Road	None Provided	25	Private

2.3 FUTURE NO-BUILD ROADWAY CONDITIONS

Burlington Mills Road at Old Burlington Mills Road

This intersection is planned to be constructed as part of the Burlington Mills Road realignment project. The westbound approach, Old Burlington Mills Road, is proposed to operate under stop control.

US 401 Business at Burlington Mills Road Realigned

As part of the Burlington Mills Road realignment project, Burlington Mills Road will connect to US 401 Business south of where it currently intersects. The signal will also be relocated to this new intersection. The current plans include exclusive turn lanes for all approaches ranging from 100 to 375 feet of full-width storage and appropriate taper.

US 401 Business at Old Burlington Mills Road

This intersection is planned to be converted to a right-in/right-out (RIRO) intersection with full movement operations being relocated to the intersection of US 401 Business and Burlington Mills Road Realigned.

Figure 3: 2019 Existing Lane Configurations and Traffic Control

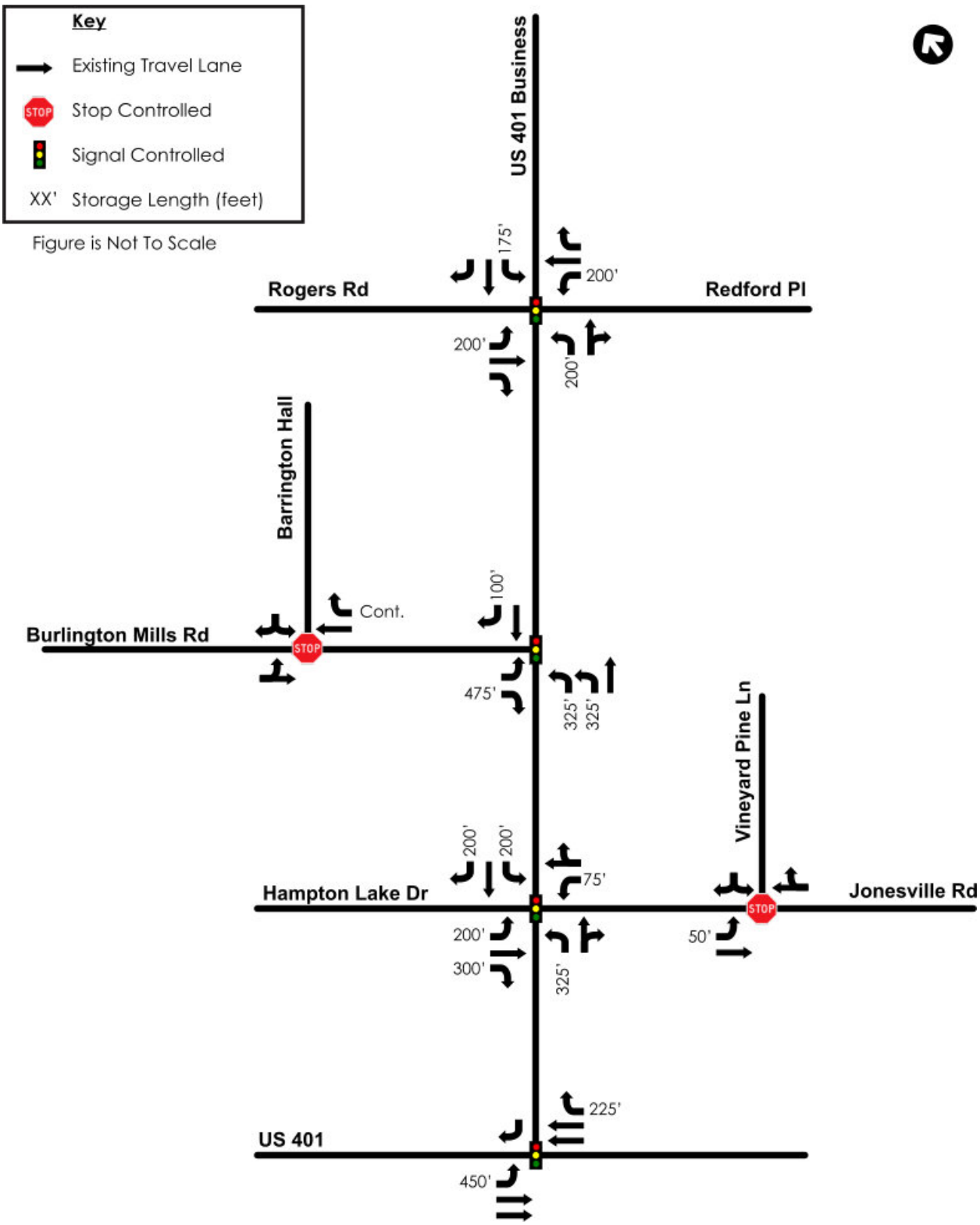
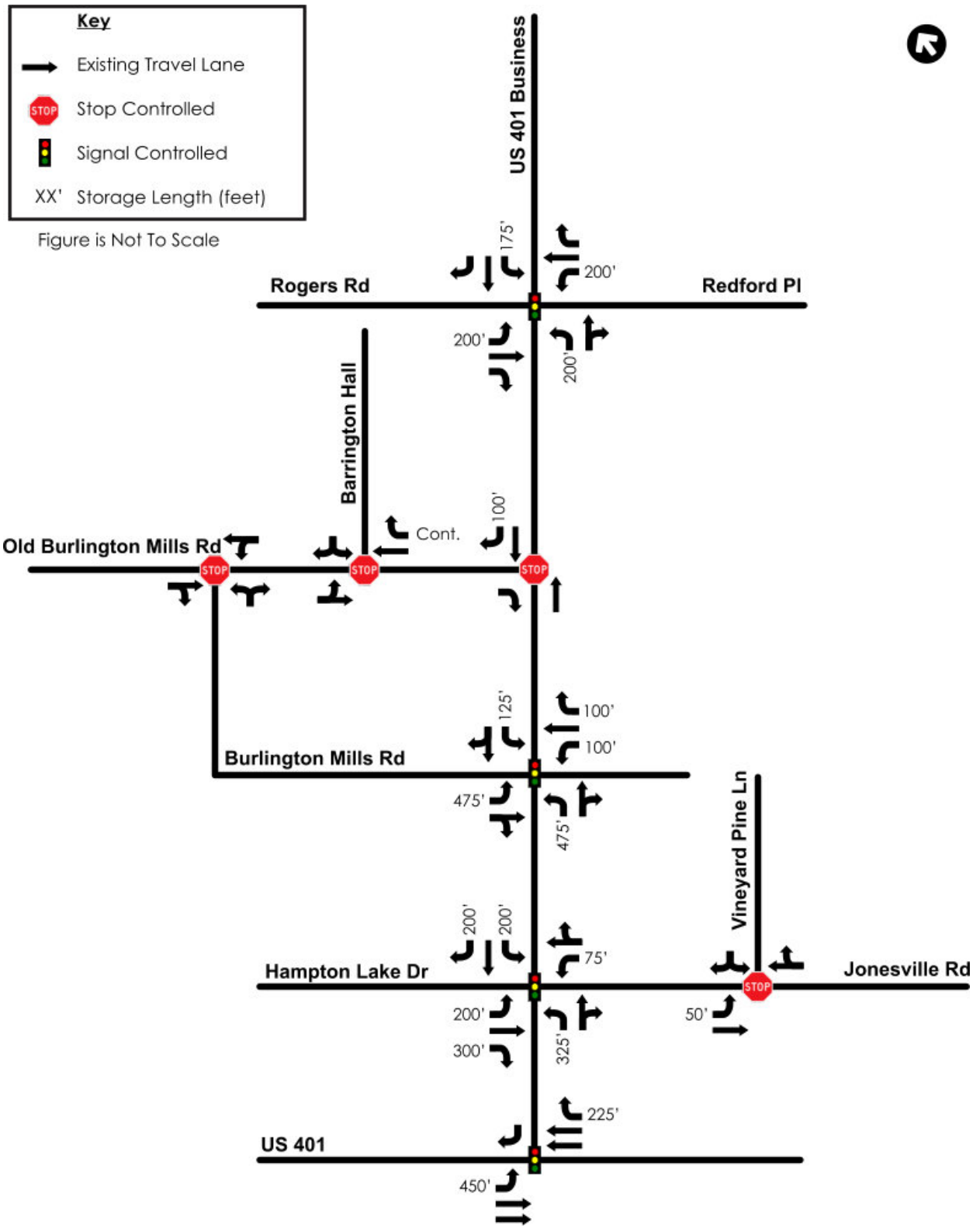


Figure 4: 2025 No-Build Lane Configurations and Traffic Control



3.0 TRIP GENERATION

Trip generation for the proposed development was performed for the proposed development in three parts, with the North site, the East site, and the South site each being calculated separately. Trips were estimated using the 10th Edition of the Institute of Transportation Engineers (ITE) Trip Generation Manual[3]. The manual provides means for calculating trips across four setting-types. That is, city center core, dense multi-use urban, general urban/suburban, and rural. Internal capture was also performed independently for the North, East, and South sites using the National Cooperative Highway Research Program (NCHRP) Report 684 spreadsheet model[4]. This trip generation, submitted to the Town and NCDOT for review, and including internal capture and trip generation methodology is located in the appendix.

3.1 NORTH SITE

The North site of the development is expected to consist of 60,000 square feet of medical-dental office space, 8,000 square feet of retail, and 6,000 square feet of a fast-food restaurant. Table 2 shows the number of anticipated trips that will be generated by the North site of the proposed development (Daily, AM Peak, and PM Peak entering and exiting).

Table 2: North Site ITE Trip Generation

North Site Trip Generation (N1, N2, N3)													
Land Use	**ITE LUC**	**Size**		**Daily**			**AM Peak**			**PM Peak**			
				Total	**Enter**	**Exit**	**Total**	**Enter**	**Exit**	**Total**	**Enter**	**Exit**	
Medical-Dental Office Bldg.	720	60	1,000 GFA	2,088	1,044	1,044	167	130	37	208	58	150	
Fast-Food Rest. w/ Drive-Thru	934	4.5	1,000 GFA	2,120	1,060	1,060	181	92	89	147	76	71	
				4,208	2,104	2,104	348	222	126	355	134	221	
Internal Capture	**ITE LUC**	**Size**		**Daily**			**AM Peak**			**PM Peak**			
				Total	**Enter**	**Exit**	**Total**	**Enter**	**Exit**	**Total**	**Enter**	**Exit**	
Medical-Dental Office Bldg.	720	60	1,000 GFA				-39	-18	-21	-2	-2		
Fast-Food Rest. w/ Drive-Thru	934	4.5	1,000 GFA				-39	-21	-18	-2		-2	
Pass-Bys	**ITE LUC**	**Size**		**Daily**			**AM Peak**			**PM Peak**			
				Total	**Enter**	**Exit**	**Total**	**Enter**	**Exit**	**Total**	**Enter**	**Exit**	
Fast-Food Rest. w/ Drive-Thru	934	4.5	1,000 GFA				-70	-35	-35	-72	-38	-34	
Adjusted Trip Generation	**ITE LUC**	**Size**		**Daily**			**AM Peak**			**PM Peak**			
				Total	**Enter**	**Exit**	**Total**	**Enter**	**Exit**	**Total**	**Enter**	**Exit**	
Medical-Dental Office Bldg.	720	60	1,000 GFA	2,088	1,044	1,044	128	112	16	206	56	150	
Fast-Food Rest. w/ Drive-Thru	934	4.5	1,000 GFA	2,120	1,060	1,060	72	36	36	73	38	35	
Total Trips Generated				4,208	2,104	2,104	200	148	52	279	94	185	

3.2 SOUTH SITE

The South site of the development is expected to consist of a 71,400 square feet of retail space, a 50,000 square foot grocery store, a 4,000 square foot bank, and a 7,500 square foot restaurant. Table 3 shows the number of anticipated trips that will be generated by the South site of the proposed development (Daily, AM Peak, and PM Peak entering and exiting).

Table 3: South Site ITE Trip Generation

South Site Trip Generation (S1, S2, S3)												
Land Use	**ITE LUC**	**Size**		**Daily**			**AM Peak**			**PM Peak**		
				Total	**Enter**	**Exit**	**Total**	**Enter**	**Exit**	**Total**	**Enter**	**Exit**
Shopping Center	820	71.4	1,000 GLA	4,780	2,390	2,390	187	116	71	423	203	220
Supermarket	850	50	1,000 GFA	5,340	2,670	2,670	191	115	76	462	236	226
Drive-In Bank	912	4	1,000 GFA	400	200	200	38	22	16	82	41	41
High-Turnover (Sit-Down) Rest.	932	7.5	1,000 GFA	840	420	420	105	60	45	131	68	63
				11,360	5,680	5,680	521	313	208	1,098	548	550
Internal Capture	**ITE LUC**	**Size**		**Daily**			**AM Peak**			**PM Peak**		
				Total	**Enter**	**Exit**	**Total**	**Enter**	**Exit**	**Total**	**Enter**	**Exit**
Shopping Center	820	71.4	1,000 GLA					-12	-3	-9	-22	-12
Supermarket	850	50	1,000 GFA					-13	-3	-10	-23	-13
High-Turnover (Sit-Down) Rest.	932	7.5	1,000 GFA					-25	-19	-6	-46	-20
Pass-Bys	**ITE LUC**	**Size**		**Daily**			**AM Peak**			**PM Peak**		
				Total	**Enter**	**Exit**	**Total**	**Enter**	**Exit**	**Total**	**Enter**	**Exit**
Shopping Center	820	71.4	1,000 GLA							-136	-65	-71
Supermarket	850	50	1,000 GFA							-158	-80	-78
Drive-In Bank	912	4	1,000 GFA				-11	-6	-5	-28	-14	-14
High-Turnover (Sit-Down) Rest.	932	7.5	1,000 GFA							-37	-21	-16
Adjusted Trip Generation	**ITE LUC**	**Size**		**Daily**			**AM Peak**			**PM Peak**		
				Total	**Enter**	**Exit**	**Total**	**Enter**	**Exit**	**Total**	**Enter**	**Exit**
Shopping Center	820	71.4	1,000 GLA	4,780	2,390	2,390	175	113	62	265	126	139
Supermarket	850	50	1,000 GFA	5,340	2,670	2,670	178	112	66	281	143	138
Drive-In Bank	912	4	1,000 GFA	400	200	200	27	16	11	54	27	27
High-Turnover (Sit-Down) Rest.	932	7.5	1,000 GFA	840	420	420	80	41	39	48	27	21
			Total Trips Generated	11,360	5,680	5,680	460	282	178	648	323	325

3.3 EAST SITE

The East site of the development is expected to consist of 170 townhomes, 20,000 square feet of office space, and 18,000 square feet of retail space. Table 4 shows the number of anticipated trips that will be generated by the East site of the proposed development (Daily, AM Peak, and PM Peak entering and exiting).

Table 4: East Site ITE Trip Generation

East Site Trip Generation (E1, E2, R1)												
Land Use	**ITE LUC**	**Size**		**Daily**			**AM Peak**			**PM Peak**		
				Total	**Enter**	**Exit**	**Total**	**Enter**	**Exit**	**Total**	**Enter**	**Exit**
Multifamily Housing (Mid-Rise)	221	170	Units	926	463	463	58	15	43	74	45	29
General Office Building	710	20	1,000 GFA	222	111	111	40	35	5	87	16	71
Shopping Center	820	18	1,000 GLA	1874	937	937	161	100	61	153	73	80
				3,022	1,511	1,511	259	150	109	314	134	180
Internal Capture	**ITE LUC**	**Size**		**Daily**			**AM Peak**			**PM Peak**		
				Total	**Enter**	**Exit**	**Total**	**Enter**	**Exit**	**Total**	**Enter**	**Exit**
Multifamily Housing (Mid-Rise)	221	170	Units				-1		-1	-3	-1	-2
General Office Building	710	20	1,000 GFA				-3	-2	-1	-3	-2	-1
Shopping Center	820	18	1,000 GLA				-4	-2	-2	-6	-2	-4
Pass-Bys	**ITE LUC**	**Size**		**Daily**			**AM Peak**			**PM Peak**		
				Total	**Enter**	**Exit**	**Total**	**Enter**	**Exit**	**Total**	**Enter**	**Exit**
Shopping Center	820	18	1,000 GLA							-50	-24	-26
Adjusted Trip Generation	**ITE LUC**	**Size**		**Daily**			**AM Peak**			**PM Peak**		
				Total	**Enter**	**Exit**	**Total**	**Enter**	**Exit**	**Total**	**Enter**	**Exit**
Multifamily Housing (Mid-Rise)	221	170	Units	926	463	463	57	15	42	71	44	27
General Office Building	710	20	1,000 GFA	222	111	111	37	33	4	84	14	70
Shopping Center	820	18	1,000 GLA	1,874	937	937	157	98	59	97	47	50
Total Trips Generated				3,022	1,511	1,511	251	146	105	252	105	147

3.4 WEST SITE

The West site of the development is expected to consist of 27,000 square feet of office space, and a 5,000 square foot fast-food restaurant. Table 5 shows the number of anticipated trips that will be generated by the West site of the proposed development (Daily, AM Peak, and PM Peak entering and exiting).

Table 5: West Site ITE Trip Generation

West Site Trip Generation (W1)												
Land Use	**ITE LUC**	**Size**		**Daily**			**AM Peak**			**PM Peak**		
				Total	**Enter**	**Exit**	**Total**	**Enter**	**Exit**	**Total**	**Enter**	**Exit**
General Office Building	710	27	1,000 GFA	298	149	149	52	46	6	95	17	78
Fast-Food Rest. w/ Drive-Thru	934	5	1,000 GFA	2356	1178	1178	201	102	99	163	85	78
Gas./Serv. Station w/ Conv. Market	945	16	Fuel Pos.	3286	1643	1643	200	102	98	224	114	110
				5940	2970	2970	453	250	203	482	216	266
Internal Capture	**ITE LUC**	**Size**		**Daily**			**AM Peak**			**PM Peak**		
				Total	**Enter**	**Exit**	**Total**	**Enter**	**Exit**	**Total**	**Enter**	**Exit**
General Office Building	710	27	1,000 GFA				-9	-6	-3	-2	-2	
Fast-Food Rest. w/ Drive-Thru	934	5	1,000 GFA				-10	-4	-6	-3		-3
Pass-Bys	**ITE LUC**	**Size**		**Daily**			**AM Peak**			**PM Peak**		
				Total	**Enter**	**Exit**	**Total**	**Enter**	**Exit**	**Total**	**Enter**	**Exit**
Fast-Food Rest. w/ Drive-Thru	934	5	1,000 GFA				-94	-48	-46	-80	-42	-38
Gas./Serv. Station w/ Conv. Market	945	16	Fuel Pos.				-124	-63	-61	-126	-64	-62
Adjusted Trip Generation	**ITE LUC**	**Size**		**Daily**			**AM Peak**			**PM Peak**		
				Total	**Enter**	**Exit**	**Total**	**Enter**	**Exit**	**Total**	**Enter**	**Exit**
General Office Building	710	27	1,000 GFA	298	149	149	43	40	3	93	15	78
Fast-Food Rest. w/ Drive-Thru	934	5	1,000 GFA	2,356	1,178	1,178	97	50	47	80	43	37
Gas./Serv. Station w/ Conv. Market	945	16	Fuel Pos.	3,286	1,643	1,643	76	39	37	98	50	48
Total Trips Generated				5,940	2,970	2,970	216	129	87	271	108	163

4.0 TRAFFIC DISTRIBUTION

4.1 SITE TRIP DISTRIBUTION

To accurately determine the effect of the proposed development on the surrounding roadway network, an estimate of the expected distribution of traffic entering and exiting the site is needed. The following percentages were used in the AM and PM peak hours for the proposed site.

These percentages were developed using a combination of existing traffic volume counts, historic AADTs provided by NCDOT, and engineering judgment. This trip distribution was submitted to the Town and NCDOT for review.

4.2 PASS-BY TRIPS

According to NCDOT standards, the retail shopping center (LUC 820), supermarket (LUC 850), bank (LUC 912), sit-down restaurant (LUC 932), fast-food restaurant (LUC 934), and gas station (LUC 945) allow for the use of pass-by trips for this land use of 34% in the PM, 36% in the PM, 29% in the AM and 35% in the PM, 43% in the PM, 49% in the AM and 50% in the PM, and 62% in the AM and 56% in the PM peak hour, respectively. The calculated pass-by trips are greater than 10% of the peak hour traffic on US 401 Business (Main Street) for the intersection of Access B. With the southern section of the site including a grocery store, a gas station, a bank, food, and general retail, coupled with the moderate traffic volumes on Main Street, it is reasonable for the pass-by trips to exceed the 10% threshold.

Pass-by trip distribution is shown in Figure 17 in the appendix.

5.0 TRAFFIC VOLUMES

Morning (7:00 – 9:00 am) and evening (4:00 – 6:00 pm) turning movement counts were collected on the days respectively listed at the intersections below:

- US 401 Business at US 401 (12/3/2019)
- US 401 Business at Hampton Lake Drive / Jonesville Road (12/13/2018)
- US 401 Business at Burlington Mills Road (12/13/2019)
- US 401 Business at Rogers Road / Redford Place (9/10/2019)
- Jonesville Road at Vineyard Pine Lane (11/12/2019)
- Burlington Mills Road at Barrington Hall (11/12/2019)

The count data is categorized by cars, heavy trucks, bicycles, and pedestrians. Raw count data for these locations as well as all traffic volume calculations are included in the appendix.

5.1 VOLUME BALANCING

Traffic volumes for the AM and PM peak hours were balanced between all study intersections except Redford Place Drive and Burlington Mills Road on US 401 Business due to the distance and numerous accesses between the two signalized intersections. To be conservative, volumes were only added to the network and not subtracted. The balanced existing (2019) volumes are shown in Figure 5.

5.2 FUTURE TRAFFIC GROWTH

Future traffic growth is the increase in traffic volumes due to usage increases and non-specific growth throughout the area. The 2019 Existing volumes were grown by a 2.5% annual rate to estimate the 2025 volumes.

5.3 APPROVED DEVELOPMENT TRAFFIC

There are two (2) approved development within the study area. Redford Place is a mixed-use development comprised of a single 19,500 square foot building located in the northeast quadrant of the US 401 Business intersection with Rogers Road and Redford Place. With the anticipated completion date for this development occurring in 2023, the associated site traffic for Redford Place was distributed and assigned to the study intersections included in all future-year analyses.

The other approved development is Jonesville Road Townhomes which is expected to consist of 53 townhomes. This development, located in the southeastern quadrant of Jonesville Road and Louisburg Road, is expected to be completed in 2021.

Trips associated with the Redford Place and Jonesville Road Townhome developments are shown in Figure 10 in the appendix.

5.4 NO-BUILD TRAFFIC VOLUMES

The historical growth and approved development traffic volumes were added to the existing volumes to determine the No-Build traffic volumes. The 2025 No-Build traffic volumes are shown in Figure 6.

5.5 TOTAL BUILD TRAFFIC WITH PROPOSED DEVELOPMENT

To obtain the total 2025 Build traffic volumes, the distributed site traffic was added to the respective no-build traffic volumes. The total AM and PM peak hour turning movement volumes for the study intersections were then calculated and analyzed for the 2025 traffic scenarios. The 2025 Build-out traffic volumes are shown in Figure 7.

Figure 5: Existing (2019) Traffic Volumes

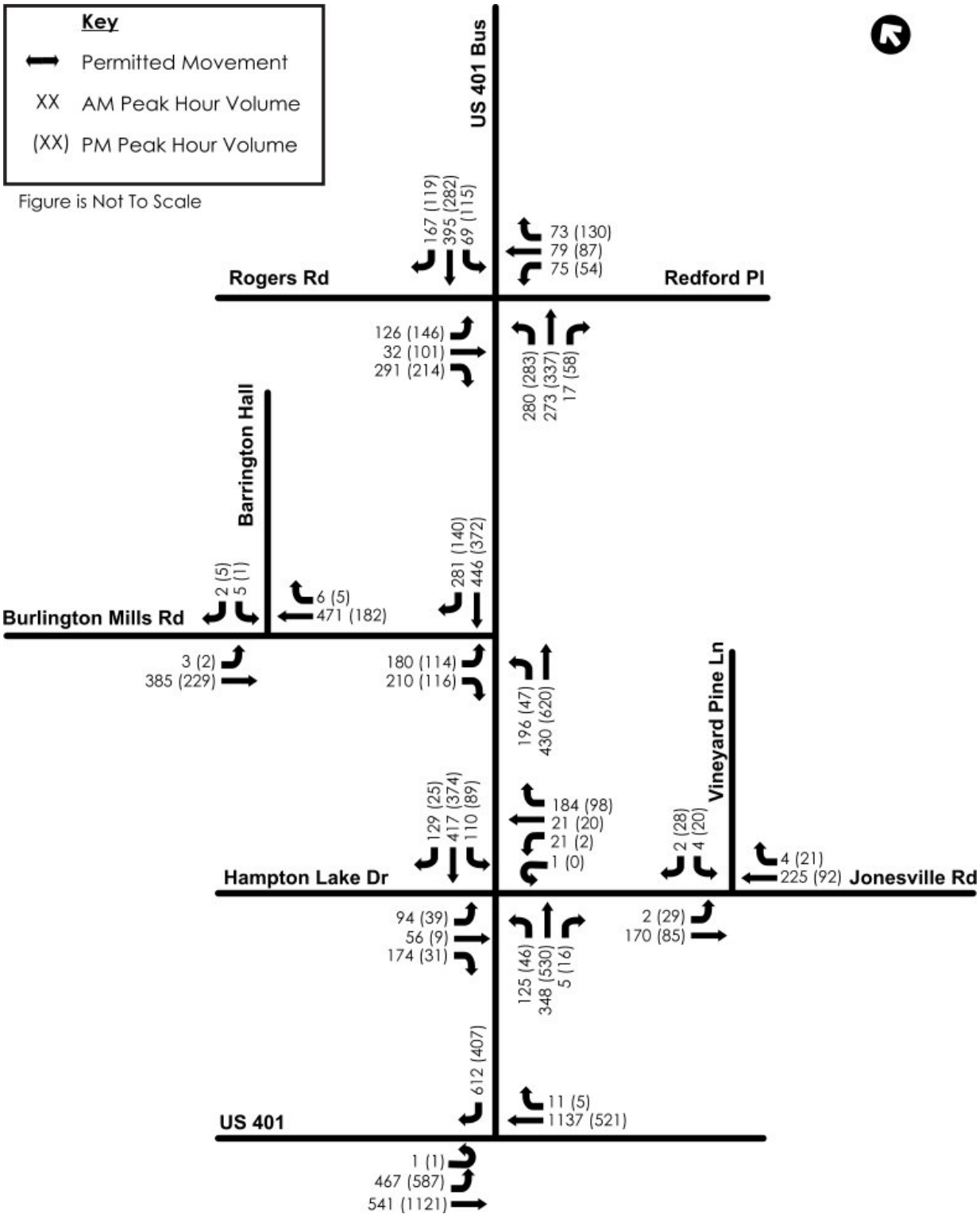


Figure 6: 2025 No-Build Traffic Volumes

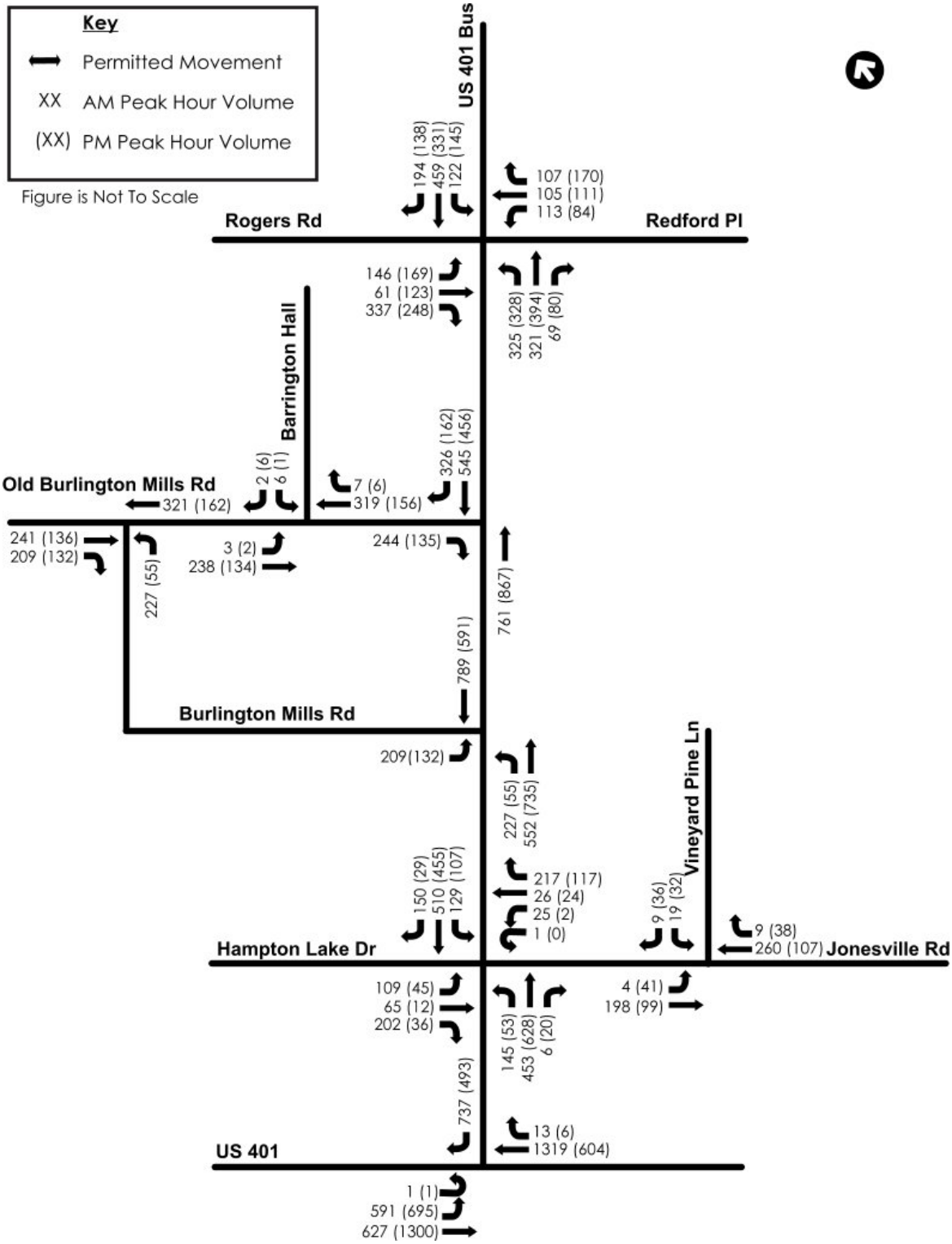
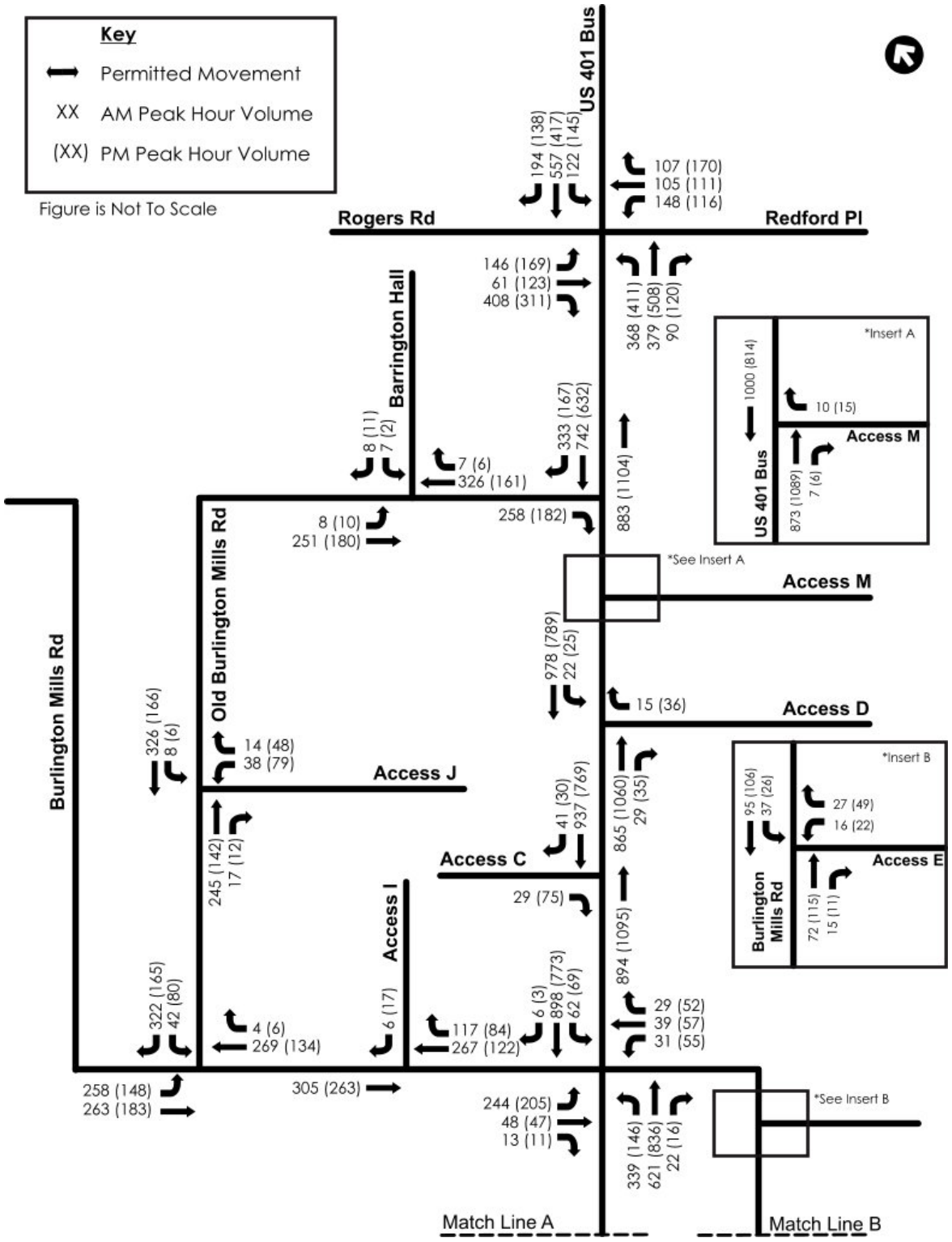
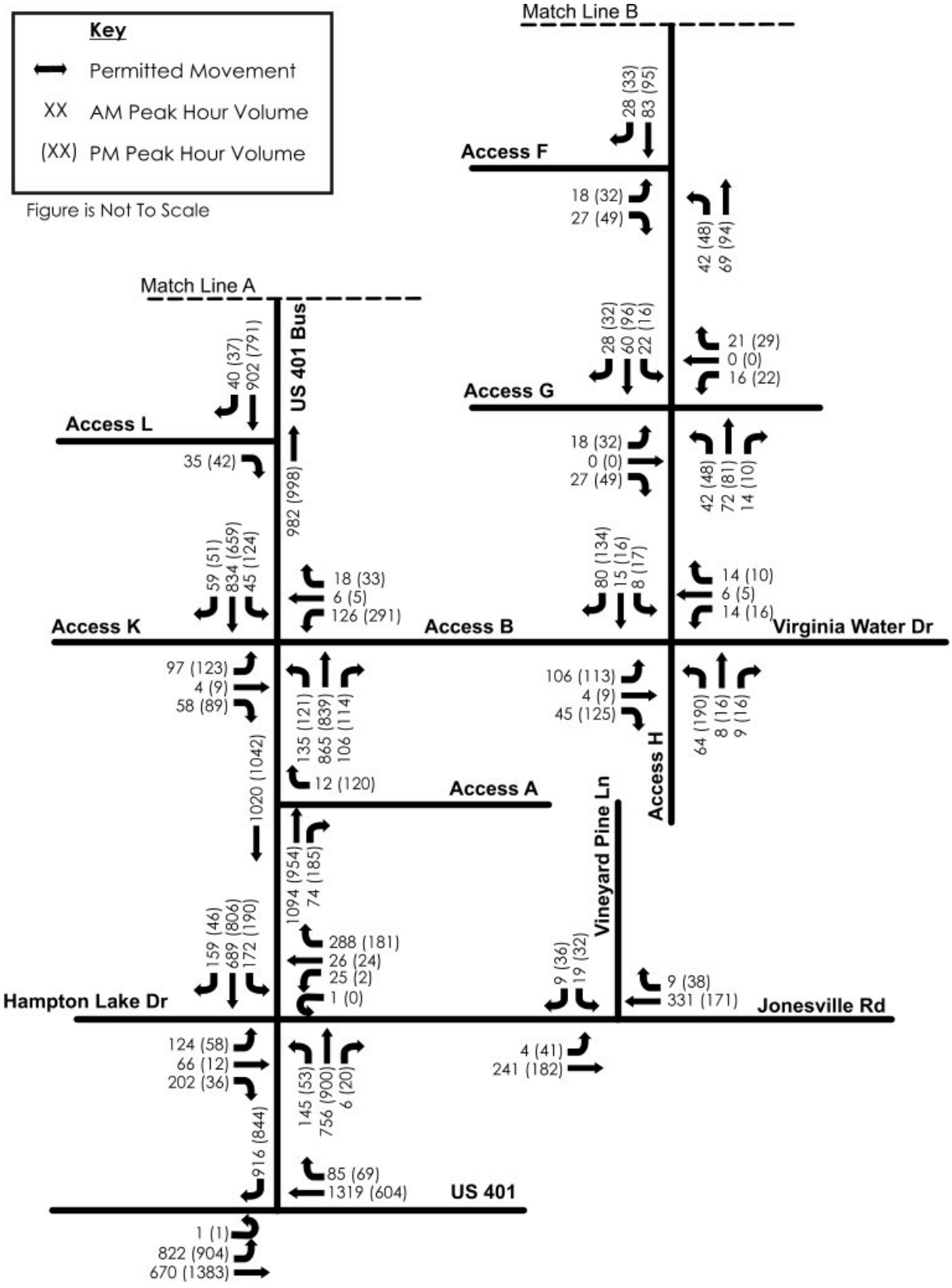


Figure 7: 2025 Build Traffic Volumes



Traffic Volumes
August 11, 2020



6.0 TRAFFIC ANALYSIS

Capacity analyses were performed for the roadway network in the project study area. The traffic analysis program Synchro Version 10 was used to analyze all signalized and stop-controlled intersections according to methods put forth by the Transportation Research Board's Highway Capacity Manual (HCM)[5]. The Highway Capacity Manual defines capacity as "the maximum rate of flow at which persons or vehicles can be reasonably expected to traverse a point or uniform section of a lane or roadway during a specified period under the prevailing roadway, traffic, and control conditions, usually expressed as vehicles per lane per hour."

Level of service (LOS) is a term used to describe different traffic conditions and is defined as a "qualitative measure describing operational conditions within a traffic stream, and their perception by motorists/ or passengers." LOS varies from Level A, representing free flow, to Level F where traffic breakdown conditions are evident. At an unsignalized intersection, the primary traffic on the main roadway is virtually uninterrupted. Therefore, the overall delay for the intersection is usually less than what is calculated for the minor street movements. The overall intersection delay and the delay for the intersection's minor movement(s) are reported in the summary tables of this report. Generally, LOS D is acceptable for signalized intersections in suburban areas during peak periods. The ITE Recommended Practice Manual, "*Designing Walkable Urban Thoroughfares: A Context Sensitive Approach*"[6] states, "Often in urban areas, thoroughfare capacity is a lower priority than other factors such as economic development or historical preservation, and higher levels of congestion are considered acceptable." With the current method of reporting LOS for unsignalized intersections, it is not uncommon for some of the minor street movements to be operating at a LOS F during peak hour conditions and that is not necessarily indicative of an area that requires improvements.

Capacity analyses were completed following *NCDOT Congestion Management Capacity Analysis Guidelines*[7]. It should be noted that the analyses include permitted + protected signal phasing at the US 401 Business intersections with Hampton Lake Drive/Jonesville Road and Rogers Road/Redford Place Drive. This provided results more indicative of field conditions as the signal currently operates with a flashing yellow arrow. Table 6 presents the criteria of each LOS as indicated in the *HCM*[5].

Table 6: Level of Service Criteria

Level of Service (LOS)	Signalized Intersection Control Delay (seconds / vehicle)	Unsignalized Intersection Control Delay (seconds / vehicle)
A	≤ 10	≤ 10
B	>10 and ≤ 20	>10 and ≤ 15
C	>20 and ≤ 35	>15 and ≤ 25
D	>35 and ≤ 55	>25 and ≤ 35
E	>55 and ≤ 80	>35 and ≤ 50
F	>80	>50

Capacity analyses were performed for the following conditions.

- Existing (2019)
- Future Year (2025) No-Build
- Future Year (2025) Build
- Future Year (2025) Build with Improvements

The following intersections were included in the capacity analysis for the above scenarios; where applicable:

- US 401 Business at US 401
- US 401 Business at Hampton Lake Drive / Jonesville Road
- US 401 Business at Burlington Mills Realigned
- US 401 Business at Burlington Mills Road
- US 401 Business at Rogers Road / Redford Place
- Jonesville Road at Vineyard Pine Lane
- Burlington Mills Road at Old Burlington Mills Road
- US 401 Business at Access A
- US 401 Business at Access B/Access K
- US 401 Business at Access L
- US 401 Business at Access C
- US 401 Business at Access D
- US 401 Business at Access M
- Burlington Mills Road at Access E
- Burlington Mills Road at Access F
- Burlington Mills Road at Access G
- Burlington Mills Road at Access H
- Burlington Mills Realigned at Access I
- Old Burlington Mills Road at Barrington Hall
- Old Burlington Mills Road at Access J

SimTraffic runs were completed for all scenarios to observe the predicted traffic operations throughout the study area during each of the peak hours. As is standard practice, ten (10) SimTraffic analysis runs were performed for each scenario. Detailed SimTraffic queuing and blocking reports can be found in the Appendix. Queues for the exclusive turn-lanes are summarized in tables for each study intersection. Queues are not reported for intersections that do not have exclusive turn-lanes. For simplicity, the greater of the 95th percentile queue as reported by Synchro or the maximum observed queue as reported by SimTraffic are shown in the tables.

All Synchro files and detailed printouts can be found in the appendix. A summary of the results of the analyses is provided in the following sub-sections.

6.1 2019 EXISTING CAPACITY ANALYSIS

The 2019 Existing scenario results show that all intersections and approaches currently operate at LOS D or better in both peak periods except the westbound approach at US 401 Business and Hampton Lake Drive/Jonesville Road which can be attributed to school traffic. The level of service and delay for the existing traffic conditions are listed below in Table 7.

Table 7: Level of Service and Delay for 2019 Existing Conditions

Intersection/Approach	Peak Hour	Overall (LOS)	Eastbound	Westbound	Northbound	Southbound
US 401 Business at US 401 (Signalized)	AM	B (12.7)	-	B (13.5)	C (25.7)	A (1.3)
	PM	B (12.7)	-	B (13.5)	C (20.1)	A (0.9)
US 401 Business at Hampton Lake Dr / Jonesville Rd (Signalized)	AM	C (25.7)	C (23.9)	E (57.2)	B (14.2)	C (24.0)
	PM	C (21.6)	C (30.3)	E (61.2)	B (14.1)	B (19.6)
Jonesville Rd at Vineyard Pine Lane (Unsignalized)	AM	- (0.3)	- (0.2)	- (0.0)	-	B (10.2)
	PM	- (2.5)	- (1.9)	- (0.0)	-	A (9.6)
US 401 Business at Burlington Mills Rd (Signalized)	AM	B (13.7)	D (49.5)	-	A (2.1)	A (4.4)
	PM	B (10.5)	D (46.9)	-	A (2.7)	A (4.3)
Burlington Mills Rd at Barrington Hall Dr / Access J (Unsignalized)	AM	- (0.2)	- (0.1)	- (0.0)	-	C (15.2)
	PM	- (0.3)	- (0.1)	- (0.0)	-	B (10.3)
US 401 Business at Rogers Rd / Redford Place (Signalized)	AM	C (25.1)	D (43.0)	D (45.8)	B (10.4)	B (18.1)
	PM	C (23.4)	D (46.5)	D (45.4)	A (8.5)	B (10.8)

Key: LOS (Delay (seconds/vehicle))

6.2 2025 NO-BUILD CAPACITY ANALYSIS

The 2025 No-Build scenario results show that all intersections and approaches will operate at LOS D or better in both peak periods except the westbound approach at US 401 Business and Hampton Lake Drive/Jonesville Road and the eastbound approach at US 401 Business and Burlington Mills Road Realigned. There are no queuing issues throughout the network in the 2025 No-Build scenario. The no-build level of service and delay are listed below in Table 8.

Table 8: Level of Service and Delay for 2025 No-Build Conditions

Intersection/Approach	Peak Hour	Overall (LOS)	Eastbound	Westbound	Northbound	Southbound
US 401 Business at US 401 (Signalized)	AM	C (24.6)	-	C (26.7)	D (47.4)	A (2.2)
	PM	B (14.3)	-	B (17.3)	C (21.2)	A (0.7)
US 401 Business at Hampton Lake Dr / Jonesville Rd (Signalized)	AM	C (20.5)	C (24.0)	E (59.1)	A (5.2)	B (17.3)
	PM	C (25.7)	C (27.1)	E (63.3)	B (17.9)	C (25.5)
Jonesville Rd at Vineyard Pine Lane (Unsignalized)	AM	- (0.7)	- (0.2)	- (0.0)	-	B (11.0)
	PM	- (2.8)	- (2.2)	- (0.0)	-	B (10.2)
US 401 Business at Burlington Mills Rd Realigned (Signalized)	AM	D (38.0)	F (84.5)	D (40.4)	C (28.7)	C (34.6)
	PM	B (18.5)	E (58.9)	D (39.2)	B (10.9)	B (18.8)
US 401 Business at Old Burlington Mills Rd (Unsignalized)	AM	- (2.7)	C (20.6)	-	- (0.0)	- (0.0)
	PM	- (1.1)	B (13.6)	-	- (0.0)	- (0.0)
Burlington Mills Rd at Barrington Hall Dr / Access J (Unsignalized)	AM	- (0.3)	- (0.1)	- (0.0)	-	B (12.1)
	PM	- (0.4)	- (0.2)	- (0.0)	-	A (9.7)
Burlington Mills Rd at Old Burlington Mills (Unsignalized)	AM	- (6.5)	-	B (14.0)	- (0.0)	- (4.5)
	PM	- (5.4)	-	A (9.6)	- (0.0)	- (3.9)
US 401 Business at Rogers Rd / Redford Place (Signalized)	AM	C (30.1)	D (54.0)	D (44.4)	B (14.4)	C (21.8)
	PM	C (26.0)	D (50.7)	D (46.3)	A (9.6)	B (13.6)

Key: LOS (Delay (seconds/vehicle))

6.3 2025 BUILD CAPACITY ANALYSIS

As a result of the 2025 Build analysis, all intersections are expected to operate at LOS D or better in both peak periods, with a few exceptions. The intersection of US 401 Business and Burlington Mills Road Realigned is expected to operate at LOS E in the AM peak hour. Additionally, the following approaches operate at LOS E or F during the peak hours:

- US 401 Business at US 401 (NB - AM Peak)
- US 401 Business at Hampton Lake Dr / Jonesville Rd (WB - AM & PM Peak)
- US 401 Business at Access A (WB - PM Peak)
- US 401 Business at Access B/Access K (EB - AM Peak, WB - AM & PM Peak, NB - PM Peak)
- US 401 Business at Burlington Mills Rd Realigned (EB – AM & PM Peak, SB – AM Peak)
- US 401 Business at Old Burlington Mills Rd (EB – AM Peak)
- US 401 Business at Rogers Rd/Redford Pl (EB – PM Peak, WB – AM & PM Peak)

The analyses show that the proposed development will have an impact on the surrounding roadway network in the vicinity of the site without any improvements.

Table 9: Level of Service and Delay for 2025 Build Conditions

Intersection/Approach	Peak Hour	Overall (LOS)	Eastbound	Westbound	Northbound	Southbound
US 401 Business at US 401 (Signalized)	AM	D (37.2)	-	D (46.8)	E (58.6)	A (3.3)
	PM	B (16.3)	-	C (24.5)	C (22.1)	A (3.5)
US 401 Business at Hampton Lake Dr / Jonesville Rd (Signalized)	AM	C (34.3)	C (34.7)	F (87.4)	C (26.7)	C (23.1)
	PM	C (32.3)	D (42.8)	F (102.1)	C (29.6)	B (19.8)
Jonesville Rd at Vineyard Pine Lane (Unsignalized)	AM	- (0.6)	- (0.1)	- (0.0)	-	B (11.5)
	PM	- (2.1)	- (1.4)	- (0.0)	-	B (10.8)
US 401 Business at Access A (Unsignalized)	AM	- (0.1)	-	D (27.3)	- (0.0)	- (0.0)
	PM	- (2.4)	-	E (45.7)	- (0.0)	- (0.0)
US 401 Business at Access B/Access K (Signalized)	AM	C (21.2)	E (65.6)	F (81.9)	B (13.6)	B (12.9)
	PM	D (53.7)	D (46.5)	F (110.4)	E (58.2)	C (27.5)
Virginia Water Dr at Access H (Unsignalized)	AM	A (8.2)	- (8.6)	- (7.7)	- (8.3)	- (7.7)
	PM	B (10.2)	- (10.6)	- (8.6)	- (10.8)	- (9.0)
US 401 Business at Access L (Unsignalized)	AM	- (0.2)	B (10.2)	-	- (0.0)	- (0.0)
	PM	- (0.2)	B (10.0)	-	- (0.0)	- (0.0)
Burlington Mills Rd at Access G (Unsignalized)	AM	- (4.2)	B (10.0)	B (10.2)	- (2.5)	- (1.5)
	PM	- (4.6)	B (10.5)	B (10.6)	- (2.6)	- (0.8)
Burlington Mills Rd at Access F (Unsignalized)	AM	- (2.8)	A (9.5)	-	- (2.8)	- (0.0)
	PM	- (3.3)	A (9.9)	-	- (2.6)	- (0.0)
Burlington Mills Rd at Access E (Unsignalized)	AM	- (2.6)	-	A (9.5)	- (0.0)	- (2.1)
	PM	- (2.7)	-	A (9.9)	- (0.0)	- (1.5)
US 401 Business at Burlington Mills Realigned (Signalized)	AM	E (65.4)	F (126.4)	D (50.2)	D (47.7)	E (65.9)
	PM	C (30.9)	E (74.5)	D (47.4)	B (19.1)	C (28.2)
Burlington Mills Realigned at Access I (Unsignalized)	AM	- (0.1)	- (0.0)	- (0.0)	-	B (10.3)
	PM	- (0.3)	- (0.0)	- (0.0)	-	A (9.3)
Burlington Mills Rd at Old Burlington Mills Rd (Unsignalized)	AM	- (12.2)	- (4.3)	- (0.0)	-	D (32.8)
	PM	- (7.0)	- (3.5)	- (0.0)	-	C (15.8)
Old Burlington Mills Rd at Access J (Unsignalized)	AM	- (1.2)	- (0.0)	- (0.2)	B (13.5)	-
	PM	- (3.3)	- (0.0)	- (0.3)	B (11.4)	-
US 401 Business at Access C (Unsignalized)	AM	- (0.3)	C (20.1)	-	- (0.0)	- (0.0)
	PM	- (0.7)	C (18.5)	-	- (0.0)	- (0.0)
Old Burlington Mills Rd at Barrington Hall Dr (Unsignalized)	AM	- (0.4)	- (0.2)	- (0.0)	-	B (12.0)
	PM	- (0.6)	- (0.4)	- (0.0)	-	A (9.8)
US 401 Business at Access D (Unsignalized)	AM	- (0.3)	-	C (15.0)	- (0.0)	- (0.3)
	PM	- (0.8)	-	D (27.6)	- (0.0)	- (0.6)
US 401 Business at Access M (Unsignalized)	AM	- (0.1)	-	C (15.5)	- (0.0)	- (0.0)
	PM	- (0.2)	-	D (27.4)	- (0.0)	- (0.0)
US 401 Business at Old Burlington Mills Rd (Unsignalized)	AM	- (4.7)	E (40.4)	-	- (0.0)	- (0.0)
	PM	- (1.8)	C (20.1)	-	- (0.0)	- (0.0)
US 401 Business at Rogers Rd / Redford Place (Signalized)	AM	C (34.6)	D (49.9)	E (57.9)	B (16.3)	C (31.7)
	PM	C (32.8)	E (60.5)	E (59.5)	B (15.3)	B (19.8)

Key: LOS (Delay (seconds/vehicle))

6.4 2025 BUILD WITH IMPROVEMENTS CAPACITY ANALYSIS

The 2025 Build with Improvements analysis shows that all intersections and approaches are expected to operate at LOS D or better in both peak periods, except for Old Burlington Mills Road at US 401 Business in the AM peak hour. Although the intersections are expected to operate at an acceptable level of service, the intersection of Old Burlington Mills Road at US 401 Business experiences a higher delay.

Improvements:

US 401 Business & Access A

- Construct a northbound exclusive right-turn lane with 100 feet of storage and appropriate taper

US 401 Business at Access B/Access K

- Install a signal
- Construct a northbound exclusive left-turn lane with 175 feet of storage and appropriate taper
- Construct a northbound exclusive right-turn lane with 125 feet of storage and appropriate taper
- Construct a southbound exclusive left-turn lane with 350 feet of storage and appropriate taper
- Construct an eastbound exclusive left-turn lane with 225 feet of storage and appropriate taper
- Construct a westbound shared through-right-turn lane with 100 feet of storage and appropriate taper

Virginia Water Drive at Access B/Access H

- Construct single-lane roundabout

US 401 Business at Burlington Mills Road

- Construct dual northbound exclusive left-turn lanes with 375 feet of storage and appropriate taper
- Construct a westbound exclusive left-turn lane with 100 feet of storage and appropriate taper
- Construct a westbound exclusive right-turn lane with 100 feet of storage and appropriate taper
- Construct an eastbound exclusive left-turn lane with 500 feet of storage and appropriate taper
- Construct an eastbound exclusive right-turn lane with 175 feet of storage and appropriate taper
- Construct a southbound exclusive left-turn lane with 100 feet of storage and appropriate taper
- Construct a southbound exclusive right-turn lane with at least 250 feet of storage and appropriate taper (beginning at least 100 feet north of the Access C driveway)

US 401 Business at Access D

- Construct a southbound exclusive left-turn lane with 100 feet of storage and appropriate taper

Burlington Mills Road at Access I

- Construct a westbound exclusive right-turn lane that is continuous from receiving the second northbound left-turn lane at US 401 Business and Burlington Mills Road

Burlington Mills Road at Old Burlington Mills Road

- Construct a southbound exclusive left-turn lane with 100 feet of storage and appropriate taper

Table 10: Level of Service and Delay for 2025 Build with Improvements Conditions

Intersection/Approach	Peak Hour	Overall (LOS)	Eastbound	Westbound	Northbound	Southbound
US 401 Business at US 401 (Signalized)	AM	D (37.2)	-	D (46.8)	E (58.6)	A (3.4)
	PM	B (16.0)	-	C (24.5)	C (22.1)	A (2.7)
US 401 Business at Hampton Lake Dr / Jonesville Rd (Signalized)	AM	C (34.2)	C (34.7)	F (87.4)	C (25.3)	C (23.9)
	PM	C (33.0)	D (41.9)	F (94.7)	C (32.1)	C (20.6)
Jonesville Rd at Vineyard Pine Lane (Unsignalized)	AM	- (0.6)	- (0.1)	- (0.0)	-	B (11.5)
	PM	- (2.1)	- (1.4)	- (0.0)	-	B (10.8)
US 401 Business at Access A (Unsignalized)	AM	- (0.1)	-	D (27.0)	- (0.0)	- (0.0)
	PM	- (1.5)	-	D (28.0)	- (0.0)	- (0.0)
US 401 Business at Access B/Access K (Signalized)	AM	B (20.0)	E (65.6)	F (81.9)	B (11.0)	B (12.9)
	PM	D (47.1)	D (36.2)	E (59.9)	D (48.5)	D (43.1)
Virginia Water Dr at Access H (Roundabout)	AM	A (4.0)	A (3.9)	A (3.9)	A (4.0)	A (4.1)
	PM	A (5.1)	A (4.6)	A (4.5)	A (5.5)	A (5.6)
US 401 Business at Access L (Unsignalized)	AM	- (0.2)	B (10.2)	-	- (0.0)	- (0.0)
	PM	- (0.2)	B (10.0)	-	- (0.0)	- (0.0)
Burlington Mills Rd at Access G (Unsignalized)	AM	- (4.2)	B (10.0)	B (10.2)	- (2.5)	- (1.5)
	PM	- (4.6)	B (10.5)	B (10.6)	- (2.6)	- (0.8)
Burlington Mills Rd at Access F (Unsignalized)	AM	- (2.8)	A (9.5)	-	- (2.8)	- (0.0)
	PM	- (3.3)	A (9.9)	-	- (2.6)	- (0.0)
Burlington Mills Rd at Access E (Unsignalized)	AM	- (2.6)	-	A (9.5)	- (0.0)	- (2.1)
	PM	- (2.7)	-	A (9.9)	- (0.0)	- (1.5)
US 401 Business at Burlington Mills Realigned (Signalized)	AM	D (47.8)	F (81.0)	D (44.8)	C (30.3)	E (55.4)
	PM	C (27.9)	E (70.0)	D (46.0)	B (18.8)	C (22.0)
Burlington Mills Realigned at Access I (Unsignalized)	AM	- (0.1)	- (0.0)	- (0.0)	-	A (9.1)
	PM	- (0.3)	- (0.0)	- (0.0)	-	A (8.7)
Burlington Mills Rd at Old Burlington Mills Rd (Unsignalized)	AM	- (6.9)	- (4.3)	- (0.0)	-	C (15.7)
	PM	- (5.8)	- (3.5)	- (0.0)	-	B (12.3)
Old Burlington Mills Rd at Access J (Unsignalized)	AM	- (1.2)	- (0.0)	- (0.2)	B (13.5)	-
	PM	- (3.3)	- (0.0)	- (0.3)	B (11.4)	-
US 401 Business at Access C (Unsignalized)	AM	- (0.2)	B (13.0)	-	- (0.0)	- (0.0)
	PM	- (0.5)	B (12.5)	-	- (0.0)	- (0.0)
Old Burlington Mills Rd at Barrington Hall Dr (Unsignalized)	AM	- (0.4)	- (0.2)	- (0.0)	-	B (12.0)
	PM	- (0.6)	- (0.4)	- (0.0)	-	A (9.8)
US 401 Business at Access D (Unsignalized)	AM	- (0.3)	-	C (15.0)	- (0.0)	- (0.3)
	PM	- (0.8)	-	D (27.6)	- (0.0)	- (0.6)
US 401 Business at Access M (Unsignalized)	AM	- (0.1)	-	C (15.5)	- (0.0)	- (0.0)
	PM	- (0.2)	-	D (27.4)	- (0.0)	- (0.0)
US 401 Business at Old Burlington Mills Rd (Unsignalized)	AM	- (4.7)	E (40.4)	-	- (0.0)	- (0.0)
	PM	- (1.8)	C (20.1)	-	- (0.0)	- (0.0)
US 401 Business at Rogers Rd / Redford Place (Signalized)	AM	C (34.8)	D (50.3)	E (57.8)	B (16.7)	C (31.7)
	PM	C (32.4)	E (60.4)	E (59.3)	B (14.4)	B (19.9)

Key: LOS (Delay (seconds/vehicle))

7.0 SIMTRAFFIC OPERATIONS

SimTraffic runs were completed for all analysis scenarios to observe the predicted traffic operations throughout the study area during each of the peak hours. As is standard practice, ten (10) SimTraffic analysis runs were performed for each scenario to get an average. Detailed SimTraffic Queuing and Blocking reports can be found in the appendix.

In the Build AM peak hour, there is extensive queuing along southbound US 401 Business at the realigned Burlington Mills Road, extending sometimes as far back as Rogers Rd/Redford Pl. This queuing also blocks vehicles from turning right onto southbound US 401 Business from Old Burlington Mills Road causing additional queuing on Old Burlington Mills Road. The addition of the second northbound left turn lane at this intersection in the Build Improved scenario significantly improves the queuing for this approach and Old Burlington Mills Road.

It was observed in the AM peak hour that there are queues exceeding 1000 feet for the eastbound left turn from US 401 to US 401 Business. However, the signal operates at an acceptable level of service. It is expected that with the transformation of the downtown Main Street corridor, future throughput vehicles might continue on eastbound US 401 and access other destinations in Rolesville via Young Street, reducing the observed queuing issues. It should be noted that the intersection was modeled with the eastbound left turn having only a protected phase, as was done in the original study per Congestion Management Guidelines[7]. The signal in the field utilizes permitted and protected phasing for the eastbound left turn movement so there is additional capacity that is not shown in the model. Testing the model with this movement as permitted and protected reduces the maximum observed queue to less than 300 feet in both peak hours.

In the Build PM peak hour, there is significant queuing along northbound US 401 Business at the Hampton Lake Rd/Jonesville Rd and Access B/Access K intersections. The vehicles clear the intersection quickly and the queues are a result of the reduced cross-section and complete street elements as detailed in the Rolesville Main Street Vision Plan[8].

In both peak hours, it is observed that the westbound approach of the US 401 Business & Access B/Access K intersection queues back into the proposed roundabout at Virginia Water Dr & Access H intersection. According to SimTraffic, this queuing is temporary and only occurs approximately 12% of the peak hour.

A summary of the maximum queue lengths observed during the simulation is provided in Table 11 and Table 12.

Table 11: Maximum Queue Length Summary for Unsignalized

Intersection	Directional Movement	2019 Existing		2025 No Build		2025 Build		2025 Build w/ Imp	
		AM	PM	AM	PM	AM	PM	AM	PM
Jonesville Rd @ Vineyard Pine Ln	EBL	14	33	8	53	19	56	25	47
	WBTR	0	2	16	0	83	58	194	2
	SBLR	30	54	34	59	60	136	70	58
US 401 Business @ Access A	WBR	-	-	-	-	55	398	31	403
	NBR	-	-	-	-	-	-	0	200
Virginia Water Drive @ Access B/H	EBLTR	-	-	-	-	85	131	19	34
	WBLTR	-	-	-	-	42	55	5	5
	NBLTR	-	-	-	-	95	352	11	35
	SBLTR	-	-	-	-	95	361	14	29
US 401 Business @ Access L	EBR	-	-	-	-	60	250	80	243
Virginia Water Dr @ Access G	EBLTR	-	-	-	-	74	138	68	94
	WBLTR	-	-	-	-	52	100	46	58
	NBLTR	-	-	-	-	36	107	46	65
	SBLTR	-	-	-	-	28	107	33	31
Virginia Water Dr @ Access F	EBLR	-	-	-	-	64	71	54	68
	NBLT	-	-	-	-	46	48	37	54
	SBTR	-	-	-	-	2	2	5	0
Virginia Water Drive @ Access E	WBLR	-	-	-	-	58	80	61	59
	NBTR	-	-	-	-	2	33	0	0
	SBLTR	-	-	-	-	48	62	49	41
Burlington Mills Road @ Access I	WBTR	-	-	-	-	0	0	0	0
	SBR	-	-	-	-	31	44	28	33
Burlington Mills Road @ Old Burlington Mills Road	EBLT	-	-	-	-	840	99	182	81
	WBLR	-	-	155	71	-	-	-	-
	WBTR	-	-	-	-	108	11	12	2
	SBLR	-	-	-	-	1296	148	-	-
	SBLT	-	-	160	59	-	-	-	-
	SBL	-	-	-	-	-	-	75	72
	SBR	-	-	-	-	-	-	164	67
	NBTR	-	-	6	0	-	-	-	-
Old Burlington Mills Rd @ Access J	EBTR	-	-	-	-	162	0	0	0
	WBLT	-	-	-	-	968	44	33	18
	NBLR	-	-	-	-	144	100	65	93
US 401 Business @ Access C	EBR	-	-	-	-	213	204	255	141
Old Burlington Mills Rd @ Barrington Hall	EBLT	34	21	22	18	137	26	60	16
	WBTR	-	-	-	-	728	65	0	0
	WBR	0	0	0	0	-	-	-	-
	SBLR	23	23	24	23	143	36	32	32
US 401 Business @ Access D	WBR	-	-	-	-	41	58	44	66
	SBL	-	-	-	-	-	-	156	49
US 401 Business @ Access M	WBR	-	-	-	-	30	44	36	37
US 401 Business @ Old Burlington Mills Rd	EBR	-	-	149	86	626	124	442	119
	SBR	-	-	0	0	156	99	17	0

Table 12: Maximum Queue Length Summary for Signalized

Intersection	Directional Movement	2019 Existing		2025 No Build		2025 Build		2025 Build w/ Imp	
		AM	PM	AM	PM	AM	PM	AM	PM
US 401 @ US 401 Business	EBL	338	474	598	526	1095	596	1095	596
	WBT	253	150	606	203	1022	243	1059	234
	WBR	0	0	30	0	325	61	325	56
	SBT	8	14	28	4	25	40	33	9
US 401 Business @ Hampton Lake Dr / Jonesville Rd	EBL	153	87	179	101	193	122	215	108
	EBT	117	40	111	42	154	52	143	52
	EBR	213	81	210	83	244	66	208	79
	WBL	116	13	162	18	166	86	164	72
	WBTR	262	170	352	198	524	451	515	386
	NBL	155	67	296	105	425	425	425	425
	NBTR	353	372	494	439	1351	1713	824	2610
	SBL	263	147	299	299	299	300	300	285
	SBT	380	243	661	459	675	1174	669	499
	SBR	181	46	300	206	270	300	300	205
US 401 Business @ Access B/H	EBL	-	-	-	-	234	186	172	216
	EBTR	-	-	-	-	340	172	137	180
	WBL	-	-	-	-	298	518	271	356
	WBLR	-	-	-	-	690	200	199	200
	NBL	-	-	-	-	275	275	258	275
	NBT	-	-	-	-	690	1300	415	1302
	NBR	-	-	-	-	-	-	224	225
	SBL	-	-	-	-	103	382	108	339
	SBTR	-	-	-	-	129	509	195	1023
US 401 Business @ Burlington Mills Road / Virginia Water Dr	EBL	-	-	329	226	612	424	500	340
	EBT	-	-	82	40	152	117	100	95
	EBR	-	-	-	-	-	-	50	41
	WBL	-	-	34	32	77	115	72	118
	WBT	-	-	32	35	91	142	90	110
	WBR	-	-	31	37	83	129	84	103
	NBL	-	-	398	124	568	236	373	167
	NBT	-	-	337	423	915	318	490	230
	SBL	-	-	150	24	145	145	144	144
	SBT	-	-	873	380	2839	857	1219	810
	SBR	-	-	-	-	-	-	24	22
US 401 Business @ Old Burlington Mills Road	EBL	231	152	-	-	-	-	-	-
	EBR	249	147	-	-	-	-	-	-
	NBL	106	60	-	-	-	-	-	-
	NBT	194	196	-	-	-	-	-	-
	SBT	307	197	-	-	-	-	-	-
	SBR	198	97	-	-	-	-	-	-
US 401 Business @ Rogers Road / Redford Pl Dr	EBL	185	181	200	229	210	236	213	248
	EBT	70	157	152	200	276	214	195	223
	EBR	347	238	366	227	495	322	397	318
	WBL	135	122	182	144	260	185	250	210
	WBT	144	155	199	180	370	199	227	214
	WBR	135	192	185	218	228	220	205	213
	NBL	224	236	265	297	296	300	300	300
	NBTR	227	299	339	374	511	604	634	659
	SBL	187	128	274	243	275	274	275	265
	SBT	371	246	453	390	620	490	620	490
	SBR	159	101	217	104	416	185	446	141

Legend

No movement

XX Maximum queue length (feet)

8.0 RECOMMENDATIONS

Based on the findings of this study, specific improvements have been identified and should be completed as part of the proposed development. Except where noted, all intersections are recommended to operate under two-way stop control (TWSC), with the site accesses serving as the minor movement(s). These improvements are shown in Figure 8 and listed below:

US 401 Business at Access A

Construct Access A as a limited-movement intersection onto US 401 Business restricting southbound and westbound lefts. Construct a northbound right-turn lane with 100 feet of full-width storage.

US 401 Business at Access B/Access K

Construct Access B and Access K as a full-movement signalized intersection onto US 401 Business with an exclusive northbound left-turn lane with 175 feet of storage and appropriate taper, and a northbound right-turn lane with 125 feet of full-width storage and appropriate taper. Construct an exclusive southbound left-turn lane with 350 feet of full-width storage and appropriate taper on US 401 Business. Construct eastbound egress with an exclusive left-turn lane with 225 feet of storage and appropriate taper. Construct westbound egress with an exclusive left-turn lane with full storage and an exclusive shared through & right-turn lane with 100 feet of full-width storage.

US 401 Business at Access L

Construct Access L as a limited-movement intersection onto US 401 Business restricting northbound and eastbound lefts.

US 401 Business at Access C

Construct Access C as a limited-movement intersection on to US 401 Business restricting northbound and eastbound left-turns.

US 401 Business at Access D

Construct Access D as a limited-movement intersection on to US 401 Business allowing all movements but a westbound left. Construct an exclusive southbound left-turn lane with 100 feet of full-width storage and appropriate taper.

US 401 Business at Access M

Construct Access M as a limited-movement intersection on to US 401 Business restricting southbound and westbound left-turns.

Burlington Mills Road at Access E

Construct Access E as a full-movement intersection on Burlington Mills Road.

Burlington Mills Road at Access F

Construct Access F as a full-movement intersection on Burlington Mills Road.

Burlington Mills Road at Access G

Construct Access G as a full-movement intersection on Burlington Mills Road.

Burlington Mills Road at Access H

Construct Access H as single-lane roundabout on Burlington Mills Road.

Burlington Mills Road at Access I

Construct Access I as a limited-movement intersection on to Burlington Mills Road restricting eastbound and southbound left-turns. Construct a westbound exclusive right-turn lane that is continuous from receiving the second northbound left-turn lane at US 401 Business and Burlington Mills Road.

Old Burlington Mills Road at Access J

Construct Access J as a full-movement intersection on Old Burlington Mills Road.

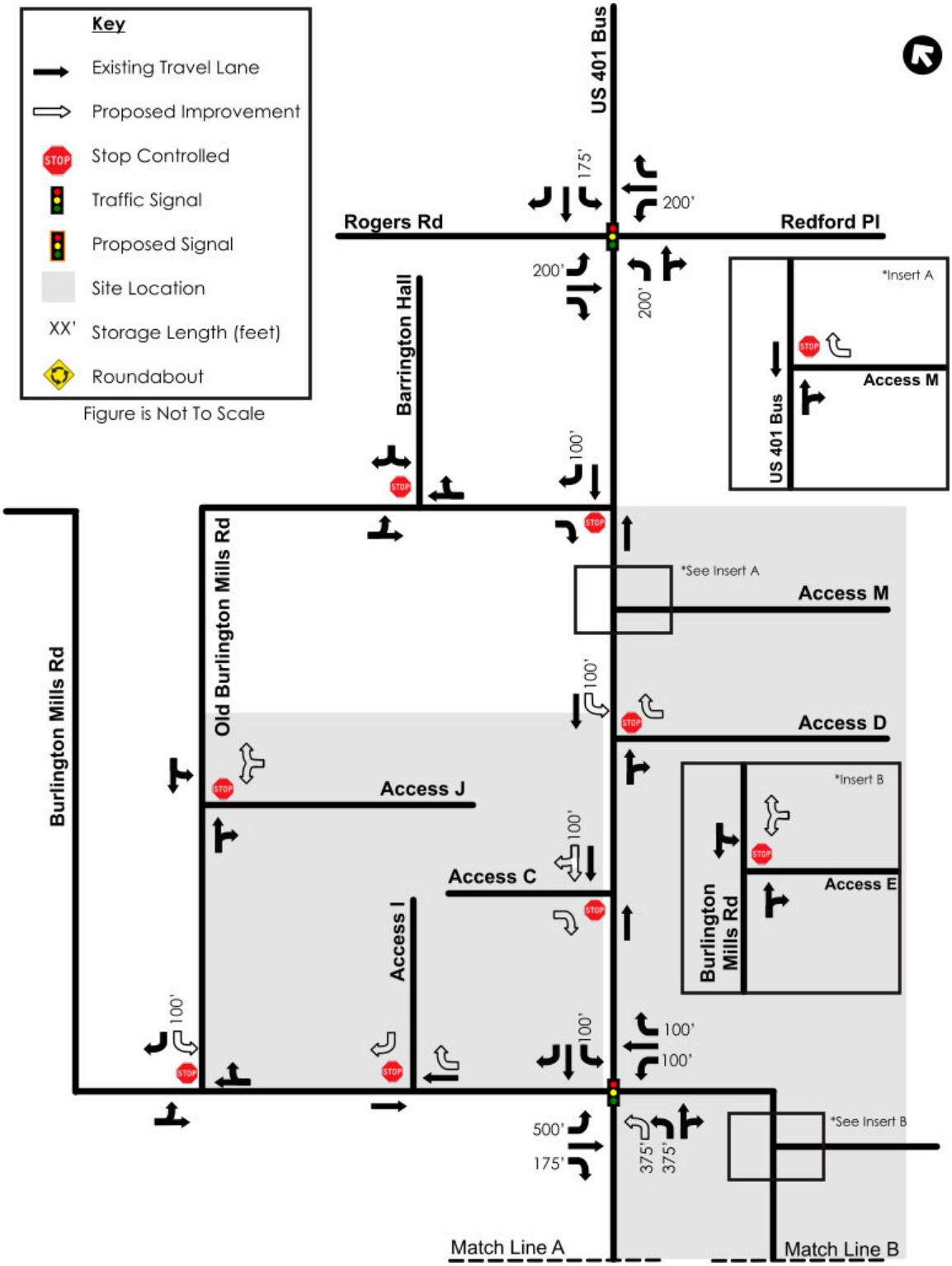
Burlington Mills Road at Old Burlington Mills Road

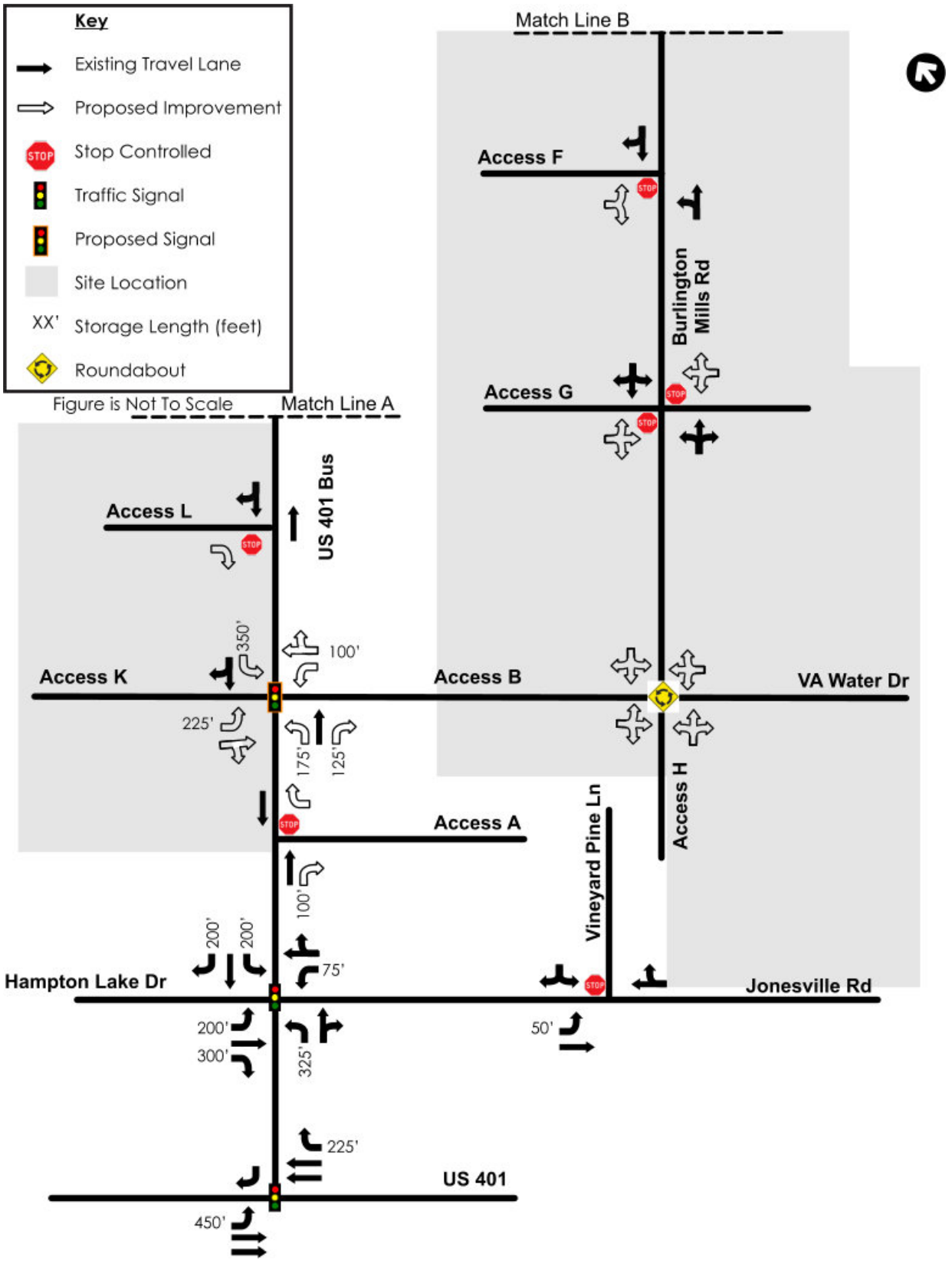
Construct an exclusive southbound left-turn lane with 100 feet of full-width storage and appropriate taper.

US 401 Business at Burlington Mills Road Realigned

Construct dual northbound exclusive left-turn lanes with 375 feet of full-width storage and appropriate taper. Construct an exclusive westbound left-turn lane and an exclusive westbound right-turn lane, both with 100 feet of full-width storage and appropriate taper. Construct an exclusive eastbound left-turn lane with 500 feet of full-width storage and appropriate taper and an exclusive eastbound right-turn lane with 175 feet of full-width storage and appropriate taper. Construct an exclusive southbound left-turn lane with 100 feet of full-width storage and appropriate taper and an exclusive southbound right-turn lane with at least 250 feet of full-width storage and appropriate taper. The southbound right-turn lane should start at least 100 feet prior to the US 401 Business at Access C intersection.

Figure 8: Build Recommended Lane Configurations




Key
Existing Travel Lane
Proposed Improvement
Stop Controlled
Traffic Signal
Proposed Signal
Site Location
XX' Storage Length (feet)
Roundabout
Figure is Not To Scale
Match Line A
Match Line B
Access F
Access G
Burlington Mills Rd
Access L
US 401 Bus
Access K
Access B
VA Water Dr
Access A
Access H
Vineyard Pine Ln
Hampton Lake Dr
Jonesville Rd
US 401
350'
100'
225'
175'
125'
100'
200'
200'
75'
200'
300'
325'
50'
225'
450'

9.0 CONCLUSIONS

The study shows that the traffic generated by the proposed Wallbrook Development will have a minimal impact on surrounding roadways and intersections with the recommended improvements included to mitigate the site traffic. The signalized intersections operate at an overall LOS of D or better during both peak hours. Approaches for the unsignalized intersections operate at LOS D or better except for the eastbound approach at US 401 Business and Old Burlington Mills Road which operates at LOS E in the AM peak hour.

10.0 REFERENCES

[1] ***NCDOT Functional Classification Map***,
http://ncdot.maps.arcgis.com/home/webmap/viewer.html?layers=029a9a9fe26e43d687d30cd3c08b1792

[2] ***2017 NCDOT Average Daily Traffic Volumes***,
https://ncdot.maps.arcgis.com/home/webmap/viewer.html?webmap=b7a26d6d8abd419f8c27f58a607b25a1

[3] ***Trip Generation (10th Edition)***, Institute of Transportation Engineers (ITE), September 2017.

[4] ***NCHRP Report 684: Enhancing Internal Trip Capture Estimation for Mixed-Use Developments***. Washington, D.C.: Transportation Research Board, 20151.

[5] ***HCM 2010: Highway Capacity Manual***. Washington D.C.: Transportation Research Board, 2010.

[6] ***Designing Walkable Urban Thoroughfares: A Context Sensitive Approach***. Institute of Transportation Engineers (ITE), 2010.

[7] ***NCDOT Congestion Management Capacity Analysis Guidelines***. North Carolina Department of Transportation (NCDOT), July 2015,
https://connect.ncdot.gov/resources/safety/Congestion%20Mngmt%20and%20Signing/Congestion%20Management/Capacity%20Analysis%20Guidelines.pdf

[8] ***Rolesville Main Street Vision Plan***. Town of Rolesville et al.,
https://www.rolesvillenc.gov/sites/default/files/uploads/planning/mainstreetvisionplan.pdf

APPENDIX

A link containing all relevant files is electronically sent with this report:

- Traffic Signal Plans
- Site Plan
- NCDOT Scoping Checklist
- Raw Traffic Count Data
- Synchro Files
- SimTraffic Reports
- Approved Development Traffic Information

Figure 9: Approved Development Trips

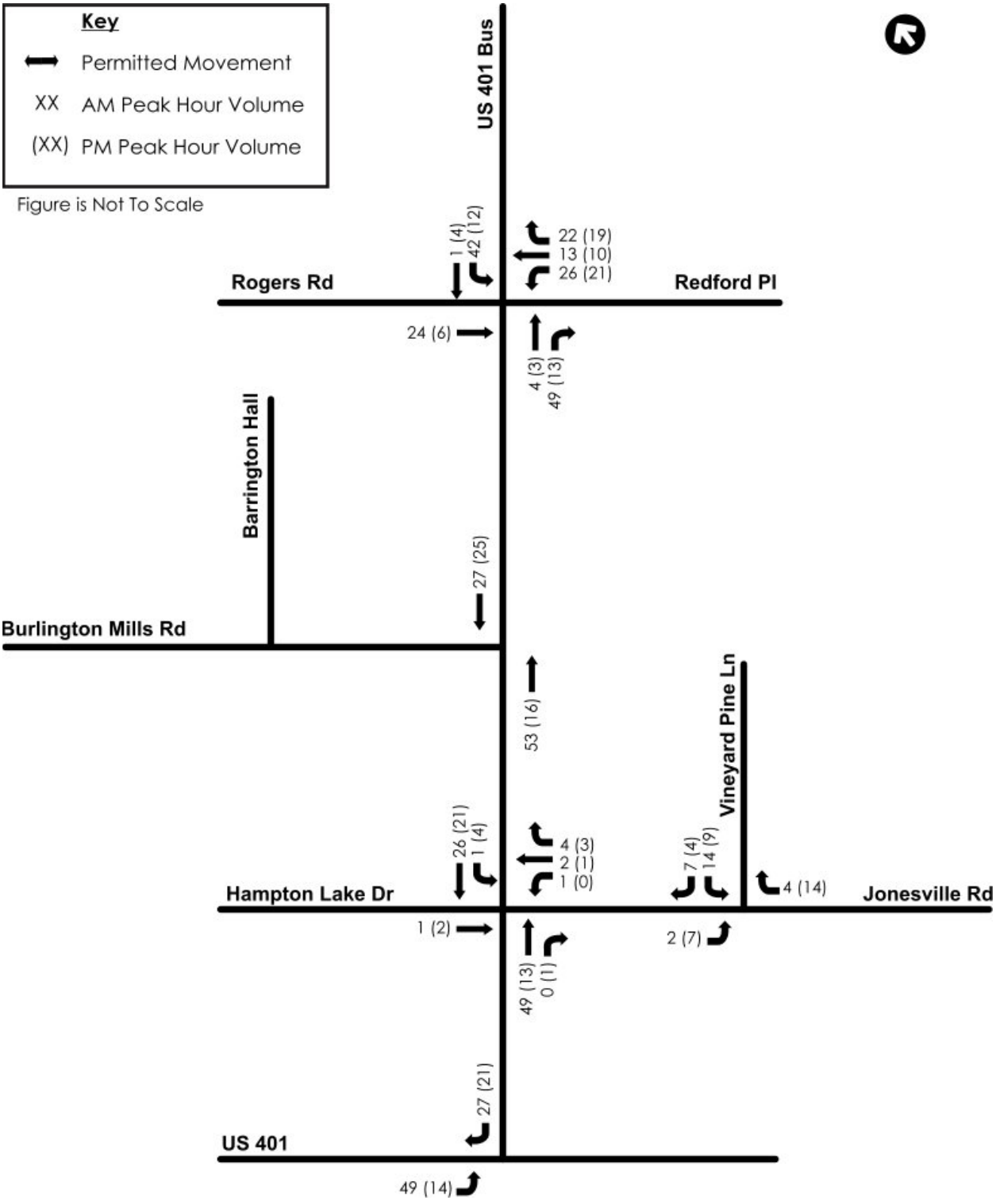
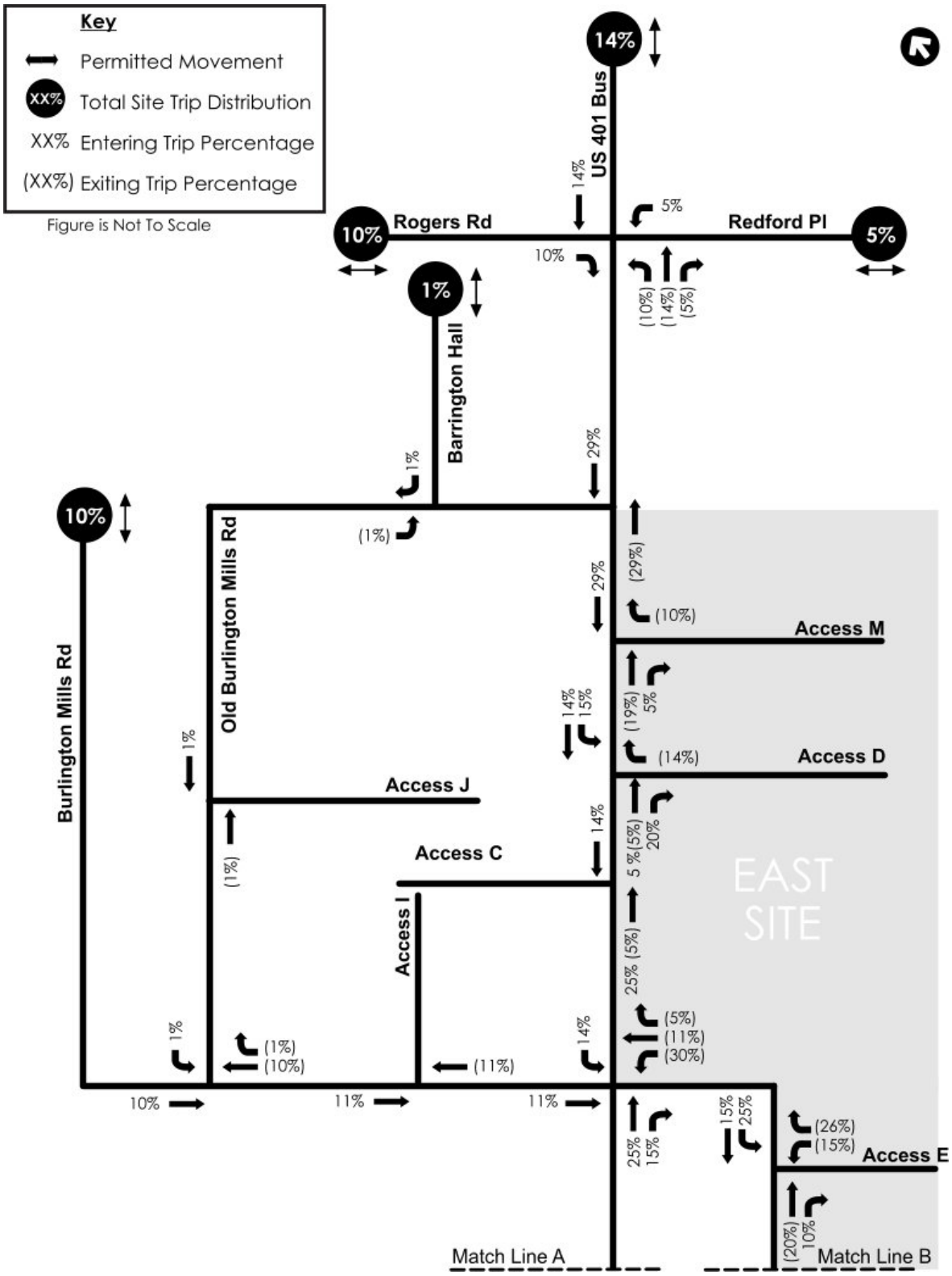


Figure 10: East Trip Distribution



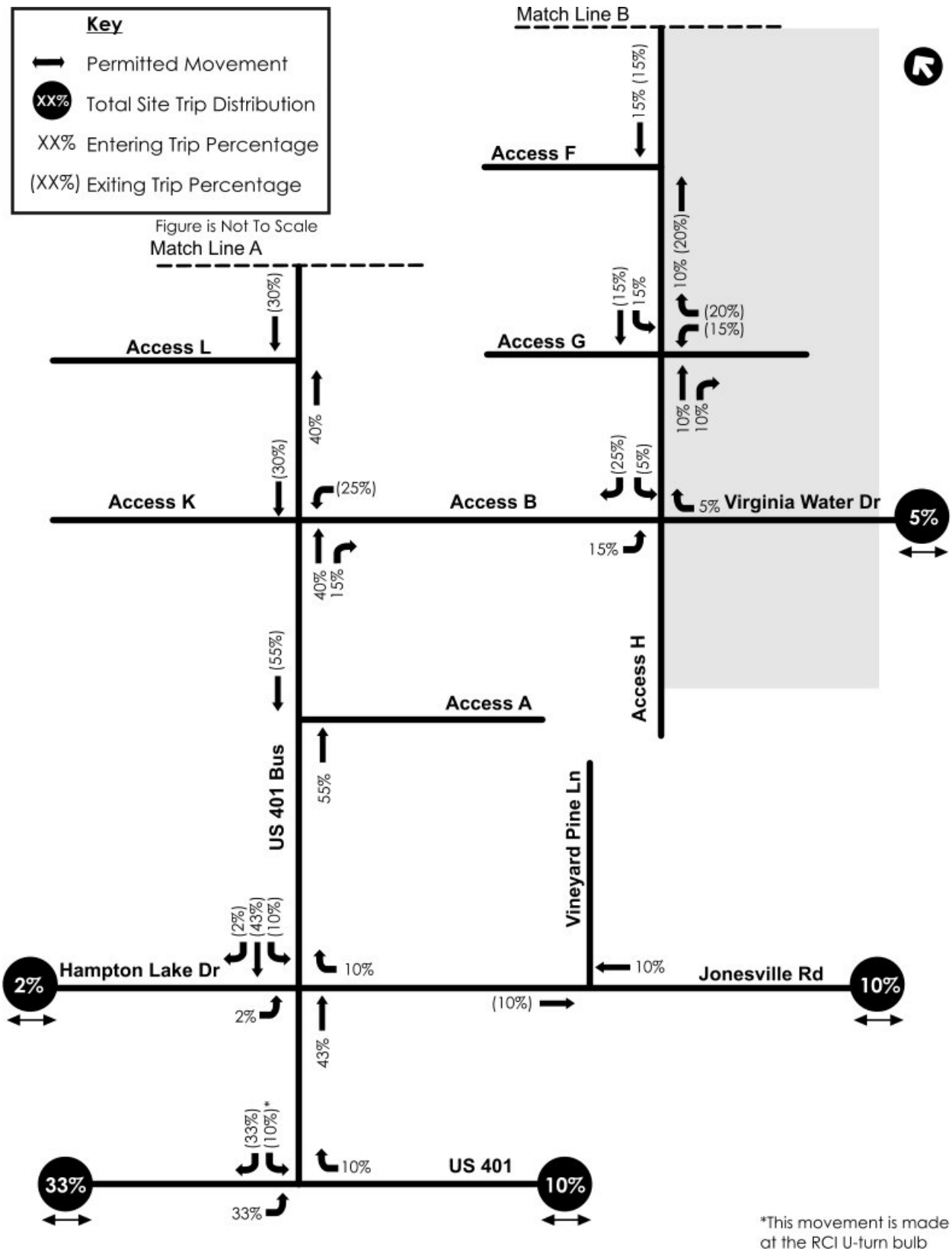
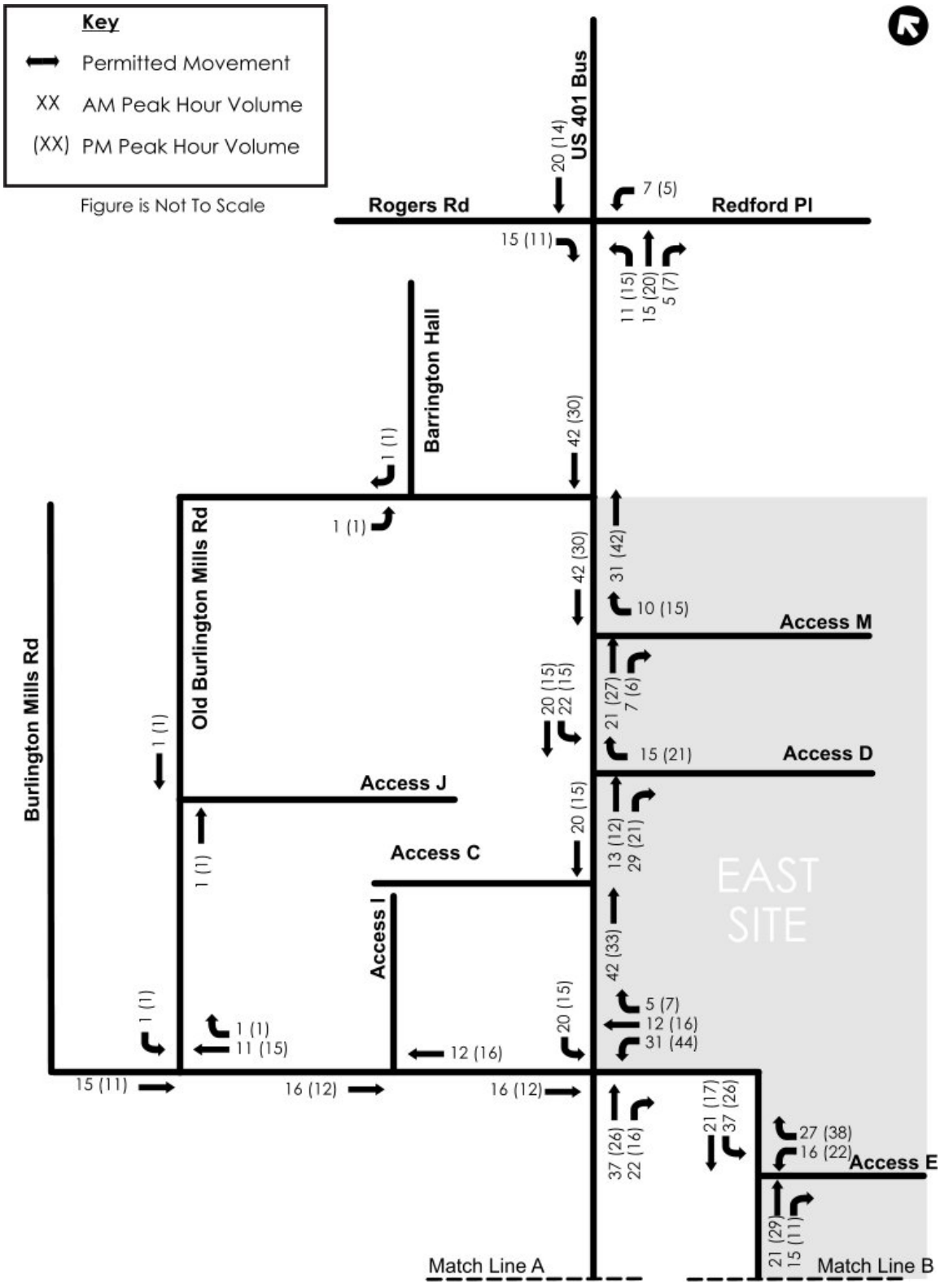

Key
Permitted Movement
XX% Total Site Trip Distribution
XX% Entering Trip Percentage
(XX%) Exiting Trip Percentage
Figure is Not To Scale
Match Line A
Match Line B
Access L
Access K
Access F
Access G
Access B
Access A
Access H
US 401 Bus
Vineyard Pine Ln
Hampton Lake Dr
Jonesville Rd
US 401
Virginia Water Dr
2%
10%
33%
5%
(30%)
40%
(25%)
(55%)
55%
15% (15%)
10% (20%)
(20%)
(15%)
15%
(5%)
10%
(2%)
(43%)
(33%)
(10%)*
*This movement is made at the RCI U-turn bulb

Figure 11: East Site Trip Assignment



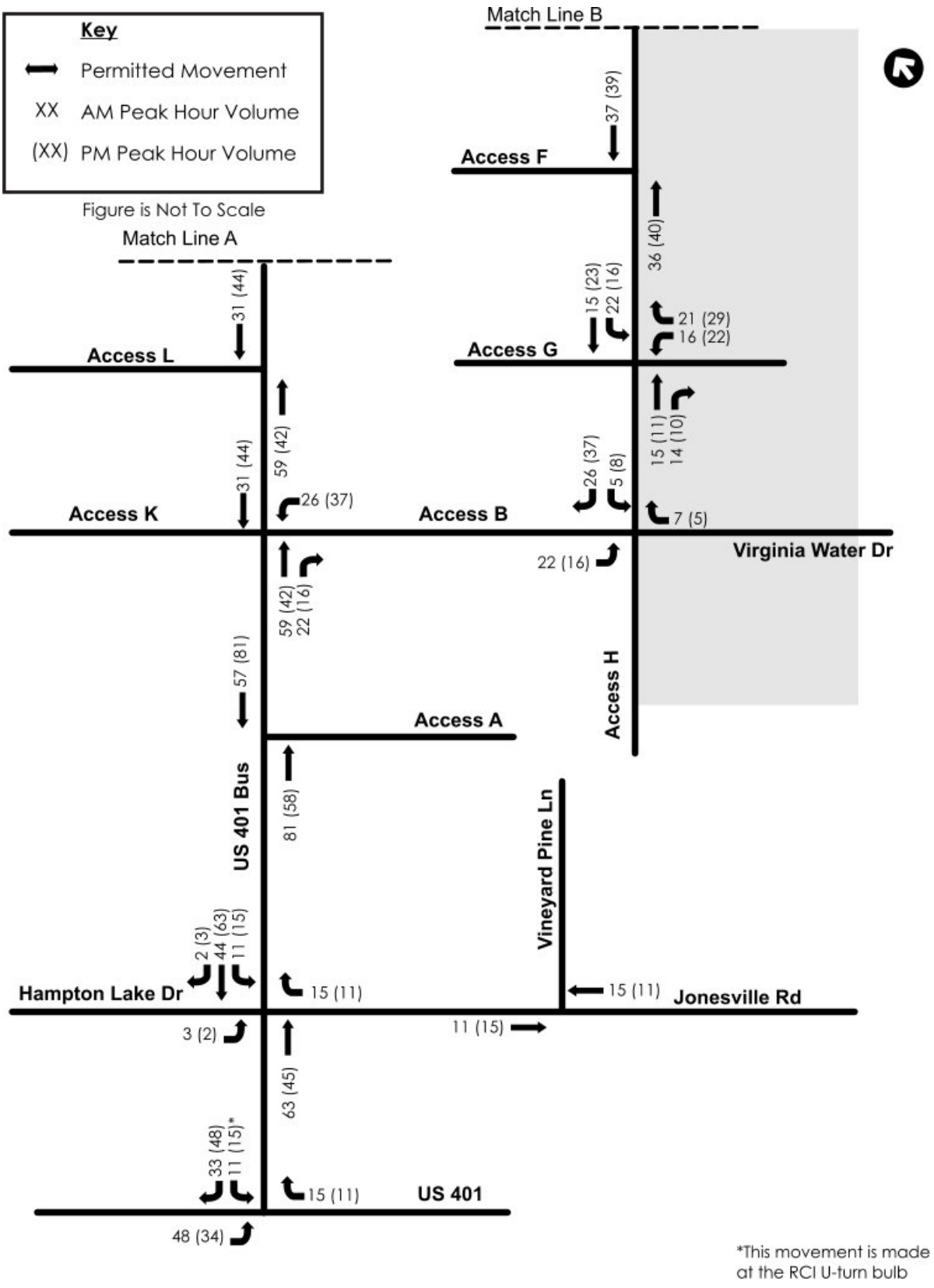
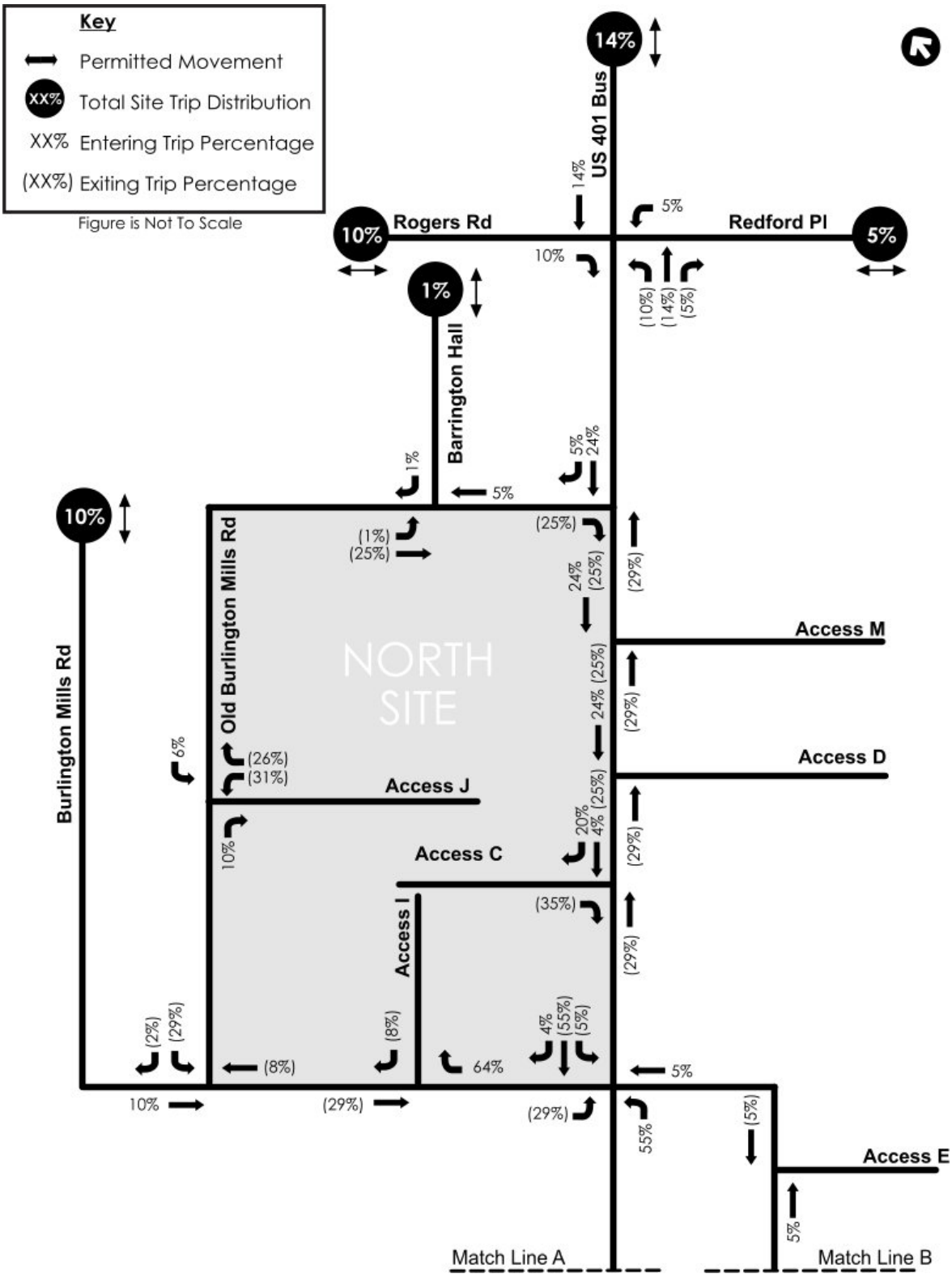

Key
Permitted Movement
XX AM Peak Hour Volume
(XX) PM Peak Hour Volume
Figure is Not To Scale
Match Line A
Match Line B
Access L
Access K
Access F
Access G
Access B
Access A
Access H
Virginia Water Dr
US 401 Bus
Vineyard Pine Ln
Hampton Lake Dr
Jonesville Rd
US 401
31 (44)
59 (42)
26 (37)
57 (81)
81 (58)
2 (3)
44 (63)
11 (15)
15 (11)
3 (2)
63 (45)
33 (48)
11 (15)*
48 (34)
37 (39)
36 (40)
15 (23)
22 (16)
21 (29)
16 (22)
26 (37)
5 (8)
15 (11)
14 (10)
7 (5)
22 (16)
59 (42)
22 (16)
15 (11)
11 (15)
*This movement is made at the RCI U-turn bulb

Figure 12: North Site Trip Distribution



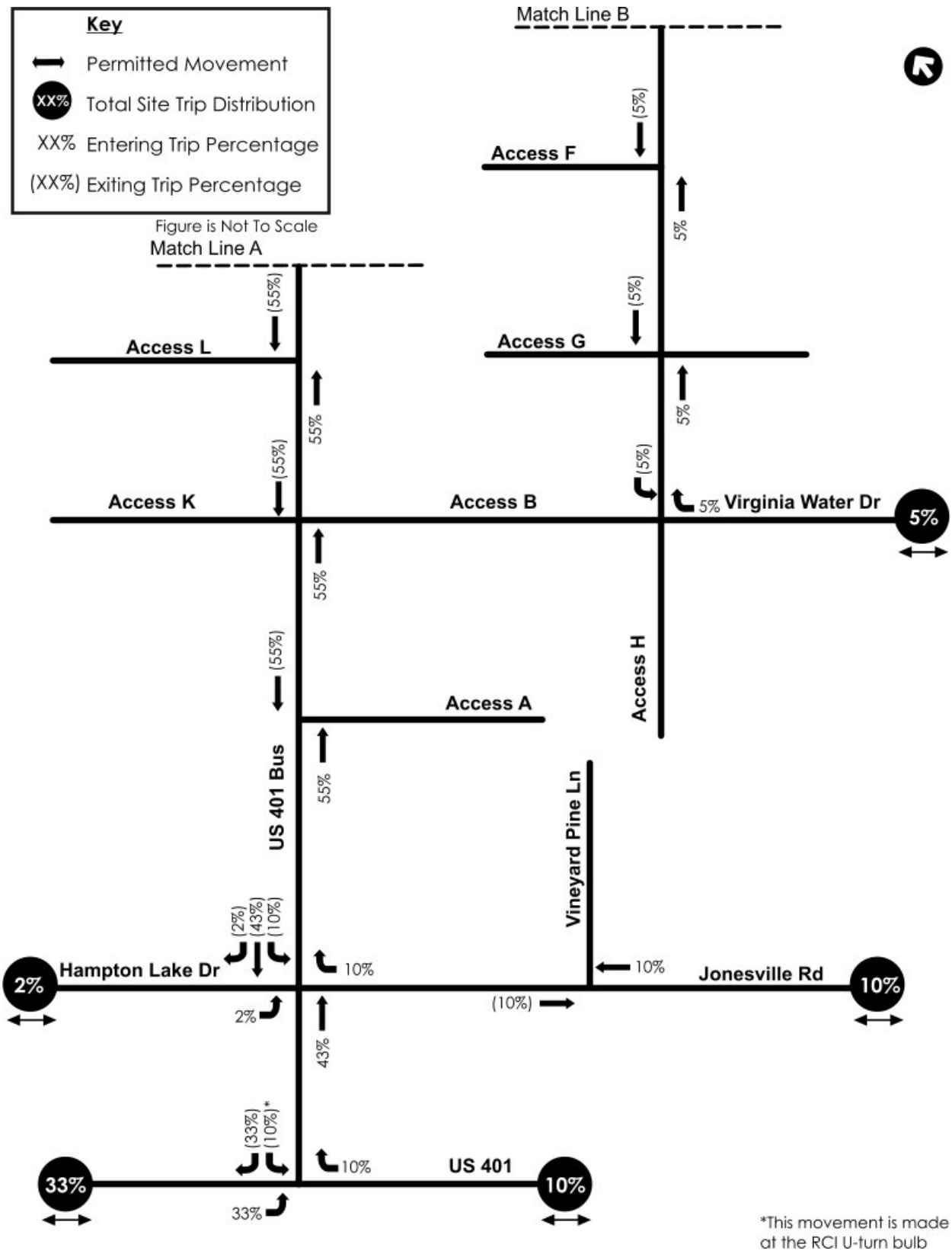
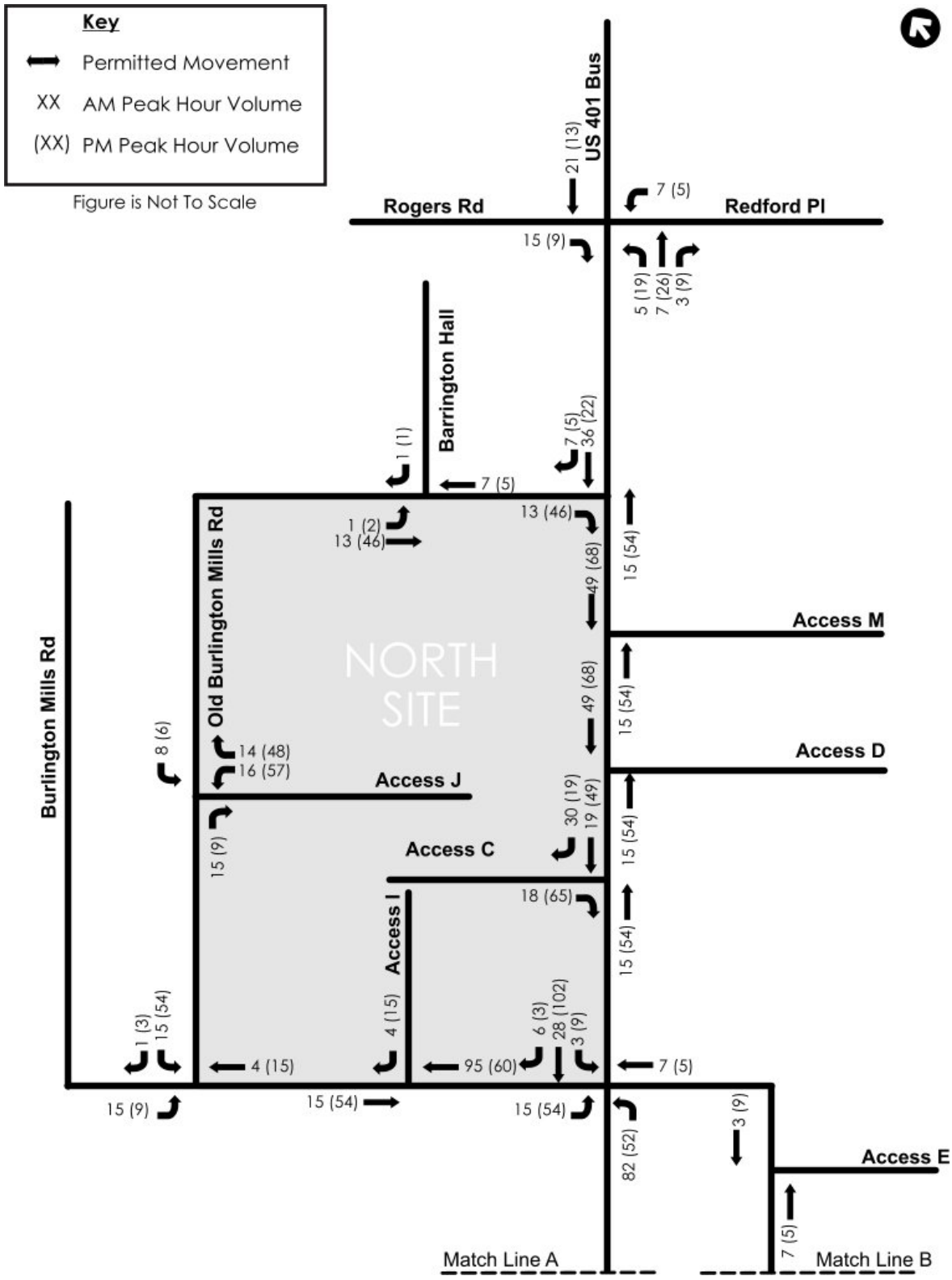

Key
Permitted Movement
XX% Total Site Trip Distribution
XX% Entering Trip Percentage
(XX%) Exiting Trip Percentage
Figure is Not To Scale
Match Line A
Match Line B
Access L
Access K
Access B
Access F
Access G
Access H
Access A
US 401 Bus
Vineyard Pine Ln
Hampton Lake Dr
Jonesville Rd
US 401
Virginia Water Dr
2%
10%
33%
5%
*This movement is made at the RCI U-turn bulb

Figure 13: North Site Trip Assignment



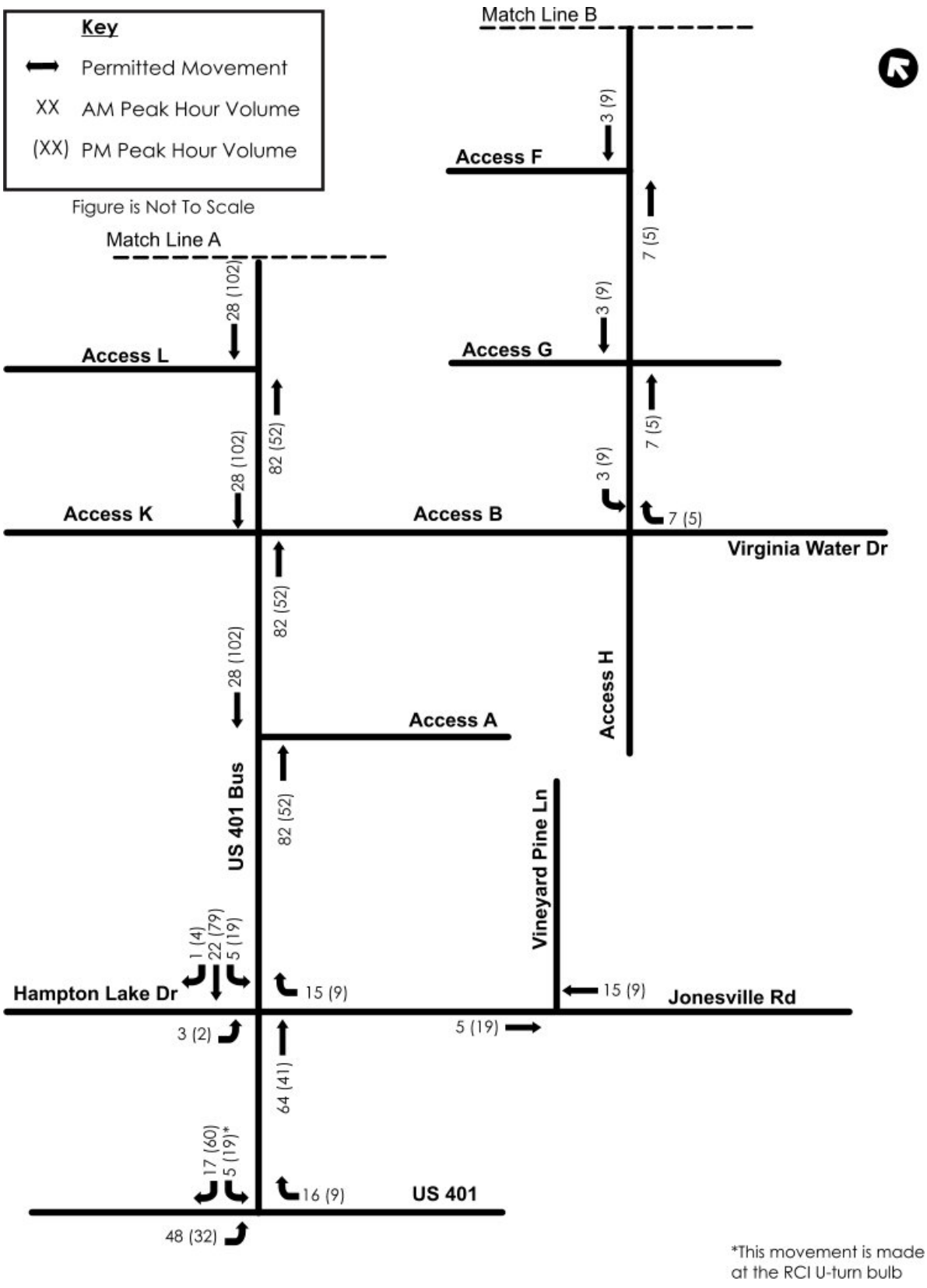
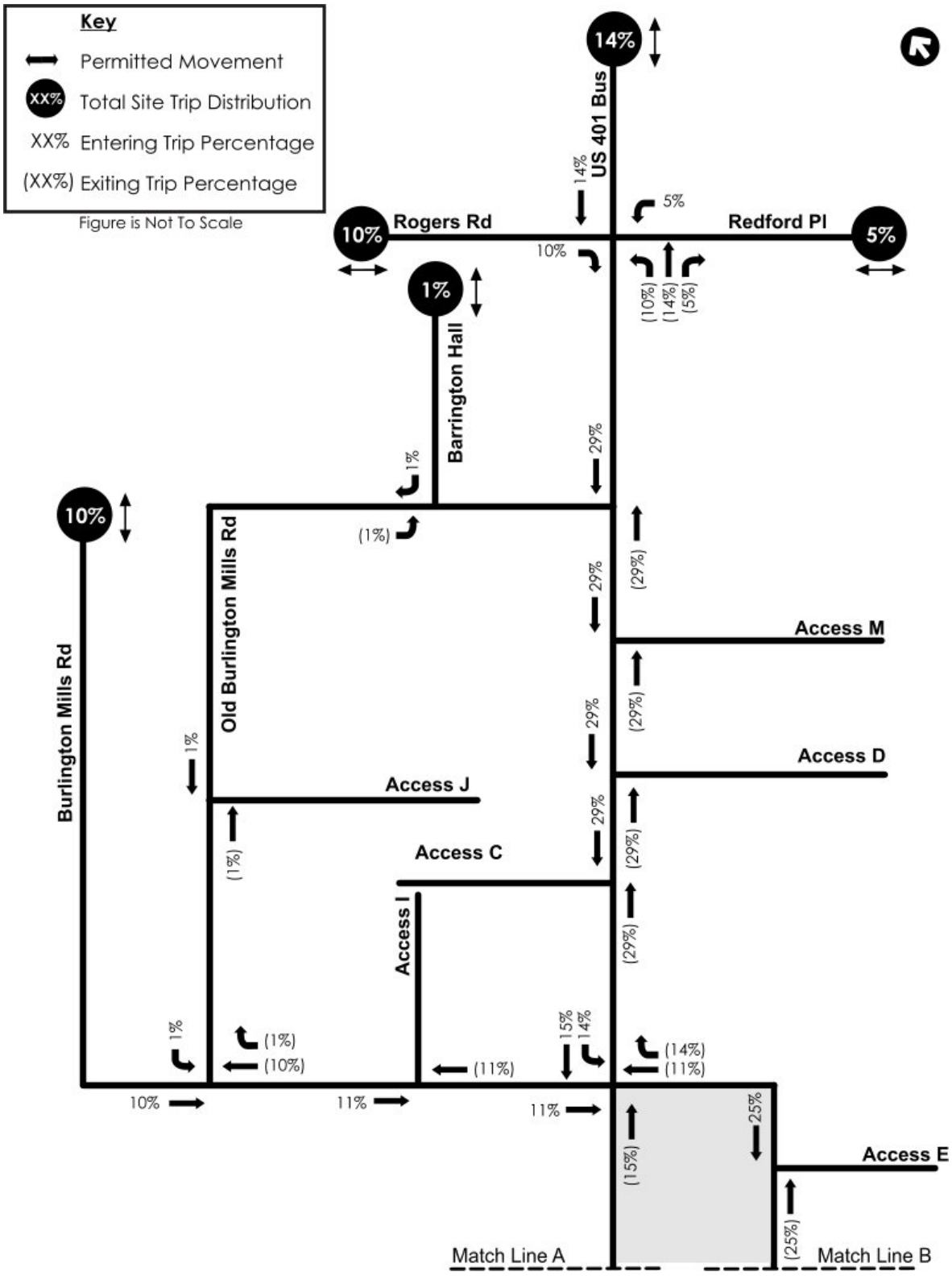

Key
Permitted Movement
XX AM Peak Hour Volume
(XX) PM Peak Hour Volume
Figure is Not To Scale
Match Line A
Match Line B
Access L
Access K
Access F
Access G
Access B
Access A
Access H
Virginia Water Dr
US 401 Bus
Vineyard Pine Ln
Hampton Lake Dr
Jonesville Rd
US 401
28 (102)
82 (52)
3 (9)
7 (5)
1 (4)
22 (79)
5 (19)
15 (9)
3 (2)
5 (19)
64 (41)
17 (60)
5 (19)*
16 (9)
48 (32)
*This movement is made at the RCI U-turn bulb

Figure 14: South Site Trip Distribution



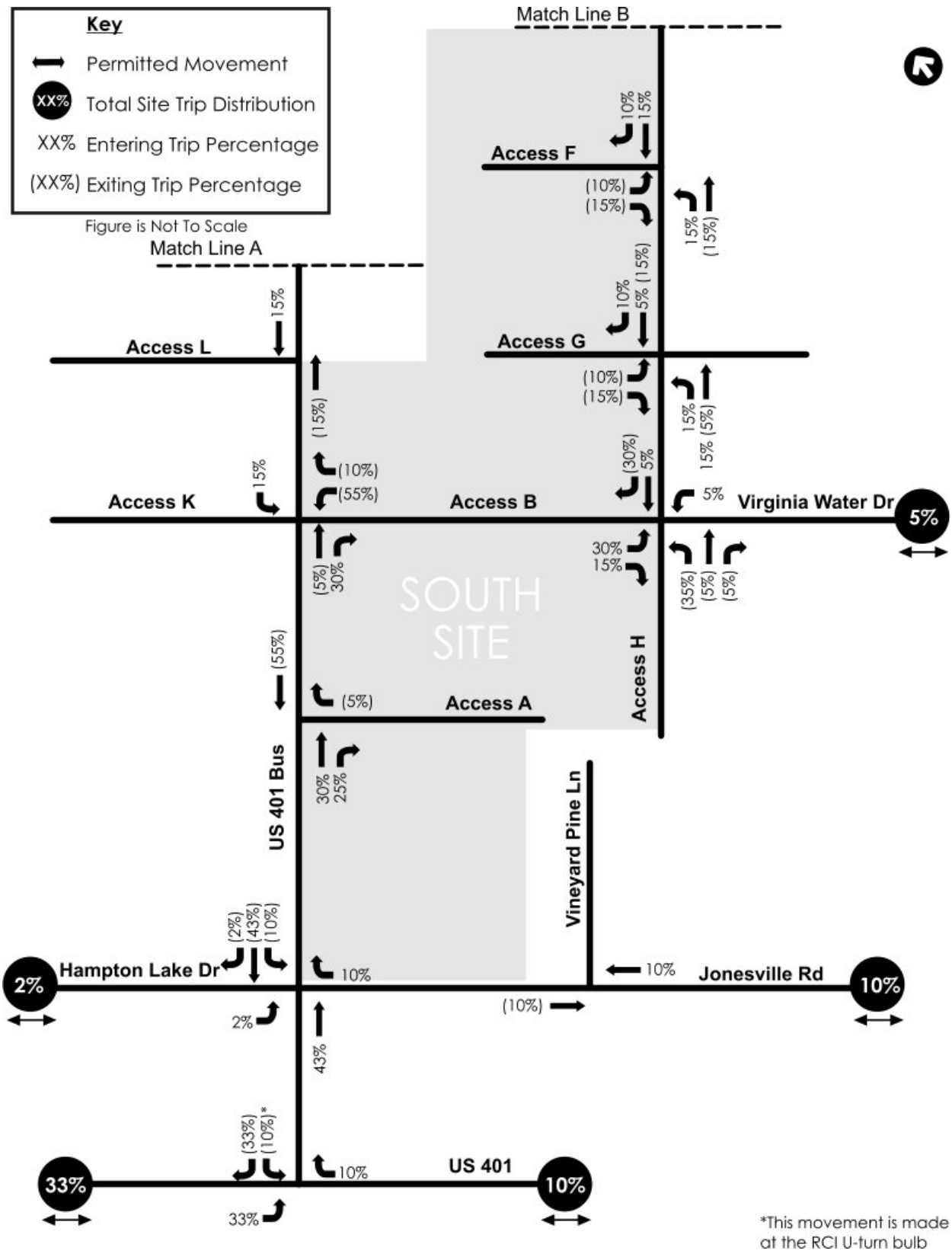
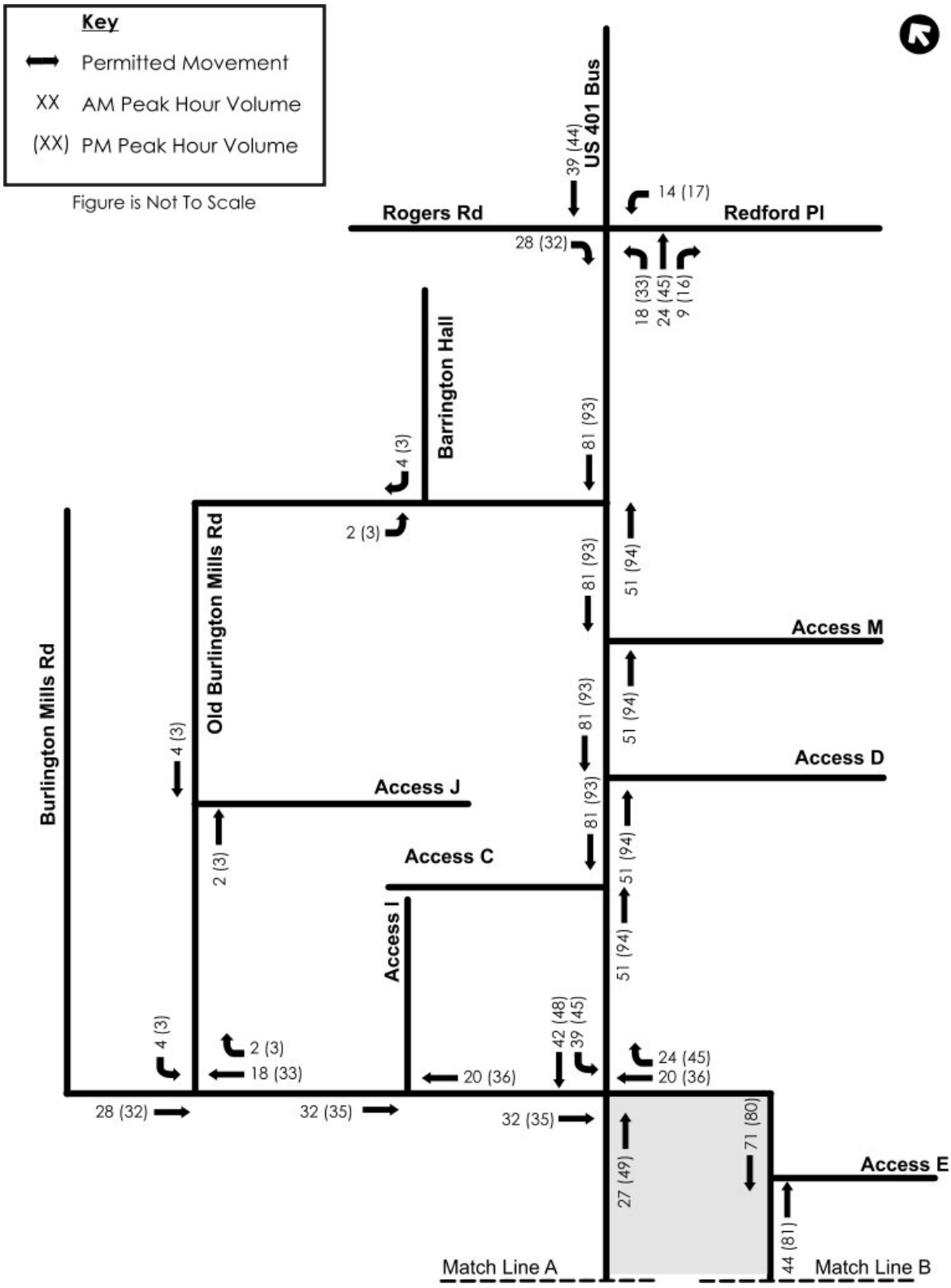

Key
Permitted Movement
XX% Total Site Trip Distribution
XX% Entering Trip Percentage
(XX%) Exiting Trip Percentage
Figure is Not To Scale
Match Line A
Match Line B
Access F
Access G
Access L
Access K
Access B
Access A
Access H
SOUTH SITE
US 401 Bus
Vineyard Pine Ln
Virginia Water Dr
Hampton Lake Dr
Jonesville Rd
US 401
5%
2%
10%
33%
10%
*This movement is made at the RCI U-turn bulb

Figure 155: South Site Trip Assignment



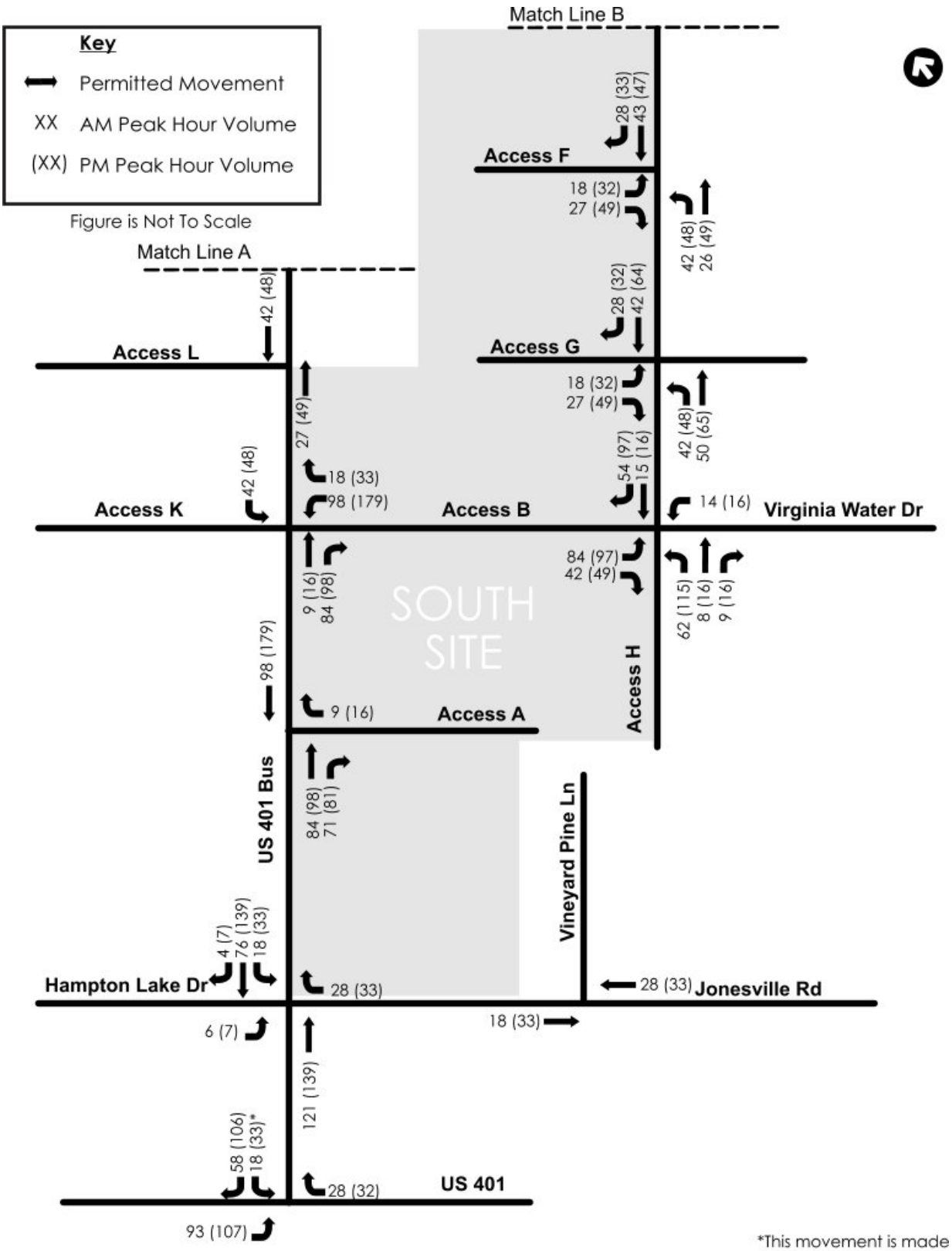
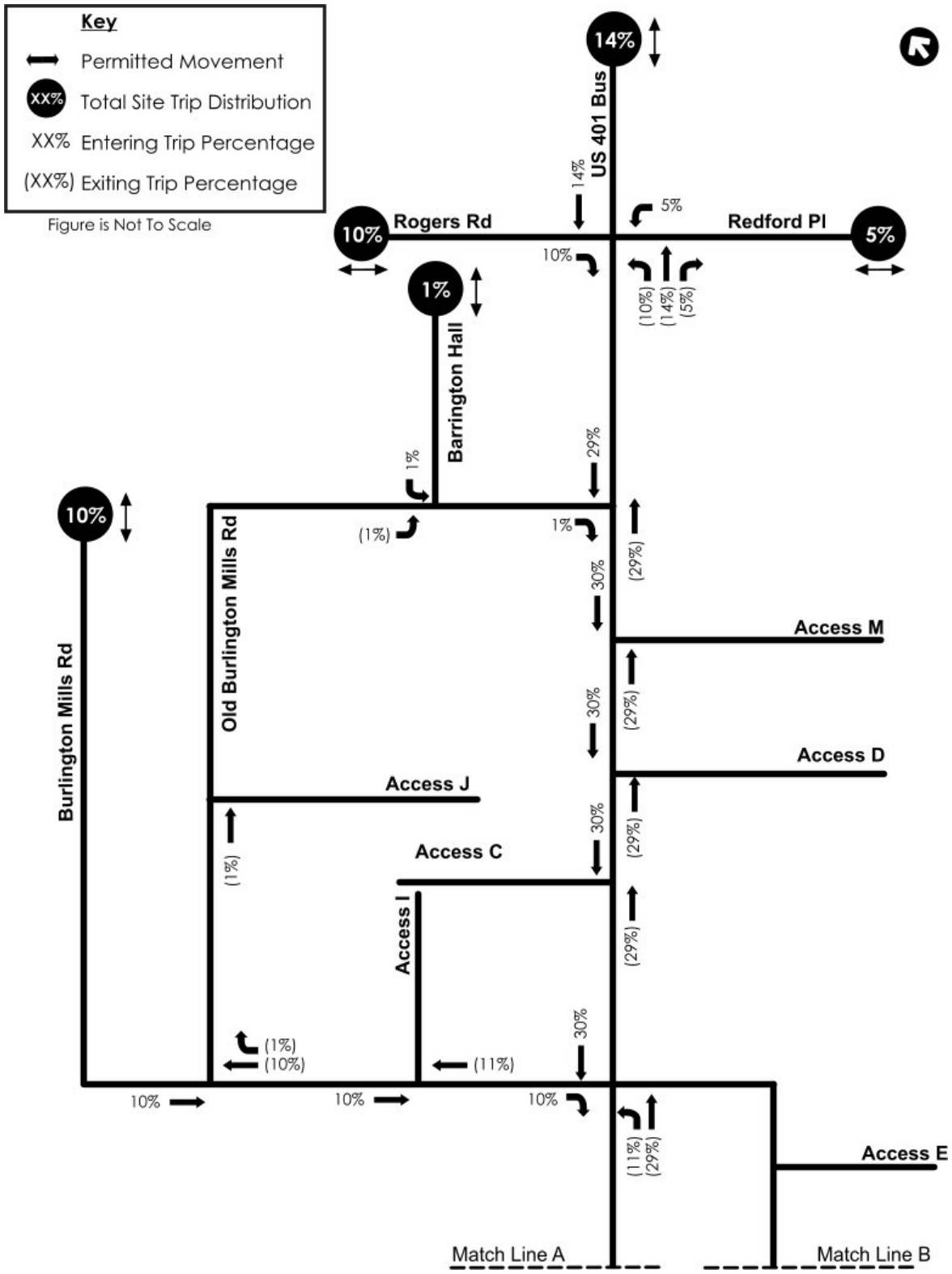

Key
Permitted Movement
XX AM Peak Hour Volume
(XX) PM Peak Hour Volume
Figure is Not To Scale
Match Line A
Match Line B
Access L
Access K
Access F
Access G
Access B
Access A
Access H
Virginia Water Dr
US 401 Bus
Vineyard Pine Ln
Hampton Lake Dr
Jonesville Rd
US 401
SOUTH SITE
42 (48)
27 (49)
18 (33)
98 (179)
9 (16)
84 (98)
71 (81)
4 (7)
76 (139)
18 (33)
6 (7)
121 (139)
58 (106)
18 (33)*
93 (107)
28 (33)
43 (47)
18 (32)
27 (49)
42 (48)
26 (49)
28 (32)
42 (64)
54 (97)
15 (16)
50 (65)
14 (16)
84 (97)
42 (49)
62 (115)
8 (16)
9 (16)
28 (32)
*This movement is made at the RCI U-turn bulb

Figure 16: West Site Trip Distribution



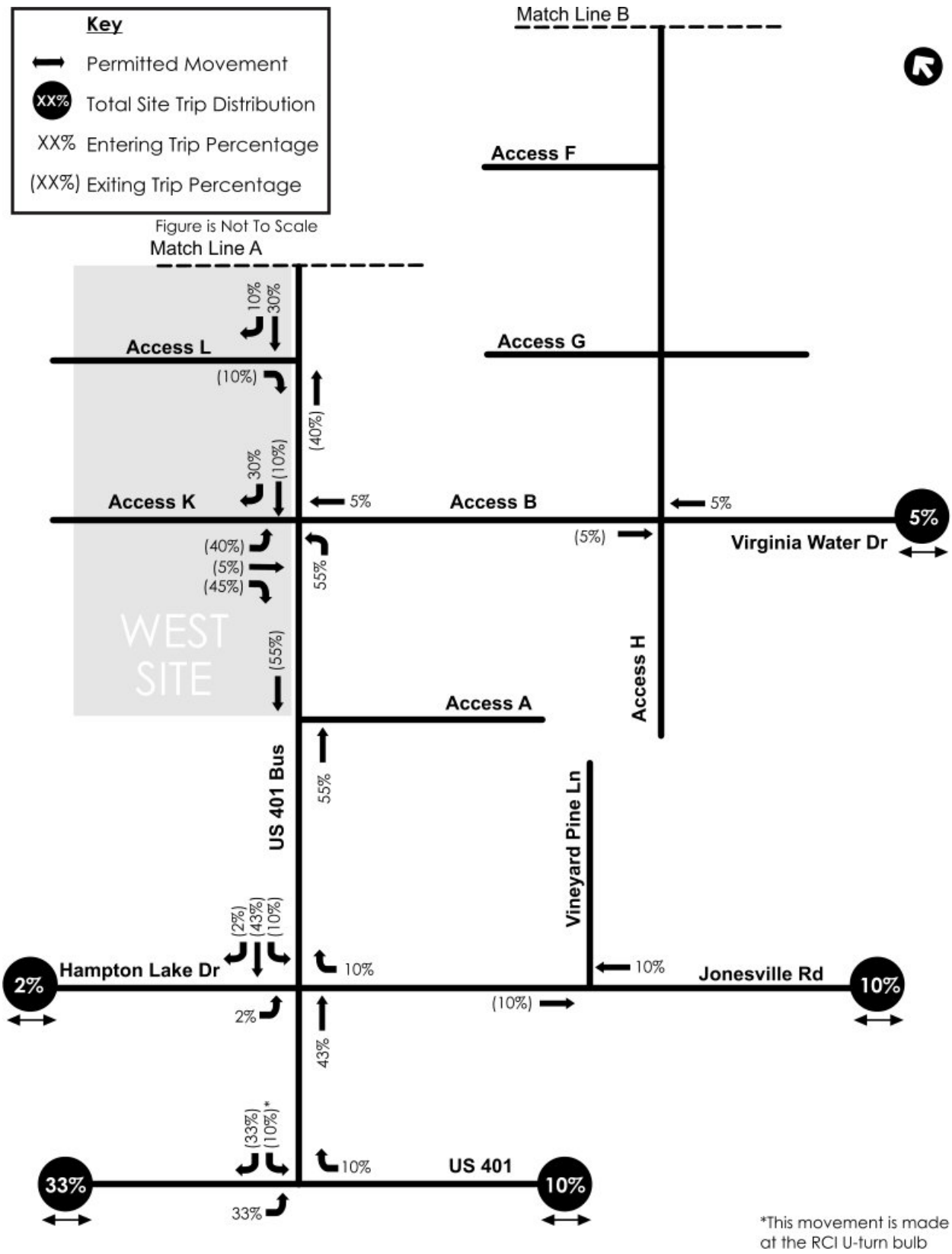
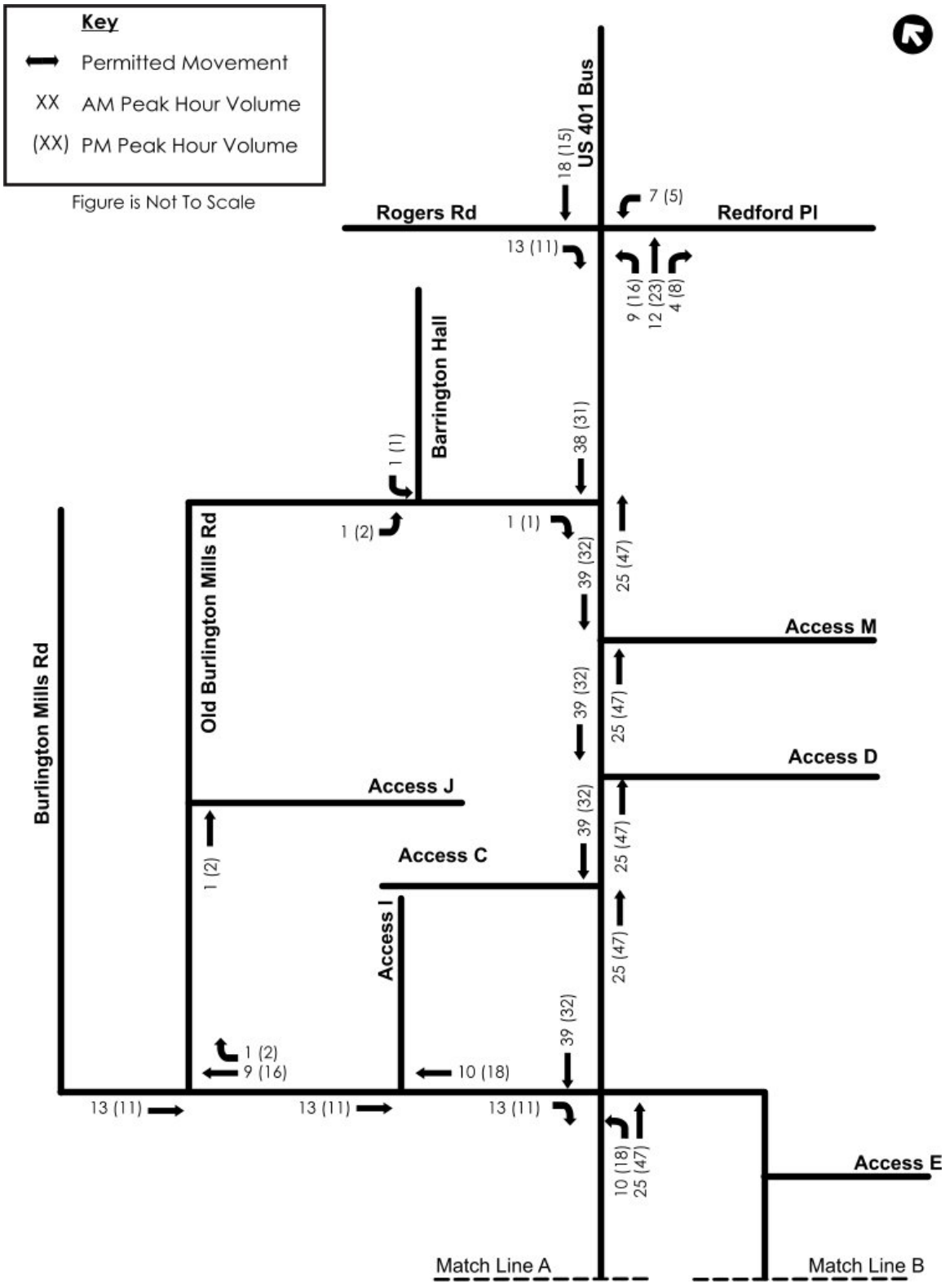

Key
Permitted Movement
XX% Total Site Trip Distribution
XX% Entering Trip Percentage
(XX%) Exiting Trip Percentage
Figure is Not To Scale
Match Line A
Match Line B
Access F
Access G
Access L
Access K
Access B
Access A
Access H
US 401 Bus
Vineyard Pine Ln
Virginia Water Dr
Hampton Lake Dr
Jonesville Rd
US 401
WEST SITE
10%
30%
(10%)
(40%)
5%
55%
(5%)
(45%)
(55%)
(2%)
(43%)
2%
43%
(33%)
(10%)*
33%
*This movement is made at the RCI U-turn bulb

Figure 17: West Site Trip Assignment



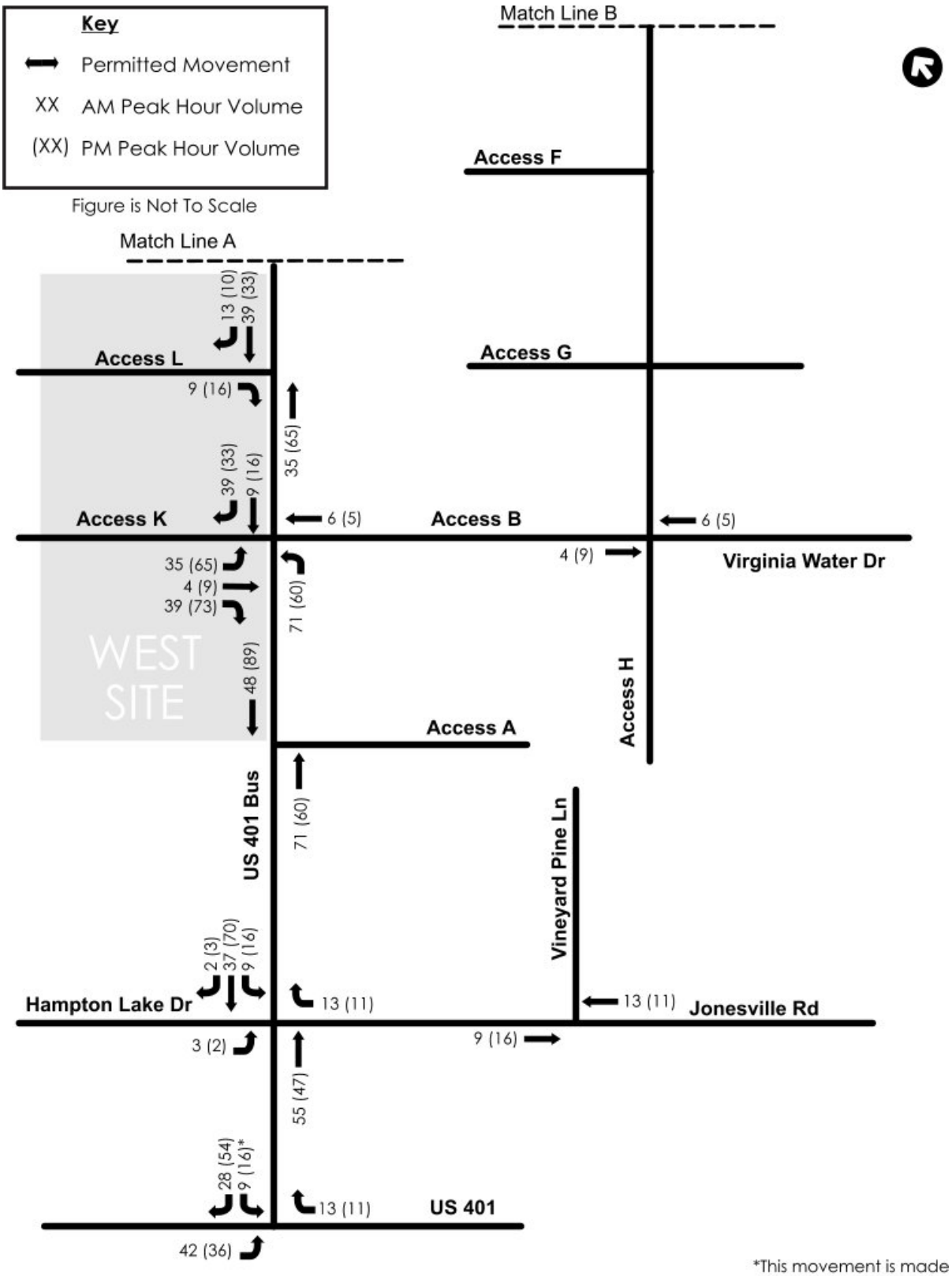

Key
Permitted Movement
XX AM Peak Hour Volume
(XX) PM Peak Hour Volume
Figure is Not To Scale
Match Line A
Match Line B
Access L
Access K
Access F
Access G
Access B
Access A
Access H
Virginia Water Dr
Jonesville Rd
Hampton Lake Dr
US 401 Bus
Vineyard Pine Ln
US 401
WEST SITE
13 (10)
39 (33)
9 (16)
35 (65)
39 (33)
9 (16)
6 (5)
6 (5)
4 (9)
35 (65)
4 (9)
39 (73)
71 (60)
48 (89)
71 (60)
2 (3)
37 (70)
9 (16)
13 (11)
13 (11)
9 (16)
3 (2)
55 (47)
28 (54)
9 (16)*
13 (11)
42 (36)
*This movement is made at the RCI U-turn bulb

Figure 168: Pass-By Trips